TOME X. 1937. No. 1/2

U. S. Department of Agriculture

INTERNATIONAL REVIEW OF POULTRY SCIENCE

OFFICIAL ORGAN OF THE

WORLD'S POULTRY SCIENCE ASSOCIATION

EDITOR:
Dr. B. J. C. TE HENNEPE
ROTTERDAM (Holland)

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Published by: Fritz Pfenningstorff, Berlin W 57

Berlin, 1 July 1937.

On January 1st 1937 I commenced work in my function of President of the World's Poultry Science Association, in accordance with my appointment at Leipzig during the VIth World's Poultry Congress.

This honourable appointment will encourage me to use all my power and all the means at my disposal to make the work of the W. P. S. A. a success.

The W. P. S. A. is a chain that links together the scientists and men of practice of all countries in the world in the sphere of poultry science and poultry breeding. It will be my special aim to unite the various links of this chain more closely in order to maintain and forster the present prosperous collaboration between all the nations and persons concerned.

Under my presidency it will also be regarded as an agreable duty of the W. P. S. A. to support the VIIth World's Poultry Congress in the United States, and to appeal to all members for unstinted participation in the Congress in order to make it still more successful than any previous World's Poultry Congresses.

K. VETTER.

Bologna, 1 July, 1936.

On December 31st of last year I consigned my task of President of the World's Poultry Science Association to my successor Mr. Karl Vetter, Germany. I now take this opportunity to send all the members of the Association my farewell-greetings and my heartiest thanks.

The triennium of my Presidency was full of satisfaction and of pleasure to me, thanks to the most valuable assistance given me by all members, either by active cooperation or by the interest shown by the fact of their membership of the W. P. S. A.

The World's Poultry Congress at Berlin-Leipzig, the sixth in the series, which was held during my presidency, was universally considered a great success; this has been confirmed by all the participators who have spoken with me personally, by all the poultry reviews, by the newspapers and by the numerous letters which I received when I resigned the presidency. I am quite conscious that neither the work of a single person nor that of several would have been sufficient to assure the great success of this Congress, and that is was only the assiduous, indefatigable and untiring cooperation of all those interested in poultry-keeping, and the perfect harmony among all those belonging to the great army of poultrymen all over the world, which made success a certainty.

Moreover the success of this Congress is specially due the enthusiastic devotion of three persons to their task, namely to Mr. K. Vetter, Managing President, to Dr. W. Kupsch, Secretary General of the Congress and to the Secretary for Continental Europe of our Association Dr. B. J. C. te Hennepe. To all three I also wish to express on this occasion my most heartfelt thanks.

The preparations for the VIIth World's Poultry Congress, which will take place in the United States of America, are already in progress. To this Congress I wish the most complete success possible, I wish my successor Mr. Vetter a presidency as full of satisfaction as mine has been and I hope that it will be possible for me to cooperate always in the interests of the W. P. S. A. and consequently for those of the poultrymen all over the world to whom I wish every success in their poultrykeeping.

ALESSANDRO GHIGI.

World's Poultry Science Association

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Financial Statement for 1936

RECEIPTS

Balance on hand, January 1, 1936	$ 166.69
Subscriptions	„ 594.55
International Review	„ 87.—
	$ 848.24

EXPENDITURES

International Review (Dr. te Hennepe)	$ 200.—
Postage, telegrams	„ 26.74
Printing	„ 6.65
Exchange and tax on checks	„ —.35
Travel expenses	„ 68.02
	$ 301.76
Transferred to contingency	„ 100.—
Balance January 1, 1937	„ 446.48
	$ 848.24

Dr. G. F. Heuser.

At one of the meetings in Leipzig it was suggested that the Association procide a distinctive badge for its members to be worn at gatherings such as the Poultry Congresses. It was also suggested that some of the membres might have good ideas for an appropriate design.

I should like to ask any members who are interested to submit designs for such a badge to me.

DR. TE HENNEPE.

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THE JOURNAL OF THE DEPARTMENT OF AGRICULTURE OF SOUTH AUSTRALIA, Victoria Square, Adelaide.

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IRISH FREE STATE. JOURNAL OF THE DEPARTMENT OF AGRICULTURE, Dublin, C. 17.

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JAPAN. JAPAN POULTRY BULLETIN, Official Bulletin of the Central Poultry Association of Japan. Tanashi near Tokio.

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BREEDING

Reaction of white and yolk during incubation. Die Reaktion verschiedener Komponenten in den Hühner- und Enteneiern im Zusammenhang mit dem Stoffwechsel des Embryos während der Brut. N. M. Schkljar. Archiv für Geflügelkunde, Vol. 10, 1936, No. 1.

1. In the first 3-4 days of incubation the alcalinity of the white increases; afterwards alcalinity decreases again, but not down to neutral.

2. The yolk shows a slightly acid reaction at the start; at the termination of the incubation the reaction becomes fairly alcaline.

3. The pH of the amnionliquid varies during incubation, never becoming more than slightly alcaline.

4. In the beginning this liquid is alkaline (pH > 8). From the 16th day the reaction becomes acid, and in our investigations it reached a pH of 5.632 at hatching time.

5. The pH differs in different organs of the embryo, during its development the different organs become more and more acid in different degress. This increase in acidity is most striking in the glandular part of the stomach.

6. The acid reaction of the stomachcontent becomes pronounced in the last days of embryonic life, expressing itself in a progressive of H-ion concentration.

Variation in the development of embryos of hens' eggs. E. H. McNally and T. C. Byerly. Poultry Science, Vol. 15, 1936, p. 280.

In studies at the National Agricultural Research Center, Beltsville, Md., the relation of the development of the embryo when the egg is laid to hatchability was determined by counting the somites in the embryos of eggs incubated for 48 hr. immediately after laying. Hatching percentages were determined for eggs from the same hens. The maximum average number of somites and maximum hatchability were obtained from eggs with an interval of 27 hr. between the time of laying. The hatchability of eggs with a longer interval was rapidly reduced. The relation of egg weight to embryo development was also evident.

Proteases and ontogenesis. 1. Cathepsin in the chick embryo. E. Mystkowski. Biochemical Journal, Vol. 30, 1936, p. 765.

The optimum pH of cathepsin with gelatine or ovalbumin as substrate is about 4-7 and about 5-8 with lecithovitellin. The activity of cathepsin undergoes little change during the whole developmental period

and is very small even when activated by cysteine. Activity is much greater in the yolk sac than in the embryo. No positive results on synthesis of protein were obtained.

The effect of egg weight, quantity of total albumen per egg, and quantity of thick albumen per egg on hatchability. A. B. Godfrey. Poultry Science, Vol. 15, 1936, p. 294.

At the U.S.D.A. Beltsville Research Center, it was found that within a breed of chickens there is a low but significant negative correlation between hatchability and either egg weight, weight of total albumin per egg, or weight of thick albumin per egg. There is also a significant survilinear trend between hatchability and either egg weight or weight of total albumin. The percentage of thick albumin of the total albumin is not related to hatchability. In a comparison between breeds the high positive correlation between hatchability and each of the above-named factors is not significant.

A new toxicant occurring naturally in certain samples of plant foodstuffs. 7. Low hatchability due to deformities in chicks produced from eggs obtained from chickens of known history. K. W. Franke and W. C. Tully. Poultry Science, Vol. 15, 1936, p. 316.

Egg production and hatchability of eggs from chickens of known history were severely affected by rations containing up to 65 per cent of toxic grains containing selenium. The eggs which failed to hatch were found to contain monstrosities similar to those found on farms where these grains were produced.

The effect of tremulous air cells upon the hatchability of eggs. C. W. Knox and M. W. Olsen. Poultry Science, Vol. 15, 1936, p. 345.

This study at the U.S.D.A. Beltsville Research Center conclusively shows that fresh eggs (as well as eggs 3 weeks old) having tremulous air cells have a much lower percentage hatchability than eggs of the same age having normal air cells.

Jarring eggs which were held with the large end downward readily produced tremulous air cells, but similar jarring while holding eggs with the small end downward did not produce such effect. Jarring did not affect fertility of eggs, neither did it affect hatchability unless tremulous air cells were produced. This study did not determine whether tremulous air cells are directly responsible for low hatchability or only an indication of the injurious effects of jarring on the embryo.

Effects of different temperatures in the incubator on the prenatal and post-natal development of the chick. A. L. Romanoff. Poultry Science, Vol. 15, 1936, p. 311.

This is a description of incubation tests tests conducted at the [New York] Cornell Experiment Station.

Series 1 consisted of 12 lots of eggs, each incubated continuously at uniform temperature, with a range of from 35° to 40.5° C. by 0.5° inter-

vals employed for the different lots. Series 2 consisted of 13 lots of eggs each incubated at 37.5° for the first 16 days, after which the different lots were subjected to temperatures ranging from 29.5° to 41.5° by 1° intervals for the remaining incubation period. Series 3 was a repetition of series 2 within a range of 33.5° to 38.5°.

Continuous exposure below 37° or above 38° resulted in progressively lower hatchability with increasing distance from these limits. Lowering the temperature by as much as 3° after 16 days of incubation had no ill effects either on percentage of hatchability or physical well-being of the chicks up to 3 weeks of age. The frequency of crippled chicks increased with either high or low extremes of incubating temperature.

Electrical conductivity of yolk, albumen, allantoic and anniotic fluids of the developing birds' eggs. Alexis L. Romanoff and Horace J. Grover. Department of Poultry Husbandry, Cornell University Agricultural Experiment Station, Ithaca, New York. Journal of Cellular and Comparative Physiology, Vol. 7, 1936, p. 425.

The data here presented show distinct changes in the electrical conductivities of albumen, yolk, allantoic fluid and amnictic fluid during the development of the embryos of chickens, pheasants, quail, turkeys and ducks.

In general, the electrical conductivity of albumen drops from a high value to one-third, and then slowly rises; that of the yolk starts at a value lower than that of albumen, drops about two-thirds, and then rises to nearly its original value; that of the allantoic fluid rises and remains at high level; that of the amniotic fluid has a sharp rise and then a fall to below early values.

The electrical conductivity of albumen and yolk of unfertilized incubated eggs rises slightly and almost lineally.

Determiny the sex of day old chicks. Geslachtsbepaling by Eendagskuikens. Prof. Dr. G. van Assche en Dr. A. de Troyer. Vlaamsch Diergeneeskundig Tydschrift, Vol. 6, 1937, p. 90.

Summary:

The authors give a survey on historic, basis, technic, results, advantages and disadvantages of the Japanese method for determining the sexe of day old chicks.

Determination of the Age of Chicks. Bydrage tot de Leeftydsbepaling van knikens. Dr. A. de Troyer. Rykuniversiteit Gent. Vlaamsch Tijdschrift voor Diergeneeskunde, 1937, p. 40.

Summary:

During more than one year, the author has controlled in baby chicks "Coucou of Malines", following points: formation, growth, renewing of the feathers, weight increase, cicatrisation of the navel and other elements which can be taken as a basis for the determination of the age of baby chicks. With these data the author could establish a rule for the determination of the age in baby chicks "Coucou of Malines".

Maturation and Learning in chicks. W. W. Cruze. State College, Raleigh, N. Carolina. The Journal of Comparative Psychology, Vol. 19, 1935, p. 371.

Upon the basis of the data presented in this study is seems that the pecking reaction in chicks is an integration of both learned and unlearned activities. Maturation during the first five days seems to be sufficient explanation for the reduction and near elimination of missing errors, although under all normal conditions practice effects aid in this elimination. Accuracy in the total response including the consummatory response of swallowing seems to be very definitely the result of learning. More mature chicks develop accuracy in this reaction more rapidly than chicks which are less mature. The degree of accuracy attained with such chicks seems to be determined, to a large extent, by the amount of practice allowed.

Inheritance of rate of growth in Barred Plymouth Rocks. E. E. Schnetzler. Poultry Science, Vol. 15, 1936, p. 369.

In this investigation at the Indiana Experiment Station 35 of the heaviest and 33 of the lightest individuals at from 8 to 9 weeks of age were selected from a large brood of Barred Plymouth Rock pullets and were designated as the fast and slow groups, respectively. These two groups were handled under similar conditions through the growing and first laying period.

The results indicate that it is possible to select fowls at from 8 to 9 weeks of age which have inherent differences in body weight. The rate of growth appears to be associated to some extent with mature body weight, maturity being attained at about the same age in both groups. The rate of egg production during the first year seems independent of body weight, but the fast-growing group laid larger eggs on the average. By selecting eggs for hatching from the fast- and slow-growing parent stock over two seasons, chicks were hatched which showed significant differences in growth rate, giving evidence that rate of growth in inherited.

Comparison of management methods for chicks, layers, and breeding hens. C. W. Upp. Lousiana Sta. Bull. 275, 1936.

In two series of experiments early-hatched chicks grew faster and at a more uniform rate and showed a lower mortality than late-hatched chicks, clearly indicating the advantage of early hatching. Breeding results over a 4-yr. period showed that breeding on wire floors or in battery brooders is much more desirable than breeding on litter from the start or placing birds on litter at 4 weeks of age, particularly from the standpoint of coccidiosis control. Pullets placed in the laying house at 12 weeks of age were generally smal at the beginning of the laying year and suffered relatively high mortality, with coccidiosis a contributing factor to this mortality.

Mortality of pullets in laying cages was generally similar to that of comparable lots with outdoor range and was consistently lower than that of pullets confined to laying houses, particularly those that did not have access to a sun porch. Birds having access to green feed in outdoor runs produced from 1 to 3 dozen more eggs and consumed less feed per bird and per dozen eggs than the confined lots. Fertility and hatchability were appreciably higher in the range pullets than in those confined on wire floors or stud mated in laying batteries.

Sexed chicks experiment. Chanticleer, March 30, 1937.

An experiment was recently conducted at the Lancashire County Council School at Hutton with the object of determining whether the prominence of the eminence as revealed when sexing day-old chicks may be an indication of relative fecundity and vigour, as has been suggested as a possibility. Eighty-four sexed White Wyandotte pullets were divided into three groups—those with prominent eminences, those with slight eminences and those without eminences at all. These pullets were kept intensively, and were individually trapped over nine periods, each of 28 days. At the end of the experiment it was found that the average production from each group was as follows: Prominent eminence group, 161 eggs; slight eminences, 157.3 eggs; no eminences, 157.7 eggs.

Chicken rearing.

The leaflet is one of six small pages of print dealing with what should be the essential aims in successful chicken rearing whether the system adopted is the natural one of rearing chickens with hens in coops, or the artificial one more generally used in commercial methods to-day. The various systems of feeding are discussed in some detail, including the kinds of food and their properties and qualities. Greater detail on the subject, if poultry feeders desire to go into them, is contained in Bulletin No. 7 on "The Scientific Principles of Poultry Feeding". The Advisory Leaflet No. 113 is obtainable either directly or through any bookseller from H. M. Stationery Office, Adastral House, London, Kingsway, W.C. 2.

A New Breed of Poultry, White Australorps. The Farmers Weekly, South Africa, 3rd March 1937.

White Australorps from white chicks that had been hatched from eggs from pure black Australorps. As for as is known at present this stud of white Australorps is the only one of its kind in the world. Most extraordinary was that in so many matings of black and white Australorps only one chicken out of the many hatched was splashed white and black. All the others were either pure white or pure black, the only suggestion of any blending of the colours being inthe legs. It seems that white sports are not so rare in Australorps as at first was imagined.

Mr. Addison resulted also in breeding red Australorps from black birds.

The inheritance of certain characters affecting egg quality. A. van Wagenen and G. O. Hall. Poultry Science, Vol. 15, 1936, p. 405.

In this study at the [New York] Cornell Experiment Station, all eggs laid by the experimental White Leghorn flock during a 10-day period in each of the months of January and February were subjected to quality tests. The measures of quality included condition of the firm albumin, percentage of firm albumin, percentage of inner thin albumin, percentage of outer thin albumin, yolk index, and yolk color.

A tabulation of the records of individual hens showed that they differ significantly in one or more of these characters and that the value for each may be considered as clearly characteristic of that individual.

In further analyses of the data for evidence of the inheritance of certain quality factors it is shown that the condition of the firm albumin exhibits inheritance typical of quantitative characters. The correlations between daughters and their dams, daughters and their sires' dams, and daughters and the average of their dams and sires' dams were 0.402 ± 0.058, 0.502 ± 0.057, and 0.549 ± 0.053, respectively. These significant correlations indicate that this is an inherited character, probably dependent upon multiple factors. Similar grouping tests and correlation studies indicate that the characters, percentage of outer thin albumin, percentage of firm albumin, and yolk index have not been effectively fixed in the offspring by the type of selection which has been followed.

The genetics of the fowl.—IV, Linkage relations of crest, dominant white and frizzling in the fowl. D. C. Warren and F. B. Hutt. Amer. Nat., Vol. 70, 1936, p. 379. (Ref. Exp. Station Record, Vol. 76, 1937, p. 318.)

Data bearing on linkage of the genes for the incompletely dominant characteristics of crest, dominant white, and frizzling in the fowl, obtained at the Kansas and Minnesota Experiment Stations, are presented in continuation of this series.

In backcrosses of the double heterozygotes for crest and dominant white to double recessives, there was found to be considerable variability in the crossing over in different families, but the average for 1,984 gametes produced by both sexes was 12.5 per cent. The crossing-over percentages between the dominant white and frizzle genes was 17.1 percent and between the crested and frizzled genes was 29.4 per cent, based on 1,105 and 677 gametes, respectively. No double cross-overs were found among 284 gametes in backcross matings of triple heterozygotes to triple recessives, although six were theoretically expected if crossing-over in one region did not interfere in another region. The failure of double cross-overs to appear was also confirmed by the map distances for the three genes arranged in the order Cr-I-F. Although differences were small, there was evidence that greater amounts of crossing-over occurred in females than in males.

A study of the relation of cerebral hernia to crest in different types of matings supported evidence that it is ordinarily due to the homozygous expression of the crest gene, but many irregularities were found. The hernia may appear in the heterozygote or be suppressed in the homozygote. Characters independent of the Cr-I-F linkage group are tabulated.

Genetics of the fowl.—V, The modified Frizzle. F. B. Hutt. Jour. Genet., Vol. 32, 9136, p. 277.

Continuing the above series of studies, the occurrence of a recessive autosomal gene which causes partial suppression of the frizzled plumage of heterozygous Frizzles is noted. This gene is independent of the gene for frizzling, and a symbol of mf is proposed for it. This modifier when homozygous is manifested in all birds heterozygous for frizzling and in about 40 per cent of those homozygous for frizzling. The modified heterozygotes may show only a slight ruffling of body feathers but always have abnormal wing feathers, while the modified homozygotes show less curling of feathers on all parts of the body. This gene is apparently widely distributed among domestic fowls.

A Brahma-Plymouth Rock mosaic. E. Roberts and J. H. Quisenberry. Journal of Heredity, Vol. 26, 1935, p. 11.

A mosaic with a Barred Plymouth Rock mother and probably a Brahma father showing the characteristics of the Plymouth Rock on the right side of the body and the Brahma on the left is described. The possibility of the conditon being due to the loss of two autosomes is discussed.

Superior Breeding Stock in Poultry. M. A. Jull. 1936. U.S. Department of Agriculture Year Book.

A list is given of dominant and recessive characters in chickens. There is a history of the development of poultry in the United States, and an account of laying tests, together with a statement of the progress achieved by record of performance accomplishments.

The low relationship between daughter and dam production is stressed, reference being particularly made to the work of Gooddale at Mount Hope.

The importance of progeny testing is emphasized as well as the characters requisite for determining egg production, and methods by which this may be achieved.

The pattern and symmetry of adult plumage units in relation to the order and locus of origin of the embryonic feather papillae. A. Holmes. Amer. Jour. Anat., Vol. 56, 1935, p. 513.

A study of the origin of feather follicles showed that in the fowl the appearance of the feathers follows a definite order in each tract and in relation to other feather tracts.

Inheritance of rate of growth in domestic fowl.—III, Comparative rates of growth of Leghorns and Rocks. V. S. Asmundson and I. M. Lerner. Poultry Science, Vol. 13, 1934, p. 348.

Continuing this series, an analysis was made of the growth rates of White Leghorns and Barred Plymouth Rocks from hatching to 24 weeks of age at the California Experiment Station. The most suitable age for studying genetic differences was considered to be between the second and eight weeks of age.

Statistical studies on the inheritance of rate of laying in White Leghorns and Rhode Island Reds. A. B. Godfrey and M. A. Jull. Poultry Science, Vol. 15, 1936, p. 63.

A statistical study of the rate of laying of White Leghorns and Rhode Island Reds at the National Agricultural Research Center, Beltsville, Md., showed that the daughters of different sires or daughters of different dams with the same sires differed significantly in their rate of production. More closely related birds laid more nearly at the same rate than more distantly related ones. All results pointed toward the fact that rate of laying behaved as an inherited character.

The Cause of the small size of Bantams. Die Entstehung von Unterschieden in der Körpergröße bei Hühnern. Dr. L. Kaufman. Archiv für Geflügelkunde, Vol. 10, 1936, No. 10.

1. Bantam eggs hatched 24 hours earlier in the same incubator as eggs from greenshanked chickens of normal size.

2. During the first stages of embryological development no difference in size between bantam and large embryos could be detected. The difference in size is caused by a slower rate of growth in the bantam and it becomes noticeable during development.

3. The small size of the bantams is not caused by eggsize alone, but one or possibly more than one inhibiting gene contribute to it.

Register of accredited Poultry Breeding Stations and accreditul Hatcheries, 1937. Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W. 1. December, 1936.

The main purpose of this register is to supply poultry keepers who may wish to purchase eggs for hatching, day-old chicks or breeding stock with the names of some reliable breeders in England and Wales who have been accredited by county authorities for agricultural education in accordance with certain regulations. These regulations are briefly described and are embodied in a scheme which has been drawn up by the Ministry of Agriculture and Fisheries. The scheme is only in operation in the counties named in this register, and the county authority is responsible for the administration of the scheme within its area. The names of the accredited breeders are arranged in the register under county headings, and in order to facilitate reference two indexes are included, one an alphabetical list of the names of all the accredited breeders and the other giving the names of the breeders under headings of the breeds and cross-breeds in respect of which they are accredited, followed by a list of the breeders accredited in respect of Ducks.

Accredited breeders are only accredited by the county authority after an official inspection by the authority and after the stock has passed the agglutination test prescribed by the regulations. The accredited stations are subject to inspection from time to time on behalf of the county authority and by officers of the Ministry of Agriculture.

The accompanying register should be of material assistance to poultry keepers as an indication of sources from which they can obtain stock with a minimum of risk as regards disease and with a reasonable measure of security as regards the quality, health and vigour of the parent stock.

Special technics for dubbing and cropping chickens. O. W. Schalm. University of California, Davis. Journal of the Am. Vet. Med. Association, Vol. 89, 1936, p. 713.

The method described in this article has been used on 63 full-grown males without a single death. Is involves the use of a local anaesthetic, a scalpel, a special clamp and a searing-iron. The article is illustrated with 3 figures.

Further experiments with the p gene in the fowl. J. P. Quinn. Jour. Genet., Vol. 30, 1935, p. 477.

From a study of the results of crossing Red-Splashed Whites (p) with Light Sussex and Jersey Black Giant fowls at the U.S.D.A. Beltsville Research Center, it is concluded that the pp genes suppress the columbian pattern and black color, except in the latter case for a black spot on the head.

The inheritance of skeletal dimensions in the domestic fowl. A. J. G. Maw. Scientific Agriculture, Vol. 16, 1935, p. 85.

Results are reported of studies from the Wisconsin Experiment Station of the skeletal dimensions of Golden Sebright Bantams and Light Brahmas and the F_1 and F_2 crosses between them. The F_1s and F_2s were slightly smaller than the average between the parental breeds. The F_1 females sired by the Brahma male showed significantly longer leg and wing bones than the females of the reciprocal cross, indicating sex linkage of size genes. There was no association of shank color or comb type genes with size, although plumage color and rate of tail feathering were linked. Evidently a sex-linked factor was introduced into the cross, which reduced the size of the skeletal dimensions. Correlation coefficients above 0.9 were found between the skeletal measurements of the F_2s, although they were considerably lower between the skeletal measurements and the cranial measurements.

The origin of breeds. Rassen- und Artbildung bei Haushühnern. Prof. Dr. P. Hertwig. Archiv für Geflügelkunde, Vol. 10, 1936, No. 4.

Gallus bankiva, Gallus sonnerati, Gallus lafayetti and Gallus varius may be considered to be the ancestors of our domestic fowl. They can be crossbred with the domestic fowl and both sexes are fertil with the exception of the Gallus varius ♂ × domestic — hen cross. The first cross male is fertil, but the first cross female ist always steril.

Crossbreedings demonstrate that the wild species and the domestic fowl have some identical genes. Yet other genes of the domestic fowl must be looked at as mutations.

Linkage tests with the Yellow-Head and Dominant-White Plumage and White-Skin Characteristics in Domestic Fowl. A. Deakin and G. Robertson. Central Experimental Farm, Ottawa, Canada. Scientific Agriculture, Vol. 17, 1937, p. 451.

No linkage is evident between the yellow-head and dominant-white plumage factors nor between yellow-head and white-skin factors.

The yellow-head factors cause an extension of the yellow-skin pigment into the head furnishings, the yellow-head characteristic thus being dependent upon the presence of yellow pigment in the skin.

The evidence indicates that the yellow-head factors affect the vascularization of head furnishings, causing pale-coloured heads.

Comparison between half-weight and lightbreeds. Die Rentabilität der halbschweren Hühnerrassen. Dr. E. Martimo. Archiv für Geflügelkunde, Vol. 10, 1936, No. 11.

Summary:

1. Half-weight breeds can produce just as much as light breeds.
2. Half-weight breeds are not so sensitive to changes in external circumstances, so that their winterproduction is better than that of light breeds.
3. The feeding costs of half-weight-breed hens are higher than those of light breeds.
4. Half-weight breeds need considerably more food than light breeds.
5. Half-weight hens can probably satisfy the greater need of albumen through a larger consumption of dry fodder.

Preliminary observations on the relationship between production, fertility and hatchability of eggs. M. R. Montemayor. Philippine J. Animal Indust., Vol. 3, 1936, p. 467. (Ref. Nutrition Abstract., Vol. 6, 1937, p. 1151.)

Hatchability of eggs decreased when heavy production was continued for a few months, and increased after the point of minimum production. Fertility appeared to bear no relationship to either production or hatchability. The eggs in this study were not chosen at random but carefully selected for size, uniformity of shape and quality of shell.

Five years' management tests with chicks and pullets. D. C. Kennard and V. D. Chamberlin. Poultry Science, Vol. 15, 1936, p. 230.

From studies at the Ohio Experiment Station data are presented on the egg production and the degree of mortality of groups of pullets confined, allowed access to fresh range, and access to old or used range. No significant difference in mortality was noted among these groups, while pullets on fresh range produced more eggs. Tests were also conducted in which healthy layer pullets were imported from healthy flocks and compared with similar strains in the station flock, both when kept in separate lots and when mixed with the station pullets. In every case mortality was less and egg production was greater for the imported pullets than for those raised at the station. Suggestions are made regarding the shortcomings of sanitary measures as a means of controlling such diseases as paralysis, leucosis, typhoid, and cholera-like diseases, and the possibility of eliminating infection by removing all infected and carrier individuals from the premises periodically and making a fresh start.

Numbers and uniformity in experimental lots. F. A. Hays. Poultry Science, Vol. 15, 1936, p. 235.

This paper from the Massachusetts Experiment Station discusses essential points to be considered in the selection of experimental lots when annual egg production is to be used as a measure of experimental resuts.

Curves are presented to show the frequency distribution observed in certain groups with reference to annual egg production, age at which

first egg was produced, and differences between first and second year's egg production. It is recommended that 100 birds may be a fair sample in an improved flock, while greater numbers are necessary for mixed or unimproved stock. Yearling hens were somewhat less variable in egg production than pullets.

Studies on the "Khaki-Campbell" ducks. S. Shibata. 6. Weltgeflügelkongress, Leipzig, 1936.

Since the introduction of Khaki-Campbell ducks into Japan in 1929 a comparison has been made with Peking ducks as regards growth rate, egg production, composition and weight of eggs, fertility and hatchability. In almost all respects, the Peking were superior to the Khaki-Campbells.

Egg size in relation to growth of Narragansett turkeys. H. M. Scott and R. E. Phillips. Poultry Science, Vol. 15, 1936, p. 435.

There was a high correlation between weight of the day-old turkey poult and weight of the egg from which it was hatched, but no correlation between weight at hatching and subsequent mature weight.

A study of egg production in Bronce turkeys. S. J. Marsden. Poultry Science, Vol. 15, 1936, p. 439.

Trapnest records of 100-200 turkeys extending over 5 years showed that turkeys do not differ significantly in their egg laying habits from chickens and that in broodiness, in number and size of egg "litters" and in number and size of egg clutches there is considerable variation.

Summary of feeding and confinement rearing experiment with turkeys during 1935. F. N. Barrett, C. G. Card, and A. Berridge. Michigan Sta. Quart. Bul., 19, 1936.

Poults hatched May 8 were divided at 1 week of age into 4 lots of 25 birds each and placed in an indoor pen until transferred to a large open turkey house at the end of the seventh week. Poults hatched June 28 were similarly treated except that they were removed to the open house at the end of the fifth week. The rations fed in the respective lots contained 23, 19, 24, and 26 per cent of protein in the mash. Lots 1 and 4 received water only to drink, while lots 2 and 3 received skim milk only. The mash, whole corn, gravel, and drink were before the birds at all times, and chopped fresh alfalfa was fed daily.

The early-hatched poults were more efficient in the amount of feed required to produce 1 lb. of gain and in cost per unit of gain than the late-hatched poults. The latter birds consumed a greater proportion of corn to mash in all lots. Poults receiving liquid skim milk consumed less mash per pound of gain but ate more corn than poults receiving water to drink. At the prices of feed charged the cost per pound of gain was approximately 2 ct. less for the lots receiving liquid milk. Feeding milk, however, had the disadvantage of requiring more labor in caring for the milk and dishes and in attracting more flies with their possibility of tapeworm infestation. The cost of producing gains with any of the rations used was quite satisfactory. The method of rearing under confined conditions was found to be practicable with the rations used.

Poultry culture in the Salt River Valley of Arizona. B. W. Heywang. U.S. Dept. Agr. Bur. Anim. Indus. Anim. Husb. Div. 1935, A. H. D. No. 15.

Poultry production in Arizona, including problems in feeding, housing, diseases and marketing of products, is discussed.

Poultry specialty clubs. U.S. Dept. Agr. Bur. Anim. Indus. Anim. Husb. Div. 1936, A. H. D. No. 18.

The names of poultry specialty clubs, together with the name and address of the secretary of each club, are listed.

Livability and production of pullet layers may be predetermined. D. C. Kennard and V. D. Chamberlin. Ohio Sta. Bimo. Bull. 183, 1936.

The difficulty of producing healthy layer pullets in close proximity to breeding and laying flocks is pointed out, and data are presented to show the superiority of pullets reared on comparatively disease-free farms over those reared in proximity to a breeding flock known to carry various poultry diseases. It is suggested that the production of disease- and parasitefree, livable, ready-to-lay pullets may be considered a desirable new phase of specialization in poultry raising.

Influence of ovulation rate on the tendency of the fowl to produce eggs in clutches. H. M. Scott and D. C. Warren. Poultry Science, Vol. 15, 1936, p. 381.

In a study at the Kansas Experiment Station the authors have made observations on successive eggs laid by a group of 35 hens over a 28 day period. By palpation through the intestinal wall the forming egg can be detected in the isthmus of the oviduct about 4 hr. after ovulation. Tracing the eggs through the greater part of their formative period, it appears that either the first or second egg of the clutch required slightly more than 23 hr. complete formation from the time it was first palpated in the oviduct. As further evidence that the first egg of the clutch required no longer time for formation than succeeding eggs, somite counts made on first and second eggs of the clutch after 38-hours-incubation were practically identical (8.64 and 8.79, respectively). When a clutch was terminated the first egg of the succeeding clutch could not be detected for more than 20 hr. after the previous egg was laid, thus indicating a delay in ovulation of more than 15 hr.

It is concluded that hens seldom ovulate in the afternoon, the "held" eggs does not normally exist, the day of nonlaying is a result of delayed ovulation and a new clutch is initiated when the hen lays the morning following the day of nonproduction.

Inbreeding in the White Leghorn. N. F. Waters and W. V. Lambert. 1936. Iowa Agric. Exp. Stn. Res. Bull. No. 202.

Of recent years a considerable amount of work has been done on the subject of inbreeding. Till recently no very systematic attempts have been made to use close inbreeding in a practical way for family improvements. Many breeders have recognised the usefulness of the method as a means for fixing traits, but have avoided continued close inbreeding for fear of also fixing undesirable characteristics. However, progress has

been made with inbreeding in the field of plant improvement with remarkable success as regards productive characters. With smaller mammals intensive inbreeding has been carried on, but relatively few experiments have been conducted with the farm animals.

Continued close inbreeding in the fowl almost invariably has resulted in disaster. Hitherto no experiment has been reported in which very close inbreeding has proceeded beyond the sixth generation. The whole subject of inbreeding and crossbreeding in poultry is reviewed by the authors.

For the experiment the foundation birds were obtained from the flock of the Iowa State College. The object of the experiment was to discover the effect of inbreeding in the single comb White Leghorn fowl as regards fertility, hatchability, viability, days to first egg, egg production, egg size, and body size. It was also intended to develop lines homozygous for a number of the characters of greatest economic usefulness.

The degree of inbreeding adopted was somewhat less intense than that of brother and sister or parent and offspring matings. However, one intensely inbred family was maintained successfully for nine generations, while six more or less distinct families, each with a different type, but with similar foundation ancestry, were developed.

The ancestry of all the birds in these six families is traced to four males and seven females. One of the original males has a greater degree of relationship to the present generation than any of the other foundation birds.

There was no general decrease in per cent of fertile eggs as the degree of inbreeding increased. On the contrary, some inbred families showed an increase of fertile eggs. There was a decline in the average hatchability of fertile eggs as inbreeding increased: as the hatchability was well above 60 per cent this is not considered a serious matter. The authors conclude that it is possible to maintain a reasonably safe level of hatchability under a system of intense inbreeding. There was a significant decrease in the number of days to first egg. The most intensely inbred birds mature sexually sixteen days earlier than the birds of the original non-inbred foundation stock.

There was no marked decrease in the 200-day egg production for any of the six separate families, neither was there any decrease in egg weight. Growth rate and adult body weight were unaffected. Pullet year mortality, however, showed a marked rise for the more intensely inbred birds. One point of special interest was the freedom of defects and abnormality of all types.

The authors hope that the favourable results will encourage other investigators to undertake the development of good inbreds, and the present study suggests a practical application of the principle of inbreeding. How much should a poultry breeder inbreed without decreasing the efficiency of his flock? In general, the advanced breeder desires to confine his breeding programme to his own flock, thus reducing the dangers involved when unrelated birds are introduced. Inbreeding tends to increase uniformity within the flock, not only for type and general conformation, but for all other characters, both good and bad. The inbreeding provides a mechanism by which the good results of right crosses and the bad results of wrong choices in selection are much more apt to be retained in the flock and fixed permanently on it than if no inbreeding accompanied the selection; therefore, the breeder who is inbreeding must be exceptionally cautious in his choice of birds for breeding if he is to avoid the fixation of undesirable characteristics in his flock.

NUTRITION

VITAMINS

VITAMIN A

The vitamin A requirements of the laying pullet. W. C. Russell, C. S. Platt, M. W. Taylor, and D. F. Chichester. New Jersey Stas. Circ. 369, 1936.

In the experiments herein reported seven pens of healthy pullets reared on range were started on experiment late in August and continued under confinement for a 12-mo. period. All lots received essentially the same basal ration, but the proportions of yellow corn and white corn and the supplements of alfalfa meal, vitamin A concentrate, and fresh green feed were varied so that the U. S. P. units of vitamin A per pound of feed were 400, 700, 1,300, 2,200, 3,800, 4,100, and 30,000 for lots 1 to 7, respectively. Data are reported on the percentage mortality, live weight changes, egg production, hatchability of eggs, mortality of chicks during the first 2 weeks of life, and vitamin A storage in the livers of the hens.

Aside from the somewhat higher mortality in lot 1 and the higher chick mortality in lots 1 and 2, there was no marked difference in the results obtained from the different lots. Maximum egg production was obtained from lot 4 (2,200 units). Values for liver vitamin A fell in essentially the order of the increasing amounts of this factor fed. Since 2,200 units of vitamin A per pound of ration, which is probably well below that present in poultry rations commonly fed, gave as satisfactory results as the larger quantities supplied in this experiment, it appears that the addition of more vitamin A to the usual poultry ration is of no value in improving egg production and hatchability or in reducing mortality.

A study of the vitamin A requirement of the chick during early life. R. C. Ringrose and L. C. Norris. Poultry Science, Vol. 15, 1936, p. 390.

This contribution from the Cornell Experiment Station describes a biological method for assaying feeds for vitamin A, using chicks as test animals, based on the experimental findings that the vitamin A requirement of the chick during the first 8 weeks of life is about 150 U.S.P.X. units per 100 g of feed consumed. Employing this method of assay yellow corn was found to contain 7 units of vitamin A per gram, and a number of corn gluten meal samples were found to contain from 7 to 25 units per gram.

The quantities of vitamin A required by growing chicks. R. M. Sherwood and G. S. Fraps. Texas. Agric. Exp. Stat. Bull. No. 528, Sept. 1936.

Chicks hatched from eggs laid by hens receiving 265 Sherman-Munsell units of vitamin A daily, or 325 units per 100 g. feed, had average mortality of 64.4 per cent, and those from hens receiving 425 or 539 units daily, a mortality of 38.5 per cent under the same conditions. Feeding large amounts of vitamin A to chicks hatched from eggs of deficient hens did not overcome the effects of the deficiency. In feeding tests on chicks hatched from eggs laid by hens on high vitamin A rations, different amounts of vitamin A were required in 3 successive years and the general conclusion was drawn that chicks from eggs of normally fed hens require 100 to 150 and probably not less than 125 units of vitamin A per 100 g. feed for safe rearing, while chicks from eggs of slightly deficient hens may need 300 units.

Vitamin A, B_1 and B_2 content of raw and cooked yolk of hen's egg. Sul contenuto in vitamine A, B_1 et B_2 del tuorlo di uovo di gallina crudo e cotto. L. de Caro and A. Locatelli. Quad. Nutrizione, Vol. 3, 1936, p. 187. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 622.)

Curative experiments with depleted rats, in which comparison was made with the international standard preparations, indicated that hen's egg yolk contained per g. when raw, 88 international units of vitamin A and 1 I. U. of vitamin B_1 and after boiling for 5 to 7 minutes in water, 55 I. U. of vitamin A and 1 I. U. of vitamin B_1. The content of the vitamin B_2 complex was considered to be 4 biological units per g. for both cooked and raw egg yolk.

Destruction of vitamin A by rancid cod liver oil. D. V. Whipple. Oil and Soap, Vol. 13, 1937, p. 231. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 933.)

The curve of vitamin A potency plotted against the peroxide value fell much more steeply when rancidity developed naturally at room temperature than in accelerated oxdiation tests at 100° C.

Vitamin deficiency and infection. A disease of ducks with symptoms of both conditions. Carencia e infection: una enfermedad en los patos con este doble aspecto. C. A. Martin and R. C. Onetti. 6. Weltgeflügelkongress, Leipzig, 1936.

A condition of deficiency of vitamins A and B complex, complicated by infection with Salmonella enteritidis, is described in ducks. Treatment with vogan and yeast was effective in curing the trouble and it is considered that the deficiency condition was accentuated by the concurrent infection, against which antibodies were present in the blood of normal ducks.

Pilchard oil as a source of vitamins A and D for poultry. J. Biely, E. A. Lloyd and W. Chalmers. 6. Weltgeflügelkongress, Leipzig, 1936.

In biological tests with baby chicks the oil of the pilchard, Sardinia caerulea, provided adequate vitamins A and D for growth and development of normal bones when the oil was fed as 0.5 per cent of the ration. Practical poultry feeding tests confirmed the experimental finding that pilchard oil was a rich and economical source of vitamin A, but rather more than 0.5 per cent was required in the ration to provide sufficient vitamin D for laying hens.

Sardine oils less potent in vitamin "A" than "D". New England Poultryman. March 15, 1937.

The 1934 annual report of the Idaho Agricultural Experiment Station, recently published, presents some interesting results concerning the relative A and D potency of 2 different brands of sardine oil. Three sets of trials indicated that 1 % oil in the ration was essential for normal growth and physical condition, whereas normal growth and bone development were attained at a $^1/_2$ % level. In each instance the oil was the sole source of vitamins A and D respectively. Neither sample proved adequate when used at $^1/_2$ % level as a sole source of A, whereas both proved adequate at that level as the sole source of D. It is concluded that sardine oil is relatively less potent in A than in D in respect to its adequacy in meeting the requirements of growing chicks.

Experimental changes of the pigments in the yolk of the egg with reference to the vitamin content. Experimentelle Beeinflussung des Eidotterfarbstoffes in bezug auf die Vitaminwerte. Fr. Bilek. 6. Weltgeflügelkongress, Leipzig, 1936.

The colour of the yolks of hens' eggs depended on the amount of pigment in the food, especially such foods as yellow maize, carrots or lucerne meal. Biological tests indicated that the vitamin A content of the yolk was proportional to the amount of pigment and that the amount of cholesterol also increased with increasing depth of colour.

Vitamin A deficiency in chickens. A-Avitaminose bei Hühnchen. S. N. Matzko, N. M. Ossipova and I. S. Dergatschev. Problems of Nutrition, Moscow, Vol. 5, 1936, No. 4, p. 85. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 618.)

In chickens deprived of vitamin A, conjunctivitis and other eye symptoms were observed in a high percentage of birds, and none in control birds receiving vitamin A. The deprived birds showed a lowered resistance to infections by the presence of lesions of the mucous membranes of the mouth, throat and nose, and of the lungs and kidneys. It was essential to provide adequate vitamin B complex in the ration by means of yeast so that the symptoms of vitamin A deficiency might be uncomplicated by deficiency of vitamin B.

A discrepancy between biological assays and other methods of determining vitamin A.-I. R. S. Morgan, J. R. Edisbury, and R. A. Morton. Biochem. Journal, Vol. 29, 1935, p. 1645.

In this investigation determinations for vitamin A were made by the method of biological assay, the measurement of the ultraviolet absorption at 328 mμ, and the evaluation of the blue color intensity in the antimony trichloride test on a series of 22 oils and concentrates covering a range of potency of from 530 to 1,290,000 international units per gram. The potency of "100" per cent vitamin A was calculated from the assay of each substance and from the physicochemical tests. The characteristics of a highly active vitamin A described by Carr and Jewell were taken as those of the pure substance. The variations in the assays when so expressed were from 1.23 to 3.38 million units per gram, or a mean of 1.77, when calculated from the blue values and from 1.08 to 2.9 million units per gram, or a mean of 1.73, when calculated from the spectroscopic estimates. "This variation is greater than can be accounted for by the known errors of the assays and the physicochemical measurements; allowance for these errors leaves a range of variation from 67 to 150 per cent of the mean value to be accounted for."

Relation of the carotene content of certain feed materials to their vitamin A potency. G. S. Fraps, R. Treichler, and A. R. Kemmerer. Texas Agricultural Experiment Station. Journal of Agricultural Research, Vol. 53, 1936, p. 716.

It is now known that alpha-, beta-, and gamma-carotene, cryptoxanthin, and some other yellow pigments of plants can be utilized for the same purposes as vitamin A.

Carotene can be determined in a few hours, whereas the biological determination of vitamin A potency requires several weeks. Variations in carotene content can be easily ascertained chemically. The determination of carotene therefore offers a rapid method for estimating the vitamin A potency of many feeds, provided the relation between the carotene content of a particular feed and its biological value is known. Hence the relation between the carotene content of feeds and their vitamin A potency is of considerable practical as well as scientific importance. In connection with vitamin A investigations at the Texas Agricultural Experiment Station, it was necessary to determine the vitamin A potency of a number of feeds. Advantage was taken of the material available to determine the carotene content also and to secure information regarding the ratio mentioned.

Seven samples of alfalfa products containing from 7.3 to 63.5 micrograms of carotene had a vitamin A potency of from 13 to 77 Sherman-Munsell units (15.6 to 92.4 international units) per gram, with an average value of 1.4 units (1.6 international units) per microgram of carotene. Five samples of peanut hay ranging from 5.6 to 26.5 micrograms of carotene per gram had an average value of 1.3 Sherman-Munsell units (1.5 international units) per microgram of carotene.

Two samples of yellow corn containing 1.7 and 2.6 micrograms of carotene per gram had an average value of 1.2 Sherman-Munsell units (1.4 international units) per microgram of carotene, while one sample of

Johnson grass hay containing 9.3 micrograms of carotene per gram had a vitamin A potency of 1.1 Sherman-Munsell units (1.3 international units) per microgram of carotene.

One microgram of carotene in the international standard had a value of 1.4 Sherman-Munsell units, and 1 microgram of purified carotene had the same value. Carotene in alfalfa products and peanut hay had practically the same vitamin A potency, expressed in Sherman-Munsell units, as the carotene in the international standard and in purified carotene dissolved in oil.

Estimation of vitamin A. A. L. Bacharach, J. C. Drummond, and R. A. Morton. Nature, London, Vol. 137, 1936, p. 148.

The authors show that of the three approved methods of estimating vitamin A the values obtained by the spectroscopic method do not agree with those obtained by the biological assay. Direct biological comparison with international standard preparations of carotene is apparently liable to variations of from 20 to 100 per cent. The suggestion is made that in the future the subsidiary standard should be accompanied by a statement showing the date at which the biological activity was directly determined and the value of the absorption coefficient at that date. At present it is almost impossible to have workers in different laboratories compare vitamin A estimates unless they use practically identical methods. It is also difficult for the manufacturers to market products of known constant vitamin A content, and this confusion brings discredit upon the use of international units and international standard preparations.

Estimation of vitamin A. E. M. Hume. Nature, London, Vol. 137, 1936, p. 277.

To prevent the possibility of an incorrect impression concerning certain decisions on vitamin A made by the 1934 International Conference on Vitamin Standards, arising from the letter written by Bacharach et al. and noted above, the author explains that the decisions made by the conference were considered to be subject to the verdit of experience. The problem regarding the accuracy of the factor 1,600, which was assigned by the conference for application in relating the results of spectroscopic examination and biological tests for vitamin A, is at present being investigated. The possible instability of the cod-liver oil subsidiary standard is also being considered.

VITAMIN B

Lactoflavin unit of measure developed. Poultry Tribune, Jan. 1937.

Lactoflavin, mentioned frequently in advertisements and articles, is a new term adopted by scientists as a result of recent studies, and really means, insofar as poultry feeding is concerned, the same thing as vitamin G, that part of milk and whey that promotes growth, maintains health and improves hatchability.

In breaking down vitamin G, one part was found to be yellow in color—and that is the part now called Lactoflavin. It is the most important part of vitamin G to poultry raisers for the reasons mentioned above.

The Lactoflavin content of milk or whey can be measured by two simple, chemical tests. One of these is by use of the photo electric cell to measure the amount of light rays absorbed by Lactoflavin. The second test involves the use of ultra violet light under which Lactoflavin throws off a characteristic greenish-yellow color, the intensity of which measures the amount of Lactoflavin in the solution tested.

Dr. L. C. Norris, Cornell University, has worked out a very simple method for expressing Lactoflavin or vitamin G value of feeds in terms of "chick units". On this basis, the flavin value of various feedstuffs is given by him as follows: dried pork liver, 100 units of vitamin G per gram; dried yeast, 35 units; dried whey, 30; dried skimmilk, 20; alfalfa meal, dehydrated, 16; alfalfa meal, 11; white fish meal, 10.

Dried whey, which is one of the rich sources of Lactoflavin (or vitamin G) also contains milk sugar, milk minerals (calcium and phosphorus), albumen and other whey vitamins, the value of which have been established in poultry feeding.

Observations on the vitamin G requirement of the chicken. C. H. Hunt, P. R. Record, and R. M. Bethke. Ohio Sta. Bimo. Bul. 183, 1936.

In this experiment six lots of White Leghorn chickens were fed the same basal ration, known to be deficient in vitamin G, throughout the growth and production period. Vitamin G was supplied to the various lots in the form of 5 per cent of alfalfa leaf meal, 5 per cent of alfalfa leaf meal plus 2.5 or 5 per cent of dried skim milk, and 2.5, 5, or 7.5 per cent of dried skim milk, respectively.

The rate of growth was highly correlated with the amount of vitamin G consumed, the amount supplied from various sources being apparently of equal efficiency in promoting growth. The lots receiving the combined supplement produced the greatest number of eggs per hen. Those lots receiving 5 per cent and 7.5 per cent of dried skim milk produced well for a few months but declined rapidly in the latter months of the trial and suffered a high percentage of mortality. In the lots receiving the combined supplement the hatchability varied directly with the units of vitamin G transferred from the feed to the egg, but this condition did not hold true for hens receiving only dried skim milk, this supplement giving relatively low hatchability at all levels. The results indicate that the alfalfa leaf meal or a combination of alfalfa leaf meal and dried skim milk contain a factor or factors not contained in the dried skim milk alone and necessary for sustained production and good hatchability in the eggs so produced.

The vitamin G-requirement of poultry. L. C. Norris, H. S. Wilgus Jr., A. T. Ringrose, V. Heiman, and G. F. Heuser. Cornell Sta. Bul. 660, 1936.

In this report the term "Vitamin G" is used to designate the growth-promoting factor. A chick unit of vitamin G is proposed which is roughly equivalent to 1 microgram of flavine. Dried pork liver containing approximately 100 microgram of flavine per gram has been assigned a value of 100 chick units of vitamin G per gram and is used as a unit of reference in this experiment.

The relative vitamin G content of common feeding stuffs used in poultry feeding is presented in tabular form. Dried yeast, dried whey,

dried skim milk and dehydrated alfalfa meal are among the most potent sources of this vitamin, animal byproducts contain appreciable quantities, and cereals are a poor source of it.

The vitamin G required to produce normal growth in chicks to 8 weeks of age is established at about 290 units per 100 g. of feed. In the laying ration 130 units of vitamin G per 100 g. of feed appears sufficient to support normal egg production, while about 230 units per 100 g. of feed are required to obtain obtimum hatchability. The requirement of the chick for vitamin G is closely correlated with rate of gain, indicating that the vitamin is closely associated with growth and is not required to any great extent for maintenance.

Maintenance nutrition in the pigeon.—The influence of dietary protein and vitamin B_3. C. W. Carter and J. R. O'Brien. Biochem. Jour., Vol. 29, 1935, p. 2746.

In this contribution to the question as to the nature of the multiple deficiencies in an exclusive diet of polished rice responsible for the syndrome of human beriberi and avian polyneuritis, a series of feeding experiments with pigeons is reported, leading to the following conclusions:

Limitation of protein rather than total caloric intake is one of the factors which prevent full weight recovery in pigeons on polished rice supplemented solely by a vitamin B_1 preparation, but the evidence thus far does not differentiate between limitation of protein per se and a deficiency of some specific amino acid. The response to an adequately adjusted protein intake is only partial or may be absent entirely if the preliminary period of depletion on polished rice results in a fall of weight below 70 per cent of the maximum. "In such cases recovery is limited by the appearance of a deficiency of vitamin B_3, which is wholly or largely lacking in the diet. This deficiency can be corrected by the administration of vitamin B_3 in the form of extracts of liver. Our experiments, therefore, seem to indicate that two factors at least are necessary to promote weight restoration in pigeons on polished rice supplemented with vitamin B_1: (1) Protein in adequate amount and (2) vitamin B_3."

The distribution of vitamin B_4 in some plant and animal products. O. L. Kline, H. R. Bird, C. A. Elvehjem, and E. B. Hart. Jour. Nutrition, Vol. 12, 1936, p. 455.

Following the plan for producing vitamin B_4 deficiency in chicks and employing the depleted chicks as test animals, the authors have determined the vitamin B_4 potency of a considerable number of both vegetable and animal products. The results of these assays are presented in tabular form. Dried grass, peanuts, wheat germ, pork brain, and pork kidney were found to be relatively good sources of the factor. The grains were found to be relatively poor sources, although white corn and hulled oats proved definitely superior to wheat and yellow corn.

Adrenals and vitamin B deficiency. Nebennieren und B-Avitaminose. E. Kokas. Arb. ung. biol. Forsch.-Inst., Vol. 8, 1935-1936, p. 295. (Ref. Nutrition Abstracts, Vol. 6, 1936, p. 641.)

The time required for development of polyneuritic symptoms in two

groups of 50 pigeons, one white and one dark, fed on polished rice were 10 to 18 and 20 to 30 days, respectively. In 25 normal white birds the weight of the suprarenals was only 60 per cent of that in a group of normal dark birds of similar body weight. Similar observations were made on rats fed on a diet deficient in vitamin B (B_1). The time for development of symptoms in white rats was 10 to 14 days shorter than in grey rats, while the suprarenals of normal white rats were 18 per cent lighter in weight.

The relative vitamin G content of alfalfa meal. H. S. Wilgus Jr., L. C. Norris, and G. F. Heuser. Poultry Science, Vol. 15, 1936, p. 446.

The vitamin G (B_2) content of alfalfa meals was determined by their growth promoting effects on chicks, from the 2nd to the 6th week of life, when fed as 5 per cent of a ration otherwise deficient in vitamin B_2. The results were compared with those obtained with supplements of dried pig liver which was rated at a value of 100. Commercial samples of alfalfa meal, either sun cured or artificially dried, obtained from different States, gave values from 9 to 20 on this scale. The artificial drying process appeared to produce meals of higher vitamin B content. It was calculated that the vitamin B_2 content of sun cured meals was about 60, and of artifically dried about 85 per cent that of dried skimmilk. Determinations on samples, for which time of cutting and stage of maturity of the plant were known, showed the highest values in the meals from alfalfa cut at the early blossom stage. An attempt was made to correlate the vitamin B_2 content and the percentage of leafy material, protein and fibre, but the differences were not sufficiently great to be significant.

Fat metabolism in the nerve tissue of pigeons in vitamin B deficiency. Umsatz der Fettstoffe in den Nervengeweben der Taube bei der B-Avitaminose. Y. Takata. Journal Biochem. Tokyo, Vol. 24, 1936, p. 153. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 953.)

Total fatty acids and cholesterol were estimated in polished rice, and neither lecithin nor kephalin was detected in as much as one kg. of the rice. Normal brain tissue was analysed for total fatty acids, cholesterol phosphatide phosphorus and amino-nitrogen. The far metabolism was compared in the nerve tissue of four groups of pigeons, normal, starved, deprived of vitamin B_1 or of vitamins B_1 and B_2. Results showed that in brain tissue there was a decrease in total fatty acids in the last three groups as compared with the normal, the decrease being greater in the vitamin B_1 deficient than in the starving group. There was no noticeable change in total cholesterol, phosphatide phosphorus or amino-nitrogen. In the spinal cord and peripheral nerves there was no great difference between the normal and starving animals, but in the deprived groups, particularly in that deprived of vitamin B_1, there was a decrease in total fatty acids. It is concluded that vitamin B_2 promotes oxidation of fats in nerve tissue and that vitamin B_1 inhibits such oxidations! Fat metabolism in nerve tissue should, therefore, be kept in a state of equilibrium by cooperation of vitamins B_1 and B_2.

Bisulphite-binding capacity of the blood of pigeons with B_1 deficiency. S. de Jong. Arch. néerland. Physiol., Vol. 21, 1936, p. 465.

A micro-method is described for determining the bisulphite-binding substances in 30 cmm. blood. The values obtained for the increase in these during polyneuritis in pigeons, expressed as mg. pyruvic acid per 100 g. blood, agree with those of earlier workers. The symptoms of acute polyneuritis were, however, developed before the rise in bisulphite binding capacity was evident, and disappearance of the symptoms after administration of vitamin B_1, might precede the lowering of the bisulphite binding capacity. Symptoms of chronic polyneuritis were not accompanied by a rise of the bisulphite binding capacity of the blood.

Production of experimental polyneuritis in the pigeon by the addition of urea to the diet. Production de polynévrite expérimentale chez le pigeon par simple adjonction d'urée à sa ration. R. Lecoq. Comptes Rendus Société Biologie, Vol. 123, 1936, p. 592.

Pigeons fed on a diet deficient in vitamin B_1 and containing 20 per cent urea, developed polyneuritic symptoms which rapidly passed into coma and death. The addition of yeast in amounts up to 1 g. daily delayed, but did not prevent, the onset of the symptoms.

Production of nutritional unbalance by administration of uric and oxalic acids in the food of the pigeon. Production d'un déséquilibre alimentaire par introduction d'acide urique ou d'acide oxalique dans la ration du pigeon. R. Lecoq. Comptes Rendus Academie Sciences, Vol. 203, 1936, p. 627.

Pigeons, fed on a diet deficient in B vitamins but otherwise adequate, containing 66 per cent sucrose, developed fatal polyneuritis which was prevented by adding not less than 1 g. yeast daily. Despite the addition of up to 2 g. of yeast (4 g. when oxalic acid was given) polyneuritis occurred when 10 g. and 2 g. respectively, of uric acid or oxalic acid were substituted for 10 g. or 2 g. of sucrose, the effects of the disease being most evident in the feet, and a condition resembling gout being produced.

Action of enzymes in birds deprived of vitamin B. Fermentwirkung im Vogelorganismus bei B-Avitaminose. S. Tsunoo, M. Takamatsu, T. Kamachi and M. Imaizumi. J. Biochemy, Tokyo, Vol. 22, 1935, p. 225.

Comparison of enzymes, nucleinase, glycerophosphatase, glycogenase, amylase, urease, esterase, arginase and protease, from the tissues of normal fowls and pigeons and from ones deprived of vitamin B showed very irregular results, but there was, in general, a lowering of the enzymic activity in the deprived birds; exceptions were pancreatic esterase and liver amylase, the activity of which seemed to be raised.

Investigations on deficiency of the vitamin B complex in various breeds of fowls. Untersuchungen über die Avitaminose des B-Complexes bei verschiedenen Hühnerrassen. G. Nichita, N. Tuschak, and G. Iftimescu. 6. Weltgeflügelkongress, Leipzig, 1936.

Avitaminosis B in Rumanian Poultry and in Sussex Hens. Avitaminose du Complexe B chez les poules indigènes et de race Sussex. Prof. Dr. G. Nichita, Dr. N. Tuschak, and Dr. G. Iftimescu. Annales de l'Institut National Zootechnique de Roumanie, Vol. 5, 1936, p. 83.

Studies of the effects of deficiency of the vitamin B complex in Rhode Island Red Sussex, Leghorn and Roumanian fowls were continued for a period of three years. Methods of diagnosing the deficiency condition in its early stages were particularly sought, since yeast was only effective in producing cures if given before serious involvement of the central nervous system had occurred.

The response of rats, chicks and turkey poults to crystalline vitamine G (Flavin). S. Lepkovsky and T. H. Jukes. Journal of Nutrition, Vol. 12, 1936, p. 515.

Diets are described, deficient in lactoflavin and containing other vitamins of the B complex, suitable for rats, chicks and turkey poults. The symptoms of flavin deficiency in rats were greasy fur, loss of hair, bloodstains on paws and face, encrustations on the ears, soiling of feet and tail, and gastro-intestinal disturbances causing distention of the abdomen and later diarrhoea. Chicks deficient in flavin did not grow; they developed diarrhoea but there was no dermatitis. In turkey poults on the other hand, flavin deficiency led to the development of acute dermatitis, although the diet was adequately supplied with the "filtrate factor" of Lepkovsky and Jukes, which prevents dermatitis in chicks.

The relation of vitamin G to the hatchability of hens' eggs. R. M. Bethke, P. R. Record, and D. C. Kennard. Journal of Nutrition, Vol. 12, 1936, p. 297.

Many substances rich in vitamin G (B_2) increased the hatchability of eggs when included in the hen's ration. The effect was not associated with the protein in the diet or with Vitamin B_4 or vitamin E. The active factor was water soluble and could be extracted with alcohol from dried liver or whey. It was destroyed by autoclaving in an alkaline medium. It is concluded that vitamin B_2 is necessary for the normal development of the embryo of the chick.

The effect of the ration of the hen on the vitamin G content of eggs with observations on the distribution of vitamin B and G in normal eggs. R. M. Bethke, P. R. Record, and F. W. Wilder. Journal of Nutrition, Vol. 12, 1936, p. 309.

By experiments on rats it was confirmed that egg white contains vitamin G (B_2) but not B (B_1) while egg yolk contains both.

Hens given a diet rich in vitamin B_2 produced eggs rich in this vitamin and with high degree of hatchability.

Differentiation between vitamin G and an insoluble factor preventing a pellagra-like syndrome in chicks. A. T. Ringrose and L. C. Norris. Journal of Nutrition, Vol. 12, 1936, p. 535.

1. Dried pork liver contained a factor which prevented dermatitis in chicks fed on a diet containing dried egg white. This factor was not extracted by 20 per cent alcohol, and was destroyed by autoclaving at p_H 11. The liver also contained a factor which promoted the growth of chicks fed on a diet containing casein. This factor was extracted by 20 per cent alcohol and was relatively more stable to autoclaving at p_H 11. This factor was vitamin G (B_2).

Chicks fed on the casein diet developed dermatitis which was less severe than, though similar to, the dermatitis in the chicks on the egg white diet. Autoclaving egg white prevented the development of the dermatitis, which was attributed to the liberation during autoclaving of a factor preventing dermatitis, rather than to the destruction of a toxic factor, as postulated by other workers.

2. Dried pork liver contained a water soluble factor which prevented the development of a pellagra-like dermatitis in chicks, fed on a heated casein and cereal diet; it also contained a water soluble factor which promoted growth of chicks fed on an unheated casein and cereal diet. The factor preventing dermatitis was destroyed by exposure to heat in a dry atmosphere for 144 hours at 100° C; it was not adsorbed from an acid solution by fuller's earth, and was present in unheated cereal and coagulated egg white. The growth promoting factor was adsorbed on fuller's earth and was relatively stable to dry heat.

It is suggested that the dermatitis developed by chicks fed on a diet containing egg white is identical with that resulting from a heated casein and cereal diet. The view is held that two factors present in liver are required for the prevention of this dermatitis, one soluble in 20 per cent alcohol and the other insoluble.

Effect of packinghouse byproducts, in the diet of chickens, on the production and hatchability of eggs. H. W. Titus, T. C. Byerly, N. R. Ellis, and R. B. Nestler. Journal Agricultural Research, Vol. 53, 1936, p. 453.

A number of meat packing house byproducts when used to feed pullets resulted in good egg production and a high degree of hatchability, comparison being made with a diet containing a meat, fish and milk supplement known to be efficient in these respect. The materials were examined for vitamin B_2 content by growth tests on rats and proved fairly rich. Different methods of cooking and drying did not affect the vitamin B_2 content of meat scrap or blood meals. The commercial use of packing house byproducts for poultry feeding is suggested, use being made of a mixture of carcases, livers, spleen, skulls, beef rennets, tripe trimmings, hashed pecks and beef cutting scrap.

VITAMIN D

Effect of different sources of vitamin D on the laying bird. 1. II. Poultry Science, Vol. 15, 1936, p. 326. These are reports of studies at the Ohio Experiment Station.

1. Egg production, hatchability and tissue composition. R. M. Bethke, P. R. Record, C. H. Kick, and D. C. Kennard.

In the first study four lots of 30 White Leghorn hens each were used, each lot receiving the same all-mash ration. Lots 1 and 4 received no vitamin D supplement, lot 2 received 2 per cent of cod-liver oil in the mash, lot 3 received the same equivalent number of rat units as irradiated ergosterol. Lots 1, 2, and 3 were housed behind ordinary window glass, while lot 4 was housed behind Cel-O-Glass.

The average egg production per bird from December 1 to May 30 was 39.3, 86.8, 67.2 and 78.3 and the percentage mortality over the same period was 23.3, 10, 30, and 16.6 for the four lots, respectively. After 5 mo. on experiment the percentage of dry eggshell expressed as on the fresh weight of eggs was 5.25, 9.45, 7.96 and 9.27, and the percentage hatchability of fertile eggs was 0, 60.5, 47.6 and 62.5 for the respective lots. These results indicate that mortality, egg production, eggshell quality, and hatchability of eggs are greatly influenced by the amount of the antirachitic factor supplied.

Feeding adequate amounts of irradiated ergosterol or allowing access to direct sunlight after 6.5 mo. on a ration either low in or devoid of vitamin D materially improved production, shell quality, and hatchability of eggs. Irradiated ergosterol is not as efficient a source of vitamin D as cod-liver oil for laying hens, requiring approximately ten times as many rat units to give the same results. Fifty-four international rat units as cod-liver oil per 100 g. of ration were insufficient for optimum results, while 5.400 units per 100 g. of ration were excessive and decreased egg production and hatchability. Massive doses of 54.000 units of irradiated ergosterol per 100 g. of ration were toxic, leading to anorexia, loss of weight, and lowered production, with evidence of decreased plasma phosphorus and calcification in the kidneys.

2. Storage of vitamin D in the egg and chick and mineral composition of the mature embryo. R. M. Bethke, P. R. Record, O. H. M. Wilder, and C. H. Kick.

1. Groups of 30 White Leghorn yearling hens received an all mash ration. Two groups received no supplement; one received 2 per cent cod liver oil containing 108 international units of vitamin D per g. and one received irradiated ergosterol to the same rat dosage. All were housed behind window glass except one of the groups without supplement which was behind cel-o-glas. The performance, as regards body weight, survival rate, egg production, percentage of dry egg shell, and hatchability, was much better in the cod liver oil and cel-o-glas groups, the performance of the irradiated ergosterol group being in some particulars little better than that of the unsupplemented group. A second test showed that egg production and hatchability were greatest with 540 I. U. of vitamin D per 100 g. ration as cod liver oil, and with 5400 I. U. as irradiated ergosterol, being less with one-tenth or ten times these amounts.

2. Eggs from the same hens were tested for vitamin D by the 10 days line test, monthly for seven months from one month after the beginning of the experiment. The vitamin D value of the eggs from hens receiving irradiated ergosterol, though at first the same as that of eggs from hens receiving cod liver oil, fell rapidly. The eggs of hens behind cel-o-glas started with a low value which rose rapidly. Eggs from hens in the second test described in Part I above confirmed the result that vitamin D supplied to the hen as irradiated ergosterol was less well transferred to the egg than when supplied as cod liver oil.

With chicks hatched from these eggs and maintained on a rachitogenic ration, ash and blood analyses and weight increase at 4 to 5 weeks of age showed higher values in the cod liver oil groups than in the ergosterol and negative control groups.

Chicks hatched from eggs of hens in the second experiment in Part. I and killed at 5 weeks showed marked superiority in bone ash only when the hens received 5400 I. U. of vitamin D from cod liver oil per 100 g. of ration.

Egg oil from hens given irradiated ergosterol was less effective when tested on chicks in equal rat dosage than egg oil from hens given cod liver oil.

The mineral composition of chicks just hatched did not appear to be influenced by the vitamin D intake of the hen.

Further studies on the effect of sources of vitamin D in the diet of the chicken on storage of the antirachitic factor. G. M. de Vaney, H. E. Munsell, and H. W. Titus. Poultry Science, Vol. 15, 1936, p. 149.

Continuing this investigation, a study was made of the effect of adding varying quantities of vitamin D from either cod-liver oil or viosterol, but mixed with corn oil in such proportion that 8 per cent of fat was added to the diet in each case. This level of fat in the diet apparently exerted no inhibiting effect on vitamin D storage which amounted to about 2 per cent of the amount ingested when 2 and 4 per cent of cod-liver oil or 8 per cent of viosterol 5 D was fed. The percentage retention was somewhat lower when 8 per cent of cod-liver oil or 2 or 4 per cent of viosterol 5 D was fed. The number of eggs or bird was quite similar in all trials except in the case of those receiving 8 per cent of cod-liver oil, where egg production was markedly decreased.

Effect of calcification upon growth and sex differences in White Leghorn chicks. L. L. Lachat and H. A. Halvorson. Poultry Science, Vol. 15, 1936, p. 127.

In this series of tests six groups of day-old chicks, including both sexes, were fed on the basal rachitogenic diets plus varying quantities of antirachitic supplements at such levels as to produce a range from severe rickets and subnormal growth to normal calcification and growth during the 4-week period. Apparently deprivation of vitamin D affects growth and calcification of females more seriously than males, although females utilized vitamin D more efficiently. A high degree of correlation was found to exist between body weight and calcification amounting to 0.759 ± 0.02 for males and 0.819 ± 0.014 for females. Since growth rates

are seasonally affected, this relationship explains the seasonal variations in calcification as noted above. Females are considered more satisfactory than males for vitamin D investigation.

The provitamin D of heat-treated cholesterol. M. L. Hathaway and D. E. Lobb. Jour. Biol. Chem., Vol. 113, 1936, p. 105.

The method of Hart et al. was used to test on chicks the activity of provitamin D produced by heat treatment of cholesterol. The supplements to the ration were reference cod-liver oil (95 U. S. Pharmacopoeia units per gram), irradiated ergosterol in maize oil, crude cholesterol, purified cholesterol, and heated purified cholesterol. All the cholesterols were irradiated with ultraviolet light. The purified cholesterol was prepared from crude cholesterol through the use of dibromide, and a sample of it was heated in an oil bath at 200° C. for 2 hr. and then recrystallized from hot alcohol.

The results of a preliminary assay indicated that 1 Steenbock rat unit or 0.5 mg. of crude cholesterol was effective in protecting the chick from rickets, but that the same number of units of purified cholesterol was ineffective. The results of further assays showed that 10 Steenbock rat units of cod-liver oil, irradiated crude cholesterol, or irradiated heated purified cholesterol per 100 g. of food adequately protected the chick, and that 5 rat units did not give adequate protection except in the case of crude cholesterol. Irradiated ergosterol fed at levels of 100 Steenbock rat units per 100 g. of ration was about equivalent to 5 rat units of heated purified cholesterol and 300 rat units to 10 of heated purified cholesterol. These results confirm the observations of Waddell.

This investigation has given evidence that the provitamin D of crude cholesterol was destroyed by purification through dibromide, and that a new provitamin was formed in the purified cholesterol by heat treatment. Levels of from 2.5 to 5 mg. per 100 g. of ration of heat-treated purified cholesterol completely protected the chick. As shown by the chick, the vitamin D of irradiated, heated, and purified cholesterol has properties resembling more closely the natural vitamin D of cod-liver oil than that of irradiated ergosterol.

Requirement of poultry for vitamin D and associated factors. Nagra synpunkter pa hönsens D-vitaminbehov och i samband därmed stäende faktorer. N. Olsson. Nord. Jordbruksforsk, 1936, p. 34. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 947.)

Four groups of White Leghorn pullets were maintained behind window glass for 4 spring months. One group received no addition, and one each of the other three received, per pullet daily, 0.29, 0.86 or 1.44 g. cod liver oil containing 144 international units of vitamin D per g. The food consumption, weight increase and egg production of the birds, and the weight, shell weight, hatchability and vitamin D storage of the eggs were recorded. The birds showed great individual variation in vitamin D requirement for the same performance, but the largest dose of cod liver oil seemed to satisfy all requirements.

Studies on some physical and physiological characters in hens' eggs. N. Olsson. 6. Weltgeflügelkongress, Leipzig, 1936.

In eggs from hens on a ration deficient in vitamin D the mean weight of the yolk was significantly higher than in eggs from hens on a diet of optimal vitamin D content but total egg weight and mean weight of shell were lower. The difference in weight of albumin was insignificant. The variability in the weight of the whole eggs, and in the weights of the component parts, particularly in weight of shell, was always greater in the vitamin D deficient group. A large amount of correlation data is given on the physical composition of the shell, together with results of studies on loss in weight in eggs during storage.

Some viewpoints on the vitamin D requirement of poultry and factors relating thereto. N. Olsson. Nord Jordbrugsforsk, 1936, p. 185. (Ref. Exp. Station Record, Vol. 76, 1936, p. 378.)

Comparative feeding trials were conducted with four groups of White Leghorn pullets each housed behind ordinary window glass and receiving a basal diet low in vitamin D. Group I received no vitamin D supplement, while lots 2, 3, and 4 received 0.288, 0.864 and 1.44 g. of cod-liver oil per bird daily, respectively.

Great individual variations in vitamin D requirement of the hens were noted, certain hens in group I being able to maintain production, shell quality, and hatchability of eggs without additional supply while the majority showed a definite need for a supplement. Based on group averages, a daily intake of 0.288 g. of cod-liver oil was sufficient to maintain optimum production, although shell quality and hatchability were adversely affected at this level, while 0.864 g. was ample for optimum hatchability. Rapid decrease in the percentage of shell weight in successively laid eggs is a reliable symptom of vitamin D deficiency. The need for further investigation on the cause of variation in the vitamin D requirements of individual hens is pointed out.

Standardising vitamin D supplements with Chicks. Untersuchungen über die Möglichkeit, Vitamin D-Präparate mit wachsenden Küken zu standardisieren. N. Olsson. Archiv für Geflügelkunde, Vol. 10, 1936, No. 11.

An investigation was made on growing chicks concerning the possibility to standardize vitamin D supplements. The main results are as follows:

1. The influence of vitamin D on the bone calcification in growing chicks can be studied on x-ray photographs of the elements laying around the intertarsal joint.

2. The distance between the calcification zones of the distal bone in the tarsus and of the metatarsus is inversely proportional to the intensity of calcification in growing chicks at a certain age.

3. The most suitable age of the chicks for the estimation of their calcification by this method seems to be 6 weeks.

4. Vitamin D supplements can be standardized with chicks by using tmt values as indicator of the calcification, provided that the vitamin D

intake is sufficiently small in order to effect a variation in these values, and a sufficient number of chicks are included in the investigation.

5. For a normal calcification in growing chicks up to the age of 8 weeks a minimum of 1.75 g. of the cod-liver oil here used was required per kg. food (corresponding to 0.175 per cent) for whole groups, and a minimum of 15.91 g. of shark-liver oil per kg. food (corresponding to 1.59 per cent) on a Ca:P ration of 2:1 in the food.

6. There is a great individual variation in the vitamin D requirements of the chicks.

Yeast (Torula pulcherrima) as a source of vitamin D. E. P. Kratinova and A. I. Pokhil. Problemy Zhivotnovodstva, No. 9, 1935, p. 93. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 856.)

In 1933 the Ukrainian Institute of Experimental Veterinary and Zootechnical Sciences carried out some investigations on the treatment of moist feeding stuffs with yeast, to verify its capacity for increasing the N and vitamin content of silage. The increase of the N content of silage was confirmed, the increase of vitamin D occurred only after irradiation of the yeast. Torula yeast was the most satisfactory both in laboratory experiments and in feeding experiments with chickens. Details are given of a large scale experiment on a poultry sovkhoz (state farm). Of the different foodstuffs silaged, pumpkins were the most satisfactory. Use of the food treated with yeast lowered the percentage of rachitic chickens and the general mortality.

The vitamin D requirements of growing chicks and laying hens. R. R. Murphy, J. E. Hunter, and H. C. Knandel. Pennsylvania Sta. Bul. 334, 1936.

This bulletin gives further consideration to the results previously published and presents results of a second series of experiments of a similar nature. A cod-liver oil vitamin D concentrate (Zucker process) was used as the primary source of vitamin D in both series of experiments. Using the rat assay method (U.S.P.X. Revised 1934), the concentrate was found to contain 310 U.S.P. units of vitamin D per gram. This concentrate was added to the basal rachitic diet fed all groups of birds at such rates as to provide a vitamin D potency ranging from 0 to 310 units per 100 g. of ration.

In general, the results of the second series of experiments confirmed the previous findings. Chicks on the basal diet without vitamin D supplement and confined without access to sunlight became rachitic at approximately 3.5 weeks of age. Nineteen units of vitamin D per 100 g. of feed appeared to be the minimum protective level for chicks up to 24 weeks of age, a few individuals showing rachitic symptoms at this level although growth rate was normal. Thirty-nine units per 100 g. of feed produced very satisfactory growth and bone development, while no advantages resulted from providing higher levels of vitamin D in the ration of the growing chicks.

In the experiments with laying pullets confined without access to sunlight 58 units per 100 g. of the all-mash ration gave unsatisfactory results, while 78 units per 100 g. of ration gave satisfactory results in maintenance of body weight, egg production, size of eggs, quality of shell, and hatchability. Under climatic conditions existing in this experiment

spring-hatched chicks under range conditions secured sufficient sunshine irradiation for normal growth and bone development, and the laying pullets on range received sufficient irradiation for satisfactory performance during the entire laying period.

The effect of vitamin D intake of the hen on the bone calcification of the chick. R. R. Murphy, J. E. Hunter, and H. C. Knandel. Poultry Science, Vol. 15, 1936, p. 284.

Groups of White Leghorn fowls received an all mash laying ration to which were added amounts of cod liver oil concentrate to provide from 0 to 270 U.S.P. units of vitamin D in 100 g. food. The chickens hatched from their eggs were reared in uniform conditions and received an all mash ration deficient in vitamin D. Estimations on their bones when one week old clearly showed an ash content increasing with the increasing vitamin D intake of the mother. The relation was less clear at two weeks and at three weeks it no longer existed. Photographs of the split epiphyses showed some influence of the mother's vitamin D intake persisting for slightly longer.

Ultraviolet irradiation in the rearing of chickens. Ultraviolettbestrahlung bei der Kükenaufzucht. J. G. Tukker. 6. Weltgeflügelkongress, Leipzig, 1936.

Ultraviolet irradiation stimulated the growth of Barnevelder chickens; but it may be that an equivalent response could be obtained by the use of small quantities of cod liver oil.

The effect of cod-liver oil in the diet of the mother hen on embryo, mortality and on the calcium and phosphorus content of the embryo. W. M. Insko Jr. and M. Lyons. Kentucky Sta. Bul. 363, 1936.

The data reported in this bulletin were concerned with embryo mortality as influenced by cod-liver-oil fed to White Leghorn pullets (1) confined to the house with sunshine only through window glass, (2) confined to the house and allowed sunshine in a wire-screened porch, and (3) allowed bluegrass range. A study was also made of the effect of the first and third sets of conditions upon the calcium and phosphorus content of the embryo.

Pullets confined without vitamin D supplement produced eggs having a very high embryo mortality during the third week of incubation, Exposure to sunshine or access to bluegrass range markedly reduced mortality during this period, and the range was more effective than sunshine alone. Adding codliver oil to the ration under the above conditions decreased embryo mortality during the third week. The decrease was most marked in the confined lot, with only a slight decrease in the bluegrass lot.

The calcium and phosphorus content of embryos from the pens receiving no antirachitic treatment was consistently less after the sixteenth day than that of embryos from other pens. The greatest difference in this respect occurred on the eighteenth or nineteenth day of incubation, which coincided with the peak of embryo mortality during the last week of incubation.

The relative Potency of Vitamin D from Different sources. E. M. Hume. Nutrition Abstracts and Reviews, Vol. 6, 1934, p. 891.

After examining the evidence there can be no doubt that the discrepant behaviour of rats and chickens towards vitamin D in cod liver oil and irradiated ergosterol is due to a chemical difference in the vitamin as present in these two sources. Further, these two are not the only forms of vitamin D in existence, for several other well authenticated forms have been prepared in the laboratory, and it is also more than probable that even the vitamin as present in natural sources is not always the same chemical substance. This fact is not yet, however, fully established.

No quantitative comparison of the relative activity of the various forms of vitamin D has yet been made on any other species of animal, besides the rat and chicken except man. The conclusion seems fairly certain that for the human infant, vitamin D from fish liver oils, irradiated ergosterol, irradiated cholesterol and vitamin D milks of various kinds, has the same relative potence as for rats.

As far as the human being is concerned, therefore the standardisation of sources of vitamin D against irradiated ergosterol as standard, in tests with rats, would seem to be a satisfactory method of procedure. Sources of vitamin D for use with poultry should, on the other hand, be standardised by means of tests with chickens only, and the standard material used for comparison should certainly not be irradiated ergosterol. So far as can be seen at present, the vitamin or vitamins D of fish liver oils are the only ones of practical interest for poultry feeding, but until there is more certain knowledge of the number of these and of their relative value, a final decision cannot easily be taken as to the most useful substance to be adopted as international standard of comparison for testing vitamin D products designed for use in poultry feeding.

A quantitative method for the assay of vitamin D with chickens. O. N. Massengale and C. E. Bills. Journal of Nutrition, Vol. 12, 1936, p. 429.

The chicks for the tests are derived from a colony of White Leghorn fowls maintained at all seasons on a ration containing 200 I. U. vitamin D as cod-liver oil per 100 g. food. Eggs for hatching are selected. During a 2 weeks' preparatory period and a 4 weeks' experimental period the chicks receive a diet of yellow maize 56, wheat bran 10, linseed oil meal 10, wheat gluten 10, skim milk powder 9, $CaCO_3$ 2, NaCl 1, vegetable oil 2, The Ca:P ratio is 2:1. The test material is incorporated in the vegetable (maize or cottonseed) oil of the diet. Ten birds are used for each dose. At the end one femur is removed from each bird, extracted with ether and alcohol, and ashed.

Curves of response are constructed relating percentage ash to dose for 6 doses of vitamin D as cod liver oil, and 7 as irradiated ergosterol, 20 to 50 birds being used for each dose. The shape of these curves is not the same, and the maximum percentage ash atteinable with irradiated ergosterol is about 47, while with cod liver oil it is well over 48. The differing results obtained by different workers for the relative doses of the two substances needed to secure the same percentage ash is thus seen to be due to differences in the level of dosage selected.

The magnitude of the probable error of the method is examined, and, with 10 chicks for a dose, may be as low as 9 per cent of the value found, expressed in units.

The comparative antirachitic activity of several fish liver oils and other sources of vitamin D for the chicken and the rat. A. Black and H. L. Sassaman. Amer. Jour. Pharm., Vol. 108, 1936, p. 237.

In a series of comparative tests with rats and chicks, it appeared that on the basis of U. S. P. XI D units, tuna fish oils are approximately one-half as active as liver oils of cod, swordfish, halibut, and mackerel, and irradiated cholesterol D, each of which contain vitamin D with about the same activity for chickens. Irradiated phytosterol, or unsaponifiable matter from alfalfa, was similar to irradiated ergosterol in its activity.

Studies relative to the estimation of vitamin D.—4. Effect of seasonal variation upon vitamin D assay. L. L. Lachat and H. A. Halvorson. Poultry Science, Vol. 15, 1936, p. 362.

Continuing this series of investigations, day-old White Leghorn chicks were placed on the A. O. A. C. rickets-producing ration, certain groups being started around March 1 and others about August 1. Lots in each group included negative controls and those receiving various levels of U. S. Pharmacopeia "reference cod-liver oil" as well as commercial cod-liver and other fish oils.

From data obtained on growth rates and bone ash analysis it is concluded that the chick's response to vitamin D additions is variable, with definite seasonal trends. The chick's requirement per 100 g. of A. O. A. C. ration during the 4-week feeding period was about 26.7 U.S.P. units of vitamin D for the spring months and about 23.8 units during the late summer and autumn months. It was further noted that negative controls have higher average ash in the autumn months than in the spring months, this difference being characterized by more rapid growth rate during the former season. The desirability of having a standard preparation containing vitamin D for poultry to obviate errors in interpreting results of assays of vitamin D carriers at different seasons of the year is pointed out.

Studies relative to the estimation of vitamin D.

5. Roentgen (X-) ray diagnosis and ash determination of bone calcification, and blood mineral analyses in White Leghorn chicks. H. A. Halvorson and L. L. Lachat.

6. Comparative vitamin-D requirement of the chick for sardine (pilchard), concentrated, and cod-liver oils, irradiated yeast, irradiated ergosterol, and irradiated cholesterol. L. L. Lachat and H. A. Halvorson.

7. Effect of age, sex, size and calcification in young chicks on accuracy of preventive bioassay. L. L. Lachat.

J. Assoc. Off. Agric. Chem., Vol. 19, 1936, pp. 628, 637, 647. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 944.)

5. It was concluded that neither the Mg nor Ca content of the blood plasma was influenced consistently by the age of the chick or the amount and kind of vitamin D supplement given, and that the inorganic phosphorus was influenced only slightly. The X-ray examination of the bones gave a better, and the bone ash determination the best, indication of the antirachitic action of supplements. The unsupplemented A. O. A. C. diet deficient in vitamin D produced a low bone ash in young chicks within two weeks; the length of the feeding period could thus be shortened to 3 or even 2 weeks.

6. The superiority of the bone ash method was confirmed. Twenty-eight "units" of vitamin D per 100 g. A. O. A. C. ration, as determined by tests with rats, given as irradiated cholesterol or as the U. S. P. reference oil, produced equal effects in chicks. Irradiated ergosterol or irradiated yeast in 50 times this dosage failed to produce a normally calcified bone. Irradiation for 20 minutes of the A. O. A. C. diet supplemented with corn oil produced slightly subnormal calcification.

7. A number of conclusions was drawn from experiments on more than 2000 chicks. Depreviation of vitamin D reversed the normal finding of higher calcification in female, than in male, chicks. Heavier birds (male or female) had a higher ash content in the bones than lighter birds. But weight increase was not as accurate a criterion as ash content. No decrease in calcification was apparent until the chicks had received the vitamin D deficient diet for 3 weeks, but calcification was increased in 3 weeks with a sufficient supply of the vitamin. Both sexes showed a similar variation in size and calcification at different ages, which was most pronounced at 3 weeks. The effect of sex on the ash content of the bones of birds 4 weeks old or less receiving vitamin D supplements was negligible. The greatest accuracy was obtained in tests in which the average ash content of the bones lay below 35 or above 45 per cent. The error of the test was not increased by reducing the feeding time from 4 to 3 weeks.

Provitamin of egg sterol. Über das Provitamin des Eiersterins. A. Windaus and O. Stange. Hoppe-Seyler's Zeitschrift, Vol. 244, 1936, p. 218.

Cholesterol from egg yolk was fractionated by chromatographic adsorption on alumina, and the substance showing absorption in the ultraviolet was separated in the pure condition. It was identified as ergosterol.

Effect of the Ca:P ratio and of the Ca and P content of the basal diet on the vitamin D requirements of chicks. Über den Einfluß der Ca- und P-Verhältnisse und des Ca- und P-Gehaltes in der Grundkost auf den Bedarf an D-Vitamin bei Küken. M. J. L. Dols. Archives néerland. de Physiologie, Vol. 21, 1936, p. 554.

The casein, wheat bran, maize grits, dried yeast, NaCl, $CaCO_3$, $CaCl_2$ and $CaHPO_4$ in the diet were varied in amount to give different total Ca and P contents and differing Ca: P ratios. Cod liver oil, 0, 1.0 or

2.0 per cent, or carotene was given. Day old White Leghorn chicks were used, and the criteria were ash analyses of tibiae after 8 weeks and X-ray photographs of the right ankle joint at 4.6 and 8 weeks.

With a P content of the diet between 0.45 and 1.0 per cent the requirement of vitamin D became less as the P content rose; below 0.45 per cent no amount of vitamin D could produce normal bones. With a P content of 1.0 per cent and a Ca: P ratio of 3:1, normal bones were obtained at 5 weeks without any addition of vitamin D.

Effect of cod and tunny liver oil and of irradiated cholesterol and ergosterol preparations on rickets in poultry. Über die Wirkung von Dorschlebertran, Thunfischleber und bestrahlten Cholesterin- und Ergosterin-Präparaten bei der Geflügelrachitis. M. J. L. Dols. Zeitschrift für Vitaminforschung, Vol. 5, 1936, p. 161.

The greater part of the material in this paper has appeared before. The presence of a small measure of antirachitic activity in the saponifiable fraction of cod liver oil was traced to a small amount of vitamin D which had passed into it. The author concludes that the naturally occurring vitamin D of cod or tunny liver oil is identical with that of irradiated cholesterol but not of irradiated ergosterol.

Kentucky bluegrass as a source of vitamin D and protein for growing chicks. G. D. Buckner, W. M. Inko, and J. H. Martin. 6. Weltgeflügelkongress, Leipzig, 1936.

White Leghorn chickens, kept in battery brooders away from direct sunlight, were fed on mash in which irradiated or non-irradiated fresh Kentucky blue grass was substituted for the usual cod liver oil as source of vitamin D. Another group of chicks received a mash with dried irradiated blue grass, in place of dried skim milk, as main source of vitamin D and of protein. Irradiated and non-irradiated fresh grass were not adequate sources of vitamin D even in large amounts, but irradiated dried grass protected the chicks from rickets. The protein of dried blue grass was less satisfactory than that of dried skim milk. It is suggested that chicks which thrive on blue grass ranges probably derive the antirachitic vitamin from exposure to the sun and not from eating the fresh grass.

Antirachitically active irradiation product of 7-dehydrocholesterol. Über das antirachitisch wirksame Bestrahlungsprodukt aus 7-Dehydrocholesterin. A. Windaus, Fr. Schenk, and F. v. Werder. Hoppe-Seyler's Zeitschrift, Vol. 241, 1936, p. 100.

The antirachitically active ultraviolet irradiation product of 7-dehydrocholesterol was purified as the 3:5-dinitrobenzoate or as the allophanate. The oily saponification product of the dinitrobenzoate showed the same characteristic absorption maximum at 265 mμ as vitamin D_2 (calciferol). Tested biologically, this product contained in 1 mg. 24,000 international units of vitamin D, as against 40,000 in vitamin D_2.

A formula is proposed, only differing from that of vitamin D_2 in the structure of the sidechain. The substance is said to be identical with that isolated by Brockmann from tunny liver oil and is called vitamin D_3.

7-Dehydrositosterol. Über das 7-Dehydrositosterin. W. Wunderlich. Hoppe-Seyler's Zeitschrift, Vol. 241, 1936, p. 116.

7-Dehydrositosterol was prepared from sitosterol by way of 7-ketositosteryl acetate and 7-hydroxysitosteryl dibenzoate, the series of steps being similar to that in the preparation of 7-dehydrocholesterol from cholesterol. The substance showed reactions and absorption spectrum similar to those of ergosterol. It was rendered antirachitically active by irradiation, but the product had only one-fortieth the activity of the product from ergosterol.

Estimation of the antirachitic activity of new sterol derivatives. Experiments on rats and chickens. Die Auswertung der antirachitischen Wirksamkeit neuer Sterinderivate im Versuch an Ratten und Küken. W. Grab. Hoppe-Seyler's Zeitschrift, Vol. 243, 1936, p. 63.

The various possible explanations of the difference in potency for rats and chicks of vitamin D from different sources are briefly discussed, and all except that of an actual difference of substance are rejected. Biological tests are described with rats and chicks to determine the antirachitic value of the materials.

With rats receiving McCollum 3143 rachitogenic diet three series of tests were made to find accurately the minimal dose protecting 70 to 90 per cent of the animals for a period of 14 days; the test dose was administered daily into the mouth and the criterion was X-ray photography. Doses of a standard not the international standard, were given simultaneously.

Day-old white Leghorn chicks received the rachitogenic diet of Hart, together with a daily prophylactic dose, administered into the crop, of the test material for 63 to 85 days. Criteria were macroscopic signs of rickets in life and at autopsy, ash content of tibiae, serum Ca and P, and X-ray picture of the knee joints.

The materials tested were crystalline irradiated ergosterol (vitamin D_2) halibut liver oil, a tunny liver oil concentrate both crude and crystalline, the crude irradiation product of 7-dehydrocholesterol, of 22-dihydro-ergosterol, of 7-dehydrositosterol and of 7-dehydrostigmasterol, and also a crystalline irradiation product of 7-dehydrocholesterol (vitamin D_3). It was concluded that for chickens, in rat dosage, tunny liver oil concentrate and irradiated 7-dehydrocholesterol were equally potent, and that 7-dehydrocholesterol is the natural provitamin of tunny liver pol. Very little inferior for chicks was irradiated 22-dihydroergosterol which possesses the same side chain as 7-dehydrocholesterol. On the other hand, irradiation products of 7-dehydrositosterol and of 7-dehydrostigmasterol, both sterols with C_{29} in the empirical formula, were only feebly antirachitic for both rats and chicks. The ratio for chicks in rat dosage of the minimal dose needed of vitamin D_3 to that of vitamin D_2 was 1:32 to 80.

VITAMIN E

A lymphoblastoma occurring in young chicks reared on a diet treated with ferric chloride to destroy vitamin E. F. B. Adamstone. Amer. J. Cancer, Vol. 28, 1936, p. 540. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 951.)

In 31 of 34 chicks fed from the time of hatching on a normal diet which had been treated with 1 per cent ferric chloride in ether, malignant growths (lymphoblastoma) of the liver, heart and other organs were found at autopsy. Ferric chloride is known to destroy vitamin E and it is suggested that vitamin E deficiency is at least partially responsible for the appearance of the growths.

The isolation from wheat germ oil of an alcohol, a-tocopherol, having the properties of vitamin E. H. M. Evans and O. H. and G. A. Emerson. Journal Biol. Chemistry, Vol. 113, 1936, p. 319.

In this study from the University of California, an oily alcohol having the properties of vitamin E was isolated from the nonsaponifiable matter of wheat-germ oil with the use of cyanic acid. The name proposed for the alcohol was a-tocopherol from the roots "tokos = childbirth; phero = to bear; -ol indicating an alcohol". It has a melting point of from 158° to 160° C.; a characteristic absorption band at 2,980 a. u., $E^{\text{per cent}}_{1\text{ cm}} = 90$ ca; and an analysis of two derivatives, urethane and allophanate, indicated a provisional formula of $C_{29}H_{50}O_2$. Two other allophanates isomeric with a-tocopherol were also obtained from the wheat-germ oil. One allophanate with a melting point of 250° had no vitamin E potency and the other with a melting point of 138° had some vitamin E potency. Single doses of 1 mg. of a-tocopherol produced litters of rats sporadically and 3 mg. produced litters quite regularly.

SUNDRIES

Protection afforded by certain vegetable oils against nutritional encephalomalacia of chicks. A. M. Pappenheimer and M. M. Goettsch. Soc. Expt. Biol. and Med. Proc., Vol. 31, 1934, p. 777. (Ref. Experiment Station Record, Vol. 76, 1937, p. 232.)

Continuing this line of investigation in an attempt to find materials offering protection against nutritional encephalomalacia, the authors, with the assistance of A. Alexieff, have shown that when certain vegetable oils were substituted for lard in the basal diet (No. 108) all chicks were completely protected from the disease. Cottonseed oil, hydrogenated cottonseed oil, corn oil, and peanut oil, each afforded complete protection, while olive oil was less efficacious.

The prevention of nutritional encephalomalacia in chicks by vegetable oils and their fractions. M. Goettsch and A. M. Pappenheimer. Jour. Biological Chemistry, Vol. 114, 1936, p. 673.

In continuation of the above studies, this investigation, in which

the authors had the assistance of A. Hart, demonstrated the presence of the antiencephalomalacia factor in the nonsaponifiable fraction of certain vegetable oils. When the diet (No. 108) upon which the disease was first observed was supplemented with 5 per cent of soybean oil, which replaced an equal amount of lard, the incidence of the disease was 1.6 per cent, or one chick developed the disorder out of a total number of 62. This oil was, therefore, used for studies on properties and concentration of the factor.

The factor as present in soybean oil was found stable to autoclaving for 6 hr. at 120° C. and to irradiation from a quartz lamp for 30 min. at a distance of 3 ft. It was only partially soluble in 95 per cent ethyl alcohol at room temperature. Continuous extraction with the alcohol for 2 weeks failed to remove any more of the active material. The factor in this extract was stable to aeration at room temperature for 48 hr. and to saponification at room temperature for 18 hr. in a nitrogen atmosphere. Saponification with exposure to air completely inactivated the extract.

Petroleum ether, purified by treatment with concentrated sulfuric acid for several weeks, followed by washing and distillation, was used to extract the nonsaponifiable and fatty acid fractions. The protective dose of the nonsaponifiable fraction was 0.24 g. per kilogram of the diet. The fatty acid and watersoluble portions of the extract had no protective activity.

The discussion included in this paper related to the nonidentity of this factor to vitamin E, to the gizzard factor of Dam, and to the vitamin B_4 of Keenan et al.

Effects on three types of animals of injecting the new factor curative of pellagra-like symptoms due to egg white. J. G. Lease, E. Kelly, and H. T. Parsons. Jour. Biol. Chem., Vol. 114, 1936, p. LXI.

In this study at the Wisconsin Experiment Station, a water-soluble factor prepared by digesting liver residue with papain and reextracting the dried extract with methanol was found to cure a severe dermatitis and a nerve disorder caused by dietary egg white in three types of animal. The curative dose for the rat was 0.25 cc. given intraperitoneally 3 times a week, for the chick 0.5 cc. injected 3 times a week, and for the rabbit 4 cc. a day. This factor was not identical with vitamins B_1 or B_2.

Importance of vitamins in poultry feeding. L'Importance et le rôle des vitamines dans la nutrition des volailles. H. Simonnet. 6. Weltgeflügelkongress, Leipzig, 1936.

A survey is given of the requirements of vitamins A, D, E, C, K and B complex in poultry feeding, with a separate bibliography for each section. In the general summing up it is noted that the requirement of vitamins is particularly high for young growing chicks and for laying hens, but that in poultry raising under good conditions of feeding the addition of vitamins to the diet does not accelerate growth nor increase laying capacity. It is most important that the food should be properly prepared in order to, preserve its vitamin content and ensure the digestibility of the protein.

The distribution and properties of the anti-gizzard-erosion factor required by chicks. H. R. Bird, O. L. Kline,

C. A. Elverjem, E. B. Hart, and J. G. Halpin. Journal of Nutrition, Vol. 12, 1936, p. 571.

Experimental studies with young chicks as test animals showed that the anti-gizzard-erosion factor was distinct from the anti-haemorrhagic factor and that it occurred in pork lung, liver and kidney, and in the whole grains of oats, wheat and maize. The heat stability of the factor varied according to its source, being apparently greater in preparations made from pork lung than in those from cereals. It was insoluble in ether and ethyl alcohol and followed the acid precipitable protein fraction in preparations from pork lung. The observation of Almquist and Stokstad that the factor was present in hexane extracts of alfalfa was not confirmed and tests of other leafy materials were also negative.

Factors influencing the incidence of dietary hemorrhagic disease in chicks. H. J. Almquist and E. L. Stokstad. Journal of Nutrition, Vol. 12, 1936, p. 329.

The antihaemorrhagic vitamin was found in the faeces of chicks on a diet deficient in this factor. Increased amounts probably as a result of bacterial action, were present in faeces allowed to stand for 24 hours. Deprived experimental birds should not, therefore, be allowed access to their faeces, and all bacterial contamination of their food should be avoided. The diet of the hen had a marked influence on the incidence of the haemorrhagic syndrome in the young chicks. As low a level of the vitamin as is consistent with satisfactory hatching, should therefore, be used when producing chicks for experiments with this vitamin. Yolk, but not white of egg contained the vitamin. The livers of young chicks receiving an adequate diet did not contain the vitamin.

Relation between diet and changes in the albumin content of blood serum in birds. Les changements de l'albumine des sérums sanguins des oiseaux en rapport avec le régime alimentaire. M. L. Rokhline and A. S. Katznelson. Bull. Biol. Med. exp. U. R. S. S., Vol. I, 1936, p. 209. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 939.)

Four groups, each consisting of 5 hens and 1 cock, received a basal diet, with addition of vitamin A only or of vitamins A and D, an acid ration with addition of vitamins A, D and E, and an alkaline ration with the same additions, respectively. In the hens the highest value for serum albumin was found in the second group receiving the normal basal ration with vitamins A and D and the hens of this group also laid the greatest number of eggs. The lowest serum albumin and the lowest number of eggs were given by hens in the first group. The amounts of the different vitamins in the rations did not affect the level of serum albumin very greatly, but the absence of vitamins D and E and abnormal acidity or alkalinity of the ration reduced the egg laying capacity. In the cocks no notable variations in serum albumin were observed.

In a further series of experiments on pigeons little variation in serum protein was found on different diets. There were considerable variations in the amount of serum protein in different species of birds but variations within any one species were slight.

MINERALS

The production of iodised eggs and their use in the treatment of children's diseases. La produzione di uova iodate e l'impiego di queste nella terapia infantile. V. Vezzani, T. Devalle, E. Meynier, and R. Simonetti-Cuizza. 6. Weltgeflügelkongress, Leipzig, 1936.

Milk to which small quantities of I and liver oil had been added increased the amount of I in the ovaries and made possible the production of eggs containing 9500 gamma I at an increased cost of 0.93 lire per egg. It was demonstrated that these eggs had a beneficial effect on the health of children showing symptoms of lymphatism.

The influence of kelp meal feed on the iodine contents of the hen's eggs. E. Sumita, A. Kawabata, and Y. Fujioka. 6. Weltgeflügelkongress, Leipzig, 1936.

The I content of both white and yolk of eggs was considerably increased by feeding 5 or 10 g. kelp meal per bird per day. There was a very rapid increase in the I content of the white but a much greater if somewhat delayed increase in the yolk. When kelp feeding was discontinued the I contents of both white and yolk returned to nearly normal within 12 days.

Effect of different forms of iodine on laying hens. V. S. Asmundson, H. J. Almquist, and A. A. Klose. Journal Nutrition, Vol. 12, 1936, p. 1.

This study at the California Experiment Station deals with the effect of feeding iodine either as oystershell, desiccated thyroid, sodium iodide, potassium iodide, iodosalicylic acid, diiodotyrosine, or iodized olive oil on laying hens.

Feeding moderate amounts of iodine in the above-named forms did not adversely affect body weight, feed consumption, or egg production of the hens except in the case of desiccated thyroid, which resulted in very low feed consumption after 3 weeks' feeding, followed by rapid loss of body weight and cessation of laying. Similar results were obtained when doses equivalent to 16,000 gamma of sodium iodide were fed daily per bird. The iodine content of the eggs varied widely with different sources of iodine and corresponded only approximately to the iodine intake, contrary to the results reported by the Ohio Experiment Station. In general, when the percentage of total iodine intake recovered in the feces was high, as occurred when iodosalicylic acid was fed, the iodine content of the egg was relatively low. Determination of the iodine content of certain body tissnes showed the thyroid to vary considerably in this respect, although this is of doubtful significance. The thymus contained appreciable quantities, while the ovaries, spleen, and other tissue contained minimal amounts.

Effect of supplementary iodine on egg size and quality. E. A. Johnson. Poultry Science, Vol. 15, 1936, p. 355.

In a trial conducted at the Minnesota Experiment Station three lots of White Leghorn pullets received a dietary supplement of potassium

iodide at rates of 0.5, 2 and 4 mg. per hen daily, respectively, and in a later trial two similar lots received 4 mg. per hen daily and at a rate of 3 oz. per ton of mash ration, respectively. In each case eggs from the experimental pens were compared with those from control pens on the same basal ration without iodine supplements. In no case was there any significant difference in egg size, percentage of thick albumin, yolk index, yolk weight, yolk color, or shell thickness following the addition of iodine to the diet. Evidently the hen's requirement for iodine was amply supplied in the ordinary ration.

The effect of supplementary iodine on egg production and mortality in the laying flock. C. E. Lee, S. W. Hamilton, and C. L. Henry. Poultry Science, Vol. 15, 1936, p. 307.

In a series of feeding tests with laying hens of three different breeds no beneficialeffect on rate of egg production or on rate of mortality could be attributed to the addition of potassium iodide equivalent to about 2 mg. of iodine per hen daily to a mash ration originally containing 715 parts per billion of iodine. Neither could it be shown that the addition of iodine in organic combination was any more effective than the addition of the potassium iodide.

On the iodine in the poultry body. R. Sasaki. J. Agric. Chem. Soc. Japan, Vol. 12, 1936, p. 1069. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 1003.)

The feeding of supplementary I raised the I content of the lungs, liver, kidney, spleen, ovary and testes of poultry to a greater extent than that of the thyroid gland.

Poultry investigations in Rhode Island. Rhode Island Sta. Rpt., 1935.

Results obtained in a study of the effect of certain calcium intake levels on hatchability and eggshell formation are reported.

Is oystershell better than mussel shell for laying hens? R. Fangauf and O. Brüninghaus. Arch. Geflügelk., Vol. 9, 1935, p. 180.

In experiments with two groups of Leghorn hens, one of which received oystershell and the other mussel shell, it was noted that total feed consumption was greater and more and heavier eggs were produced by the group receiving the latter supplement. There are apparently no advantages in using oystershell instead of the more common mussel shell.

Effects of Minerals and Fiber on avian intestinal pH. V. G. Heller and R. Penquite. Poultry Science, Vol. 15, 1936, p. 397.

Results of five series of tests conducted at the Oklahoma Experiment Station are reported. Experimental subjects ranged from 6-week-old chicks to 1-year-old hens, and the rations were varied to cover a wide range of intake of basic salts, calcium-phosphorus ratios, and crude fiber

content. Samples of the contents from eight different sections of the alimentary tract were taken for pH determinations. The intake of large amounts of basic salts caused a marked decrease in acidity in the fore part of the alimentary tract, particularly in the gizzard, but changes in the intestines were of small significance. Neither the range of calcium-phosphorus ratios employed nor the wide range in crude fiber intake produced any significant changes in pH values. Evidently the digestive tract of the fowl is well equipped to care for the normal changes in the food and water ingested.

The Rôle of Minerals in Poultry Nutrition. E. T. Halnan. Rep. VIth World's Poult. Congr., Leipzig, 1936.

Contains a summary of the existing knowledge on the part played by mineral salts in growth production and egg production. The main points emphasized are: The ash percentage composition of the bird rises rapidly in the first few weeks of the chicks life, pathological conditions arising from errors of mineral metabolism therefore become evident during this period.

Ash deposition in the body is rapid from 8 weeks upwards, indicating the need for inclusion of mineral supplements in chick dietaries at this stage of the chick's growth. For growth purposes, the inclusion of sodium chloride in a chick's dietary is shown to give beneficial results, and the desirability of the addition of a calcium salt indicated.

For egg production, the limiting mineral factors are shown to be sodium, chlorine and calcium, and experimental evidence is adduced showing improved egg production following the use of sodium chloride and calcium salts as mineral supplements.

Studies on the calcium Metabolism of laying hens. H. J. Deobald, E. J. Lease, E. B. Hart and J. G. Halpin. Poultry Science, Vol. 15, 1936, p. 179.

The Wisconsin Experiment Station has studied the effect of various levels of calcium intake on the blood calcium, skeletal calcium, and calcium content of the eggs produced, also the effect of parathormone injections during calcium starvation on the calcium metabolism.

The blood calcium of hens on low calcium intake was lowered, but for any individual hen the variation during her complete egg cycle (36 hr.) was not more than 4 mg. per 100 g. of whole blood. When hens were deprived of calcium the calcium content of eggshell was reduced to less than 25 per cent of the normal, egg production virtually ceased within 12 days, and approximately 10 per cent of the skeletal calcium was removed to supply the requirement for eggshell formation. During calcium starvation repeated 1-cc injections of parathormone had no noticeable effect on calcium metabolism, while single large injections produced marked rise of the blood calcium 3 to 7 hr. after injection in actively laying hens.

The rôle of certain inorganic elements in the cause and prevention of perosis. H. S. Wilgus Jr., L. C. Norris, and G. F. Heuser. Science, Vol. 84, 1936, p. 252.

From the beneficial results following the addition of small amounts of inorganic salts to perosis producing rations it is concluded that perosis

in chickens is due to deficiency of certain inorganic elements, notably Mn, and that its occurrence is aggravated by an excess of Ca and probably of P in the ration.

Calcium and phosphorus metabolism in the chich embryo. Zur Kenntnis des Kalk- und Phosphorstoffwechsels im Hühnerembryo. T. Kamachi. J. Biochem. Tokyo, Vol. 22, 1935, p. 189. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 1634.)

The CaO and P_2O_5 contents of the embryos after 13 and 17 days incubation were slightly lower when $CaCl_2$ or Na_2HPO_4 was introduced into the eggs. Introduction of yatokonin, a Ca salt of fructosephosphoric acid, caused increase in the P_2O_5 content but decrease in the CaO content. It is concluded that $CaCl_2$ and Na_2HPO_4 check the transfer of Ca from the shell to the embryo and that the P required for calcification in the embryo is probably derived from organic P compounds.

The state and partition of the calcium and inorganic phosphorus in the serum of the fowl. Effect of growth and ovulation. D. M. Greenberg, C. E. Larson, P. B. Pearson, and B. R. Burmester. Poultry Science, Vol. 15, 1936, p. 483.

The serum Ca and inorganic P were studied in hens from 2 weeks to $5^1/_2$ months of age. Non changes were observed in the serum Ca levels but the serum inorganic P decreased with age. A large increase in serum Ca was notid at the beginning of egg laying, with a corresponding increase in serum inorganic P. The increase in serum Ca was confined almost entirely to the non-diffusible fraction but could not be entirely accounted for by the formation of colloidal tricalcium phosphate. Experiments to determine whether the remainder of the Ca increment was combined with phospholipoids or vitellin were not conclusive, but the Ca-combining power of vitelin was considered to be high enough to produce the phenomenon.

Mineral requirements of poultry. Finely ground limestone as mineral supplement for laying hens. Uppgifter angaende hönsens mineralämnesbehov. Finkrossad kalksten som mineralfoder för värphöns. H. Edin and A. Andersson. Rep. No. 466, Central Agric. Res. Stat. Stockholm, 1936, p. 46. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 860.)

In hens on a diet of mixed grains (oats, wheat, maize) mixed meal (e. g. wheat bran, oats, maize, clover hay, linseed cake, soya bean, fish meal, meat meal, bone meal, iodised salt, cod liver oil) A. I. V. fodder and skimmilk, with ground limestone (98 per cent $CaCO_3$) or of oyster shell (96 per cent $CaCO_3$) ad lib., the addition to the mash of 2 per cent ground limestone had no appreciable effect on the weight of the eggs, the weight of the ash from the shells, the variations in body weight of the hens, the frequency of diseases due to lack of Ca the egg production or

the ratio between the energy value of the food consumed and the total energy production. Sufficient Ca for the requirements of the hens was taken from the self-feeders without addition to the mash. The amount of food consumed was scarcely affected by the Ca content and the average amount of the Ca supplement taken per day was 3.0 g. The amounts of CaO in the eggs were 46-51 per cent of the amount consumed by the hens receiving no Ca in the mash and about 70 per cent of this was derived from the supplement. When mussel shell was substituted for oyster shell, the amount of CaO consumed was about the same, but the egg production was not so high.

The cause of deformed breastbones. Untersuchungen über die Verkrümmungen des Brustbeins beim Huhn. Prof. Dr. P. Carstens, Dr. G. Wenzler und Dr. J. Prüfer. Archiv für Geflügelkunde, Vol. 10, 1936, No. 4.

1. In 1465 animals, the sternum was examined every fortnight.

2. In most cases curvatures were found at the age of 7-8 weeks. They generally begin in certain periods, mostly during periods of active growth.

3. Although in the three breeds, white und brown Leghorn and Sussex the same number of chicks ultimately showed a curvature of the sternum, the time at which the malformation is noticed differs in the breeds. In the Sussex and the white Leghorn the malformations were noticed earlier than in the brown Leghorn.

4. The earliest hatched lots showed the greatest number of individuals with deformed breastbones, the lots hatched at the usual date showed fewest malformations, the latehatched lots were intermediate.

5. The malformations were more pronounced and commoner in cockerels than in pullets.

6. Roosting favours the deformation of the breastbone.

7. The cause is probably to be found in an insufficient calcium-metabolism resulting from different causes. In these experiments an absolute lack of Ca and P from the diet, is just as improbable as a disproportion, or as the lack of Vitamin D. It is more probable that individual constitution, influencing the individual use of the available Ca and P plays a role.

8. No correlation could be shown between laying and deformed breastbones, and none existed between the number of eggs produced by the mother and malformations in the offspring. The production was not influenced by these deformities.

9. No difference was found in respect to the deformities between inbred and non-inbred strains.

10. In the experiments no evidence was found that the deformed individuals were weakened constitutionally (fertilisation, hatchability of the eggs).

11. A direct inheritance of the deformities could not be proved. It could be shown statistically that the descendants of hens with crooked breastbones were more likely to be deformed than descendants of hens with straight breasts. It is possible that differences in calciumrequirement exist, but further experiments are necessary.

PROTEINS

Effect of packing-house byproducts, in the diet of chickens, on the production and hatchability of eggs. H. W. Titus, T. C. Byerly, N. R. Ellis, and R. B. Nestler. Jour. Agricultural Research, Vol. 53, 1936, p. 453.

This is a report of an extensive investigation by the U. S. D. A. Bureau of Animal Industry. The various packing house byproducts studied included meat meal, meat-and-bone meal, beef scrap, blood meal, and stick, each being tested individually and several being used in various combinations. In each case the test material was fed at a 20 per cent level as a supplement to a basal ration of yellow corn, wheat bran, rolled oats, and alfalfa leaf meal.

In every case the egg production of birds on the byproducts rations was materially higher than for those on the basal diet, and in nearly all cases somewhat higher than that of birds receiving a meat-fish-milk supplement which was used as a positive check. In general, satisfactory hatchability was obtained from the egg produced on the byproducts ration, ranging from 70 to 80 per ecnt in most cases. In a few instances decreased hatchability was encountered, apparently being closely associated with increased second-week embryonic mortality. Liquid stick and a mixture of blood meal and stick in the diet seemed to cause an increased embryonic mortality throughout the incubation period. Live weight gains, feed consumption, and egg size were generally satisfactory on the byproducts rations. Within the range studied, cooking temperature (maximum of 200° F.) and time of processing (maximum 8 hr.) had little effect on the quality of the meat scrap. A formula is presented which has been found to produce generally satisfactory results.

The syndrome induced in poultry by an intoxication factor and its relation to the antihemorrhagic factor. K. G. Scott and S. F. Cook. Univ. California Pub. Physiol., Vol. 8, 1936, p. 135. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 982.)

The haemorrhagic and anaemic syndrome in birds, attributed to the presence in fish meal of a toxic factor, and absence of an antihaemorrhagic factor, which can be supplied in alfalfameal, was shown to be a combination of two sets of symptoms. The first syndrome showed a greatly prolonged blood clotting time, with haemorrhages and a moderate lymphocytosis; it occurred in absence of both the toxic and antihaemorrhagic factor; it was prevented by administering the anti-haemorrhagic factor and seemed to be due purely to this deficiency. The second syndrome showed a slightly prolonged clotting time, slight haemorrhages and a very distorted blood picture including a marked increase in lymphocytes and leucocytes. This occurred only when the diet contained the toxic factor, and was not prevented by giving the anti-haemorrhagic factor. It is suggested that the toxic factor is probably a nitrogenous base, since the feeding of various substances of this nature produced the same symptoms as did sardine meal.

Versuche über die Eignung der Puppen des Seidenspinners als Eiweißfutter bei Legehühnern. E. Mangold and

H. Damköhler. Archiv für Geflügelkunde, Vol. 10, 1936, No. 10.

Dried silkwormpupae, a byproduct of the spinning of the cocoons, were examined as a source of protein for feeding poultry.

Leghornpullets were divided into four groups. All the groups received a mixed cereal mash, in addition to which protein was added in the following way:

Group 1: received 20 % ground dried pupae;
Group 2: received 10 % pupae;
Group 3: 20 % fishmeal;
Group 4: 10 % fishmeal.

The pupae contained 52 % crude protein and 27 % crude fat.

The experiments were running from Jan. Ist to the first of April.

The animals receiving a large amount of ground pupae ate less and put on less weight than the fishmealgroups, and the production was less.

This result must be due to the high fat content of the mash containing the dried pupae.

For this reason it is advised to feed the pupae after the fat has been removed, or if fed whole, to reduce the amount in the mash. In this way we can expect to make good use of the excellent animal protein of this material in feeding poultry.

Even in the cases where large amounts of silkwormpupae were given, the smell or taste of the eggs was in no way inferior.

Content of nutrient material in pupae of the silkworm. Digestibility of the pupae for poultry. Der Nährstoffgehalt der Puppen des Seidenspinners und ihre Verdaulichkeit beim Geflügel. E. Mangold, H. Stotz, and A. Columbus. Biedermanns Zentralblatt, B. Tierernährung, Vol. 8, 1936, p. 267.

The dried pupae contained on the average about 50 per cent crude protein and about 30 per cent fat. After removal of the fat the crude protein content was about 70 per cent. Experiments with 3 Leghorn hens receiving ground dried pupae mixed with about four times their weight of wheat flour showed that the coefficients of digestibility were 84.8 per cent for the crude protein and 97 per cent for the fat. The coefficient for the crude protein of the fat free pupae was 87.9 per cent. It is concluded that the pupae, which should first be freed from fat, would constitute an excellent food for poultry and probably for pigs if given in suitable amount.

Skimmilk for laying Hens. Molke und Quarg in der Fütterung der Legehühner. Dr. R. Fangauf and A. Haensel. Archiv für Geflügelkunde, Vol. 10, 1936, No. 4.

In experiments which lasted for nine months, semisolid milk and skimmilk was compared to fishmeal in feeding laying hens.

The group of hens eating fishmeal gave the highest production. When 25 % fishmeal was given, the addition of skimmilk to the diet did not produce more eggs, but the eggs were heavier.

Fresh milk waste as a fodder. Die Verfütterung von frischen Milchabfällen. R. Fangauf. 6. Weltgeflügelkongress, Leipzig, 1936.

Feeding hens with surplus milk products saved fodder, had a favourable effect on setting and raising of broods, caused increased gains in weight and improved the quality of the flesh. Hens will consume on an average 250 g. shimmed milk per day when water is not available; but 115 g. is all that is required to produce the best laying results.

How much skimmilk do Hens drink when they have free access to water? Wieviel Milch trinken Legehennen, wenn gleichzeitig Wasser zur Verfügung steht? R. Fangauf and A. Haensel. Archiv für Geflügelkunde, Vol. 10, 1936, No. 2.

Summary:

In an experiment with three groups of 2,25 Leghorns each, which was running for nine months (November 1934 till July 1935) it was tried to ascertain how much skimmilk the hens will take when they have free access to water, as is usual on the farm, and whether this consumption of skimmilk is sufficient to supply the protein required.

The results were as follows: The hens had no preference for either water or skimmilk, taking approximately equal amounts. Under these circumstances the hens consumed around 50 grams of skimmilk daily per head in winter, and the consumption ran up to about 90 grams in the summer. The amount of skimmilk taken in winter was not sufficient to retain the same eggproduction as in the groups consuming fishmeal, in the summertime the hens which had free access to both skimmilk and water harldly lagged behind the fishmeal group.

We ought not to conclude from these facts that feeding skimmilk should be discouraged, for in those farms were everything is done to produce a maximum winterproduction, the hens are kept in such a way that they have no access to water other than rainwater. For this reason the hens consume so much skimmilk that their proteinrequirements are satisfied, and maximum production is obtained. In the mixed farms on the contrary, where it is usually impossible to keep the hens from taking some water in addition to the skimmilk, the object should not be to obtain the same maximumproduction which can be obtained with imported fishmeal. On the farm the object should be to obtain a good medium production with food produced at home.

These experiments which have been running for three consecutive years have surely proved that skimmilk can be used as a substitute for the usual fish and meatmeal. As the amount of fishmeal produced in Germany is very restricted, the byproducts of the milk-industry should be used to obtain a sufficient number of wintereggs.

The results have confirmed earlier results, and conclusively show:

a) Skimmilk, given in addition to a complete mash does not increase production.
b) Feeding skimmilk saves food.
c) Bodyweight is somewhat increased.
d) Hatchability of the eggs is increased.

Feeding vegetable Proteins. Wie ist die Legetätigkeit der Hühner bei rein pflanzlichem Eiweiß? Dr. R. Fangauf and O. Brüninghaus. Archiv für Geflügelkunde, Vol. 10, 1936, No. 6.

The experiments with feeding vegetable proteins exclusively show that under conditions of free range, the animal proteins can be replaced by vegetable ones in summer without unfavourable results. This is important in Germany as fishmeal and meatmeal are scarce. In winter the same production could not be obtained with proteins of vegetable origin alone, and it is therefore indivated to give some animal protein, either fish or meat or skimmilk to drink, when a good eggproduction is desired.

The total consumption of mash was not diminished when vegetable protein was given exclusively. This is in accord with other observations on hens and swine.

The hatchpercentages were alike in both series, better hatching results were not obtained by feeding vegetable proteins. In bodyweight no difference was found either.

No good results were obtained by supplementing the oilcakemixture with minerals.

Relation between Development of Chicks and Production. Besteht ein Zusammenhang zwischen Jugendentwicklung und Legeleistung? Dr. R. Fangauf, A. Haensel, and M. Harken. Archiv für Geflügelkunde, Vol. 10, 1936, No. 11.

Summary:

The following observations were made in a comparsion of pullets which had been raised on a high protein ration with pullets raised on a normal ration.

No relation existed between the consumption of mash and the way in which the animals were raised, but the milk-fed pullets consumed 19,4 % less mash than the pullets drinking only water. It was sufficient to give $2^1/_4$ ounces of milk per head daily to obtain the same results as from a proteinmixture.

The pullets raised on milk, being heavier, started laying earlier, but the total number of eggs laid in the 12 months of the experiment was not raised significantly, so that our results confirm those of Eickel; an effect of the superior way of raising the birds could not be shown.

In regard to egg-weight different results were obtained, the lots raised on milk laid the heaviest eggs, both when they were subsequently fed on milk or on the proteinmixture with water. Te next best lot in this respect was the lot raised on water but fed on milk later on, and the eggs laid by the lot raised on water and kept on water were smallest.

As to economic foodconsumption all the four lots were approximately equal. At the beginning of the experiment the pullets raised on milk were heaviest. And this difference persisted in the lots fed on milk subsequently.

No difference could be shown to exist in the hatchability of the eggs of the different lots.

After all, the accelerated growth resulting from raising the chicks on a high protein ration has not resulted in a more econimic production

of the adult pullets, so that no relation could be shown to exist between an exceptionally good diet of the chicks and their subsequent production. The weight of the eggs only seemed to be improved.

Experiments with skim-milk. Fütterungsversuch mit Magermilch und Buttermilchquarg an Legehennen. P. Carstens and J. Prüfer. Archiv für Geflügelkunde, Vol. 10, 1936, No. 11.

1. In a feeding experiment with 240 young Leghorn hens in four groups (2 parallel breeds to every 30 birds), a normal feeding with 25 % animal-albumen (German fish-meal, animal-meal, blood-meal), a feeding with skim-milk given at discretion, 120 g. skim-milk per bird per day, and buttermilk at discretion, were compared with birds fed on albumen foodstuffs alone. The experiment lasted 12 months.

2. The normal group had the greatest dry-food consumption over the milk and curd group. The group with skim-milk consumed, on the average, throughout the whole year, 187,3 g. of skim-milk, per bird per day of their own free will, the curd group 49,2 g. curds. As the output of the last group was insufficient after the first six months, at the beginning of the second experimental half year, a change was made insomuch that one parallel breed, as hitherto, kept to buttermilk curds as the only albumen food; the other one, however, in addition to the curds, received another dry foodstuff with 10 % fish-meal.

3. The group receiving skim-milk at discretion had the highest laying capacity, and the highest egg yield surplus, and, in these respects, was clearly in advance of the normal group, which, in its turn, was followed by the group with 120 g. skim-milk and the curds with 10 % fish-meal at a fairly long distance, whereas the pure curds breed completely failed and achieved only 54 % of the output of the best group. The 50 % higher milk dosage which the skim-milk group received at discretion, compared to the group with 120 g. skim-milk, effected an increase in output of 43 eggs per bird. The success of the 10 % fish-meal dosage (3 g. per bird per day) was still greater with one curd breed which, within half a year, beat by 33,5 eggs per bird, another breed which did not receive this addition.

4. The egg-weight was somewhat increased by the skim-milk feeding, decreased by the curd feeding. The breed with curds as sole albumen food had also the lowest bodily weight, whereas the slight fish-meal dosage with the second curds breed was so successful that, at the end of the experiment, these birds weighed over 300 g. (11 ozs) more than those exclusively fed on curds. It was impossible to establish beyond doubt a definite effect of the skim-milk on the bodily weight, as the skim-milk group taking this food at their own discretion was, in this respect superior to the normal group. On the other hand, the group with 120 g. skim-milk was considerably below this.

5. This experiment has proved that skim-milk, in a quantity of at least 180 g. per bird per day, in practice, completely meets the albumen needs of laying hens with normal run conditions, and that, with this quantity, the highest output can be obtained. A quantity of 120 g. skim-milk gave, it is true, satisfactory but considerably smaller results, so that with an increased quantity of milk leading to a reduction in the proportion of the albumen, increased outputs are to be expeted. Buttermilk curds as the sole albumen food have shown themselves as absolutely insufficient,

and this in spite of an assimilation of roughly 50 g. and, at the same time, of a very narrow proportion of albumen.

This verdict has, however, not yet gained general acceptance; it refers only to the product of the Württemberg Milchverwertung A.-G. which we have tested.

Value of skimmilk. Untersuchungen an Hühnern über den Futterwert von Milcheiweiß. Dr. Weinmiller and Voigt. Archiv für Geflügelkunde, Vol. 10, No. 2, 1936.

Summary:

Four groups of 26 Leghorn pullets each were used in a nutrition experiment, in which milk was the only source of animal protein. The amount of milk was gradated from 95,9 grams intake per head per day, up to 197,13 grams. The animals had no yard. Notwithstanding the wide Proteinproportion, which varied between 1: 6,9 and 1: 5,8, tolerably good production was obtained. Production was raised by giving more milk. Where no yard can be given at least 150 grams of sour milk should be given daily per head. When the experimental groups were compared to groups obtaining animal protein in the shape of fishmeal, meatmeal and tankage, the animals getting milk laid a few more eggs, when the nutritive proportions were 1: 4,4 or 1: 4,3. The amount of animal protein, required for the production of 100 grams of eggmaterial however, was higher in those groups than in the groups which obtained milk as their source of animal protein.

The Value of different Proteins. Untersuchungen über die Futterwirkung verschiedener Eiweißfuttermittel. Dr. Weinmiller and Voigt. Archiv für Geflügelkunde, Vol. 10, 1936, No. 8.

To six groups of 20 pullets each were fed the same starchy basal foodmixture, to which different proteins were added. Group one obtained Clubkraft (a commercial mixture of different foodstuffs, rich in protein) without added milk. Group 2 was fed with Clubkraft and milk, group 3 obtained a mixture of fishmeal and ground extracted sojabean, group 4 had the same mixture with milk added, group 5 obtained a mixture of fishmeal and peanutcakemeal, group 6 had the same mixture with milk. The nutritional value was made the same in the six rations, so far as this was possible where hoppers were used. (In feeding mashes from hoppers small differences in the composition of food actually ingested are possible.) In all the groups the production was equally good, the difference noted existed only in a difference in weight, both groups obtaining Clubkraft gained most in bodyweight. These experiments again showed that it is more economical to use a complicated proteinmixture, such as Clubkraft, rather than mixtures composed of only two ingredients. Adding milk to the ration gave good results.

Summary of feeding and confinement rearing experiment with turkeys during 1935. F. N. Barrett, C. G. Card, and A. Berridge. Quart. Bull. Mich. Agric. Exp. Stat., Vol. 19, 1936.

Four different mashes, the protein contents of which were 23, 19, 24 and 26 per cent respectively, were compared. The first and last con-

tained 10 per cent dried milk, but liquid milk was fed to the other two groups instead of water. Less mash and more whole maize per pound gain in weight were consumed by groups 2 and 3 than by groups 1 and 4. There were no differences in the final weights or in the quality of the turkeys reared on the different rations.

The protein requirements of laying hens. G. F. Heuser. 6. Weltgeflügelkongress, Leipzig, 1936.

With commercial casein as the source of supplementary protein, the following conclusions were reached: a 16 per cent protein ration resulted in satisfactory egg production, body weight and egg size; a 14 per cent protein ration gave satisfactory egg production but did not maintain body weight nor optimum egg size; a 12 per cent protein ration was completely unsatisfactory.

Further studies on the growth factor required by chicks. The essential nature of arginine. A. Arnold, O. L. Kline, C. A. Elvehjem, and E. B. Hart. J. Biological Chemistry, Vol. 116, 1936, p. 699.

Arginine appears to be an essential amino-acid for the growth of chickens. During the rapid growth period chickens do not obtain an optimum supply of this amino-acid from the ordinary grain rations. Although such rations are low in other amino-acids also, addition of arginine definitely increased the rate of growth during the first 6 weeks after its addition.

Nutritive value of protein supplements. J. L. St. John and J. S. Carver. 6. Weltgeflügelkongress, Leipzig, 1936.

A useful review is given of recent work on the problem of protein requirements of poultry. Emphasis is laid on the need for ascertaining the causes of variability in the results reported by different workers, and for standardising such factors as age and weight in experimental animals used.

The comparative influence of animal and plant proteins upon the growth of chicks reared on free range. I. I. Tabakoff. 6. Weltgeflügelkongress, Leipzig, 1936.

In Bulgaria such supplementary feeds as meat or bone meal are scarce and expensive but sunflower oil cake, dried brewer's grains and cottonseed meal are available in quantity. An experiment was therefore done to determine whether growth in chicks fed on these plant protein concentrates would compare with that of chicks on animal protein concentrates. The basal ration was yellow corn meal, wheat bran and oatmeal and the additions were 15 per cent meat meal and 4 per cent bone meal and 16 per cent sunflower oil cake and 10 per cent dried brewer's grains respectively. The digestible crude protein content of the two rations was similar. Over a period of 100 days there was little difference in the rate of growth between the two groups in spite of the fact that no mineral mixture appears to have been fed to the plant protein group. There was a big difference in the cost of the two rations.

The influence of proteins on the digestibility of cellulose in chickens. L'Influenza delle proteine sulla digestione della cellulosa nei polli. F. Usuelli. 6. Weltgeflügelkongress, Leipzig, 1936.

It is shown that an increase in the proportion of proteins in the food is followed by an increase in the digestibility of cellulose and that this increase in digestibility is produced chiefly by proteins of animal origin of which ground meat is more effective than casein.

Technical conditions in the preparation of fish meal and its nutritive value. Die technologischen Bearbeitungsbedingungen und die biologische Wertigkeit des Fischmehls. N. J. Chlebnikow and A. F. Arsenjef. Biedermanns Zentralbl. B. Tierernährung, Vol. 8, 1936, p. 565.

Comparisons with growing chicks were made of 4 types of herring meal and 3 of cod meal, either untreated or treated in different ways (soaking and extraction). The soaking process reduced the vitamin B_2 content, but dit not affect the quality of the protein. Judged by general growth promoting quality and the biological value of the protein the best of the herring meals was a soaked and extracted meal, and the worst a soaked but not extracted meal. All the herring meals were superior to the cod meals. Fish meal containing 7,15 per cent oil and up to 9,47 per cent salt had no detrimental effect on the birds.

Study of the dependence of the nutritive value of fish meal on the raw material used. Untersuchung der biologischen Wertigkeit des Fischmehls, in Abhängigkeit vom Rohstoffe. A. F. Arsenjew and N. J. Chlebnikow. Biedermanns Zentralbl. B. Tierernährung, Vol. 8, 1936, p. 580.

Results of further experiments with chickens are recorded. Seven types of fish meal were compared with each other and with casein and meat meal. The fish meals were superior to the casein and meat meal in growth promoting efficiency. The biological efficiency of the protein in the fish meal rations proved equal to that in the casein rations. The protein of the fish meals was about 80 per cent digestible. The vitamin B_2 content of the fish meals was variable and in no case adequate for the needs of growing chicks. Fish meal may serve as the only source of animal protein for chicks, but in such case any mineral addition should not exceed 1 per cent. The biological value of fibrin as protein supply was found to be very low, and the use of meat meal as sole source of animal protein is therefore not recommended.

Haddock Fish meal proteins. Pigs and Pigs Products, Vol. 5, 1936, p. 11. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 601.)

A digest is given of Investigational Report No. 31 of the U. S. Bureau of Fisheries, reviewing the effect of the method of manufacture upon the composition of haddock meal.

Different methods for processing fish meals are described. Analyses of the different products obtained from the same source of raw material

are given. Dry process meals were found to have a higher protein and a lower ash and ether extract content than wet process meals. The protein content of meal made from the backbone portion of haddock fillet waste was considerably higher than that for meal prepared from the head portion of the waste.

The protein requirement of ringnecked pheasant chicks. L. C. Norris, L. J. Elmore, R. C. Ringrose, and G. Bump. Poultry Science, Vol. 15, 1936, p. 454.

Variations in protein content of the ration were produced by altering the quantities of purified casein and corn starch, care being taken to keep the ratio, Ca : P constant and the vitamin B_2 content adequate. Maximum growth was obtained at a 30 per cent protein level, but at 24 per cent growth and utilisation of food were so satisfactory that it was considered desirable in practice to adopt this lower level, since the risk of creating partial deficiencies of other nutrients would be thereby reduced.

The influence of certain protein levels on the growth of pullets. R. S. Dearstyne, C. O. Bollinger, G. K. Jones, and H. P. Brigman. North Carolina Agric. Exp. Stat. Bull. No. 304, April 1936, p. 16.

White Leghorns and Rhode Island Reds on free range were fed at three different levels of protein intake with varying amounts of animal protein from the time they weighed 1 $^1/_2$-2 lb. until production for 7 days reached a level of 25 eggs per 100 bird. Neither body weight nor age at sexual maturity was appreciably affected by the different levels used, and it is concluded that 15 per cent protein in the mash (grain fed in addition) is more than ample during the growing and developing period.

Notes on locust meal as a poultry feed. F. M. Fronda. Philippine Agric., Vol. 24, 1935, p. 425. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 1149.)

A preliminary test using two lots of three chicks each was conducted at the College of Agriculture. The results of the chemical analysis indicated that locust meal could be profitably used as a source of protein for chicks. If used to supply the optimum level of protein it may increase the crude fibre content of the ration beyond a desirable point. Locust meal was not as efficient but was as palatable as fish meal.

Factors which determine protein toxicoses. Faktoren, welche die Entwicklung proteinogener Toxikosen bestimmen. L. A. Tscherkes and N. D. Dukler.

Nature of the factor producing alitoxicosis. Über die Natur des Alitoxikose hervorrufenden Faktors. L. A. Tscherkes, A. C. Nathanson, and G. A. Tscherkes. Bull. Biol. Méd. exp. U.R.S.S., Vol. I, 1936, p. 99.

The proteinogenous toxicosis. 3. The role of complex vitamins B on processes of detoxication. L. A. Tscherkes

and N. D. Dukler. Ukrainian Biochem. J., Vol. 9, No. 3, 1936, p. 925.

New group of components entering into the composition of foodstuff (alitoxins) and pathological processes connected with it. L. A. Tscherkes. Arch. Sci. biol., Vol. 40, 1935, p. 5. (Ref. Nutrition Abstracts, Vol. 6, 1936, p. 640.)

1 and 3. White mice fed on diets composed exclusively of proteins, such as casein, egg albumin, clotted blood serum, gluten or soya bean protein, died in 2 to 10 days from protein "toxicosis", with pathological changes in liver and kidneys. The condition was mitigated, and survival time increased to 93 to 116 days by addition of 10 per cent dry yeast or 2 per cent marmite to the diet. The active factor in yeast was stable to heat, 130° C. for 3 hours, and to alkali and, in this respect, was similar to the Y factor of Chick and Copping and to vitamin B_6 of György, but different in this respect, and in distribution, from the X factor of Boas-Fixsen which neutralises the toxic factor in egg white. The presence of fat in the ration also mitigated the toxicosis and increasing age rendered the animals more resistant.

2 and 4. "Alitoxicosis" is the name given to a pathological condition developed in 4 weeks to 12 months in white mice receiving a diet containing all the known vitamins, but consisting exclusively of cereals, such as wheat, maize and millet. In this condition skin changes were prominent, including loss of hair, necrosis of ears, tail and toes. Rats were resistant to the disease but in rabbits paralysis and convulsions were frequent and could be prevented by small amounts of cabbage. Autoclaving the diet to reduce the "excess of vitamin B_1" had no effect, nor was the toxic substance destroyed. In wheat the toxic factor was located in the protein. Examples are quoted from work of other investigators, pointing to the presence of toxic factors in cereals.

Protein levels in the fattening ration as influencing the composition of the thigh muscle with different ages of poultry meat stock. W. A. Maw, A. J. G. Maw, R. Holcomb, and L. H. Bemont. Macdonald College, Que. Scientific Agriculture, Vol. 17, 1937, p. 453.

It would appear from this study that the protein and fat content of the thigh muscle are not significantly influenced by different protein levels in the fattening ration; nor does it appear that the sizes of stock used have any effect upon the chemical composition of the thigh muscle.

Effect of manufacture on the quality of nonoily fish meals. R. W. Harrison, A. W. Anderson, and S. R. Pottinger. U. S. Dept. Com., Bur. Fisheries, Invest. Rpt., No. 30, 1935.

High drying temperatures were detrimental to the quality of nonoily fish meals for both protein and vitamin G values, particularly the latter, flame-dried meals proving decidedly inferior in quality. Removal of water extractives in the wet process of manufacture slightly improved protein quality, but decidedly lowered the vitamin G value of the resulting meal.

The greater tonnage secured from dry rendering tended to offset the greater cost involved in this process. The advantages of vacuum drying over steam drying are more pronounced in the dry rendering than when the wet process is used.

Grasshoppers spoil tests. Internat. Baby Chick News., Dec. 1936.

Very peculiar results are being reported by several parties in the Middle West where the grasshoppers were heavy last year during the drought and early fall season.

As the hens are fond of these grasshoppers, some trouble has been reported in getting proper reactions from Pullorum testing where the hens ate largely of grasshoppers.

Some research work is being done on this problem by the U. S. Department of Agriculture. Dr. Herbert Bunyea was called from Washington recently to the Middle West on this difficulty experienced in getting reaction where the hens had been eating heavily of a grasshopper diet.

GRAINS

Free choice of grain and mash. Körnerfutter zu beliebiger Aufnahme. R. Fangauf and A. Haensel. Archiv für Geflügelkunde, Vol. 10, 1936, No. 4.

In two groups of hens one was fed in the usual way, but in the other group both mash and the grainmixture were given ad libidum. In this latter group the daily grainconsumption increased from 50 to 75 g., whereas the mashconsumption was smaller by the same amount.

Eggproduction did not differ in the two groups.

As a result, this timesaving method can be recommanded in those cases where the grain is cheaper than the mash.

Continuous hopper feeding of corn and oats to laying pullets. J. A. Davidson. Michigan Sta. Quart. Bul., Vol. 19, 1936.

Two pens of 120 White Leghorn pullets each and two pens of 100 Rhode Island Reds each were fed for 11 mo., one pen of each breed receiving a 20.5 per cent protein mash containing ground corn and the other a similar mash containing ground barley. Corn and oats were fed in individual hoppers similar to those used for the mash.

Hopper feeding of corn and oats gave satisfactory egg production, and under the conditions of this trial the pullets balanced their crude protein intake. This method of feeding eliminated irregularities in time of feeding and amounts fed, but artificial lights appeared necessary for its successful use. Mortality was similar to that obtained under usual feeding methods.

A factor in the milk fattening ration: The milk absorbing efficiency of certain grains and rations used for crate fattening poultry. L. Payne and F. Santo. Amer. Creamery and Poultry Prod. Rev., Vol. 81, 1936, p. 806.

This study at the Kansas Experiment Station gives information on the milkabsorbing capacity of eight single ground grains and two ground

grain mixtures. When allowed to soak in milk at room temperature for 24 hr. the quantity of milk absorbed ranged from 21.1 gal. per 100 lb. of ground milo to 67.1 gal. per 100 lb. of ground whole oats, all others falling within a range of 30 to 45 gal. There was no apparent relation between the moisture content of the grain and the amount of milk it would absorb.

The Value of Rye for laying hens. Dr. R. Fangauf and A. Haensel. Archiv für Geflügelkunde, Vol. 10, 1936, No. 2.

In these experiments rye, given dry, after germination and after treatment with "Rogginstoff D. R. P." was compared with the usual grainmixture, consisting mainly of maize and oats. The results were as follows:

1. The hens do not take rye as readily as other cereals, even after a long period of getting used to this grain, and even when the rye has been treated in different ways. When a normal amount of grain, 50 g., is fed at night, the hens do not consume all this rye, as they would do with other cereals, but leave some grain to eat it next morning. Germinating the grain treating it with "Rogginstoff" made it more acceptable.

2. Feeding rye had no influence on the consumption of mash. The health of the animals was excellent, and no cases of diarrhoe were noted. It is clear that treating the grain with the patent preparation does not make it unfit for consumption by the hens.

3. Feeding 25 g. of germinating rye together with 25 g. of a mixture of maize and oats, gave the same results as feeding 50 g. of Roggintretaed rye, and the same as 50 g. of a maiez-oats mixture.

Feeding 50 g. of rye or germinated rye produced a fallingoff of about 10 % in eggproduction.

4. As far as body-weight is concerned, results were lower in the lastnamed groups. As to hatchability of the eggs, all the other lots of hens hatched well, with the exception of the group consuming "Roggin".

5. As a result, it can be stated, that rye cannot only be used as a partial substitute, it can be used to replace other cereals completely, for in no case production was lowered or the health broke down.

Giving the hens up to 50 g. of ordinary or germinated rye will reduce their output, but this can be remedied by treating the rye in advance.

Two methods have proved valuable:

a) The amount of cereals fed to hens can be reduced to onehalf by the introduction of rye, when this is fed after germination.
b) We can substitute rye all together for different other kinds of grain, provided we have treated the rye with "Rogginstoff D.R.P.".

Prof. Dr. K. Richter and Dr. H. Brüggemann.

1. In an experiment with laying hens, lasting 168 days, it was tried to ascertain whether rye, given as such or after germination can be fed to hens. A comparison was made a mixture of wheat, oats and barley.

2. After they got used to rye, the hens took rye readily, both dry and after germination, and without bad results.

3. The absolute eggproduction was not influenced by feeding dry or germinated rye. Number of eggs per hen, weight per egg, and amount of egg produced were about the same in the four experimental lots. In all of the groups utilization of the food was very satisfactory.

4. For the germination of the rye a homebuilt germination-sieve with movable trays was used. The rye was fed after five days in the apparatus.

5. The colour of the yolk improved by feeding germinated rye.

6. As a result of these experiment, rye can be safely utilized as a cereal food for laying hens.

The comparative feeding values for poultry of barley, oats, wheat, rye and corn. A review and analysis of published data. E. W. Crampton. MacDonald College, McGill University, Quebec. Dominion of Canada, Nat. Res. Counc. Rep. No. 29, 1936, p. 50.

This extremely valuable review and summary of published and certain unpublished data indicates that the cereals may be rated in the following order. For growth: oat, groats, barley, maize, wheat, rye; for laying and breeding: maize, barley, wheat, oats, rye; for fattening: maize, barley, wheat, oats. A reminder is given, however, that when the ration is scientifically balanced, the differences between barley, maize and wheat are very small and likely to be masked in many cases by differences in the quality of different samples of grains. A mixture of two or more cereals is preferred to the exclusive use of any single one.

The utility of wheat, oats, barley and rye as grain for laying hens. Die Verwendbarkeit von Weizen, Hafer, Gerste und Roggen als Körnerfutter an Legehennen. J. Jaeger. 6. Weltgeflügelkongress, Leipzig, 1936.

In an experiment of 258 days' duration in which the four cereals were fed in quantities of 55 g. per hen per day in each group, the egg yields per hen were: wheat group, 6.032 kg., oat group, 5.409 kg., barley group, 3.795 kg., rye group 4.158 kg.

Comparative digestibility of mixed and grain feeds. Vergleichende Verdaulichkeit von Misch- und Körnerfutter. I. T. Maslieff and I. P. Denissoff. Biedermanns Zentralbl. B. Tierernährung, Vol. 8, 1936, p. 613.

The digestibility of grain (wheat, oats) by fowls was on the whole not increased by grinding. A slight increase in the digestibility of the oil was recorded. The ground grain was digested more quickly than the whole grain.

The relative value of farm grains in poultry nutrition. H. L. Wilcke, Ames, Iowa. Iowa Agricultural Experiment Station. Journal of the Am. Vet. Med. Association, Vol. 43, 1937, p. 188.

Rations consisting of large amounts of ground whole oats as the sole source of cereal grain have been found to be quite satisfactory for growth and feathering in chicks. A ration containing 81.5 per cent of ground whole oats, 15 per cent of dried buttermilk, 1.5 per cent of ground oyster shell, 1 per cent of steamed bone meal, 1 per cent of salt, and

1 per cent of cod-liver oil produced good growth and excellent feathering in single comb White Leghorn chicks. A ration containing the same amount of corn with the same amounts of these supplements, was not satisfactory from the standpoints of growth, feathering or the number of cases of perosis which developed.

There appears to be some constituent in oats, and to a lesser extent in wheat, which is necessary for good growth and for good feathering chicks, but this substance is lacking in corn.

The nutritive value of maize as a feed for various breeds of poultry. Der Nährwert des Maises bei verschiedenen Hühnerrassen. G. Nichita, N. Tuschak, and G. Iftimescu. 6. Weltgeflügelkongress, Leipzig, 1936.

The mortality in a group of birds fed exclusively on maize was 90 per cent. This was due to gross deficiencies of amino-acids, vitamins, mineral matter and raw fibre.

The Value of dried Potatoes for chickens. Versuche über Kükenaufzucht bis zur Legereife mit den neuen, mit mechanischer Vorentwässerung hergestellten Kartoffelflocken. Prof. Dr. E. Mangold and H. Damköhler. Archiv für Geflügelkunde, Vol. 10, 1936, No. 2.

In these experiments, Leghornchicks were raised on a mash made of coarsely ground mixed grain with 10 % fishmeal, some Chicks from the 9th to the 28th week, some until laying started.

One group (normal controls) was raised on this mixture exclusively, two other groups were raised respectively on a mash in which potatoflakes or coarse potatoflour was substituted for 25 % of the cereal mixture. This potatoproduct was made by the process invented by Prof. W. Koeniger in which the potatoes are partly dehydrated by pressing, a method which has economical advantages, compared to the usual way of dehydrating potatoes.

In the control group the average increase of weight during the time of the experiments was 1044 g., in the group fed on potatoflakes 876 g., in the group consuming the new article 806 g.; the figures expressing economical nutritive value were resp. 709, 830 and 890. Laying started earliest in the group of controls.

The difference in nutritive value between the coarse potatomeal and the usual flakes is so small that it is balanced by the lower cost of feeding it, caused by the cheaper process of manufacturing it. For this reason this product ought to be of some importance four poultryfeeding.

The small difference in quality of the results of feeding 25 % flakes or potatomeal instead of the usual cereal mixture only, ought to be balanced by the cheaper cost of feeding; it is probable that 20 % of the dehydrated potatoes in the mash could be given instead of 25 %, could be given without lowering the results compared to these obtained by feeding the usual cereal mixture in the mash.

Potatoes for chickens. D. C. Kennard. Ohio Sta. Bimo. Bul. 182, 1936.

Results are presented to show that steamed or boiled potatoes may be substituted on a dry matter basis for a considerable proportion of the

cereal grains in the ration of either laying or fattening chickens with satisfactory results. From 4.1 to 4.67 lb. of potatoes were required to replace 1 lb. of grain in the ration. Feeding raw potatoes to broilers was unsatisfactory.

Potatoes as poultry food. Kartoffelfütterung beim Geflügel. W. Stahl. 6. Weltgeflügelkongress, Leipzig, 1936.

This is a brief summary of existing information. In laying hens, freshly steamed or ensiled potatoes, up to 70 g. daily per bird, or potato flakes, up to 60 per cent of the ration, can safely be fed without detrimental effect on food utilisation, egg yield or hatchability. For fattening poultry all forms of potatoes may be used as a supplement to or a substitute for grain mixtures.

Potatoes as a feed for chickens. M. J. Klooster and C. G. Card. Quart. Bull. Mich. Agric. Exp. Stat., Vol. 19, 1936, p. 104.

Raw potatoes proved unpalatable to chickens and could not replace part of the cereals in an egg laying ration. Mashed cooked potatoes were much more satisfactory in this respect. Dried potatoes replaced equal amounts of maize meal in the ration of growing chicks, but again proved unsatisfactory. Dried cooked potatoes could, however, without any apparent adverse effects, replace all the maize in a ration containing 36 per cent.

SUNDRIES

A nutritional deficiency causing gizzard erosions in chicks. H. J. Almquist and E. L. R. Stokstad. Nature, London, Vol. 137, 1936, p. 581.

The California Experiment Station has demonstrated that gizzard erosion, which is commonly observed in chicks receiving usual practical diets and even in embryos in late stages of incubation and in day-old chicks, is a deficiency disease which may be corrected by a new fat-soluble factor. The saponifiable fraction of a hexane extract of dried kale or dried alfalfa was found to be an effective source of this factor. It is further shown that this disease is not associated with the hemorrhagic disease, copious amounts of known vitamins containing the antihemorrhagic factor proving ineffective in preventing gizzard erosion.

Feed consumption and cost of feeding of Bronze turkey breeding stock. S. J. Marsden. Poultry Science, Vol. 15, 1936, p. 400.

Studies at the U. S. D. A. Beltsville Reasearch Center show that young Bronze breeding hens consumed an average of 117.12 lb. of feed each per year. The weekly feed consumption for an 8-week winter period, a 16-week spring period, a 24-week summer period (feed limited), and a 4-week autumn fattening period was 3.23 lb., 2.73, 1.4, and 3.5 lb., respectively. The males consumed approximately twice as much feed as the hens. Based on existing feed prices the annual feed cost for males and females was $3.97 and $1.94, respectively. Feed consumption by hens declined somewhat during the third, fourth, and fifth years of production.

The effect of various levels of alfalfa meal upon the development of body organs of cockerels. F. R. Sampson and F. E. Mussehl. Poultry Science, Vol. 15, 1936, p. 304.

In a study at the Nabraska Experiment Station two lots of 50 White Rock cockerels each received rations of similar composition and digestible nutrient value but containing 5 per cent and 20 per cent of alfalfa meal, respectively. The two pens were carried on the experimental ration for 84 days, at which age all birds were killed and the organs removed, carefully dissected of all fat, and weighed or measured.

The only significant difference noted between the size of organs of the two lots was the greater length of small intestines of the lot receiving the high level of alfalfa meal. The possibility of using this principle in developing pullets with greater digestive capacity and also the possibility of such development resulting from a high crude fiber content in the ration rather than from the more complex contribution of alfalfa meal are suggested.

A ration for growing chicks. G. E. Mann. Malayan Agric. J., Vol. 24, 1936, p. 529. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 1148.)

A ration consisting of ground padi 33 parts, ground yellow maize 20 parts, bran 20 parts, whole meat meal 10 parts, ground nut cake 10 parts, steamed bone flour 2 parts, powdered limestone 1 part, salt 1 part and red palm oil 3 parts, gave satisfactory growth between 14 and 22 weeks of age.

Experiments in the selective feeding of chickens and laying hens. Versuche über die Wählfütterung der Küken und Legehühner. O. Hübner and W. Liebscher. 6. Weltgeflügelkongress, Leipzig, 1936.

With free selection of food, pullets consumed on an average 80 g. corn and 39 g. other farinaceous foods daily throughout the year. Production results were the same in self-fed as in rationed hens, but labour costs were cheaper by the former method.

Psychological problems in the breeding and feeding of poultry. Psychologische Probleme in der Geflügelzucht und -ernährung. W. Fischel. 6. Weltgeflügelkongress, Leipzig, 1936.

It is suggested that individual food preferences should be considered, more especially in increasing the efficiency of a given breed.

Nettles in poultry feeding. L'ortica nell'alimentazione dei poli. R. Marracino. Quad. Nutrizone, Vol. 3, 1936, p. 480. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 1149.)

The use of nettles in poultry feeding is recommended on account of their high vitamin content. Nettles give as good results as cod liver oil, fresh lucerne and possibly even as good as milk and its products. They appear to have a greater physiological value than would be predicted

from their composition, due probably to their vitamin content and to the fact that they cause increased absorption of other foods owing to their prolonged retention in the intestine. Nettles have also a beneficial laxative effect.

Critical comments on methods used in poultry feeding experiments. Kritische Betrachtungen über die Methodik bei Geflügelfütterungsversuchen. R. Römer. Biedermanns Zentralblatt, B. Tierernährung, Vol. 8, 1936, p. 397.

A critical review is given of common defects in the planning of poultry experiments.

Digestion by hens of the material of the cell walls in fodder (lignin, pentosans, cellulose and crude fibre). Über die Verdauung der Zellwandbestandteile des Futters (Lignin, Pentosane, Cellulose und Rohfaser) durch das Haushuhn. A. Tscherniak. Biedermanns Zentralblatt, B. Tierernährung, Vol. 8, 1936, p. 408.

The composition of crude fibre was found to vary considerably in different materials. In lucerne meal about one-half of the fibre consisted of lignin, one-eight of pentosans, and two-fifths of cellulose. In grain foods the corresponding proportions were one-eight, one-seventh and seven-tenths respectively. Fibre in faeces from grain food and soya meal was richer in protein and cellulose and poorer in lignin and pentosans than the fibre of the food. Digestibility data for fibre in different classes of foodstuffs are thus not comparable.

Determinations with poultry showed that cellulose, lignin and pentosans of coarse fodder (lucerne meal) were almost completely indigestible.

In grain foods (meals from wheat, barley, maize and oats) and in soya bean meal, cellulose was again found to be practically indigestible, whereas from 12.40 per cent of the lignins and pentosans was apparently digested, neither showing any consistent superiority over the other.

Poultry progress at the Kizimbani Experimental Station, 1932-1935. F. B. Wilson. East African Agric. J. Zanzibar, Vol. 2, 1936, p. 90. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 860.)

When 10 per cent shark meal was added to a cereal ration, which had previously been fed alone, the egg yield greatly increased. The ration finally adopted consisted of a mash containing bran, maize, meal, millet meal, cocoanut meal, dried shark and salt, and a grain mixture of maize, sorghum and. bulrush millet.

Contribution to the biological study of rations causing symptoms of "leg weakness" in chickens. Contribution à l'étude biologique de rations déterminant des symptômes de "leg-weakness" chez les poussins. A. Devuyst.

Bull. Inst. agronom. Gembloux, Vol. 5, 1936, p. 50. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 868.)

To discover whether the beneficial effects of a commercial preparation containing vitamins were due to its mineral and or its vitamin content, feeding experiments were carried out with 140 chickens (chiefly White Leghorns) divided into 5 groups. Cases of leg weakness were numerous and mortality was high in the first group which received a rachitogenic basal ration. The chickens of the second group received the same ration supplemented with the commercial preparation and grew normally, maintaining excellent health. For the third group the basal ration was supplemented by the commercial preparation deprived of its vitamins. In this group cases of enlarged hock and, in one case, slipped tendon occurred. Although the fourth group received a theoretically adequate diet (maize, wheat, oatmeal, bran, buttermilk, bone meal, cod liver oil, yeast, sulphur, salt, wood charcoal, crushed rice, sugar) more than half of them developed nutritional paralysis, possibly because of lack of vitamin B_4. The fifth group received the basal ration supplemented by a well balanced mixture of bone meal, $CaCO_3$ and NaCl. In this group health and growth were slightly below normal and two cases of leg weakness, one with enlarged hock, developed. It is concluded that the beneficial effect of the commercial preparation was due to its vitamin content. The experiments also showed that two distinct diseases, enlarged hock (sometime complicated with slipped tendon) and nutritional paralysis, in addition to common rickets, occur in chickens.

Feeding poultry for production. Foring av verpehons. I. Finne. Norsk Landbruk, Vol. 2, 1936, p. 592. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 858.)

Of home grown feeds boiled potatoes may be given and skimmilk should be supplied. The chief part of the ration should consist of grains and other concentrates. Barley, oats, wheat and maize should be given at the rate of 50 g. per hen. The birds should have free access to a mixture of concentrates containing about 170 g. protein per Scandinavian feed unit. The mixture of concentrates should contain 10 per cent (but not more) of fish meal (herring meal of low salt content).

Rural studies at Dauntsey's School. Report on experiments, 1934-1936. J. O. Thomas. Dauntsey's School, West Lavington, Wiltshire. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 858.)

1. Continuation of the experiment with Rhode Island Red hens on a high, medium or low protein intake for a further period of 13 months gave the following results (for the whole period):

	High	Medium	Low
Number of eggs	2640	2213	1954
Food cost per doz. eggs . . . . . :	4.7 d.	5.1 d.	7 d.

2. High protein and low protein rations were fed respectively to two groups of 37 Rhode Island Red chicks during a threemonth period with the following results:

	High	Low
Total cost of ration	25/8 d.	20/2 1/2 d.
Total live weight of chicks at 3 months . .	94 lb.	75 lbs.
Cost of food to produce 1 lb. live weight .	3-28 d.	3-32 d.

When during a period of 10 1/2 months, the egg productions of 9 birds of the high protein group were subsequently compared with those of 9 of the low protein group kept in a cinder run and 9 of this group kept in a grass run the results showed a distinct advantage in favour of the high protein ration and the grass run.

3. The experiment described under (2) was repeated with two groups of 52-day-old chickens and a third group receiving a ration containing half as much protein as the high protein ration. After a 12-week period the results were:

	High	Medium	Low
Total cost of ration	45/4 d.	45/0 d.	27/2 q.
Total live weight of chicks at 3 months old	124 lb.	120 lb.	88 lb.
Cost of food to produce 1 lb. live weight .	4.35 d.	4.4 d.	5.9 d.

The egg productions and costs for 20 pullets of each group on the rations of experiment (I) during a subsequent 9-month period were as follows:

	High	Medium	Low
Number of eggs	2364	2163	1563
Food cost per doz. eggs	3-7 d.	4-4 d.	5-6 d.

4. The above experiments having shown that increase in the protein content of the ration caused increase in the proportion of cocks, 22 chicks from hens fed for 12 months on the high protein ration and 28 chicks from hens fed for 12 months on the low protein ration were reared on the high and low protein rations respectively with the following result:

	High	Low
Percentage of cocks	68.2	17.9

When two groups of chickens from hens which had received the high protein diet were fed on high and very high protein rations respectively the results were:

	High	Very High
Percentage of cocks	60.9	72.2

Chick Feeding Experiments. Küken-Fütterungsversuch. Dr. Weinmiller and K. Voigt. Archiv für Geflügelkunde, Vol. 10, 1936, No. 1.

Clubkraft has been tested as food for rearing chickens. As regards growth the Clubkraft groups were slightly superior to the groups for comparison; the use of Clubkraft effected economies in expenses for food. Only the figure of the losses in the Clubkraft groups is somewhat higher than that of the groups for comparison, but keeps within the usual limits. Clubkraft has thus proved its suitability for use in rearing chickens.

Comparison of different rearing rations. Vergleich einer hochwertigen Aufzuchtfuttermischung mit einem weniger hochwertigen Aufzuchtmischfutter. J. Jaeger and E. Rühle. Archiv für Geflügelkunde, Vol. 10, 1936, No. 1.

1. The following experiment has shown that, when there is food belonging to the farmer, and he makes a mixture himself of such food

plus an expensive but, at the same time, high-quality albumen concentrated essence, this can be thoroughly economical.

2. The ulitization figure with the use of only 20 parts "Promiul" in mixed food for chickens can, in spite of the small albumen percentage in the total nutritive substance for the mixture, be described as thoroughly favourable.

3. By virtue of the above statements, it is possible to speak of an economicalness of the albumen concentrated essence "Promiul" used in the above-mentioned experiment, in spite of its apparently high price.

Feeding Pellets or grain. Die Verfütterung von Körnerkraftfutter. R. Fangauf and A. Haensel. Archiv für Geflügelkunde, Vol. 10, 1936, No. 10.

1. Hens fed on grain and pellets clearly distinguish between the two. They definitely prefer grain to pellets.

2. For this reason, the hens, when given an excess of food tend to leave the pellets. To feed poultry on a mixture of pellets and grain requires more intelligence of the poultrykeeper than to give them mash from hoppers because a rational diet must be made up. The amount of food can not be kept constant but must be adapted to the needs of the birds.

3. In giving any kind of pellets or nuts for the first time, we must expect the birds to leave some of the food, and they need some time to accustom themselves to it, just as with novel foods of a natural kind such as rye, maize, small fishes and so on.

The time required for the birds to accustom themselves to the new foodstuffs depends mainly on two circumstances:

a) When the amount of food given is cut down rigourossly, the hens are forced to eat the whole amount given sooner than when a larger amount of feed is given, because in the second case the animals satisfy their requirements with grain, and leave the pellets. Of course this may result in a reduced eggproduction or even make the birds stop laying entirely.
b) In the experiments it was clearly shown that the birds distinguished between differently shaped pellets and nuts.

4. The groups of hens used in the experiments hat access to roomy, wellstocked grassplots, in which they could find many accessory foodstuffs. It is possible that poultry kept in small yards free of such possibilities would take more readily to the pellets.

5. It could be observed that the birds fed on a grainmixture supplemented with pellets containing fish, were not satisfied. Feeding the birds on an ordinary mash in addition to 50 g. of grain gave better production than pellets. Feeding poultry on pellets gave no advantage in several other respects. From an ecomomic standpoint the method of feeding poultry on pellets has failed completely. For this reason this method cannot be recommended from an economic standpoint.

The consumption of charcoal. Über die Höhe des Holzkohleverzehrs bei Legehühnern. R. Fangauf, O. Brüninghaus and A. Haensel. Archiv für Geflügelkunde, Vol. 10, 1936, No. 1.

When charcoal is given separately, its consumption differs with the season, being largest in winter when the birds are confined in the house

for a considerable time. Later in the season the consumption of charcoal diminishes down to a minimum in June-July. The average consumption is about 0.4 g. per head, which amounts to about one procent of the mash eaten. The feeding of milk causes a slight increase of charcoal consumption.

The Value of Charcoal. Versuche über die Wirkung der Holzkohle bei der Kükenaufzucht sowie auf die Verdauungsfunktionen und Futterausnutzung des Geflügels. E. Mangold and H. Damköhler. Archiv für Geflügelkunde, Vol. 10, 1936, No. 8.

The well known antidiarrhoic effect of charcoal was confirmed on hens; diarrhoea caused by feeding daily 30-40 g. cane-sugar to mash, or boiled potatoes only, is stopped or prevented by 5-10 g. charcoal daily.

Therefore feeding charcoal is quite useful as prophylacticum in chickens and generally in all sort of diarrhoea caused by infection or food.

Coarsely grounded charcoal is totally crushed in the gizzard, arriving in the intestine as a fine powder.

The voluntary intake of charcoal in hens was 1.8 g. daily equal to 1.5 % of the total food intake.

In raising chicks with and without 5-20 % charcoal in the food there was no effect of charcoal in young chicken and furthermore in hen chicken; only in some experiments with fattening cocks charcoal was found to cause a remarkable augmentation of the gain of weight and evaluation of food.

The passage of a normal food through the alimentary canal of hens is not prolonged by charcoal daily 8-15 g.

The digestibility of foodstuffs is not increased for protein by charcoal, daily 2-10 g.; a little increase 3-8 % was found with carbohydrates, of 5-26 % with crude fiber.

There is no evidence, that feeding charcoal to a normal food would have a regular and remarkable effect on the evaluation of food in poultry.

ANATOMY AND PHYSIOLOGY

ANATOMY

A Study of natural Pigments. Experiments with the Eggs of the Barnevelder. R. D. Axam. Poultry, March 27, 1937.

The conclusions formed are: (1) The amount of greenfeed fed to Barnevelder fowls over a period of seven months is unimportant, provided sufficient is fed to maintain normal health, and has little influence in increasing the intensity of the color or the even distribution of eggshell pigments. (2) A substantially increased amount of carotin, chiefly derived from carrots and maize rich in that substance, appears to assist in distributing more evenly the pigment and slightly increases the coffee-brown color. (3) An insufficient amount of melanin or melanin-like pigments seems to be obvious. Whether this is due to feeding or purely physiological causes, I am at the moment undecided. (4) A more comprehensive test taken over a longer period will be necessary to secure additional data.

Spurlessness of the White Leghorn. A. W. Kozelka. Jour. Hered., Vol. 24, 1933, p. 71.

Three spurless chicks hatched among a number of normal spurred individuals from a strain of white Leghorns which exhibited considerable variation ranging from total absence to spurs that were approximately the size of a male spur. The spurless condition is apparently due to the absence of the integumental portion normally found in the ordinary spur. At time of hatching both sexes are spurless or, at most, show a slight vestige of a spur, but after sexual maturity sex dimorphism appears in the form of a bony outgrowth from the shank bone in the region of the spur of the male; in the female no such growth takes place. Genetic evidence indicates that the spurless condition is inherited as a Mendelian recessive, with only a single factor difference between the spurless and the normal.

The spurless condition is apparently associated with a reduction of vitality. A significantly smaller proportion of the spurless segregates survived than the spurred.

Immunogenetic studies of dove and pigeon species. Jour. Expt. Zool., Vol. 73, 1936, pp. 85-285.

Results are reported in the following papers from the Wisconsin Experiment Station:

Immunogenetic studies of species and of species hybrids in doves, and the separation of species-specific substances in the backcross. M. R. Irwie and L. J. Cole.

A study of the species serological relation between the Ring dove and the Pearlneck and F_1 hybrids between them, employing serum from rabbits immunized to the red cells from each of the three groups, showed a new substance not present in either of the parents in the cells of the hybrids. This emphasizes the complexity of the composition of the red cells and difficulties encountered in seperation.

Immunogenetic studies of species and of species hybrids in pigeons, and the separation of species-specific characters in backcross generations. M. R. Irwin, L. J. Colo, and C. D. Gordon; *Immunogenetic studies of species and of species hybrids from the cross of Columba livia and Streptopelia risoria.* M. R. Irwin and L. J. Cole.

In serological studies on the common pigeon, Columba livia, and the domestic ringdove, Streptopelia risoria, and crosses between them; and the common pigeon, C. livia, and the triangular spotted pigeon, C. guinea, and crosses between them, the results were similar to those noted in the above paper in that the different species possessed in their erythrocytes biochemical components in common and, in addition, components characteristic of each species. The corpuscles of the F_1 birds contained substances common to both parents and, in addition, new substances not present in the cells of either parent, thus emphasizing the quantitative nature of the genetic factors controlling the biochemical composition of the red blood cells.

Preparation of avian sperm smears for microscopy. S. S. Munro. Science, Vol. 83, 1936, p. 532.

Methods for fixing and staining the elongated heads of avian sperm with a minimum of distortion are described. The methodes involve fixation in osmic acid vapor or instantaneous drying of thin smears.

Weight and size of organs in Frizzle fowl. W. Landauer and E. Upham. Storrs Sta. Bul. 210, 1936.

In continuing studies of the weights of the organs in Frizzle fowls, a comparison was made of the weights of the blood, heart, lungs, spleen, liver, adrenals, kidneys, pancreas, crop, and gizzard lining, of the length and weight of the proventriculus, gizzard, duodenum, small intestine, ceca, and large intestine, and of the intestinal volume of three age groups of Leghorns and homozygous Frizzle fowls, averaging approximately 800, 485, and 160 days of age. Comparisons were considered of the ratio of organ weight to net body weight (weight with feathers removed), ratio of cube

root of the organ weight to the length of the dorsum, and the ratio of the organ weight to the two-thirds power of the net body weight.

Considering the several indices of comparison, it is concluded that Frizzle chickens show definite increases in the relative weights of thyroids, heart, blood, spleen, kidneys, adrenals, pancreas, crop, and gizzard and in the capacity of the intestinal tract. Distinct differences in the fat deposits of Frizzle and normal chickens were observed. Young Frizzles were almost without fat deposits, while older Frizzles tended to have excessive fat accumulations. The increased rate of metabolism is associated with increased size of the thyroids and adrenals. Other changes in the organs were directly connected with the loss of body heat and increased metabolic rate associated with it.

Lessened water vaporization conserves body heat and is probably associated with the lack of enlargement of the lungs.

Although it is concluded that the Frizzle gene is directly responsible for only the plumage defect, it seems likely that residual heredity plays an important role in determining the degree of variation in organs and functions and their relation to survival.

PHYSIOLOGY

Influence of ovulation rate on the tendency of the fowl to produce eggs in clutches. H. M. Scott and D. C. Warren. Poultry Science, Vol. 15, 1936, p. 381.

It is shown that the first egg in the clutch has not been held over in the oviduct but that ovulation has been delayed, taking place in the afternoon only on rare occasions. Eggs that remain in the oviduct longer are not necessarily larger, but embryonic development is more advance.

Influence of light on ovulation in the fowl. D. C. Warren and H. M. Scott. Jour. Expt. Zoology, Vol. 74, 1936, p. 137.

This series of trials conducted at the Kansas Experiment Station was designed to determine the effect of light on ovulation in the hen as indicated by the time of egg laying.

Hens housed in a completely darkened room and subjected to continuous artificial light would lay at any hour of the day, with egg numbers approximately equally divided between day and night, while hens kept in darkness during the day and subjected to artificial light during the night would lay only at night. These changes in lighting conditions were not immediately reflected in the hens' laying reaction but required about 60 hr. to have their full effect, indicating that the influence of light in regulating laying occurs before ovulation, since it is further shown that interruptions which segregate the egg laying into clutches are due to a delay in ovulation rather than to an interruption or retardation of an egg while in the oviduct.

Critical tests showed that neither feed nor exercise could be considered as factors influencing the time of ovulation. Tests in which the color of light was varied through the use of filters and the light intensity was varied indicate that the light effect is not a quantitative one, suggesting that the laying response to light has a psychological basis.

Influence of egg production and other factors on the iron content of chicken blood. A.R. Winter. Poultry Science, Vol. 15, 1936, p. 252.

The Ohio State University made iron determinations on the blood of approximately 300 hens from 14 to 16 mo. of age. This included hens in production, both on range and under confinement, and some with complications such as gray eyes and bumblefoot, and on hens out of production, some of which were in molt.

Rather wide variations in the iron content of the blood were noted, ranging from 20.1 to 37.2 mg. per 100 cc. of blood, with an average of 27.1 ± 0.2 mg. Approximately the same range was found in each of the groups studied, leading to the conclusion that production, confinement, molt, gray eyes, or bumblefoot do not produce quickly noticeable or marked changes in the iron content of the blood.

Artificial Insemination of fowls. U. S. Dept. of Agriculture, Bureau of Animal Industry, Animal Husbandry Division, 1936.

A method of obtaining spermatozoa from male birds and the technic of artificial insemination of hens are described.

Nitrogen metabolism in pigeons on a protein free diet. Sur le métabolisme azoté chez les pigeons à l'alimentation sans matières protéiques. B. A. Lavrov and N. S. Jarussova. Problems of Nutrition, Moscow, Vol. 5, 1936, p. 59. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 712.)

When pigeons which had been in N equilibrium on a normal diet were given a diet consisting mainly of starch, the N excretion was very low until symptoms of polyneuritis began to develop. At this stage the N excretion rose and remained high until the birds died.

Attempt to produce arteriosclerosis in chickens by feeding cholesterol. H. D. Kesten, D. R. Meeker, and J. W. Jobling. Proc. Soc. Exp. Biol. Med., Vol. 34, 1936, p. 818. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 719.)

Nine 5-months-old White Leghorn roosters were given 0-3 g. of cholesterol daily for $1\frac{1}{2}$-4 months and 8 were given 0.8-1.6 g. for times weekly for $2\frac{1}{2}$-3 months in a diet of grain or grain and egg mash. High serum cholesterol (up to 300 mg. per 100 ml.) was found in only one-third of the chickens. The feeding of cholesterol did not increase the incidence of lesions of the aorta, although it may have augmented slightly the deposition of lipin, particularly in the media. It is concluded that, for the study of the production of intimal lipoid deposits in the aorta by feeding cholesterol, the chicken is an unsatisfactory animal.

Serum phosphatase in the domestic fowl. R. H. Common. Journal Agricultural Science, Vol. 26, 1936, p. 492.

Serum phosphatase in 32 normal laying hens varied from 3-6 to 40-2 Bodansky units, while in 5 cocks it ranged from 3 to 6-8 units. There

was no significant difference in values between laying and non-laying hens; 9 pullets from another source gave values comparable to those for cocks. There was no correlation between the serum phosphatase level and intensity of egg production. A high initial value of 80-90 units for day-old chicks increased to a maxium of about 110 units at 10-12 days, followed by a sharp fall to 40-50 units at about 3 weeks; thereafter the values for male birds fell regularly until maturity. The values for females corresponded closely with those for males until the onset of laying, when the values increased and a marked individual variation developed. Administration of radiostol to laying birds did not reduce or affect the range of variation of the serum phosphatase.

Two laying pullets on a low Ca ration showed a much greater increase in serum phosphatase during laying than 2 pullets receiving a high Ca ration.

The development of rickets in chicks produced a very marked increase in the phosphatase level.

Effect of castration and low external temperature on the blood sugar in cockerels. Über den Einfluß der Kastration und niedriger Außentemperaturen auf den Blutzuckerwert junger Hähne. F. Kubessa. Archiv für wissenschaftliche und praktische Tierheilkunde, Vol. 71, 1936, p. 76.

In cockerels 4-5 months old, castration produced a decrease averaging 34 per cent in the sugar content of the blood, the effect persisting for at least 3 weeks. The body temperature was scarcely affected. The increase in blood sugar produced by exposure to a temperature of —1 to —4° C. for 4 hours averaged 4 per cent in non-castrated and 8 per cent in castrated cockerels.

HORMONES

Experimental analysis of the interralation between moulting and egg production in hens. Experimentelle Analyse der Wechselbeziehung zwischen Mauser und Legeleistung beim Huhn. W. T. Larionov. Ztschr. Züchtung B. Vol. 36, 1936, p. 377. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 1154.)

The administration of 2 g. per hen daily of antithyreokrine (a preparation of dried blood serum from thyroidectomised animals) over a 2 months' period had no effect on the moulting process. Premature moulting was induced in laying hens by a single dose (15-20 g. per bird) of a thyroid preparation, and the resulting change in intensity of egg laying was compared with that of a control group undergoing normal moult. The experimental period extended from mid-July to the end of September. In the experimental group severe moulting took place in the first 10 days, while egg production fell rapidly and continued at a lower level than in the control until mid-August, when with the completion of feathering it increased considerably over that of the control group. At this time egg weight also increased. Total egg production over the period

was slightly greater in the experimental group, but this was not the case in a preliminary experiment.

From these results it is concluded that the periodicity of egg laying is dependent on the interrelation between the factors concerned in feather formation and the activity of the ovary.

The bios problem. Preparation of crystalline biotin from egg yolk. Plant growth factors. 20. Über das Bios-Problem. Darstellung von krystallisiertem Biotin aus Eigelb. Mitteilung über pflanzliche Wachstumsstoffe. F. Gögl *and B. Tönnis. Isolation of bios I from yeast. Isolierung von Bios I (Meso-inosit) aus Hefe. 21. Occurrence of biotin in the animal organism. Über das Vorkommen von Biotin im tierischen Organismus. 22.* Hoppe-Seyler's Zeitschrift, Vol. 242, 1936, pp. 43, 74; Vol. 243, p. 189.

20. A good review of the bios problem is given and also full details of the methods used for testing yeast growth factors by means of the growth rate of cultures in a synthetic medium. The speceficity of the test reaction for biotin was proved by experiments with a wide range of materials, including auxines, vitamins B_1 and C, and amino-acids, which all gave negative results. Details of the chemical processes involved in the preparation and purification of biotin from cooked egg yolks are given. The activity of the final crystalline substance was estimated to be 25,000,000,000 "saccharomyces units" per g.

21. Details are given of the preparation of bios I from yeast extracts and autolysates.

22. Watery extracts made from the organs and tissues of dogs, cows, a young male calf, and a laying hen, were sterilised and tested for their biotin activity by their effect on the growth of a yeast "Heferasse M". The liver, spleen, kidney and adrenal were the best sources of the factor and the material from the hen was more active than that from the mammals. This was particularly interesting since egg yolk is the substance from which crystalline biotin is most easily prepared.

Differences between anterior pituitary sex-stimulating hormones and pregnancy-urine substances as tested in the male mammal and bird. J. A. Schockaert. Amer. Jour. Physiol., Vol. 105, 1933, p. 497.

Differences between the effects of pituitary extracts and pregnancy urine on the male genital system of rats, ducks, and chicks were studied. It was found that the weight of testes of immature rats was increased both by pituitary extracts and pregnancy urine extracts. However, pregnancy urine extracts had no effect on the duck and chick, although piuitary extracts markedly increased the weight of the testes and comb development in the chick, with early spermatogenesis.

Prolactin induces broodiness in fowl. O. Riddle, R. W. Bates, and E. L. Lahr. Amer. Jour. Physiol., Vol. 111, 1935, p. 352.

In this study at the Station for Experimental Evolution, from the

Carnegie Institution of Washington, it has been demonstrated that daily injections of prolactin have induced a broody behavior in fowls, marked by a full expression of broodiness in laying hens of the normally broody breeds and by a partial expression as indicated by clucking in both laying and nonlaying hens of nonbroody breeds, nonlaying hens of broody breeds, and in two roosters.

The prolactin retained its effectiveness after 1 hr. of heating to destroy any growth-promoting fractions. The injections of a number of other hormonebearing substances were ineffective in producing this result. This response is evidently closely associated with other responses produced by prolactin, all closely associated with the care and feeding of the very young.

The gross action of prolactin and follicle-stimulating hormone on the mature ovary and sex accessories of fowl. R. W. Bates, E. L. Lahr, and O. Riddle. Amer. Jour. Physiol., Vol. 111, 1935, p. 361.

In further studies on the effects of injections of the anterior pituitary hormone into fowls, it was demonstrated that prolactin and the follicle-stimulating hormone exert opposite effects on the ovary and accessory sex organs of mature hens, the former causing a marked decrease in the weight of either active or resting ovaries with a corresponding decrease in the size of the oviduct and uterus, whereas the latter produced an enormous increase in weight of the ovaries and a marked increase in size of the oviduct. The size of the comb and the space between the pubic bones also decreased with the former and increased with the latter treatment. This leads to the conclusion that the anterior pituitary produces two hormones which exert opposite effects on the mature gonads.

Variation in plumage response of Brown Leghorn capons to oestrone, I, II. A. W. Greenwood and J. S. S. Blyth. Roy. Soc. [London], Proc., Ser. B., Vol. 118, 1935, p. 97.

Two papers in this series are presented from the Institute of Animal Genetics, Edinburgh.

I. Intramuscular injection.—Feather responses, as a result of the administration of standardized intramuscular doses of oestrone to 87 Brown Leghorn capons ranging from 7.5 mo. to 5.5 yr. in age, were variable, some showing only an axial spot of red on the rachis, whereas others varied all the way up to a wide band stretching from one side of the feather to the other. Attempts to correlate the variability with other conditions suggested the role of both genetic and physiological factors. Season and body weight did not show significant correlation, although the response increased with the age of the birds. Growth rate of the feathers was not a significant factor in determining the response.

II. Intradermal injection.—Intradermal injections of small doses of oestrone into 15 Brown Leghorn capons resulted in feather response in newly developing feathers growing in the area where the injections were made. The local nature of the response indicated that the replacement of black by red was a direct one. The induced bars of red pigment were frequently unsymmetrical.

Endocrine weights of the bantam fowl. S. L. Leonard and J. W. Richter. Journal Heredity, Vol. 12, 1936, p. 363.

Weights of the endocrine glands, which function primarily in growth, were studied in English game bantams and compared with similar data obtained by other investigators for White Leghorns. In bantams the thyroid gland was considerably higher and the pituitary slightly heavier, in proportion to body weight, than in the larger fowls. The adrenals, which ordinarily are not considered to affect body size, were approximately the same in both types of birds, on a weight basis. No sex differences were noted in weights of the glands.

Impairment of anterior pituitary functions by follicular hormone. B. Zondek. Lancet, Vol. 231, 1936, p. 842.

The production by injection of follicular hormone of eunuchoid dwarfs, showing characteristic bone changes, in rats and chicks is described. The effects were partially counteracted, on cessation of injection, by use of anterior pituitary growth hormone.

Mass Excretion of oestrogenic Hormone in the Urine of the Stallion. B. Zondek. Nature, London, Vol. 133, 1934, No. 3354, p. 209.

Approximately 1,700,000 m. units were excreted per day in the urine of 4 stallions.

The amount of the hormone produced by pregnant mares per day was 1,000,000 mouse units, whereas the nonpregnant mare produced only 2000.

Experiments with follicle-hormone. Versuch mit der Verfütterung von Follikelhormon an Zuchthennen. Dr. J. Prüfer. Archiv für Geflügelkunde, Vol. 10, 1936, No. 10.

Experiments were made with 89 pullets in seven breedingpens, white and brown Leghorns, to test "Provetan-oil", a follicle-hormone, as to its influence on eggproduction, fertilisation and hatchability of the eggs.

89 Pullets in 7 groups were used as controls in comparing eggproduction, but for comparing fertilisation and hatchability only 78 pullets in 6 groups could be utilized, as in one pen of white Leghorns the cock hat to be replaced during the experiment.

The preparation tested failed to have any observable influence on eggproduction, fertilisation and hatchability.

DISEASES

INFECTIOUS DISEASES

PULLORUM

Pullorum disease in captive quail. M. W. Emmel. Jour. Amer. Vet. Med. Assoc., Vol. 89, 1936, p. 716.

An investigation was made by the Florida Experiment Station of losses which occurred throughout the 1936 growing season in young quail on a farm maintaining about 300 pairs of breeding birds. Cultures made from the organs of 2 of 5 affected quail chicks examined yielded a microorganism having the characteristics of Salmonella pullorum. The infection appeared to have been introduced to the premises of the farm by birds raised in captivity that had been received in March, the infection having been spread to a considerable extent by means of the incubators. It is pointed out that while it is unlikely that pullorum disease is of particular importance in wild quail at this time, the release of pullorum-infected birds from quail farms is a potential menace to the future welfare of this game bird, particularly at this time, when the restocking of the wild supply is a conservation program of many States.

Rough Salmonella pullorum variants from chicks. H. C. Gauger. Jour. Agr. Research, Vol. 53, 1936, p. 235.

Studies were made at the North Carolina Experiment Station of two variant strains of S. pullorum isolated from baby chicks. These strains varied morphologically and serologically from the normal smooth S. pullorum strains usually found in chicks that succumb to the bacteriemic form of S. pullorum infection. Both strains exhibited a similar rough colony morphology characterized by two distinct colony types. Antigens prepared from both strains were agglutinated by S. pullorum serum and were sensitive to and only partially stable in a saline negative serum mixture.

Pullorum disease in turkeys. E. P. Johnson and G. W. Anderson. Jour. Infect. Disiases, Vol. 58, 1936, p. 337.

In this contribution from the Virginia Experiment Station the authors report upon two rather extensive outbreaks of disease among turkeys in which the death of a large number of poults was due to Salmonella pullorum infection. The significance of low titer agglutination reactions with serums from birds harboring nonpathogenic organisms is discussed, and it is concluded that a titer above 1 : 50 would be necessary to locate birds harboring S. pullorum.

Since two previous hatches of turkey eggs in the incubators used had resulted in no disease among the poults raised in these groups, the

evidence points clearly to the transmission of S. pullorum through the eggs of the affected female in each group. The fact that nearly 100 per cent mortality resulted in one flock does not discredit this view, as it is well known that a few affected individuals can easily spread the infection to a large number in a short time.

Combating pullorum disease. Der Einfluß verschiedener prophylaktischer und therapeutischer Maßnahmen bei einem Ausbruch von bazillärer weißer Kükenruhr. H. Ebell und M. Ritter. Archiv für Geflügelkunde, Vol. 10, 1936, No. 6.

The occurane of bacillary white diarrhoe in eighteen lots of chicks was studied and treated statistically. This study showed:

1. Testing twice with an interval of $2^1/_2$ months for bact. pullorum with the quick agglutination method was not sufficient in these cases to find all the bacteriacarriers.

2. The therapeutical and hygienic measures taken in this case to combat the disease failed.

3. General vitality and natural diseaseresitance were shown to be of the utmost importance in the outbreak of the disease.

4. Keeping the chicks in batteries in small groups, and observing them daily to cull out the diseased chicks was a better method to keep down B.W.D.

16th annual report on eradication of pullorum disease in Massachusetts. H. van Roekel. Massachusetts State Control Ser. Bull. 83, 1936.

252 flocks containing 329,659 fowls from 11 counties were blood tested. An average percentage of but 0.30 was positive, the lowest obtained during 16 years of testing. Of the total number of samples tested, 313,333 were from females and 30,740 from males, of which 0.31 and 0.17 per cent, respectively, were positive. In 2 of the countries no reactors were found among the birds tested. The details are given in five tables.

Massachusetts poultrymen succesful in maintaining pullorum disease free flocks. New England Poultryman and Northeast. Breeder, Vol. 22, 1936, p. 37.

This contribution from the Massachusetts Experiment Station refers briefly to the progress of pullorum disease eradication work in Massachusetts.

Studies on Incubator Hygiene. VI. A note on the resistance of Salmonella pullorum on sterilized and unsterilized egg shell. R. Graham and V. M. Michael. Poultry Science, Vol. 15, 1936, p. 490.

Very little variance in the longevity of Salmonella pullorum on egg shells which had been sterilized at 15 pounds steam pressure for 30 minutes and those which had not been sterilized previous to contamination with S. pullorum was observed following three separate formaldehyde fu-

migations of a forced-draft incubator. S. pullorum on egg shells in hatching trays survived formaldehyde fumigation for 30 minutes. After 40 minutes, S. pullorum was generally non-viable, although in one fumigation it survived for 100 minutes on sterilized egg shells. The survival of S. pullorum on egg shells during formaldehyde fumigation of a forced-draft incubator for 100 minutes suggests the advisability of keeping the incubator closed for at least two hours following fumigation. The range of viability of S. pullorum in empty incubators is comparable to results obtained in the case of a 32,000 capacity machine when loaded to various capacities. In 25 separate fumigations, S. pullorum that occasionnally survived 40 minute fumigations may have had a range of 100 minutes.

Studies on Incubator Hygiene. VII. Results of fumigation on Salmonella Pullorum in incubators at full capacity. R. Graham and V. M. Michael. Poultry Science, Vol. 15, 1936, p. 492.

Formaldehyde fumigation is probably as effective in destroying Salmonella pullorum in a forced-draft incubator operated at 50 or 66 per cent egg capacity as in a incubator that is practically empty, since the average survivability of S. pullorum and range survivability proved comparable. In one instance S. pullorum survived for 150 minutes in the lower door and 120 minutes in the upper door and proved non-viable at 180 minutes and 150 minutes respectively.

Studies on Incubator Hygiene. VIII. Resistance of Salmonella aertrycke, Salmonella anatum, and Salmonella from quail to formaldehyde fumigation. R. Graham and and V. M. Michael. Poultry Science, Vol. 15, 1936, p. 494.

Salmonella aertrycke and Salmonella newport on cotton plugs survived formaldehyde fumigation in forced-draft incubators for 30 minutes but were non-viable at 60 minutes, while Salmonella sp. isolated from baby quail survived for 60 minutes but were non-viable at 90 minutes.

An Examination of sixty-four strains of Salmonella sp. isolated from Poultry in New South Wales. L. Hart. Veterinary Research Station, Glenfield. N. S. W. The Australian Veterinary Journal, 1936, p. 233.

Summary:

Sixty-four strains of Salmonella sp. recovered during the past three years from poultry in New South Wales were examined to ascertain if all conformed to the fermentative reactions of S. pullorum. At the same time a type strain of S. gallinarum was also tested. All the strains recovered from poultry in New South Wales conformed to the reaction of S. pullorum.

Three strains came from birds in country districts, namely, Galong, Wagga and Moss Vale, whilst the remainder came from an area within a fifty-mile radius of Sydney.

As these are the main poultry raising districts in this State, we have no reason to suspect, from our examination, that S. gallinarum infection occurs in New South Wales.

PARATYPHOID

Pathogenic bacteria in foodstuffs from poultry and poultry products. Zur Entstehung bakterieller Lebensmittelschädigungen durch Geflügel und Geflügelprodukte. Lerche. 6. Weltgeflügelkongress, Leipzig, 1936.

Of 332 duck eggs examined 4.8 per cent showed salmonella infection on the shell and 0.9 per cent in the interior. Under favourable conditions the bacteria were found to pass from the shell into the interior. Food poisoning associated with duck eggs in general and means of avoiding it are briefly discussed.

TUBERCULOSIS

Tuberculosis of poultry. A. J. Durant. Missouri Sta. Bul. 364, 1936.

A practical summary of information of this disease of poultry and its control and eradication.

Tuberculosis in Man by Avian Bacilli. Prof. Wester. Tydschrift voor Diergeneeskunde, Vol. 64, 1937, p. 239.

Summary:

The author shows by a literary review that the bovine and avian types of the tubercle bacilli are more dangerous for man than formerly was believed.

The recoverability of Mycobacterium tuberculosis avium from experimentally infected guinea pigs. W. H. Feldmann. Jour. Infect. Diseases, Vol. 59, 1936, p. 1.

In the work reported the recoverability of M. tuberculosis avium from experimentally infected guinea pigs was demonstrated. Thirtyfour guinea pigs were inoculated subcutaneously with suspensions of a virulent organism. Necropsy was made from 1 to 70 days subsequent to injection and the spleens were emulsified and cultured. The avian tubercle bacillus was obtained from 8 of the 20 guinea pigs examined at necropsy up to and including 21 days after receiving the infective inoculum. Of the 14 animals examined at necropsy 28 to 70 days after the infection was introduced, 13 yielded the specific micro-organism. Macroscopic lesions of a tuberculous character were present in only 1 of the 43 animals examined.

These results have shown that the organism of avian tuberculosis may be recovered from the spleens of previously inoculated guinea pigs, although gross lesions of tuberculosis are usually absent. The findings suggest the advisability of culturing the spleens of guinea pigs routinely in the study of clinical material in which the presence of the avian tubercle bacillus is suspected.

Susceptibility of chickens to tuberculosis following spontaneous exposure to the infection. W. H. Feldmann, J. L.

Bollman, and F. C. Mann. Jour. Amer. Vet. Med. Assoc., Vol. 89, 1936, p. 551.

With a view to determining the susceptibility of apparently normal adult chickens to tuberculosis through cohabitation with chickens naturally affected with the disease, a group of 29 nontuberculous chickens were kept in contact for nearly 600 days with 30 chickens which had reacted positively to the tuberculin test. Only 7 of the previously noninfected birds contracted the disease, although tuberculosis was found in 19 of the 30 chickens that were presumably tuberculous when the experiment began.

"The results indicate that, under the conditions of the experiment, the majority of the chickens were capable of withstanding an environmental exposure to tuberculosis for a considerable period without lesions of the disease developing. Repeated or continuous exposure for a prolonged period appears to be necessary before the disease becomes manifest in adult chickens living in an infected environment."

Parasitism and tuberculosis in a crow. F. R. Beaudette and C. B. Hudson. Jour. Amer. Vet. Med. Assoc., Vol. 89, 1936, p. 215.

Post-mortem examination by the New Jersey Experiment Stations of two crows that had been shot on a farm near Stockton, Hunterdon County, N. J., showed the presence of the gizzard worm Acuaria anthuris, a common parasite of crows in that section, and of tapeworms in each bird. The examination of blood smears revealed the presence of many microfilariae, thought to be Diplotriaena tricuspis, in one of the specimens and in a crow collected later which appeared to be suffering from an injured wing and was kept in the laboratory until it died from tuberculosis.

PEST

Notes on a minor outbreak of cell inclusion disease. S. J. Gilbert and G. B. Simmins. Jour. Compar. Pathology and Therapie, Vol. 49, 1936, p. 148.

Reference is made to a minor outbreak of cell inclusion disease that occurred in poultry on farms in the vicinity of Jaffa, Palestine, during a period of a few weeks in June 1935. The mortality on four farms with flocks of from 130 to 200 fowls varied from 3 to 88.5 per cent within outbreak periods of from 10 to 32 days. As to its tenacity, it was consistently observed that the virus did not (or very exceptionally) cause the disease if preserved in 50 per cent glycerin-saline for more than 10 days.

It is concluded that until better grounds can be found for not separating the disease from plague, it should be referred to as cell inclusion disease.

Fowl plague and Newcastle disease. R. Manninger. Jour. Compar. Pathology and Therapie, Vol. 49, 1936, p. 279.

The data presented are considered to demonstrate that Newcastle disease and the classical fowl plague represent an etiological unit, although their clinical manifestations differ, particularly in the protracted course of Newcastle disease.

LARYNGOTRACHEITIS

Laryngotracheitis, one of the poultry diseases previously called "roup". T. G. Hungerford. Agr. Gaz. N. S. Wales, Vol. 47, 1936, p. 112, pp. 163-223.

A summary of information is given on this disease of poultry, widespread in New South Wales and the cause of great economic loss.

Cultivation of the virus of infectious Bronchitis. F. R. Beaudette and C. B. Hudson. New Jersey Agricultural Experiment Station. New Brunswick N. J. Journal Am. Vet. Med. Association, Vol. 43, 1937, p. 51.

1. The virus of infectious bronchitis passes all grades of Berkefeld filters.

2. Introduced intratracheally and intranasally the virus regularly provokes the disease. Subcutaneous and intramuscular inoculations are either non-infective or else produce the disease after a prolonged incubation period.

3. Inoculated into the chorio-allantoic menbrane of the developing embryo, the virus does not produce gross lesions such as are produced by the viruses of laryngotracheitis, fowl-pox and pigeon-pox. The absence of such lesions could be used to distinguish between the viruses of laryngotracheitis and bronchitis.

4. After a few passages, the virus developed the capacity to kill the embryo. The embryo appears smaller than embryos of the same age from eggs in which pox and laryngotracheitis viruses have been cultivated.

5. After passage through 14 generations, the virus was infectious for chickens that were immune to laryngotracheitis. Likewise, birds recovered from bronchitis were still susceptible to laryngotracheitis.

6. The serum of birds recovered from bronchitis is capable of neutralizing the virus.

CORYZA

Infectious rhinitis (coryza). Rhode Island Sta. Rpt. 1935.

Reference is made to the progress of work during the year with Hemophilus gallinarum as related to infectious coryza of poultry.

Studies on an uncomplicated coryza of the domestic fowl, VII, VIII. J. B. Nelson. Jour. Expt. Med., Vol. 64, 1936, pp. 749-759.

Two contributions are presented in continuation of the studies.

VII. Cultivation of the coccobacilliform bodies in fertile eggs and in tissue cultures.

The coccobacilliform bodies of fowl coryza were successfully cultivated in the fetal membranes of fertile eggs. Microscopic examination indicated growth in approximately 50 per cent of 94 eggs inoculated on the third to fourth day of incubation. Growth was generally inhibited, however, in eggs inoculated on the tenth day. One strain of the specific bodies was maintained through 11 successive passages in 4-days eggs. A more consistent growth of the coccobacilliform bodies was obtained in tissue cultures. One strain, originally isolated in November 1935, has been

carried through 100 successive subcultures at intervals of from 1 to 3 days. The specific bodies fail to maintain their morphological identity for any length of time in this medium. It is noted that growth of the coccobacilliform bodies in fertile eggs and in tissue cultures is not dependent on the presence of living cells.

VIII. The infectivity of fetal membrane and tissue culture suspensions of the coccobacilliform bodies.

The fetal membrane and tissue culture suspensions of the coccobacilliform bodies were found infective for normal fowl. Intranasal injection was commonly followed by a coryza which is serially transmissible and communicable by direct contact. The specific bodies are generally demonstrable in the nasal exudate of birds infected either by injection or contact. Compared with the original strain of the coryza of slow onset, the reaction produced by these suspensions is often less vigorous; the incidence of apparent cases, characterized by a nasal discharge, being 97 and 53 per cent, respectively. The apparent cases are similarly characterized by a long incubation period and a tendency toward chronicity.

Haemophylie Bacilli in the organs of Fowl. Haemophiele Bacillen in inwendige organen van hoenders by Coryza gallinarum met korte incubatie. Dr. C. A. van Dorssen. Tydschrift voor Diergeneeskunde, Vol. 64, 1937, p. 225.

In two experimental chronic cases of Coryza of rapid onset the author succeeded in isolating Haemophylus Coryzae from the spleen. Both fowls were in poor condition and anaemic. In one bird that died a fibrinous pneumonia was found from which also Haem. was isolated.

In the other fowl that was killed, except a mucopurulent rhinitis, no other lesions were found.

By intra-nasal infection with the isolated strains the author was able to set up coryza of rapid onset infowls.

Studies of the clinical Manifestations and Transmissibility of infectious coryza of chickens. J. R. Beach and O. W. Schalm. Poultry Science, Vol. 15, 1936, p. 466.

Infectious coryza occurs as a simple coryza manifested only by a nasal discharge or as a coryza with complications consisting of edematous swelling of the face, sinusitis, conjunctivitis, tracheitis, bronchitis, and infection of the air-sacs. The disease is easily transmitted by inoculation of normal chickens with exudative material from any infected part or by direct contact exposure of healthy fowls to diseased ones. Transmission of the disease by indirect contact was accomplished but did not take place easily. Cages contaminated by occupancy, by diseased chickens and by having virulent exudate from infected chickens placed in the feed and water-vessels, did not remain infective to susceptible chickens placed in them for longer than 24 hours. The disease was transmitted by inoculating healthy chickens with scrapings of the nasal mucosa of chickens which had been infected with coryza but had shown no symptoms for as long as 46 days. Pigeons were found to be refractory to the disease. Three turkeys which were tested were found to be susceptible and the resultant disease was of the same character as natural cases of coryza and sinusitis in this species of bird.

DIPHTHERIA

The vaccination of baby chicks against fowl pox. M. M. DeVolt, I. M. Moulthrop, and C. R. Davis. Maryland Sta. Bul. 395, 1936.

In experimental work in 1935 the vaccination of 73 12-day-old Single Comb White Leghorn chicks against fowl pox by the stick method resulted in a satisfactory performance during the first 2 weeks after vaccination. "During the next fortnight, however, there was some sickness as a result of systemic reactions which caused the death of 4 and a loss of body weight in others. The vaccinated group as a whole recovered and developed well during the remainder of their growing period, although their average body weight was slightly below that of the control group reared under similar conditions. When tested for immunity a little over 7 mo. after vaccination, only 8.33 per cent of the males tested and 45.5 per cent of the females were immune. The vaccination of these fowls at the age of 12 days, therefore, did not confer a uniform and complete immunity lasting to maturity in all cases."

OTHER INFECTIOUS DISEASES

Culex, a new vector of Spirochaeta gallinarum. M. Zuelzer. Jour. Trop. Med. and Hyg., London, Vol. 39, 1936, p. 204.

In an investigation of an extensive enzootic among fowls in the area of the Baltic Sea, due to S. gallinarum, it was shown that mites of the genus Dermanyssus are capable of transmitting the disease, but not later than 48 hr. after they have fed on infected fowls. It is pointed out that while the transmission by mites is purely mechanical, experiments with Culex mosquitoes as well as with the fowl tick have shown them to be true vectors of fowl spirochetosis.

Staphylococcus infections in birds. J. Reis and P. Nobrega. Arch. Inst. Biol., São Paulo, Vol. 6, 1935, p. 63.

The authors' observations are presented with a review of the literature on Staphylococcus infection in birds, a list of 14 references to which is included.

"In São Paulo in 2,088 autopsies made in the Biological Institute we observed 6 cases of staphylococcic arthritis, 3 being in hens (in 1 case the sample was also isolated from the liver), 2 in pigeons, and 1 in a canary. The 2 pigeons were from the same loft, where the disease manifested itself simultaneously in many individuals. From a pigeon of the same origin, which died suddenly with arthritis, nonhemolytic S. aureus was isolated from the liver. One of the hens with arthritis presented antitoxin in the serum capable of neutralizing the toxicity of the sample for the mouse.

"In 1 hen we observed a staphylococcic abscess in the superciliary region, which regressed spontaneously. In 1 case of acute spontaneous conjunctivitis, also in a hen, we isolated hemolytic S. aureus in abundant culture, but by instillation of the culture we were not able to reproduce the disease in a healthy bird.

"In the skin of pigeons with the reaction of vaccination against chicken pox we frequently observed the presence of hemolytic staphylococci, which are not found normally."

The text includes a chart in which the characters of the staphylococci isolated, both from normal birds and those with pathologic manifestations, are given.

A filterable virus, distinct from that of laryngotracheitis, the cause of a respiratory disease of chicks. J. R. Beach and O. W. Schalm. Poultry Sci., Vol. 15, 1936, p. 199.

A report of work in California, of which progress accounts have been noted.

The experiments conducted have shown "that nasal, tracheal, and bronchial exudate from two strains of a respiratory disease of chicks, which cinically resembles infectious laryngotracheitis, when suspended in bouillon and passed through Berkefeld V, N, or W filters will produce the disease. These results demonstrate the disease is caused by a filtrable virus which passes through all grades of Berkefeld filters."

Chickens that recovered from an infection with one of the two strains of virus were refractory to further infection with either strain. The sera from chickens that have recovered from an infection with one strain of the virus would neutralize virus of either strain. These results show the identity of the two strains of virus. Chickens that were refractory to infection with this virus were shown to be susceptible to coryza caused by Hemophilus gallinarum and to the virus of laryngotracheitis. "Likewise, chickens refractory to the latter virus were suspectible to the former. These results demonstrate that the two viruses are distinct from one another.

The virus dried by Swift's method and stored in a refrigerator for 180 days has produced disease. In 50 per cent glycerin and stored in a refrigerator it has remained alive for 80 days.

Report of Committee of transmissible Diseases of Poultry. Dr. L. F. Rettger, Dr. J. R. Beach, Dr. E. L. Brunette, Dr. H. Bunyea, Dr. E. P. Johnson. Journal American Vet. Med. Ass., Vol. 88, 1936, p. 392.

Report on: Avian Tuberculosis; Blackhead of Turkeys. (The main secret of blackhead control is in thorough segregation of turkeys from all other species of domestic fowl, particularly chickens.); Paratyphoid in Turkeys; (The cause of this disease is Salmonella aertrycke in some quarters and S. typhi-murium in others. It has also been known by the name of Bact. pestis caviae.); Fowl Cholera; Fowl Typhoid; Pullorum Disease; Miscellaneous.

Clostridium botulinum type C in relation to duck sickness in the Province of Alberta. R. M. Shaw and G. S. Simpson. Jour. Bact., Vol. 32, 1936, p. 79.

In the course of a study of a severe epidemic that occurred in 1933 among wild ducks feeding about Stobart and Namaka lakes, about 45 miles east of Calgary and 130 miles north of the Montana border, pure cultures of C. botulinum type C were isolated from the organs of a duck dead of duck sickness.

"Antitoxin produced against the toxin of this freshly isolated strain protected experimental birds against homologous toxin and against that of

a known culture of C. botulinum type C. The use of this antitoxin in toxin-antitoxin protection experiments enabled us to demonstrate the presence of C. botulinum type C in the bodies of six other waterfowl and in cultures of mud from the epidemic area.

"Tables were prepared showing the neutralizing effect of the antitoxin on toxin from our pure culture strain and from a known strain of C. botulinum type C. Where it was possible to obtain heart's blood from the ducks at or shortly after death, an examination was made and large numbers of filarial worms were found. These were not regarded as having any significance in the epidemic."

LEUCOSIS AND TUMORS

Field observations on the incidence of fowl Leukosis in hatching eggs and chicks. B. A. Beach, Madison, Wis. Department of Veterinary Science, College of Agriculture University of Wisconsin. Journal of the Am. Vet. Med. Association, Vol. 43, 1937, p. 194.

Fowl leukosis was studied on 14 farms where the disease had not appeared until the spring of 1935. In all cases symptoms first appeared in chicks. In twelve instances the chicks came from three hatcheries; in the two others the chicks were hatched from eggs produced on the farm. One of the latter hen flocks was shown to be infected, but in the other flock the source of the infection was not determined.

Seven of the observations were made in a county where a field veterinarian on the State Veterinarian's staff had recently made a farm-to-farm canvass of the poultry disease situation. Acknowledgement is hereby made of the valuable assistance given.

Neurolymphomatosis in Queensland. D. Forsyth Stewart. Animal Health Station, Yeerongpilly, Queensland. The Australian Veterinary Journal, Vol. 13, 1937, p. 31.

The presence of neurolymphomatosis in Australia has been recorded only in New South Wales and South Australia. Author draws attention to the existence of the disease in Queensland. The condition was diagnosed in two pullets which were fowarded from a poultry farm in the vicinity of Brisbane. Information in this state indicates that cases of paralysis are not uncommon, but they have attracted little attention for the reason that the incidence is low among the flocks of individual farms.

A study of Transmissible Fowl Leukosis. C. Olson. Rochester, Minn. The Mayo Foundation. Journal of the Amer. Vet. Med. Ass. Vol. 89, p. 681.

1. Fowl leukosis is transmissible to susceptible chickens by means of whole blood, blood plasma, and tissue emulsions.

2. The inciting agent remains viable in glycerin solution and is filtrable.

3. The disease is not transmissible to ducks, geese or turkeys.

4. The disease produced by the inciting agent is manifest by certain specific pathologic changes in the erythrocytic and granulocytic

hematopoietic tissues, and in most instances by the appearance of pathologic cells in the peripheral blood.

5. The transmissible agent of fowl leukosis is not responsible for the conditions known as lymphocytoma or neurolymphomatosis gallinarum.

6. The changes in the blood in transmissible fowl leukosis are variable quantitatively and qualitatively.

7. Transfusions with chicken blood and oral administration of arsenic in the form of Fowler's solution are of no avail in the treatment of the well-established form of the disease.

PARASITES

WORMS

The gizzard worm, Amidostomum anseris, of geese in western Washington: Reports of cases. A. C. Jerstad. Jour. Amer. Vet. Med. Assoc., Vol. 89, 1936, p. 318.

The author has found the parasitic nematode A. anseris in geese from King and Pierce Counties in western Washington. In three of the cases reported, it is considered the primary lethal factor, and in one case it was found associated with other parasites. One case infested with A. anseris, in which eggs of Capillaria sp. were found in the droppings, was successfully treated with carbon tetrachloride.

The cysticercoid of the fowl tapeworm Raillietina cesticillus. J. E. Ackert and W. M. Reid. Amer. Micros. Soc. Trans., Vol. 55, 1936, p. 97.

In work at the Kansas Experiment Station, "gravid proglottids of the fowl tapeworm R. (Skrjabinia) cesticillus (Molin) Fuhrm. fed to ground beetles (Amara basillaris Say) produced in 16 to 18 days numerous mature cysticercoids. The cysticercoids that evaginated in water showed the characteristic broad rostellum of R. cesticillus. The invaginated cysticercoids when fed to young chickens raised in confinement developed into adult R. cesticillus in 16 days. The control chickens were negative. Another species of beetle, A. basillaris Say, is added to the list of intermediate hosts of R. cesticillus, and description of the cysticercoid in this country is recorded."

The treatment of ascariasis in chickens. P. P. Levine. Cornell Vet., Vol. 26, 1936, p. 120.

Experiments conducted in an attempt to evaluate the tobacco dust treatment as a means for controlling roundworms in poultry are reported.

"Tobacco dust (nicotine content 1.78 per cent) fed to chicks continuously from the day of hatching, in concentrations of 2, 4, 6, and 8 per cent in a dry mash, did not prevent the hatching of embryonated eggs of lineata and the invasion of the intestinal mucosa by the larvae. In 2 per cent concentration the tobacco did not show any evidences of toxicity for the chicks. The higher concentrations were toxic. Forty per cent of the chicks fed on the 8 per cent level died of poisoning.

"There were no significant differences in worm numbers between tobacco treated (2 per cent) and control birds fed with the same number of embryonated ascarid eggs until the seventh week of parasitism. Since,

in another experiment, it was found that 88 per cent of the mature worms were removed from a group of pullets by such treatment continued for 4 weeks, it would appear that the immature worms are less susceptible to tobacco treatment than adults.

"A nicotine compound (Black Leaf Worm Powder) administered in a single dose removed all of the worms from 45 pullets parasitized with adult worms. This statement, however, should not be interpreted to mean that this treatment will always be 100 per cent efficient under all conditions.

"The practice of feeding tobacco dust in the mash continuously to prevent ascarid infection apparently is ineffective. The feeding of the dust for 4 weeks to older birds for expelling adult worms was less effective than a single treatment with a nicotine powder."

The genus Capillaria Zeder 1800 [Nematoda, Trichuroidea] and the capillarioses in poultry. J. F. Teixeira de Freitas and J. Lins de Almeida. Rev. Dept. Nac. Prod. Anim. [Brazil], Vol. 2, 1935, p. 311. (Ref. Exp. Station Record, Vol. 76, 1937, p. 541.)

This contribution includes descriptions and the synonymy of 10 species of Capillaria found in domestic fowl, a domestic host list, and a bibliography of 141 titles.

Microfilaria in a Duck. Tc. R. Beaudette. N. J. Agric. Exp. Station, New Brunswick. Journal of the Am. Vet. Med. Association, Vol. 89, 1936, p. 589.

In the blood smears, stained with Wright's stain, of one duck sheathed microfilaria were found. This report is made to encourage the blood examination of wild birds.

Raillietina sinensis a new tapeworm from the domestic fowl. C. F. Chang and G. F. Winfield. Peking Nat. Hist. Bull. 11 (1): 35-37, 3 text fig. The Linguan Science Journal, Vol. 16, 1937, p. 146.

This species, collected once at Tsinan, differs from most other species in that it has 43 to 57 testes that measure 0.028 mm. in diameter, a cirrus sac 0.198 mm. long and the ovary 0.048 mm. by 0.129 mm. Each uterine capsule contains 1 to 5 eggs.

Medicaments against Ascaridiosis in Pigeons. Enkele geneesmiddelen tegen Ascaridiosis by Duiven. Dr. E. A. R. F. Baudet. Tydschrift voor Diergeneeskunde, Vol. 64, 1937, p. 113.

Summary:

A great difficulty in administering medicaments to pigeons, either in capsules or in liquid is, that they easily vomit, especially when there is still some food in the craw. Therefore it is strongly advised not to

start treatment before a preliminary fasting, though even this does not always avoid vomiting.

The author has studied the effect of various medicaments against Ascaris (Ascaridia columbae): carbon tetrachlorure, tetrachlorethylene, oleum chenopodii, kamala in combination with nicotine sulphate, ascarioline (containing santonine and calomel), ascaridol oil (contains the efficacious constituent from oil chenopodii), hexylresorcinol, turpentine.

The best appeared to be oil chenopodii. Also carbon tetrachloure yielded rather good results; tetrachlorethylene appeared inefficacious against Ascaris of the pigeon. None of these three medicaments had any effect upon Capillaria. Ascaridol oil, provided that is administered in capsules and followed by a laxative, gave rather good results but the draw-back is, that at least 2-4 capsules should be given and that more than one treatment is required.

The other susmentioned medicaments failed to expel Ascaris, even after repeated treatment.

A new method for embryonating nematode eggs in fecal discharges. P. P. Levine. Jour. Parasitol., Vol. 22, 1936, p. 291.

A description is given of a method of infecting a large number of chickens with nematode eggs devised by the author while working with Capillaria columbae.

Further observations on occurence and incidence of helminths in British partridges. P. A. Clapham. Jour. Helminthol., Vol. 14, 1936, p. 61.

Reporting further, Raillietina cesticillus, Amoebotaenia cuneata, and Harmostomum commutatum are recorded from Perdix perdix for the first time. Some remarks are made on the factors influencing infestation with Trichostrongylus tenuis, Choanotaenia infundibelum, and Hymenolepsis phasianina in the partridge and H. microps and Davainea urogalli in the grouse.

Worms as the cause of Mortality in Geese. Die Parasiten des Hausgeflügels. 6. Parasitische Würmer als Ursache eines Gänsesterbens. Dr. E. Heinemann. Archiv für Geflügelkunde, Vol. 10, 1936, No. 8.

A great many casualties among young geese made it necessary to investigate these cases to look for the cause of death. The examination of four animals sent in, showed them to be heavily infected with Trematodes and Nematodes. Among the Trematodes, the Echinostomides Hypoderaeum conoideum, Echinoparaphium curvatum and Echinostomum paraulum could be determined. In addition, the Monostomides Notocotylus attenuatus, Notocolytus Thienemanni and Notocotylus seineti were found, and the Schistosome Bilhariza polonica. The Nematodes proved to be Amidostomum anseris.

The parasites and their developmental cycle were described, and measures to prevent further damage were proposed.

Notes concerning internal parasites of poultry in Puerto Rico. E. B. Cram. Puerto Rico State Agricultural Notes No. 70, 1936.

This is a report on the results of an investigation conducted in Puerto Rico from Oct. 7, 1935, to Jan. 9, 1936, to determine the kinds of parasites present in poultry, the severity of parasitic infestations, their importance economically, the influence of environmental factors and recommendations for control.

COCCIDIOSIS

Effects of sulphur on coccidiosis in chickens. C. A. Herrick and C. E. Holmes. Vet. Med., Vol. 31, 1936, p. 390. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 874.) University, Madison, Wisconsin.

Chicks were fed sulphur at various levels for 3 weeks and all groups were then infected with coccidia. The rate of gain in weight was adversely affected by the addition of sulphur to the ration but the effects of the coccidia were counteracted, mortality being reduced by 50 per cent. Sulphur had no curative effect, however, after infection had already taken place.

Age as a factor in the development of resistance of the chicken to the effects of the protozoan parasite Eimeria tenella. C. A. Herrick, G. L. Ott, and C. E. Holmes. Jour. Parasitol., Vol. 22, 1936, p. 264.

In work at the Wisconsin Experiment Station 8 groups of 151 chickens ranging in age from 2 weeks to 15 mo. were infected with the coccidian parasite E. tenella. Erythrocyte counts were made before infection and daily thereafter until the blood count had returned to normal. "From the data presented it seems apparent that (1) chickens of all ages up to and including 15 mo. are susceptible to infection with the parasite E. tenella and show symptoms of acute coccidiosis following infection, and (2) chickens infected when 3 mo. old or older are considerably more resistant to the effects of E. tenella than are chickens infected when not over 2 mo. old."

The chicken as a carrier of the oocysts of the Coccidia, Eimeria tenella. C. A. Herrick, G. L. Ott, and C. E. Holmes. Poultry Science, Vol. 15, 1936, p. 322.

In work conducted at the Wisconsin Experiment Station "15 chickens infected with cecal coccidiosis were autopsied at intervals up to and including 12 mo. following infection, and all but 2 harbored oocysts in the tissues of the cecal pouches. Viable oocysts were found to be passed in the cecal droppings and enmeshed in the tissues of the cecal pouches for a period of 7.5 mo. None of the controls was found to harbor oocysts, and since no infection resulted in susceptible chickens from the feeding of cultured cecal droppings and cecal scrapings it is believed that none of the infected animals kept in the same cages with the controls became reinfected."

BLACKHEAD

Blackhead (infectious enterohepatitis) in turkeys with notes on other intestinal protozoa. H. M. Devolt and C. R. Davis. Maryland Sta. Bul. 392, 1936.

The studies reported have shown that blackhead is not regularly, if ever, transmitted through the egg. It has been controlled consistently by incubator hatching and rearing poults in isolation from adult turkeys or chickens or soil contaminated by such birds. The parasite (Histomonas meleagridis Tyzzer) has been found to be present in the breeder yard as shown by the appearance of the disease in poults hatched by the turkey hen. The mortality rate in such young has varied between 33 and 76 per cent of the hatch.

The most frequent time of death in these poults has been during the second month of their life, but deaths from blackhead have occurred at earlier and later dates during the growing period as well. Blackhead has also appeared in the grown turkeys, most commonly causing the death of young hens in heavy egg production. The causative parasites have also been found in the chicken yard, as young turkeys have readily contracted the disease when reared under those conditions.

The presence of blackhead parasites has been demonstrated in contaminated soil, as shown by the appearance of the disease in young turkeys placed in experimental pens' on top soil taken from the turkey breeder or chicken yards. Such experiments have furthermore indicated that deaths may occur in from 2 to 3 weeks after young turkeys are exposed in this way to the disease. Experiments conducted on the problem of fly transmission have indicated that flies may be regarded with suspicion as carriers of blackhead.

"The transmission of blackhead by inoculations with material taken from the affected internal organs has made possible the isolation and identification of the causative parasite. Tyzzer's "inoculated" blackhead (E.S.R. 43, p. 885) has been reproduced by placing small pieces of affected liver tissue beneath the skin, and a new form of blackhead has resulted from the implantation of such material in cavities of the head.

"The isolation of the blackhead parasite in protozoan pure culture on modified Locke's egg medium has been accomplished by feeding young turkeys with affected liver tissue and seeding the culture medium with the cecal droppings or contents obtained at autopsy. The observation of this parasite in such droppings and cultures has shown it to be identical with H. meleagridis Tyzzer. The feeding of the cultures to young turkeys has regularly produced blackhead. Trichomonads which were formerly held to be the causative agent of blackhead by some investigators have been found on some occasions to be present in blackhead livers. While inoculation studies with trichomonads have given rise to the belief that they may be capable of causing disease under certain conditions, it was not possible to produce blackhead lesions regularly with them.

"The parasitological and clinical periods that prevail during the course of an attack of blackhead in young poults have been studied by making inoculations with Locke's egg medium cultures of histomonads. Under the conditions of this experiment, death occurred at various times between the ninth and fifteenth day after inoculation. Symptoms of illness appeared in from 4 to 9 days after inoculation, and in all cases the affected poult voided the causative parasites in the droppings before showing symptoms of illness. It was possible to transmit the disease by feeding normal poults with fresh cecal droppings containing the histomonads."

Tetrameres crami Swales, 1933, a nematode parasite of ducks in Canada: Morphological and biological studies. W. E. Swales. Canadian Journal of Research, Vol. 14, 1936, p. 151.

This report includes a description of the male and redescription of the female. The results of a study of its life history are presented, together with a description of the la val stages. Two fresh-water amphipods. Gammarus fasciatus Say and Hyalella Knickerbockeri (Bate) were found to serve as intermediate hosts. A list of definitive hosts, notes on the ecology of the intermediate hosts and on tetrameriasis crami, and a list of 16 references to literature are included.

Leucocytozoa and Microfilariae of Fowls and Haemoproteus columbae of Pigeons in Province Wellesley. A. R. Kuppusamy. Indian Veterinary Journal, Vol. 13, 1936, p. 25.

A report of observations of these blood parasites in Penang and Province Wellesley.

SUNDRIES

On Adult Mortality Among Laying Flocks of the Middle West. C. M. Ferguson—Extension Poultryman—Ohio State University. The Ohio Conference. The U. S. Egg and Poultry Magazine, May, 1937.

This conference was held at Columbus, Ohio, on April 5. Professor E. L. Dakan of Ohio State University issued the call for the meeting, which was attended by about 250 people. In preparation for this conference, the extension department of Ohio State Univertity conducted a survey leading to the following conclusions:

1. The average adult hen mortality in the states studied is at present 18.8 per cent. Only three states reported mortality data in the early 20's. These showed: Pennsylvania—11.2 per cent 1924-25), Missouri—11.1 per cent (1919-25), Ohio—10.7 per cent (1924). This mortality was considered normal in most states at that time. The increase in the last 12 to 15 years has been approximately 70 per cent. In Ohio this increase has been 127 per cent. There is evidence that this increase is still mounting.

2. This mortality is costing the poultry industry of the 10 states studied over 32,000,000 hens and approximately $ 43,500,000.

3. These estimates are based on summaries of farm records in various states. Our experience with farm record keepers would indicate that these estimates are conservative for two reasons:

a) Record keepers who suffer heavy losses either sell out or become too discouraged to complete their records. So these records are often not included.

b) Record keepers have been forced to do heavy culling in order to salvage birds going out of production. This heavy culling reduces mortality as reported by the poultryman. This accounts for the difference in farm mortality as reported, and reports from experiment stations where birds culled are reported as deaths, or left in pens to die because of experimental necessity.

4. Rumors that mortality is no longer a serious problem in certain areas are not substantiated by these data. Either poultrymen have became calloused to the situation, or they are not anxious to have their troubles too widely broadcast lest it interfere with sale of chicks and breeding stock from these areas.

5. Efforts at breeding for higher egg production are largely being offest by the mounting mortality.

6. New York's estimate that each increase of 1 per cent in mortality adds $^1/_3$ cent to the cost of every dozen eggs produced would mean that the cost of producing market eggs has increased approximately 2.6 cents per dozen throughout the area studied in the last 12 to 15 years. This loss is as great as the gains that have been made through improved marketing methods in recent years.

7. The data presented from egg laying contests, where the "cream" of every breeder's birds are under test, reveal mortality rates generally above those of farm record studies. Among the breeds most frequently represented, the death rate has reached in 1935-36, 18.8 per cent in Rhode Island Reds, 24.3 per cent in Barred Rocks and 26.6 per cent in S. C. W. Leghorns. These birds have died in spite of excellent housing, careful feeding, and sanitation.

8. Jull in 1934 states in an article published in The U. S. Egg and Poultry Magazine:

"The laying hen mortality in many commercial and farm flocks in the United States is really astounding, and presents one of the major difficulties confronting the poultry industry ...."

".... If the beef cattle and the dairy cattle breeders lost 25 to 30 per cent of their animals every year they could not long remain in business ...."

Jull adds to this report in the following quotation:

".... we observe that the lowest mortality is in the farm flocks of Nebraska, and even there they lost 11 per cent of their birds. For Iowa the mortality was 24.7 per cent, and Illinois 26.0 per cent. Coming to the northeastern part of the country we find the demonstration farm flocks in Massachusetts showing a mortality of 23.3 per cent; New Hampshire, 16.9 per cent; Connecticut, 17.4 per cent for the pullet flocks and 12.9 per cent for the hen flocks; Delaware 28.8 per cent for the pullet flocks and 20.6 per cent for the hen flocks; Maryland 36.7 per cent for the pullet flocks and 38.2 for the hen flocks; Rhode Island 15.4 per cent."

In an attempt to direct some interest to possible solutions we quote further from the same article by Jull:

"It has become apparent that chickens differ among themselves in respect to infection from disease, and that to some extent conditions are due to genetic dissimilarity which produce differences in general physiological constitution. Crew of the University of Edinburgh maintains that immunity from disease is an inherited character that can be developed in strains of animals by selection. Lambert of the Iowa Experiment Station observed that animals, in order to be most useful, must not only be kept under the best environmental conditions, but must also be equipped with good health in order to withstand attacks of disease. A limited amount of investigational work has been done, the results of which demonstrate that chickens may be bred for resistance to specific diseases ...."

9. This problem has become so acute that the industry must take

cognizance if it is to maintain itself in a position to realize a profit from production and sale of poultry and eggs.

Summary:

Tabulation of hen population according to the Agricultural Census of 1935 and estimated losses in adult birds based on records kept by representative poultrymen in cooperation with the extension services in various states. The latest figures available are used although some recent years showed a higher death rate.

State	Hen population	Per cent mortality	Number of hens lost
Illinois	20,768,479	23.7 % (1936)	4,922,130
Indiana	14,417,072	15.7 % (1936)	2,263,480
Iowa	27,361,742	17.0 % (1936)	4,651,496
Michigan	11,114,344	17.0 % (1935)	1,889,438
Minnesota	15,664,115	18.0 % (1936)	2,819,540
Missouri	20,156,868	16.3 % (1933)	3,285,569
Nebraska	11,453,882	16.0 % (1936)	1,832,621
New York	12,648,459	20.5 % (1929-33)	2,592,934
Ohio	19,619,263	24.3 % (1936)	4,767,481
Pennsylvania	16,520,302	18.3 % (1935)	3,023,215
Totals	169,724,526		32,047,904
Average per cent mortality			18.8 %

Misbranded Poultry Remedies. H. E. Moskey. New England Poultryman, April 15, 1937.

The Food and Drug Administration has been active during the past few years in controlling importations of cod-liver oil for poultry and animal feeding. The Administration, in the enforcement of the Food and Drug Act, during the past ten years has practically put a stop to interstate shipments of poultry remedies labeled for the treatment of serious diseases for which there are no known effective drug treatments.

In this connection attention is called to the limitations of the present Food and Drugs Act in that the present act gives the Government no jurisdiction over unwarranted claims made in advertising material distributed separately from the article in interstate commerce. In most instances poultrymen can be guided in the purchase of poultry remedies shipped in interstate commerce by relying upon the label claims and not upon the extravagant claims made in advertising material distributed separately.

Carbon monoxide poisoning in chickens. G. W. Stiles. Jr. Poultry Science, Vol. 15, 1936, p. 270.

This paper described two cases in which death of hens was definitely diagnosed as due to carbon monoxide poisoning, evidently due to a smoky kerosene lamp used for tempering drinking water. It is suggested that smoky kerosene lamps in brooder houses may be the source of previously unexplained losses in chicks and turkey poults.

The relation of production to mortality in the domestic fowl. S. S. Munro. Jour. Agr. Science, England, Vol. 26, 1936, p. 101.

The Central Experimental Farm, Ottawa, has made a study of the relation between egg production and rate of mortality as determined from

560 Leghorn and 710 Barred Rock hens entered in the Canadian egg-laying contest during a 51-week period.

In both breeds studied the birds that died were on the average poorer layers than those that survived, with statistical evidence that the rate of production and rate of mortality are entirely independent. It is suggested that practices tending to increase production have in a measure also contributed toward health and lowered mortality.

Respiratory Diseases. F. R. Beaudette. Hints to Poultrymen, Vol. 23, 1936.

A table with the postmortem indications that are of use in diagnosing respiratory diseases of poultry is followed by a brief practical summary of information on these affections.

Respiratory diseases of poultry. Jour. Amer. Vet. Med. Assoc., Vol. 89, 1936, p. 449.

The special committee on poultry diseases of the American Veterinary Medical Association, consisting of five members, namely, E. L. Stubbs, chairman, C. A. Brandly, H. J. Stafseth, F. R. Beaudette, and J. R. Beach, suggests the following terminology for the respiratory affections of the fowl: (1) Infectious laryngotracheitis (previously adopted), a virus disease; (2) fowl coryza, a disease primarily of the upper respiratory passages, sometimes involving the head and lower respiratory tract, caused by a specific hemophilic bacillus described by De Blieck in 1932, Nelson, and others; and (3) infectious bronchitis, a new disease immunologically distinct from laryngotracheitis, affecting primarily the lower respiratory tract but sometimes involving the respiratory passages of the head, first described by Shalk and Hawn in 1931.

Diseases of poultry, with special reference to those occurring in Cyprus. R. Moylan Gambles. Cyprus Agr. Jour., Vol. 31, 1936, p. 12.

The more important diseases and parasites of poultry in Cyprus are briefly considered.

Foreign bodies in the gizzard of a Fowl. H. T. B. Hall. The Australian Veterinary Journal, Vol. 13, 1937, p. 44.

Illustrations of 47 articles present in the gizzard of a white Leghorn Fowl.

Inheritance as a factor in poultry disease. W. V. Lambert. Poultry Science, Vol. 14, 1935, p. 131.

A discussion of the possibilities of disease control through genetic methods, including findings indicative of promise with specific diseases.

Diseases of Ducks. G. H. Warrack and T. Dalling. The British Duck Keepers Association Notes, Febr. 1937.

Contents:

Tuberculosis, Internal Parasites, Other Diseases, Rickets-Staggers, White Eye, Inflammation of the Joints.

Diseases of Ducks. G. H. Warrack and T. Dalling. The British Duck Keepers Association, Year Book 1937.

Description of: Salmonella infections and Duck Cholera.

Poisoning by lead. Über Vergiftungserscheinungen bei einer Hausgans. E. Heinemann. Archiv für Geflügelkunde, Vol. 10, 1936, No. 2.

Fife small bore cartridge-cases and a piece of plumbum produced poisoning by anser domesticus. The author discribs the symptoms and warns of throwing away cartridge in a Poultry-farm.

Experimental gout in turkeys. J. L. Bollman and C. F. Schlotthauer. Amer. J. Digest. Dis. Nutrit., Vol. 3, 1936, p. 483. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 870.)

Feeding raised the blood uric acid level markedly in turkeys. A high protein diet, or addition of urea to the diet, raised the blood uric acid still further. If high blood uric acid is maintained for several days, gouty tophi appear in the joints. Damage to the kidneys by intramuscular injections of lead or uranium salts hastened the appearance of the deposits of urates in the joints.

Erythromyelosis in fowls (yellow anaemia) and its treatment by liver extracts. H. P. Bayon. Proc. Roy. Soc. Med., Vol. 29, 1936, p. 1227. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 730.)

The literature on erythromyelosis in fowls is reviewed, and the main features of the disease, macrocytic anaemia, bony changes, frequent infestation with the estode Davainea proglottina, increased bleeding time and increased fragility of the red cells, are descrived in detail.

Normal fowls were observed over a period of 2-3 months and it was noted that sudden small fluctuations in red cell count occurred irregularly. It was shown that injection of massive doses of liver extract had no effect on the blood count in healthy fowls. Injection of liver extracts in erythromyelotic fowls led to a marked increase in red cells and Hb, followed by a phase of depression during which repeated injections had no effect. Permanent cure did not result. Anisocytosis was much les following these injections. It is suggested that the liver extract regulated blood destruction.

Malformation of the Beak of a Duck. Über eine auffällige Mißbildung bei der Ente. Prof. Dr. A. Staffe. Archiv für Geflügelkunde, Vol. 10, 1936, No. 4.

A Peking duck with a well marked malformation of the beak was carefully reared. She found later on by itself methodes of feeding, and developed normaly.

Mortality in Poultry. Die Hauptursache der Zunahme der Sterblichkeit bei den Wettlegen. Dr. A. L. Hagedoorn. Archiv für Geflügelkunde, Vol. 10, 1936, No. 2.

Summary:

1. In all the Layingtrials everywhere, mortality tends to increase from year to year. This increase is generally thought to be due to a deterioration of the general resistance of the layingstock.

2. The data on mortality from one of the large English layingtests were analyzed. Author compared the mortality of groups of hens, in which one group was kept in pens, where the year before one or more hens had died, whereas the other group was kept in pens, where the first year of the test there had been no mortality.

3. In the first groups twice as many pullets died as in the second group.

4. The infection of the layingtest-establishments, which can be determined from such figures as given here, ought to be combated. In any case, the hens which have been kept at the trials, and which for this reason have been exposed to numerous infections, ought never to be allowed to spread all over the country at the end of the test, but they should be destroyed.

Die Hauptursache der Zunahme der Sterblichkeit auf den Wettlegen. J. Eickel. Archiv für Geflügelkunde, Vol. 10, 1936, No. 4.

1. A permanent raising of mortality has not been ascertained in the Laying Trial of Hamm.

2. The cause of the mortality lays in first line in the breeders which send fowls to the Trials.

3. The killing of the hens after the Trial is not necessary, also not desirable, because these birds are often the best breeding hens.

EGGS AND TABLE POULTRY

EGGS

The causes of deterioration in market value of eggs. L. F. and O. E. Campbell. U. S. Egg and Poultry Mag., Vol. 42, 1936, p. 230.

The Kansas Experiment Station has compared the relative efficiency of a dirt-covered concrete cellar with a moist sand floor and an above-ground frame building for holding market eggs. The average July (1935) temperature for the cellar, the building, and outdoors was 68.6°, 87.1°, and 86.6° F., respectively, and the average humidity was 86.8, 49.2, and 45.2 per cent, respectively. The decline in market value of the lots of eggs stored in each structure for 1 week and then subjected to various shipping conditions averaged 38 ct. per case for the cellar-stored eggs and $ 1.16 per case for eggs stored in an ordinary building. Remarkably constant temperatures were maintained in the cellar regardless of fluctuations in outside temperature.

Microdetermination of ammonia nitrogen in eggs. S. L. Bandemer and P. J. Schaible. Indus. and Engin. Chem., Analyt. Ed., Vol. 8, 1936, p. 201. (Ref. Exp. St. Record, Vol. 76, 1937, p. 154.)

A method for the determination of ammonia nitrogen in eggs without aeration is described. The ammonia is absorbed in standard acid from a thin layer of an alkaline solution of the sample. The apparatus consists of a cell made from the top of a Petri dish, in which is centered a glass ring—providing thereby an inner chamber. To the cell is fitted a glass cover. The sample of egg material is placed in the outer chamber and the standard acid in the inner compartment. The ammonia nitrogen is determined by titration after absorption.

Sulfur in eggs. H. W. Marlow and H. H. King. Poultry Science, Vol. 15, 1936, p. 377.

The Kansas Experiment Station has studied the distribution of sulfur in the yolk, thick white, and watery white of eggs and has found them to contain 1.08, 1.63, and 1.57 per cent of total sulfur, respectively. In each instance sulfur was found to be organically bound and in the

reduced form, the presence of cysteine being doubtful. Usually all the sulfur in either egg white or egg yolk is accounted for by the cystine and methionine sulfur.

Effect of packing materials on the flavor of storage eggs. P. F. Sharp, G. F. Stewart, and J. C. Huttar. Cornell Sta. Mem. 189, 1936.

For this study clamp-top glass fruit jars were packed with two layers of four eggs each, together with half a filler, or one flat, or a corresponding amount of other material being investigated. Clean, unwashed eggs from 2 to 4 hr. old were used. The eggs were scaled in the jars, with provisions for reducing the humidity due to the continuous escape of moisture from the eggs. The jars were placed in storage at 30° to 34° F. After being removed from storage, the eggs were immersed in boiling water for 2.75 min., the blunt end of the shell removed, and the yolk mixed with the uncoagulated part of the white. The eggs were then tasted by selected judges.

The mean of a number of taste scores gave a reliable quantitative value for the flavor of eggs and could be used as a measure of the effect of factors involved in their production. The linear relation found between odor and taste of eggs indicated that the flavor obtained by tasting was due largely to the sense of smell. Great variations were found among the different persons in the ability to score eggs for flavor. There were no indications that the judges became unreliable because of fatigue after scoring from 4 to 10 eggs. The maximum ability to judge for flavor was attained only after a number of eggs had been tasted. The results did not substantiate the claim that for best flavor discrimination the eggs must be tasted while hot. Better agreement in score of eggs was obtained with good- and bad-flavored eggs than with eggs of intermediate flavor. One judge was unable to detect "musty" eggs.

The glass jars equipped with the humidity-regulating solutions proved very satisfactory for determining the effects of absorption of flavors from packing materials. These materials varied in transmitting flavors to eggs during storage. Eggs of relatively high pH developed a more undesirable flavor in storage, regardless of the type of packing, than did eggs in which the pH was held low. The effect of increasing humidity on absorption of flavors from the materials was determined by the properties of the packing material itself.

China's export of eggs and egg products. Chin. Econ. Jour. & Bull. 19(3):211-256, tab., 1936. The Lingnan Science Journal, Vol. 16, 1937, p. 127.

Poultry raising is one of the most extensive and important secondary occupations of Chinese farmers. A conservative estimate places the number of hens at 350,000,000 a year, besides hundreds of millions of ducks and geese. Shanghai, Tientsin, Tsingtao and Hankow are the collecting and distributing centers for fresh eggs. Methods of collecting and testing the eggs are discussed. Tables show the exportation of fresh poultry eggs to foreign countries; Japan buys the largest amount, with Great Britain second. The preparation of egg products is discussed and statistics are given on their export. Lime-preserved, salted and pickled eggs are also discussed. The regulations governing the inspection and testing of export eggs and egg products, promulgated July 28, 1931, are published.

The change in the concentration of ovoglobulin in egg white during egg formation. J. S. Hughes and H. M. Scott. Poultry Science, Vol. 15, 1936, p. 349.

The Kansas Experiment Station has compared the relative amounts of ovomucin, ovoglobulin and ovoalbumin in the three layers of egg white in five pairs of oviducal and laid eggs. The ovomucin content in each of the three layers of egg white was lower in the laid eggs than in the oviducal eggs, while the ovoglobulin content was greater in each layer in the laid eggs, the greatest increase occurring in the inner thin layer.

It is suggested that the increased content of water-soluble protein fraction precipitated by 1.5 M sodium sulfats (ovoglobulin) is due to the change in the solubility of the proteins after their deposition in the egg white rather than to any infiltration of ovoglobulin through the shell membrane.

Shell characteristics and their relationship to the breaking strength. G. F. Stewart. Poultry Science, Vol. 15, 1936, p. 119.

This study from Cornell University describes certain new measurements considered desirable in determining egg shape. It was found that there was very little relation between shape of eggs and their breaking strength, while a correlation of 0.509 ± 0.028 was found between shell thickness and breaking strength.

The sampling and analysis of Eggs. W. S. Guthmann and W. L. Terre. Indust. Eng. Chem. Anal. Ed., Vol. 8, 1936, p. 377. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 591.)

The methods have been designed and tested for use with products from the eggbreaking industry, e. g. sugar yolks, glycerol yolks. Three samples should be taken, one from the top, middle and bottom of each churn and thoroughly mixed. For total solids the A. O. A. C. official method for eggs is used. For glycerol in glycerol yolks the A. O. A. C. method for the determination of glycerol in meat was found to be adaptable. For sugar in sugar yolks the method of Lane and Eynon (J. Soc. Chem. Indust. Vol. 42, 1923, p. 32 T.) was found to be satisfactory. For salt in salt yolks, 5 g. of the material were diluted to 500 ml. with water. To 50 ml. of this were added 10 ml. of N/10 $AgNO_3$, 10 ml. HNO_3 and 5 ml. ferric indicator and the excess Ag titrated with N/10 thiocyanate.

Cold Storage Tests. Oiled Eggs Retain Quality Best. Chanticleer, April 27th, 1937.

Recent tests by the United States Department of Agriculture show that oiled eggs stay fresh much better in cold storage than unoiled eggs. In an eight-month storage test the original grade was retained by 65.8 per cent of the eggs oiled at a temperature of 60 deg. Fahrenheit, by 55 per cent oiled at 80 deg., but by only 32.5 per cent, unoiled.

Eggs given the oil and vacuum carbon dioxide treatment retained 88 per cent of their original grade at the end of the storage test. This method, developed by T. L. Swenson, of the Bureau of Chemistry and Soils, was 35 per cent more efficient than plain oiling, and 173 per cent more efficient than storage with no oil treatment.

In the vacuum process eggs are dipped in oil in an airtight chamber. Enough air is pumped out to create a partial vacuum. Some air also escapes from the eggs. When carbon dioxide is turned into the chamber the eggs draw enough oil into the pores of the shell to form a complete seal. Carbon dioxide has a stabilising effect on the egg white. If air is used eggs do not retain their freshness.

Effect of relative humidity on the growth of mold on eggs in storage. P. F. Sharp and G. F. Stewart. Cornell Sta. Mem. 191, 1936.

The effect of humidity on mold growth on eggs has been determined by holding the eggs in sealed containers at 30° F. in a commercial storage plant for 17 mo. The relative humidity was accurately controlled by placing a suitable mixture of sulfuric acid and water in the containers. The primary series consisted of naturally clean eggs artificially inoculated with mold and held at relative humidities ranging from 88 to 100 per cent by 2 per cent intervals.

A dark mold growth developed on the eggs after 3 mo. or more at relative humidities of 96 to 100 per cent. A meager white mold growth was observed at humidities as low as 90 per cent after several months, and such growth eventually increased the mold infection of the egg content. No mold growth occurred at a relative humidity of 88 per cent. The loss of moisture from the eggs during storage showed a direct linear relationship to humidity of the atmosphere, although fluctuations in the storage temperature caused a displacement of the relationship between relative humidity and loss of weight.

The failure of mold to grow at lower humidities is possibly due to shrinkage of the egg content which breaks the contact between the shell and content, and hence restricts the food supply on the outer shell surface. Dirty eggs supported luxuriant mold growth at lower humidities than clean eggs.

Egg yolk and bran as sources of iron in the human dietary. E. Mc Vahlteich, E. H. Funnell, G. Mac Leod, and M. S. Rose. Jour. Amer. Dietet. Assoc., Vol. 11, 1935, p. 331.

This is a continuation of the studies made on the availability of iron in egg yolk and bran.

The participants, two healthy young women, carried out two iron balance studies of 9 days each between menstrual periods. Each study was preceded by a day of low iron intake, followed during the periods of study by an average intake of 5.7 and 5.3 mg. of iron, 3 mg. of which was furnished by the egg yolk and bran.

Iron balances showed that the iron of egg yolk and of bran prepared by steaming and toasting are equally efficient in mainteining iron equilibrium in the human adult.

Tables are given showing daily food consumption and the iron balances in 3-day periods.

The egg yolk surface in fresh eggs. P. J. Schaible, J. A. Davidson, and J. M. Moore. Poultry Science, Vol. 15, 1936, p. 298.

A spotting of yolks of fresh broken-out eggs frequently observed

and caused by nonuniformity in the peripheral light yolk layer is noted. Its presence and degree of intensity varied in eggs from an individual hen from day to day. The authors were unable to show a relationship between its occurrence and rate of production, atmospheric temperature, time of day the egg was laid, the position of the egg in the cycle, or egg weight. Simulation of this condition by slight mechanical pressure on the yolk membrane of normal eggs led to the suggestion that such spotting may be due to imprints from imperfections in the follicle. Other types of spotting are mentioned, and the condition of the egg yolk surface in relation to candling of eggs is discussed.

The colouring of the yolk. Ein Beitrag zur Frage der Eidotterfärbung. Dr. H. Lang. Archiv für Geflügelkunde, Vol. 10, 1936, No. 1.

1. A small amount of caramel-solution in the drinking-water is not a means of colouring the yolk.

2. The colour of the yolk is individual with hens, and shows also differences in the size of its variation.

3. The amount of eggs laid hitherto is obviously not without influence upon the colour of the yolk.

4. The time is now come to try to solve the problem of the dark yolk by breeding.

Location of the anti-enzyme in eggs white. J. S. Hughes, H. M. Scott and J. Antelyes. Agric. Exp. Station, Manhattan, Kansas. Indust. Eng. Chem. Anal. Ed., Vol. 8, 1936, p. 310. (Ref. Nutrition Abstracts, Vol. 6, 1937, p. 600.)

Balls and Swenson showed that the anti-enzyme was located in the thin albumin of egg white. It has now been found that the outer portion of the thin albumin added to the thick albumin increases the proteolytic activity of the latter; addition of the inner portion of the thin albumin reduces the activity. It follows that the anti-enzyme is located chiefly in the inner portion of the thin albumin.

Investigations into the nature of the condition known as "floating yolk" in eggs. A. E. Platt. Austral. Jour. Expt. Biol. and Med. Science, Vol. 14, 1936, p. 107. (Ref. Exp. St. Record, Vol. 76, 1937, p. 380.)

In studies of the abnormal condition of floating yolk frequently observed in candled eggs at various packing centers in South Australia, analysis of the egg white showed that the protein content of the abnormal eggs did not differ from that of normal eggs. A thickening and enlargement of the chalaza with evidence of disintegration at the distal end was invariably noted in the abnormal eggs. Inoculating cultures with portions of the finely ground chalaza of abnormal eggs nearly always resulted in the isolation of an aerobic spore-bearing Gram-positive bacillus, not definitely classified in this study but believed to be the causative agent of the floating yolk condition. In postmortem examination

of birds laying abnormal eggs, a pure culture of this organism was isolated from the mucous membrane of the upper end of the oviduct in one instance.

Twelve hens which consistently produced normal eggs were fed spores of this bacillus in their ration, and in each case these hens began laying eggs with floating yolks within a period of from 2 days to 3 weeks, the condition usually appearing in the second or third egg laid after commenecment of the experiment. The probable role of this bacillus in relation to egg production is discussed.

Investigations into the condition known as "floating and cloudy yolk" in eggs. C. F. Anderson and A. E. Platt. Jour. Dept. Agr. So. Austral., Vol. 39, 1936, p. 1342.

This article describes the same experimental work noted above and also presents data to show the widespread occurrence of this egg abnormality in large commercial poultry flocks in Australia. So far no relationship has been established between the occurrence of floating yolk and keeping quality of the egg.

Further studies on the preservation of eggs. A. Valenzuela and S. Y. Rotea. Philippine Jour. Anim. Indus., Vol. 3, 1936, p. 211.

From this extensive study it is shown that eggs stored in a 10 per cent solution of either limewater or water glass may be expected to retain their freshness from 2 to 6 weeks, while eggs treated with the above solutions or light paraffin oil for from 5 to 20 days and subsequently placed in cold storage at from 32° to 36° F. remained in good condition for from 6 to 8 mo. More effective preservation was obtained by dipping eggs in paraffin oil under partial vacuum and treatment with carbon dioxide gas followed by storage at from 32° to 36°. Eggs treated in this manner retained their freshness with practically no shrinkage or weakening of the yolk for at least 9 mo.

Foaming of egg white. M. I. Bailey. Indus. and Engin. Chem., Vol. 27, 1935, p. 973. (Ref. Exp. St. Record, Vol. 76, 1937, p. 568.)

The author describes a new method for determining the foaming power of egg white and testing the stability of the foam obtained. No pronounced difference was found in the foaming power of frozen and unfrozen whites other than the tendency of the thawed white to reach a maximum volume in a shorter whipping time and to show greater leakage. If stability of foam is desired, the egg white should not be whipped to its maximum degree of foaming. A greater volume of foam was obtained with thick than with thin whites. With increasing time of whipping, the leakage for the thick whites increased and that of thin whites decreased.

When the pH was varied from 9.5 to 5 by treatment with phosphoric acid the untreated egg white showed a higher foaming power than the treated white, while the foam of the treated egg white adjusted to a pH of 7 or 6 was more stable than the foam of the untreated egg white. If a stable foam is desired, the best results are obtained by prolonged whipping of the egg white adjusted to approximately pH 5. Adding egg

yolk decreases the foaming power of the egg white, but to a less extent than when olive oil is added in an amount equivalent of the fat content of the yolk.

The albumen index as a physical measurement of observed egg quality. V. Heiman and J. S. Carver. Poultry Science, Vol. 15, 1936, p. 141. U. S. Egg and Poultry Mag., Vol. 42, 1936, p. 426.

This contribution from the Washington Experiment Station describes a method for measuring width and height of the thick white of eggs and presents tables for rapid calculation of the albumin index for given measurements.

Eggs were graded into one of five grades at the time measurements were taken. The correlation between grade and albumin index was found to be 0.932 ± 0.002, and the mean index for the five grades was 0.124, 0.099, 0.069, 0.048, and 0.032, respectively. The suitability of this index in determining apparent egg quality is suggested.

The height of the firm albumen as a measure of its condition. H. S. Wilgus, Jr., and A. Van Wagenen. Poultry Science, Vol. 15, 1936, p. 319.

This contribution from the [New York] Cornell Experiment Station describes an apparatus and technic for simply and accurately measuring the height of the firm albumin of eggs. In a study of the relation of the score for observed condition of the firm albumin to its measured vertical height, a correlation of -0.934 ± 0.006 was found to exist, indicating that this measurement is an accurate aid in determining condition of the firm albumin.

The albumen index determination by nomogram. L. A. Wilhelm and V. Heiman. U. S. Egg and Poultry Mag., Vol. 42, 1936, p. 426.

With further reference to the albumin index of eggs it was found that when egg weight was held constant there was a correlation of 0.986 ± 0.001 between albumin index and the height of the albumin. This led the authors to study the possibility of deriving the albumin index from albumin height, using a proper correction for egg weight. Based on the weight, albumin height, and albumin index of 2,842 eggs representing a uniform distribution in the various classes, the authors have constructed a nomogram chart for the rapid determination of albumin index. A comparison of the estimated index with the calculated index shows very close agreement between the two methods.

TABLE POULTRY

Fattening of young ducks. Changes in quality dependent on age at killing. Die Mast der Jungenten und die Veränderungen in der Qualität des Endproduktes in Ab-

hängigkeit vom Schlachtalter. J. J. Bojarkin. Biedermanns Zentralbl. B. Tierernährung, Vol. 8, 1936, p. 186.

Peking, Rouen and Khaki-Campbell ducklings, 100 of each, were reared until 40 days after hatching in battery cages after which half the birds of each group had free access to pens. The ration consisted of wheat bran, maize meal, wheat meal, meat and bone meal, and crushed shells and the proportion of bran was gradually decreased and that of the meals increased. Throughout, a supplement of 1.5 per cent cod liver oil, 2 per cent dried yeast, and 20 per cent finely chopped green food was given. From the 70th day onwards a duck and a drake from each group killed and analysed every 10 days for 120 days. The rate of increase in weight became notably slower at about 60-70 days in the Khaki-Campbell group, and after 90-100 days in the Peking and Rouen groups, which even exhebited losses in weight at 110-120 days. Determinations of the amount of digestible matter consumed per 100 g. weight increase, of total food reuqired to produce 1 kg. increase in weight, and, for 24 ducks of each group, of the Calorie value of the edible portion and of the ratio of the weight of the edible portion to the live weight at various ages showed that the utilisation of the energy of the food and the ratio of weight of edible portion to live weight nearly always increased from the 70th to the 120th days. It is concluded that determinations of weight increase per unit of food consumed are unsatisfactory as criteria of food value in ducks. Until the 40th day ducks should be reared in cages and thereafter in pens. The birds should be killed at 100-120 days. The most suitable race for fattening is the Peking, followed by the Rouen and Khaki-Campbell.

Protein requirements for finishing turkeys. F. E. Mussehl and C. W. Ackerson. Univ. Nebraska Coll. Agric. Agric. Exp. Stat. Bull. No. 298, April 1936.

Gain in weight and quality of carcase were as satisfactory on 14.5 per cent protein as on higher levels, the protein supplements used consisting of equal parts of meat scraps, fish meal, dried buttermilk and soya bean meal.

Cooking studies with frozen Poultry. K. B. Niles. U. S. Egg and Poultry Magazine, May 1937.

This discussion has been condensed from the original report of the poultry cookery research instituted at Iowa State College early in 1936. The work was done under the direction of Belle M. Lowe, associate professor of home economics. The laboratory tests were made by Frances Keltner, a graduate student in the department of home economics.

Investigational studies of this type are badly needed because so little is known about the best techniques for poultry cookery procedures. We cannot guess or assume—we must have facts.

The results of this study have given us a beginning on desirable roasting temperatures and methods for poultry. Some of the conclusions made it possible to disseminate new information and ideas to thousands of homemakers during the past several months through bulletins, newspaper releases, and radio. The supply of our bulletin, Turkey Cookery, of which 20,000 were printed, was exhausted in four months.

Studies of this type are important if the Institute and the industry are to continue to "feed" the consumers with information that will not only create a desire to buy our products but will make them satisfied, steady consumers.

The production of table poultry (poulards) in Styria with special reference to the duration of the fattening process and the consumption and utilisation of food. Die Erzeugung von Tafelgeflügel (Poularden) in Steiermark unter besonderer Berücksichtigung der Mastdauer, des Futterverbrauches und der Futterverwertung. R. Schmidt. 6. Weltgeflügelkongress, Leipzig, 1936.

Cramming is the usual method used on the peasant farms in some parts of Styria for the production of best quality table poultry. Experiments on young uncaponised cockerels showed that this method gave better feed utilisation than free fattening. The weight of food required to produce a weight gain of 100 g. varied from 360 to 635 g.

Effect of diet, range, and fattening on the physical and chemical composition of cockerels. H. M. Harshaw. Jour. Agricultural Research [U. S.], Vol. 53, 1936, p. 357.

This is a report of a study by the U. S. D. A. Bureau of Animal Industry on the physical and chemical composition of cockerels reared on a number of diets under both confinement and range conditions. Analyses were made on representative birds near maturity and on other birds of the same lots following a 2-week period of intensive fattening.

The rearing diet did not materially affect the physical composition of the birds in most cases. However, the total edible portion of the birds reared on range averaged from 6 to 8 per cent higher than for those that were confined. This increase was primarily due to a greater proportion of leg and breast muscle. Fattening resulted in about a 6 per cent increase in total edible portion without significantly affecting the percentage of leg or breast muscle. The various rations fed and conditions under which birds were reared also had relatively little effect on the chemical composition of the edible portions of the birds. However, rather pronounced changes in the chemical composition occurred during the fattening period. Seventy-three per cent of the gain in weight during fattening was represented in the edible portion of the bird, while the gain in protein, fat, ash, and water during fattening was 9, 30, 0.4, and 33 per cent, respectively, of the total gain in weight.

The marketing of quick frozen poultry: The "Z" pack for ducks in the U. S. A. M. T. Zarotschenzeff. Cold Storage, Vol. 39, 1936, p. 190.

This article briefly describes a method for quick freezing of poultry known as the Z process. In this process the dressed poultry is loaded on wooden trays and inserted into the freezing chamber, where a fine mist of brine at —5° F. passes over the trays, resulting in a very rapid heat transfer with no resultant shrinkage of the product since a relative humidity of nearly 100 per cent is maintained. After freezing each carcass

is rinsed in clear water and dipped in ice water which forms a glaze of ice that protects against freezer burn during subsequent storage. The results of brief analytical tests show that the bacterial content of the meat of carcasses frozen by the Z process and the oleic acid value of the fat was much lower than in the case of freezing by the slower commercial method.

Table Meat Production. E. T. Halnan and C. E. Fermor. The U. S. Egg and Poultry Magazine, Febr. 1937.

Summary:

1. The results of an analysis of groups of cockerels and pullets of a Light Sussex Rhode Island Red cross of varying liveweights were reported.

2. A high percentage of the dressed carcass and edible offal consists of edible material.

3. The $3^1/_2$ pound cockerel yields more edible material per pound of liveweight than any of the other liveweights studied.

4. The 5 pound cockerel gives the best yield of liveweight in proportion to the amount of food consumed.

5. Cockerels give better liveweight yields in proportion to the food consumed than do pullets, except in the case of birds of $2^1/_2$ pound liveweight.

6. Cockerels of $3^1/_2$ and 4 pounds, and pullets of $3^1/_2$ pounds yield a higher proportion of edible protein in relation to food consumed than any of the other weights studied.

7. Cockerels of $3^1/_2$ pounds and pullets of 4 pounds yield a higher proportion of edible energy in relation to food consumed than any of the other weights studied.

8. Poultry meat serves as an important source of supply of sodium, potassium, and sulphur, and to a lesser extent chlorine, but is relatively unimportant as a source of supply of calcium to human dietaries.

The relationship of the distribution of body fat to the cooking losses with graded dressed poultry. W. A. Maw, R. Holcomb, E. E. Rodger, and A. M. Franklin. U. S. Egg and Poultry Mag., Vol. 42, 1936, pp. 276, 314, 315.

Roasters were graded according to the definitions of the Canadian market grades, A, B, and C, based on conditions of fleshing and fat distribution of dressed poultry.

Analyses made on the graded carcass showed that the A grade had a significantly higher percentage of total edible parts and less total waste than either B or C grade stock. The percentage of fat in the edible portion was found to be 21.9 per cent for grade A, 14.7 for grade B, and 8.3 per cent for grade C.

The results of analyses of roasters cooked according to the described method were found to follow closely those obtained on the uncooked carcass for percentage of total edible parts and waste. The percentage of fat lost was higher for A and B grades than for C, but the percentage of moisture lost was less for the higher grades, resulting in a drier meat for grade C.

Inspection of Poultry. Dr. W. Majoewsky. Tydschrift voor Diergeneeskunde, Vol. 64, 1937, p. 275.

Summary:

The author is of opinion that inspection of game and poultry should have a repressive character, and should only be performed by veterinarians.

Summer broiler production. R. S. Dearstyne, H. D. Smith, and H. P. Brigman. North Carolina Agric. Exp. Stat. Bull. No. 303, April 1936, p. 16.

Chicks were started in batteries and afterwards transferred to brooder houses with access to range. It was found that April hatched birds required longer to reach a suitable weight for fattening than those hatched in June. Various fattening mixtures were compared. Skimmed milk as a protein supplement was more satisfactory than meat scraps, particularly for pullets. Gains were more satisfactory when part of the cereal ration consisted of ground oats or a combination of ground oats and wheat middlings than were yellow maize or yellow maize and wheat were exclusively used.

GENERAL

EGG LAYING TESTS

Eleventh central Egg-laying Test 1936-37 and Third S. A. P. A. Breeder's Register Egg-laying Test. P. E. F. Jooste. Glen, Orange Free State, South Africa. 7th April 1936 to 8th March 1937.

Light Breed Section 73 pens, heavy Breed Section 38 pens. The best hen in the light breed Section produced 285 eggs, in the heavy breed Section 269 eggs. The total production of only the four best hens in each pen is given.

In the Breeders' Register Test the best hen in the light breed section produced 275 eggs in the heave breed section 242 eggs.

Hawkesbury College Egg-laying Test. Thirty-fifth annual Competition, 1936-1937. E. Hadlington and C. E. Houghton. Poultry, April 3, 1937.

This laying competition commenced on April 1, 1936, and terminated on March 23, 1937, a period of 357 days.

Section A. Light Breeds: White Leghorns 50 groups, 300 fowls. Section B. Heavy Breeds: Australorps 31 groups, 186 fowls; Langshans 5 groups, Rhode Island Reds 4 groups.

In 1935-36 seventeen individual fowls and nine groups in the heavy breeds, and twenty-one individuals and eight groups in the light breeds failed to lay eggs of standard weight. In the test just completed the disqualifications for this reason were 55 individual fowls and 23 groups in the heavy breeds, and 37 individuals and 14 groups in the light breeds.

Feed Ration.

The ration fed to the 540 hens in the Competition was as follows:—Morning mash (lbs.): pollard 60, bran 34, M.I.B. meatmeal 6, salt 22ozs.; greenfeed midday; evening feed (lbs.): wheat 66, cracked maize 34. The 540 hens also received 23cwts. of shellgrit and 51lbs. of Epsom salts.

General Average Production.

With regard to average production there is an improvement compared with the previous year, the figures being 200.5 in the test just concluded, compared with 198.1 last year. The highest group scores are also somewhat ahead of last year, so that in the matter of production there is no falling off compared with the average over a number of years. There is an increase of six eggs per fowl in the light breed section this year, compared with last, and a reduction of three eggs per fowl in the heavy breeds, but these fluctuations are to be expected from year to year.

There were no outstanding individual scores, the highest being an Australorp hen which laid 292 eggs. There was a slight improvement as regards mortality, there being 46 deaths and 4 sick fowls replaced, compared with 51 deaths and 3 sick replaced last year.

Egg Weights.

It is disappointing after an improvement in the egg weights last year to find that the average weight per dozen this year is less in all breeds except Rhode Island Reds, the latter being .10z. per dozen higher. The comparison with last year is as follows:

	Leghorns	Australorps	R. I. Reds	Langshans.
1937	25.8	25.2	25.6	25.2
1936	26.1	25.5	25.5	26.3

In the heavy breeds there were 55 individual fowls and 23 groups disqualified under the rules for underweight eggs, compared with 17 individuals and 9 groups last year. In the light breeds section 37 individual fowls and 14 groups were disqualified, as against 21 individuals and 8 groups last year. It should be pointed out, however, that there was a difference between the number of pens competing in the two years, there being 40 pens of heavy breeds this year compared with 33 last year, and 50 groups of white Leghorns as against 57 last year.

American Laying Tests. Chanticleer, Febr. 1937.

In most contests there are 13 pullets in each pen, of which 10 score. Illinois Contest is made up of pens of seven, of which five score, and the Missouri National takes pens of eight, of which five score; while the Mississippi Egg-Laying Demonstration, as it is accurately described, is conducted in batteries, each entry consisting of six pullets, of which five score.

White Leghorns gave by far the best results in this demonstration. However, the average yield over the whole flock in 51 weeks (most of the American contests seem to run for 51 weeks) was 198.4 eggs a pullet.

Only five out of 21 contests mentioned mortality. Georgia showed a death rate of 26.6 per cent; Michigan, 28.33; New York Central, 19.7; New York Western, 20.1; and Pennsylvania, 22.16. Contests are decided on points, awarded according to size of egg. Eggs as small as $1^1/_2$ozs. score 0.70; 1.00 represents a 2oz. egg, and the maximum weight recognised is 2.17ozs., which scores 1.10 points.

The highest individual score over the whole of the 1934-35 contests was 325 eggs and 354 points, while the highest pen score by ten pullets was 2,980 eggs and 2,202,10 points, both by Rhode Island Reds.

ANNUAL REPORTS

The Poultry Industry in 1936. Sir Edward Brown, LL., Consultant National Poultry Council, and Major Ian Macdougall, O.B.E., Secretary National Poultry Council.

The census taken on June 4, 1936, showed that the decrease in poultry recorded in 1935 had, in fowls over 6 months old, continued—i. e., on holdings of an acre and upwards. The decline in England was equal to 5.2 per cent of the 1935 returns. In Wales the decrease was 2.3 per cent, or 5 per cent for South Britain. On the other hand, there was an increase

of fowls under 6 months in England of 1.7 per cent, and in Wales of 3.0 per cent, or 1.9 per cent together. This indicates a partial recovery in the number of breeding and laying stock as in 1934. In ducks there was little change. Geese of all ages decreased rather more than 2 per cent in both England and Wales, whilst turkeys in England were more numerous by 8.0 per cent and unchanged in Wales. The Scottish returns showed a slight decrease of adult fowls, and in younger an increase of 2.3 per cent. Ducklings were fewer, geese and turkeys were more numerous by 9.7 and 16.4 per cent respectively. No figures are available as to holdings under an acre, of which an estimate has had to be made. Other than these the trend appears to be upwards, tough limited in extent.

The value of egg and poultry production in 1936 exceeded the value of all cereal crops by £3,085,405.

It is of interest to note that in 1936 the value of eggs and poultry produced in Great Britain is computed to be greater by £19,467,655 than wheat, by £19,522,405 than oats, and of barley by £24,096,155.

General Observations.

It is unnecessary to refer more than briefly to what may be termed the politics of the poultry industry, in which the changes take place very rapidly. Some of these are temporary, others, and the more serious, appear to be persistent. Marketing schemes are among the former, disease the latter. During the year producers refused to give their sanction to the submission, to the Minister of Agriculture, of the main principles of a suggested Marketing Scheme for eggs and poultry which had been prepared by a joint committee of the National Poultry Council and the National Farmer's Union. Poultry-keepers now realise that their most vital problem is prevention of disease. That is essentially a question of research and official control, combined with revision of methods by practicians. The regulations recently adopted as to compulsory notification of certain diseases in poultry, may help to restore the poultry industry, as also will protective measures and an abandonment of so-called short cuts to success, if generally adopted.

Egg Imports.

In the following figures are given the figures from the Trade and Navigation Returns, published by the Board of Trade, for the two years 1935 and 1936, showing the quantities of eggs imported from the countries enumerated. As usual, the percentages of increase or decrease in 1936 as compared with the previous year are shown.

Quantities of eggs in shell imported into Great Britain and Northern Ireland, 1935 and 1936.

Great Hundreds		Percentages inc. or dec.
1935	1936	1936 from 1935
19,766,811	24,653,222	24,7 inc.

Egg imports increased in 1936 over 1935 by 24.7 per cent, or 4,886,411 great hundreds, upwards of 586 million eggs. Imports from Empire sources decreased by 2.1 per cent, or 104,045 great hundreds, whereas imports from foreign sources increased by 33.4 per cent, or 4,990,456 great hundreds, approximately 600 million eggs. The most striking increases last year were from Denmark, Poland, the Netherlands, Belgium and other foreign countries, and there were decreases from Finland and Sweden. The increases from the Netherlands and Belgium followed increases from these countries in the previous year of 183.3 and 419.5 per cent respectively. The increase of 139.9 per cent in imports from other foreign countries is

due, in the main, to the closing of the markets in Spain, which normally is the third largest importing country, owing to the revolution. It is also due, to some extent, to the fact that the financial stringency in Germany has caused that country to curtail her purchases of eggs from other Continental countries.

Imports in 1936 are only 7.2 per cent, or approximately 2 million great hundreds, less than those for the peak year, 1930. There has been a continued increase in imports since 1933, as is shown by the following table:

	Great Hundreds
1933	18,372,647
1934	18,734,209
1935	19,766,811
1936	24,653,222

Total values of eggs imported in shell, 1936, and average values for 1935 and 1936.

Total values 1936	Values per Great Hundreds 1935	1936
£	s. d.	s. d.
9,901,617	7 10½	8 0½

The increase in total value of eggs in shell imported over 1935 was £2,133,128, or 27.46 per cent, and the increase in average values was 2d. per great hundred.

Eggs Not in Shell.

As will be seen by the table given below, showing the returns for the last four years, there was an increase in the volume of imports in 1936 as compared with 1935. The increase amounted to 102,582 cwts., or 13.03 per cent. The increase in total values was 29.73 per cent, and in average values 6s. 7d. per cwt. The imports in 1936 were the highest yet recorded. As heretofore the bulk of supplies were received from China and represented 96.86 per cent of the total.

Imports of Read Poultry.

Quantities	Values
Cwts.	£
422,117	1,656,900

The quantity of dead poultry imported in 1936 was less in volume than in 1935 by 418 cwt., or 0.1 per cent, and less in value by £32,849, or 1.94 per cent.

Net values of imports, 1936	£
Eggs in shell	9,901,617
Eggs not in shell	2,155,809
Dead poultry	1,656,900
	£13,714,326

The value of total imports in 1936 was £2,578,138 higher than those for 1935.

An estimate as to value of total production and consumption of eggs and poultry in Great Britain, and adding imports, is as follows:—

	£
Home production	30,000,405
Imports of eggs and poultry, inclusive of eggs not in shell, but exclusive of re-exports	13,593,133
Total wholesale consumption values	£43,593,538

Of the total values as stated, 68.82 per cent represented home production, and 31.18 per cent from Empire and foreign countries.

January, 1937.

The British Duck Keepers Association Year Book 1937. Secretary: Captain J. K. Lipscomb, St. Anthony's, Swanley, Kent.

Contents:

Officers of the Association; Rules. Membershiplist; Diseases of Ducks by G. H. Warrack and I. Dalling; Indian Runner Duck Notes by Capt. C. O's. Cree; Incubation by A. N. Dickson; Table Duck Costings by A.B. Tice; Show Notes; Secretary's Notes; The Buff Orpington Duck Club, 1936-37; The Buff Orpington Duck.

Kentucky State Report 1935.

Poultry experiments yielded data on the effect of cage breeding stock and crossbreeding in the turkey, vitamin D and embryo development, the lipoid phosphorus, iron, and copper contents of egg yolk, starting and laying rations for chicks at the Robinson Substation, and high and low protein rations for chicks at the Western Kentucky Substation.

Results are also noted from studies of the arsenic content of the tissues of rats and baby chicks and of the effect of boron on the growth of rats.

SUNDRIES

Ducks and Geese. London.

A re-issue of the Ministry of Agriculture's Bulletin No. 70 on Ducks and Geese has recently been made. It deals with the interesting particulars of the industry of the production of these birds, systems of production, housing requirements, breeds, and marketing methods and possibilities. The Bulletin is to be obtained, price 1s. net, from H. M. Stationery Office, Adastral House, London, W.C.2, or from any bookseller.

The 20×20 multiple unit laying House and bill of Material. H. E. Besley. Agric. Exp. Station, Rutgers University, New Brunswick, N. J. Ext. Bulletin 179, May 1936.

Contents:

Itemized bills of material; Suggestions on Construction.

Force-molting of White Leghorn hens. F. L. Knowlton. Oregon Sta. Circ. 119, 1936.

A comparison of the records over a 2-yr. period of forcemolted and naturally molted flocks showed that forced molting was not profitable and could not be recommended as a dependable method of increasing the income. Mortality was about twice as high in the force-molted flock that was subsequently kept under all-night lights as in the naturally molted flock. Severe culling was necessary to keep production above 50 per cent in the forcemolted flock, while none was needed in the naturally molted flock.

Registering tattooed Poultry. J. C. Taylor. College of Agriculture, Rutgers University, New Brunswick, N. J. Ext. Bull. 183, June 1936.

The purpose of registering tattooed poultry flocks is to aid in the capture and convinction of poultry thieves. All commercial poultrymen and farm flock owners should know that the ultimate conviction of a person for poultry stealing depends to a larger extent on the positive identification of the stolen poultry by the owner.

Contents: How to tattoo poultry; Register your flock; New Jersey State Police Headquarters and Sub-Stations.

The Farm Flock. G. Robertson. Dep. of Agriculture, Dominion of Canada. Circ. 95, 1936.

Contents:

The Flock; Housing and Management; Feeding; Marketing.

Investigations with livestock in Nevada. Nevada Sta. Rept. 1935.

Results obtained in studies with livestock are reported on the effect of varying amounts of protein in turkey rations on rapidity of growth, economy of gain, and malformations of the bones, by Headley.

Dried Poultry Manure Experiments. Journal of the Ministry of Agriculture, London, 1937, p. 107.

The results of the main series of trials indicate that the relative effects of poultry manure and sulphate of ammonia differed from crop to crop in 1936, but it must be remembered that the number of experiments in each group was small. It appears, however, that for the crops known to respond abundantly to inorganic nitrogen, the poultry manure is definitely inferior to sulphate of ammonia. There is, however, some suggestion that for special crops and for cumulative effects poultry manure may have advantages over sulphate of ammonia. For immediate effects on crops responding to inorganic nitrogen, poultry manure is definitely inferior to an equivalent amount of inorganic fertilizers. The average residual effect of poultry manure, judging from first-year residues in these experiments, was small relative to that of sulphate of ammonia, which in the 1936 experiment may well be assumed to have been zero.

While it is thought desirable to place the interim results of these experiments on record, it must be said that the results are tentative and that it is proposed to carry on the experiments for three more seasons. At the conclusion of the experiments it is hoped that there will be available definite data that will provide sound criteria for evaluating the material.

Verantwortlich: für die Redaktion: Dr. B. J. C. te Hennepe in Rotterdam (Holland), für die Anzeigen: Fritz Pfenningstorff in Berlin W. 57. — D.-A. 1936: 1000.
Druck: G. Uschmann in Weimar.

Printed in Germany.

TOME X. 1937 No. 3

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INTERNATIONAL REVIEW OF POULTRY SCIENCE

OFFICIAL ORGAN OF THE

WORLD'S POULTRY SCIENCE ASSOCIATION

EDITOR:
Dr. B. J. C. TE HENNEPE
ROTTERDAM (Holland)

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PRINTED IN GREAT BRITAIN

BREEDING

The Weight and Composition of Eggs. Das Gewicht der Eier und ihrer Bestandteile während des Jahres und des Lebens bei Hennen. J. Podhradsky. Sbornik Ceskoslovenske Akademie Zemedeske, Vol. 11, 1936, p. 601.

In completion of former reports on this question it was ascertained that the results partly confirmed the statements made by writers up to the present, namely, in so far as my experiments show.

1. In the first year two big increases in weight take place, in spring and in autumn. These increases are followed by decreases which are generally underbroken by a smaller deviation, *e.g.*, in April-June.

2. In the first year these deviations occur both in albumen and shell and sometimes (contrary to what Philpott states) in the yolk.

3. The following years show a similar cycle: the course of some of the curves is, however, less regular. The weight often begins at a higher level—mostly in older hens which have been laying for some years—but sinks progressively in the course of the year and is often underbroken by smaller deviations.

4. During the course of life the weight of the ingredients increases up to the third to fourth year, with the exception of the shell, which begins to lose weight already in the second to third year.

5. The albumen dry substance (absolute and often relative, too) changes similarly to the fresh substance, respectively the total weight, during the course of the years. In the following years a sinking takes place from the beginning of the laying period. Up to the second year the dry substance increases and then decreases gradually.

6. During the individual years the yolk dry substance undergoes similar changes, but different from the changes in the total weight respecting albumen. Up to the second or the fifth year it increases and from then begins to decrease. The percentage of dry substance changes independently to the absolute. This also increases up to the third or fifth year and then decreases.

7. The eggshell dry substance (absolute and relative) changes in the same way as the raw substance in the first years. In the second or third year it reaches its maximum and then sinks gradually. The decrease is underbroken by small deviations.

8. The ash content (absolute and relative) varies in the individual egg components very irregularly, both in the individual years and throughout the whole life, and is entirely independent both of the dry substance and the raw substance.

An Analysis of Laying Capacity and Egg Formation in Production Curves. Eine Analyse der Legetätigkeit und Eibildung im Lichte der Produktionskurven. J. Podhradsky. Sbornik Ceskoslovenske Akademie Zemedelske, Vol. 10, 1935, p. 570.

The laying results of 12 hens of 6 different breeds were expressed in production graphs; these were compiled in such a way that to the total weight of a previous egg the weights of successive eggs were continually added. A study of these graphs showed the following results:—

1. The yearly production curve was in the form of an S curve with the typical three phases (acceleration, linear and retardation phases) which are clearer in bad than in good laying.

2. The curve for the whole period of laying also shows this S form (with three phases). When, however, the hen dies before the lay is nearing its end, then this ideal course is not so visible, but has usually only the first two phases.

3. The best layers are hens which show a curve in which the greatest part is lineal and when this phase is lengthy. Bad layers show an arched line.

4. The corner of the productive curve, which is drawn horizontally (the connecting line of the first and last eggs laid in the production year), gives a good idea of the production tendency. This corner varies in individual years and naturally also in individual birds. Its value is given in individual years in an arched formation.

5. This corner is not a standard for judging the intensity of production (it only shows the tendency), but the time in which a certain quantity of egg substance is formed, and by which it would be better to draw it as from the beginning of the bird's life and not as from the beginning of the production.

Improving Hatching Results. Il Controllo della Incubazione artificiale. Prof. A. Pirocchi. La Clinica veterinaria, Vol. 40, 1937, p. 147.

The percentage of the loss of humidity in hatching eggs was determined by means of the G. André apparatus. Eggs which showed deviations from the normal after one week's brooding were hatched further in a machine with a humidity suitable to such eggs and the hatching results were 15 per cent. better than those of the control eggs.

The Control of Artificial Incubation. Il Controllo della Incubazione artificiale. Dr. G. Giusti. Rivista di Avicultura, Vol. 6, 1937, p. 113.

1. The separation of White Leghorn eggs on the seventh day of hatching, according to the percentage of humidity, is a good means of increasing the hatching results.

2. The determination of the loss of humidity is carried out very practically by means of the André apparatus.

The Relation between Liver and Yolk-sac in Embryos. Sulle interrelazioni tra fegato e sacco vitellino nell'embrione degli uccolli. L. Trotti, Bollettino Mus. e. Labor Zool. e Anat. comp. Univ. Genova, Vol. 14, 1934, p. 1. (Ref. Jahresberichte Veterinär Medizin, Vol. 59, 1936, p. 12.)

A clear infiltration of fat in the liver is noticeable after the 14th or 15th day of incubation. This increases considerably and on hatching the liver cells are completely covered with drops of fat. The fat is liquefied yolk. After the day of hatching the fat in the liver suddenly decreases again and in 5-day-old chicks the fat in the liver cells has almost disappeared.

Determination of weight of pure bred White Leghorns and the country breeds of Padua and Emilian Romagna. Indagine sul peso del pollame Livorno bianco selezionato, Padavano Comune ed Emiliano-Romangnolo. Revista de Zootecnia, Vol. 11, 1934, p. 308.

The weight of 5,378 birds, 1,484 country birds from Emilia-Romagna, 478 country birds from Padua and 2,815 Leghorn hens was determined and recorded in tables. The results were as follows:—

	White Leghorns.		*Paduers.*		*Emilianers.*	
	Hens.	*Fat Hens.*	*Hens.*	*Fat Hens.*	*Hens.*	*Fat Hens.*
	Kg.	*Kg.*	*Kg.*	*Kg.*	*Kg.*	*Kg.*
Average weight ...	2,058	1,867	1,990	1,799	1,869	1,548
Frequency value ...	2,000/ 2,099	1,800/ 1,899	1,900/ 1,999	1,700/ 1,799	1,800/ 1,899	1,500/ 1,599
Highest and lowest weight	1,500/ 3,000	1,250/ 2,750	1,450/ 2,650	1,250/ 2,350	1,150/ 2,950	850/ 2,250

Present position of Investigations regarding the Rearing of Chickens in Batteries. De huidige Stand van het Onderzoek over het Opkweeken van Kuikens in Batterijen. F. Lievens. Instituut voor Huisdierkunde. Leuven. Bulletin No. 25, Boekhandel René Fonteyn. Fochplaats 13, Leuven, 1936.

Description of a series of experiments and an extensive study of literature dealing with the rearing of chicks in batteries. The battery system requires very special knowledge, especially in regard to nutrition (minerals, vitamins, albumins) and the knowledge of these is only in the initial stages. This booklet is an important addition to our knowledge of the various difficulties which accompany this method of rearing.

Pigeon Breeding in Belgium. La Colombiculture en Belgique et la Production lucrative du Pigeonneau. A. Keymeulen. Editor: Ratinckx, 10, Courte Rue Neuve, Anvers, 1936.

This booklet is devoted chiefly to the breeding of pigeons for consumption. Various breeds of pigeons are described and illustrations given. The hygiene of pigeon breeding, nutrition, fattening and other subjects are treated.

Degeneration in Poultry Breeds. De la Dégénérescence des Races aviaires. M. R. Gueneau. La Revue Avicole, 1937, p. 294.

Modern methods force nature and this results in increased disease. It is necessary that hens return to their natural life.

A great difference should be made between production and reproduction. Breeding birds should be chosen with great care.

Instructions for Poultry Breeding. Züchtungslehre für Geflügelzüchter. Copy 2 of the "Geflügelzucht-Bücherei"; Editor: Dr. L. Weinmiller. Erding, Germany. With 16 illustrations. Price RM. 1.65. Eugen Ulmer, Stuttgart-S, Olgastr. 83.

Dr. Weinmiller is well known for his manner of expressing intricate problems in simple language so that they are clear to everybody. This is again demonstrated in his "Züchtungslehre" (Breeding), which is well worth reading. In the shortest and simplest way he explains the most important theories of the sciences of Heredity and Breeding and more extensively the knowledge which has been obtained from these theories, and, further, in a most extensive manner

their consequences for practical breeding. It is not written for the utility breeder only, but is just as valuable to the breeder of exhibition poultry. For members of the State Herd Book Association and those who wish to become members, special chapters will be found in this book dealing with the technique of Herd Book Breeding and the building up of a Herd Book Breeding Station. "The Science of Heredity and Breeding is not altogether unjustly looked upon as being full of monotonous theory. This little book has been written for those who shudder at the idea of too much wisdom."

The official recognized Utility Breeds in Germany. Deutschlands anerkannte Nutzhühnerrassen. Dr. L. Weinmiller. Deutsche Gesellschaft für Züchtungskunde. Editor: Paul Parey, Berlin, S.W.11, 1937.

Historical treatise on the development of poultry breeds in Germany and a description of the five Utility Breeds recognised by the State Herd Book: (1) White Leghorns; (2) Brown Italians; (3) Rhode Island Reds; (4) White Wyandottes; (5) White Reichs Fowls. The latter originate from Orpingtons, Wyandottes, Dorkings and other breeds. It is the only breed in the Herd Book which has white flesh.

Contrasts in the Relation between Body Weight and Egg Weight in various kinds of Birds. Gegenüberstellung des Verhältnisses des Körpergewichtes zum Eigewicht bei verschiedenen Vogelarten. Geflügel Börse, 1934, Nr. 80.

In big breeds of hens of 2 kg. and an egg weight of 55 gr. there is a 36: 1 relation. In Bantams of 600 gr. and their egg weight of 35 gr. it is 17: 1. In the ostrich, with its living weight of 90 kg. the weight of the egg is about 1,500 gr., so that there is a relation of 60: 1. These figures for the Dwarf Colibri are: body weight 2 gr., egg weight 0·2 gr., relation 10: 1; sea swallow, 100 gr., 34 gr., relation 3: 1. In turkeys the relation is 100: 1.

Reaction of Eggs during Incubation. Ueber die active Reaktion des Inhalts der Hühner- und Enteneier während der Inkubationsperiode. F. J. Berenstein and E. E. Penionschkewitsch. The Journal of Physiology of U.S.S.R., Vol. 18, p. 657.

1. The albumen of hen and duck eggs has an alkaloid and the yolks a weak acid reaction.

2. The reaction of the yolks changes but slightly during storage. The *p*H of the albumen increases considerably.

3. The development of the embryo is determined by a change in the albumen and yolk reaction. The albumen becomes less alkaloid, the *p*H of the yolk increases.

The reaction of the albumen is almost neutral on the seventh day in hen eggs and on the 15th day in duck eggs. From the fifth to seventh days the yolk of hen eggs becomes neutral. The change from acid to alkaloid in duck eggs takes place on the 13th day. The albumen and yolk have a weak alkaloid reaction towards the end of the incubation period.

4. During the entire development period of the embryo the amnion liquid has a weak alkaloid reaction.

Washing of dirty Goose Eggs before Incubation. Obmiwanja sagrjasnennich gusinich jajitz pered Inkubaziej. Prof.

E. E. Penionschkewitsch, Ptizegrad. Sagorsk. Mosk. obl. U.d.S.S.R. Sowetzkoje ptizewodstno, N3, 1935, St. 25. (Ref. Archiv für Geflügelkunde, 1935, No. 273.)

On page 1 of the collection of problems dealing with incubation the writer deals with the value of washing dirty duck and hen eggs before incubation.

In 1934 the writer carried out an analogical experiment with goose eggs. Two lots of goose eggs were used in the experiment, one with dirty and one with clean shells. In the first lot most of the shells were dirtied by earth and a few by duck faeces. From the first lot three groups were formed, of practically the same weight. (The average weight per egg of Group 1 was 150 gr.; Group 2 150 gr. and Group 3 145 gr.) The dirt was not removed from Group 1. Group 2 and washed with a 5 per cent. solution of NaCl and Group 3 with clean water. The temperatures of the water and the solution were about 5° C. higher than that of the place in which the eggs were at the time. Group 4 consisted of eggs with clean, unwashed shells (control group). All four groups were placed simultaneously in the incubator. At the termination of the incubation period the following results were observed: Group 1 (eggs with dirty, unwashed shells), hatching results 20·4 per cent.; Group 2 (eggs with dirty shells washed in a 5 per cent. saline solution), hatching results 45 per cent.; Group 3 (eggs with dirty shells washed in clean water), hatching results 40 per cent.; Group 4 (eggs with clean, unwashed shells) (control group), hatching results 59·2 per cent.

Apparently the washing of dirty eggs increases the hatching results considerably, and if we compare the results in the above experiment we see that washed eggs produced almost double the number of birds. As regards the method of washing (clean water or 5 per cent. solution NaCl) both gave practically the same results. The difference of 5 per cent. more in the hatching results of eggs washed in the saline solution is unimportant as this might just as well be due to greater hatching capacity as to the effect of the action of the solution during washing. The writer states that the washing of dirty eggs has a positive action on incubation as it destroys the dirt deposits (if not completely, then to a great extent). The dirty shell serves as a good breeding ground for the development of harmful micro-organisms which pierce the shell and cause processes which are fatal to the embryo. This was confirmed, as the writer found in Group 1 (eggs with dirty, unwashed shells) a higher percentage of infected eggs (in those in which the embryos failed). Accordingly washed eggs have a prophylactic importance.

The writer draws the following conclusions: the best eggs for incubation are goose eggs with clean, unwashed shells. If the only eggs at disposal are dirty, these should be washed before being placed in the incubator.

Ozonizing of Eggs during Incubation. Osonirowanje jajitz wo wremja Inkubazii. Tarnawsky, Ptizegrad. Sagorsk. Mosk. obl. U.d.S.S.R. Sowetskoje Ptizewodstwo N9, 1935, p. 27.

Under the control of Professor E. E. Penionschkewitsch, the writer carried out experiments on the influence of ozone on the embryonal development of hens. The experiments were carried out with Leghorn eggs. The eggs complied with all standard requirements. The average weight of the eggs was 54·8 gr. The eggs were hatched in a " Pioneer " section incubator. The technique and incubation conditions were the same for all groups: temperature 38·5° C., humidity 60 to 65 per cent. The method of ozonizing was as follows: in each of the isolated sections of the incubator an ozonizer was placed over the eggs at a distance of 10 cm. from the radiator. The writer constructed an ozonizer of the Lud Benay type. It consists of six glass plates placed on top of each other and covered with tinfoil. The tinfoil was connected to the wire of a Rumkorf apparatus, which in turn was connected with an 8-volt accumulator. During operation the accumulator

has a constant strength. The addition of ozone used during hatching was practically the same during the whole process, *viz.*, 9·2 mg. to 100 c.c. air. The presence of ozone was controlled by iodine-containing paper and its strength by iodine-kali according to Schenkbein. The writer carried out three experiments.

Experiment No. 1.—Group 1 (control group), 130 eggs. These were not ozonized. Group 2, 147 eggs, were ozonized 10 minutes daily for the first 18 days. Group 3, 146 eggs, were ozonized as follows: first day 5 minutes, second day 10 minutes, third day 15 minutes, and so on with an increase of 5 minutes daily, so that on the 19th day they were ozonized for 1 hour 35 minutes. Group 4, 146 eggs, were ozonized for 2 hours on the following days of incubation: 2nd, 3rd, 4th, 5th, 8th, 9th, 10th, 11th, 17th, 18th.

Experiment No. 2.—Group 1 (control group), 143 eggs. The eggs were not ozonized. Group 2, 159 eggs. For a period of 19 days the eggs were ozonized for 10 minutes daily. Group 3, 162 eggs. The first day these eggs were ozonized for 5 minutes, the second day 10 minutes, third day 15 minutes and so on up to a maximum of 1 hour 35 minutes on the 19th day. Group 4, 162 eggs. In the first 20 days the eggs were ozonized for 1 hour daily. Group 5, 162 eggs, ozonized 2 hours the first day and afterwards on the 2nd, 3rd, 4th, 5th, 8th, 9th, 10th, 11th, 17th and 18th days. Group 6, 160 eggs, ozonized 3 hours on the following days of incubation: 2nd, 3rd, 4th, 5th, 8th, 10th, 11th, 18th, 19th.

Experiment No. 3.—Group 1 (control group), 155 eggs. These were not ozonized. Group 2, 155 eggs. Ozonized the first day for 5 minutes, second day for 10 minutes, third day for 15 minutes, up to a maximum of 1 hour 35 minutes on the 19th day. Group 3, 156 eggs, which were ozonized for 1 hour daily for a period of 20 days. Group 4, 156 eggs, ozonized for 3 hours on the following days of incubation: 2nd, 3rd, 4th, 5th, 8th, 9th, 10th, 11th, 17th, 18th.

The most intensive increase in the development of the embryo was obtained in Groups 3, 4 and 5. The writer attributes this to the favourable influence of the ozone within these limits. The process of the development of the embryos in Group 2 was not so intensive as in Groups 3, 4 and 5 and differed very little from that of the control group. The weight of the embryos in the three experiments on the 19th day was as follows: Group 1, 18·3 gr.; Group 2, 21·4 gr.; Group 3, 20·5 gr.; Group 4, 19·3 gr. The intensity of the development in Group 6 did not vary much from that of the control group, which is probably due to the fact that the 3 hours' daily ozonizing retarded development. The results of the morphological examination of the blood of the ozonized groups is greater than that in the blood of the control groups. This difference is remarkably evident during the last days of the embryonal development. In Experiment No. 2 the quantity of hæmoglobin on the 18th day was as follows: Group 1, 44; Group 2, 56·5; Group 3, 59; Group 4, 59; Group 5, 52·5; Group 6, 48·5.

The commencement and the termination of hatching in the ozonized groups took place 18 to 24 hours earlier than in the control groups. The following table gives the percentages of hatching:—

Experimental Groups.	1st Exp.	2nd Exp.	3rd Exp.
	Per cent.	Per cent.	Per cent.
1. Control Groups	52·5	40·0	62·2
2. Ozonizing of eggs, 10 mins. the first 19 days daily	55·7	55·8	—
3. Ozonizing of eggs, first day 6 mins., second day 10 mins., 19th day 1 hr. 35 mins. ...	55·3	67·3	70·7
4. Ozonizing of the eggs, about 1 hr. for the first 20 days	—	69·9	71·3
5. Ozonizing of the eggs for 2 hrs. successive days, 2, 3, 4, 5, 8, 9, 10, 11, 17, 18 ...	59·2	72·5	—
6. Ozonizing of eggs for 3 hrs. on the 2nd, 3rd, 4th, 5th, 8th, 9th, 10th, 11th, 17th, 18th days	—	57·8	64·4

As a result of the experiments carried out the writer arrives at the following conclusions: firstly, that ozone acts positively on the quantitative change of the

morphological element and the chemical quality of the blood, in so far as it increases the content of hæmoglobin and the erythrocytes. Secondly, ozone activates the embryonal development of hens, acts positively on their hold on life and increases to a small extent the hatching percentage. The writer is of opinion that the favourable influence of ozonizing obtained with a concentration of 9·2 mg./100 c.cm. air is decreased when a shorter period than 3 hours is employed. (Ozonizing for longer than 3 hours showed negative results in the writer's experiment when compared with ozonizing for 1 to 2 hours.) The writer is of opinion that the ozonizing of eggs during incubation should undoubtedly be given consideration as everything in connection with the extensive adoption of electric energy in incubators opens up wide economic perspectives. Further, that the study of the influence of ozone on the embryonal development of hens should be carried out to a greater degree, with a view to determining the proper dose to be administered and its influence on the post-embryonal development of hens.

The Egg Type of the Daikotsukei (A Preliminary Report). Riichi Tomishima, Agricultural Experiment Station, South Manchuria Railway Co. Kung-Chu-Ling. Japan Poultry Bulletin, No. 21, 1937.

1. The eggs of the Daikotsukei in Manchukuo are, as a rule, very large, but on the other hand there are some small eggs. The first study, which was held during the period from 1925 to 1928, showed the variability range in average egg weight per bird in one laying term among 197 pullets to be from 54·85 gr. to 97·77 gr.

It does not seem probable that such a wide variability is caused by a single heritable character.

2. Again, I investigated the mean egg weight per bird of the first ten eggs laid by 732 daughters during the period from 1929 to 1934. The results, in which the frequency distribution curve ranged from 47·35 gr. to 93·75 gr., showed that there are two distinct modes at 58 gr. and 64 gr., and two indistinct modes, at 52 gr. and 70 gr.

3. In this breed, the relation between the average egg weight (y) in one laying term and the mean weight of the first ten eggs (x) is

$$y = 18{\cdot}28 + 0{\cdot}7844x$$

As these egg weights range from 51 to 53 gr., 57 to 59 gr., 63 to 65 gr. and 69 to 70 gr., results, converting by the preceding formula, are as follows:—

Ranges 58-60 gr., 63-65 gr., 68-70 gr., 72-74 gr.

4. The number of dams respectively which laid the eggs ranging in weight as above, and their daughters are as follows:—

	58-60 gr.	*63-65 gr.*	*68-70 gr.*	*72-74 gr.*
Dams	19	29	35	40
Daughters	70	89	127	122

5. Fig 2 shows that there are many daughters which laid eggs weighing in close proximity to the egg weights of their dams. The frequency curves in Fig. 2 are similar to each other. Moreover, the curves in Fig. 2 are similar to the curve in Fig. 1, p. 17.

6. As regards the egg types which range from 51 gr. to 53 gr. and from 69 gr. to 71 gr., they are not caused by a single heritable character. The egg types which range from 57 gr. to 59 gr. and from 63 gr. to 65 gr. are considered to be a result of hybridation between the former two.

7. *Conclusion.*—There are two distinct types of egg weights. Of the mean egg weight per bird of the first ten eggs in the Daikotsukei, there are two distinct modes: one is 52 gr. and the other is 70 gr.

Black Orpington Bantams and their Establishment in Japan. Takanaru Mitsui, The Institute of the Central Poultry

Association, Tanashi, near Tokyo. Japan Poultry Bulletin, No. 21, 1937.

1. The Black Orpington Bantams were established 20 years ago in England, and they were fairly distributed over the country, but after the Great War they were allowed to become practically extinct.

Mr. Lyle (Gill Farm, New Jersey, U.S.A.) established the White Orpington Bantams in 1928.

Mr. Cook's and Mr. Lyle's search for the Black Orpington Bantams, having proved unsuccessful, I commenced in 1932 the work of their re-establishment.

2. For the first crossing I took the smallest Black Cochin Bantam male I had, a specimen with good greenish-black plumage, and for the female the best White Orpington Bantam I could find, which had leaden-blue shanks and which laid large eggs.

3. In F_1 I got three pure black females, but all the males had reddish-bay hackles and saddles similar to the plumage of the dark partridge, so I could not use any of them for the breeder of the next crossing.

4. As I was looking for a male, Messrs. Keiichiro and Terugoro Asada, fanciers, presented to me a very small greenish-black male, similar to the Cochin Bantams. It was a hybrid between a Black Cochin Bantam male and a cross-bred female (single comb, black plumage) which came from a crossing between a Japanese Black Bantam (Chabo) and a Japanese Black Game Bantam (Koshamo). This male had a rather long tail carried high and two-fifths of the leg feathers of the Cochin Bantam.

5. In F_2 there were many chicks with yellow shanks and many males with reddish hackle, but by this time I had also some birds with non-feathered legs.

6. I selected six birds with black plumage and without feathered legs—two males and four females, and in addition to these females I chose some good female specimens with yellowish non-feathered legs. I then made two pens for the third crossing.

In F_3 I got some individuals with black legs, even though half the number had feathered legs.

7. For the fourth crossing I was troubled because there were few satisfactory breeders; for example, there were among the males specimens with black legs but with feathers on their legs. But among the females, fortunately, the characters of early sexual maturation and good laying ability had been transmitted since F_2.

In F_4 the count as regards the legs was as follows:—

Non-feathered ...	109	Black legs ...	21
Feathered	42	White ,, ...	63
		Yellow ,, ...	67

8. In November, 1935, there were so many fowls near the imagined ideal Black Orpington Bantams that I made a preliminary display of them in the Sixteenth Poultry Exhibition of the Central Poultry Association.

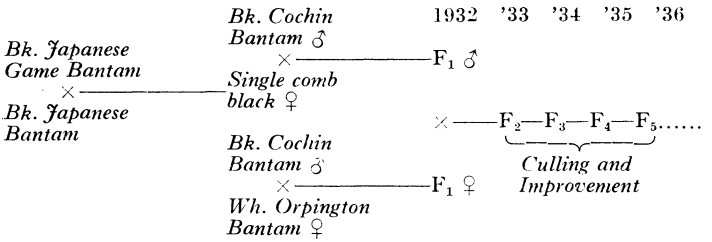
Of course, at this time they were not yet perfectly fixed as to various hereditary characters, so I did not begin to distribute them.

9. In F_5 the feathered-legged specimens became quite extinct, and the classification of the leg colours (non-feathered) was as follows:—

	Black legs.	*Black legs. Yellow tinged soles.*	*White legs.*	*Yellow legs.*
♂	24	8	7	5
♀	32	13	2	11
Total	56	21	9	16

Up to F_4 among the males there were many with reddish hackles, but in F_5 there were only one or two cases. Thus, I had this new breed practically established with only the improvement of the type left to be accomplished.

10. The process of this work from its commencement in 1932 till its culmination in 1936 is as follows:—



11. At the end of 1936, in reply to my report on this breed, Mr. Lyle announced that he had found specimens of this breed and that he was endeavouring to improve the type. Moreover, in England in the same year fowls of this breed were exhibited in the Crystal Palace Poultry Exhibition. It is a curious fact that this breed should appear in Japan, England and the U.S.A. in the same year, even though the processes of its establishment were different in each country.

12. Finding among the F_4 fowls a male with grey plumage on its breast, I began the work of establishing Blue Orpington Bantams and at the same time the work of establishing Buff Orpington Bantams, using a Buff Cochin Bantam for the male and a White Orpington Bantam for the female. In both projects I shall this year obtain F_3; I will publish later the progress of this work.

Factors that Determine the Hatchability of Eggs. 47th Annual Report of the Storrs Agricultural Experiment Station, Storrs, Connecticut.

Observations on the effect of lethal genes on hatchability have been recorded in previous reports. Further observations on Creeper fowl show that in this breed hatchability is reduced not only by the lethal mutation already described, but that in addition there are other, apparently non-genetic, agencies which reduce hatchability. This is indicated by the fact that in reciprocal crosses of Creeper and normal chickens hatchability is slightly, but significantly reduced in matings of Creeper females by normal males as compared with that of normal females by Creeper males. The normal and Creeper chickens used in these tests were full sisters and full brothers. As a first step in the analysis of these observations, data were collected concerning the shells of eggs laid by Creeper or normal chickens. It was found that relative shell weight is significantly more variable in eggs laid by Creeper chickens. Further experiments are in progress to test the hypothesis that the reduced hatchability of eggs laid by Creeper hens is due to the defective bone structure in the appendicular skeleton of such birds.

Natural and artificial Incubation. N. P. Tretyakov. Research Institute of Poultry Husbandry, Zagorsk, Russia, 1937.

1. A brood hen provides favourable conditions for embryonic development and hatching of chicks, securing in a majority of cases a 100 per cent. hatching.

2. The eggs dry more under a brood hen than in an incubator. The humidity regimen applied up to now in artificial incubation, in the U.S.S.R. as well as abroad, needs further investigation in the direction of lowering the percentage of humidity.

3. Together with the control of the drying of the egg it is necessary to control the course of the development of the embryo.

4. There are reasons for establishing a differentiated regimen in the case of incubation. The temperature in the nest of a brood hen apparently does not fall. As a matter of fact, the brood hen does not cover the eggs very closely during hatching, the air exchange increases and the heat delivery by the egg augments as well. Consequently it would be more expedient in the normal course of the incubation process during the preceding period to create such conditions during

hatching in an incubator as would allow an increased heat delivery by the egg without allowing an increase of the temperature.

5. It is impossible to copy the brood hen mechanically, as an incubator has on the whole a quite different regimen, and consequently the range of permissible temperature fluctuations will be different: wider for sectional patterns (up to 1·5 to 2·0° C.) and smaller for cupboard and indoor patterns (up to 0·2 to 0·3° C.).

6. The turning over of the eggs should be started 2 to 3 hours after placing them in the incubator and finished at the time the chicks begin to peck the shell of the egg. In this connection the technological process in the incubators has to be changed.

7. There is no sufficient reason to build incubators intended for complete carrying away of CO_2 from the incubator. Carbonic acid gas converts in the presence of water vapour insoluble calcium salts of the shell into soluble bicarbonates of calcium, which are transported to the embryo.

Statistical Studies on the Inheritance of Egg Production in the Domestic Fowl. K. Kimura, Faculty of Agriculture, Tokyo Imperial University. The Japanese Journal of Zootechnical Science, Vol. 10, 1937, June.

The data used for this study are the egg records of Single Comb White Leghorns bred for a breeding experiment for increased egg production, conducted at the Imperial Zootechnical Experiment Station since 1919. In the present study, particularly the number and mean weight of eggs in the first year of production records have been subjected to statistical analysis to examine the relationship between the near relatives such as dams and daughters, sires and daughters, sisters, grandparents and granddaughters, and cousins.

The statistical constants for the number and mean weight of eggs in the first year production as well as the age and body weight at the first egg of 1,148 White Leghorn hens are given in the following table, the first year production being the 365 days records from the first egg. For the calculation of statistical constants, all records of annual egg production were grouped into classes of ten eggs interval for the number of eggs and of 1 gramme interval for the weight of eggs, the weight records being kept to the accuracy of 0·1 gramme.

	Number of eggs.	*Mean weight of eggs (grammes).*	*Age at the first egg (days).*	*Body weight at the first egg (grammes).*
Mean	178·98 ± 1·10	52·85 ± ·07	206·51 ± ·93	1,584·6 ± 4·0
Maximum	328	64·2	394	2,425
Minimum	55	41·5	116	1,039
Standard deviation ...	55·10 ± ·78	3·28 ± ·05	46·64 ± ·66	198·7 ± 2·8
Coefficient of variation	30·78 ± ·47	6·21 ± ·09	22·59 ± ·33	12·54 ± ·18

The actual increase in the number of eggs from the mean (121·43 ± 1·45) of the first 3 years (1920-22) to the mean (221·74 ± 1·49) of the last years (1931-33) is 100·31 ± 2·08, indicating a striking increase (82·6 per cent.) during the experimental period. When the increase in the mean weight of eggs over the same period is measured in the same way as above, however, a very small difference of 0·589 ± 0·190 gramme is obtained, which shows a barely significant increase of 1·12 per cent.

While the age at the first egg was considerably shortened during the first half of the experiment, it seems to have settled on 170 days or thereabouts in the latter half. The average body weight at the first egg appears to have settled on the region of 1,650 grammes after having shown a trend of gradual increase during the first part of the experiment.

Generally speaking, the egg production of the daughter is dependent on that of her dam, the correlation coefficient between 913 daughters and their dams being $0{\cdot}608 \pm 0{\cdot}014$ for the number of eggs. At the same time it is shown that the above relation is not strictly linear, resulting $\zeta = 0{\cdot}0572 \pm 0{\cdot}0103$ as the value of non-linearity of regression, calculated from the correlation ratio $\eta = 0{\cdot}654 \pm 0{\cdot}013$. The correlation coefficient measuring the degree of dependence of the mean weight of eggs of the daughter on that of the dam is $0{\cdot}224 \pm 0{\cdot}021$, the value being remarkably low compared with that for the number of eggs.

To measure the effect of the sire on his daughters' production, the correlation was determined indirectly from the following relation:—

$$\text{Av. Stand. Dev.}_{\text{array}} = \text{Stand. Dev.}_{\text{whole table}} \sqrt{1-r^2}$$

The correlation coefficients thus obtained from the records of 657 daughters out of 34 sires are 0·730 and 0·361 for the number and mean weight of eggs respectively. It is to be seen from the results that the sire's effect on daughters' production is more pronounced than that of the dam.

The relationship between the egg production of the pairs of full sisters totalling 813 birds is shown by the correlation coefficients of $0{\cdot}631 \pm 0{\cdot}014$ and $0{\cdot}275 \pm 0{\cdot}022$ for the number and mean weight of eggs respectively, both showing a little higher value than the daughter-dam correlation. The relation between the egg records of the pairs of half-sisters with common sire, totalling 788 birds, is somewhat low in comparison with that of full sisters, the correlation coefficients being $0{\cdot}510 \pm 0{\cdot}018$ and $0{\cdot}211 \pm 0{\cdot}023$ for the number and mean weight of eggs respectively.

The correlation coefficients measuring the relationship for the egg production between the relatives other than mentioned above are given in the following table:—

	Correlation coefficient.	
	Number of eggs.	*Mean weight of eggs.*
Paternal granddams and granddaughters (455)	$0{\cdot}576 \pm 0{\cdot}021$	$0{\cdot}078 \pm 0{\cdot}031$
Maternal granddams and granddaughters (631)	$0{\cdot}443 \pm 0{\cdot}022$	$0{\cdot}054 \pm 0{\cdot}027$
Granddaughters with common paternal granddam (455)	$0{\cdot}584 \pm 0{\cdot}021$	$0{\cdot}106 \pm 0{\cdot}031$
Granddaughters with common maternal granddam (631)	$0{\cdot}538 \pm 0{\cdot}019$	$0{\cdot}069 \pm 0{\cdot}027$
Paternal grandsires and granddaughters (443)	0·728	0·098
Maternal grandsires and granddaughters (588)	0·638	0·007
Granddaughters with common paternal grandsire (455)	$0{\cdot}507 \pm 0{\cdot}023$	$0{\cdot}022 \pm 0{\cdot}032$
Granddaughters with common maternal grandsire (631)	$0{\cdot}481 \pm 0{\cdot}021$	$0{\cdot}020 \pm 0{\cdot}027$
Cousins with common		
paternal granddam (219)	$0{\cdot}540 \pm 0{\cdot}032$	$0{\cdot}011 \pm 0{\cdot}046$
maternal granddam (378)	$0{\cdot}557 \pm 0{\cdot}024$	$-0{\cdot}050 \pm 0{\cdot}035$
paternal grandsire (318)	$0{\cdot}436 \pm 0{\cdot}031$	$-0{\cdot}041 \pm 0{\cdot}038$
maternal grandsire (507)	$0{\cdot}484 \pm 0{\cdot}023$	$-0{\cdot}025 \pm 0{\cdot}030$

Remarks.—The number of birds is given in parentheses.

The value $0{\cdot}004 \pm 0{\cdot}020$ as the correlation coefficient between the number of eggs and the mean weight of eggs for 1,148 first-year records shows that the egg size is not generally affected by the number of eggs laid, although a few low negative values in the correlation coefficients for each breeding year indicate some tendency for the better layers to lay smaller eggs.

In general, heavy producers are found among early maturing birds, the correlation coefficient between the number of eggs and the age at the first egg for 1,148 birds being $-0{\cdot}611 \pm 0{\cdot}012$. The regression is not linear, however, the maximum production being made by the birds that commence laying between 120 to 180 days of age.

While the number of eggs produced does not seem to have much relation to the body weight at the first egg, the correlation coefficient being $0{\cdot}221 \pm 0{\cdot}019$, the correlation coefficient between the mean egg weight and the body weight at the first egg is $0{\cdot}467 \pm 0{\cdot}016$, indicating that the larger birds at the first egg generally produce larger eggs.

The decline in annual egg production in the successive years up to the seventh year has been studied with the present material, records for the first 2 years being obtained from 373 birds. The annual decline of the average production in the second laying year from that of the first year production is shown to be 16·0 per cent., and from the third to the seventh year the annual production decreases from 11·7 per cent. to 21·8 per cent. compared with the preceding year's production. Fitting the data to the curve $y = Ae^{-kt}$ given by Brody it is shown that the egg production at the age t is equal to $209{\cdot}47e^{-.1564t}$, which gives 14·5 per cent. as annual decline.

With regard to the annual variation in the mean weight of eggs in successive laying years, the second to the fourth year's production shows some 6·1 to 7·0 per cent. increase compared with the average (53·14 gr.) of mean weight of the first year's production. From the fifth laying year on the percentage of increase gradually lowers till the seventh year, which is 1·7 per cent. above the first year mean.

In determining the correlation between the mean egg weight of the first year production of 945 birds and the weight of eggs from which they were hatched, it resulted to the coefficient of $0{\cdot}232 \pm 0{\cdot}021$, which is almost equal to the daughter-dam correlation coefficient $0{\cdot}224 \pm 0{\cdot}021$ for the mean weight of eggs.

On Egg Production Capacity (Preliminary Report No. I). The Relation between Egg Production, Egg Weight, Body Weight and the Amount of Feed. T. Matsumoto and T. Abe, Officials of the Egg-laying and Breeding Contest of the Central Poultry Association, Tanashi, near Tokyo. Japan Poultry Bulletin, No. 21, 1937.

1. As the first step in a general investigation of egg production capacity in poultry, we investigated the relation between the four curves for annual mean egg production, mean egg weight, mean body weight, and mean amount of feed, occurring in each month.

2. In order to make it possible to observe these four curves at a glance, we indicated on the vertical axis of the graph the graduations proper to each of the four curves.

3. Using this specially graduated vertical axis, we made two charts of these four curves; one was for the "general-purpose" breeds and the other was for the Leghorns or the "egg-purpose" breeds.

4. In the charts for the Leghorns, the four curves, though widely separated, run parallel to each other, and the curve of body weight is at the bottom; whereas in the "general-purpose" charts the four curves are close together, and the curve showing body weight is slightly above the others.

5. By this means one can distinguish each breed according to its curve relations; and by this means also one can class individuals of each breed which have lost their special characteristics.

6. In both these charts the curves of body weight are generally parellel to the curves of feed amount, whereas the curves of egg production are distinctly

parallel to the latter. Between the curves of egg production and the curves of egg weight there are no distinct relations.

7. Concerning these relations we must study more precisely and mathematically.

A Hatchability Study among Ohio Hatcheries. G. S. Vickers. Poultry Science, Vol. 15, 1936, p. 496.

In a summary of the 1935 reports from Ohio hatcheries, it is shown that sudden cold spells during the winter invariably cause a drop in hatchability of eggs, starting from 3 to 5 days after the onset of the cold spell and continuing for several days. A rather marked and constant difference in hatchability results was noted between hatcheries in the northern and southern parts of the State in favour of the latter group. These differences were greatest in the late winter and were of small consequence after April 21. The season's average for the highest percentage of hatchability noted each week was 76 and for the lowest 55·4, with the highest occurring in a hatchery in the southern part of the State in most cases.

Some elementary Concepts in the theory of Sampling. W. A. Hendricks. Poultry Science, Vol. 51, 1936, p. 462.

This contribution from the U.S.D.A. Bureau of Animal Industry discusses some concepts involved in the theory of sampling, with special reference to poultry experiments, and directs attention to the interpretation to be placed on some of the newer developments in the application of statistical technique to agricultural experiments.

The " Per cent. firsts " as a Measurement of Egg Size in Pullet Yields. W. C. Thompson. New Jersey Stas. Bulletin, 621, 1936.

The author studied the relationship between the percentage of first-grade eggs produced during certain seasons of the year and " per cent. firsts " for the entire year from approximately 1,500 Single Comb White Leghorn pullets entered in the New Jersey egg-laying contests. The record year has been divided into three parts, namely, the winter season from October 1 to January 31, the spring season from February 1 to May 31, and the summer-fall season from June 1 to September 21. Frequency distribution tables, the degree of correlation for winter-year, spring-year, summer-fall year, winter-summer-fall, and January year " per cent. firsts " and regression equations for predicting the yearly performance from any of the above-described short-time records are presented. In each instance the " per cent. firsts " shown for a particular season was found to be positively and highly significantly correlated with the " per cent. firsts " produced throughout the first laying year, with an indication that a prediction of the " per cent. firsts " for the year based on " per cent. firsts " in winter, in January, in spring, and in summer-fall would be 36, 45·4, 61, and 55·8 per cent. better than pure guess. It appears that the weighing of eggs for at least a 30-day period at any time after the layers have passed the third month of production may be used as a reasonable measure of the individual bird's egg-size quality character.

Ether soluble lipoid phosphorus, lecithin, and cephalin distribution in the Development of the Chick. O. E. Kugler. American Journal Physiology, Vol. 115, 1936.

Based on the determination of the total ether-soluble extract, ether-soluble lipoid phosphorus, lecithin, and cephalin in the yolk and in the embryo and membranes, exclusive of yolk sac, at regular intervals throughout incubation, it is evident that the phospholipid metabolism in the developing chick embryo reaches

its highest stage between the 15th and 17th days of incubation. The lipoid phosphorus per 100 g. of embryo (dry weight) shows a rise to the ninth day, followed by a drop to the end of the incubation period. Lecithin and cephalin parallel each other, maintaining a ratio of about 3 : 1 in both yolk and embryo fractions throughout incubation, and show the same fluctuation trends as does ether-soluble lipoid phosphorus.

Some Effects of Breeding on Mortality. W. L. S. Hindhaugh, Northern Breeding Station, Reaseheath. The Lancashire Report, Sept., 1937.

No relationship could be traced between the cause of death of the parents and the cause of death of the progeny.

The most common cause of death, amounting to 28 per cent. of the total, was an infestation of internal parasites, which were mainly small tapeworms (*Davainea proglottina*). Diseases of the reproductive system accounted for nearly 19 per cent. of the total deaths in the two years; they occurred mainly in the period April to June. Next in importance were tumours and fowl paralysis, which were responsible for a sixth of the total deaths. Losses from this group of diseases were heaviest during the period January to March and formed a higher proportion of the losses among the cross between the White Leghorn males and Rhode Island Red dams than in the pure breeds or the other cross.

Poultry Breeding and Physiological Investigations. U.S. Department of Agriculture, Bureau of Animal Industry Report, 1936, p. 18.

Results are briefly presented on the sex-linked recessive gene for dark pigmentation in White Silkies; artificial insemination of turkey eggs with sperm from pure-bred and cross-bred chickens; prolactin content of the pituitaries of laying hens of different strains; relationship of hardiness to abnormal incubation temperatures and genetic constitution; successful artificial insemination of hens with 0·1 c.c. of mixed semen from several cockerels on alternate days; unfavourable effect of tremulous air cells on hatchability; and relationship of season of the year, growth of the bird, and individual characteristics of the hen to percentage of thick albumen in eggs.

Studies on the Inheritance of Persistency. F. A. Hays. Genetics, Vol. 21, 1936, 519.

In an experiment at the Massachusetts Experiment Station, high and low persistency lines of Rhode Island Reds were crossed. The F_1 generation showed a wide scatter in frequency distribution with regard to persistency, although there was evidence of the dominance of high persistency. The F_2 generation showed a typical bimodal distribution for length of biological year with modes at about 200 and 350 days, with a dividing line between the two populations of about 270 days. From back-crosses and reciprocal crosses data were obtained indicating that high persistency depends in inheritance upon a single dominant autosomal gene. It is suggested that in selecting breeding stock for high persistency the standard be placed well above a 270-day minimum because of overlapping in phenotypes.

Sexual Dimorphism in Single Comb Rhode Island Red down colour. T. C. Byerly and J. P. Quinn. Journal of Heredity, Vol. 27, 1936, 319.

In this study at the U.S.D.A. Bureau of Animal Industry, 1,102 Single Comb Rhode Island Red chicks and fully developed embryos were examined for evidence of black spotting or striping on the head. Of the total number examined

524, or 47·5 per cent., had some black down on the head. A classification of the population with regard to sex showed that 84·9 per cent. of the spotted or striped chicks were females and 77·8 per cent. of the normal or non-spotted chicks were males. On this basis sex could be distinguished by colour markings in 81·2 per cent. of the chicks examined. Examination of 663 chicks in another standard bred Rhode Island Red flock showed 42·1 per cent. to be spotted or striped, indicating that these characters are widely distributed among this breed.

The Normal Growth of Chickens under Normal Conditions. H. L. Kempster and J. E. Parker. Missouri Station Research Bulletin 247, 1936.

This study is based on observed growth rate of over 5,000 chicks of Single Comb White Leghorn, White Rock, and Single Comb Rhode Island Red breeds hatched at the State Poultry Experiment Station farm over a 6-year period and reared under favourable (normal) conditions. Pullets of these breeds averaged 39·7, 41, and 41·5 g. in weight, respectively, at hatching; 184, 179·2, and 186·2 g. at 4 weeks; and 1,587·3, 2,290·3, and 2,480·5 g. at 40 weeks of age. The greatest gains during any 4-week interval were in the ninth- to twelfth-week period for each of the three breeds. Differences in growth rate of males and females became apparent at 8 weeks of age, and at 20 weeks the White Leghorn, White Rock, and Rhode Island Red pullets averaged, respectively, 77·2, 78·2, and 80·8 per cent. as much as the cockerels. No significant relation was found between the age of the hens and the weight of their pullet progeny at 40 weeks of age. Early hatched chicks made above normal gains up to 20 weeks but below normal growth thereafter, whereas the late-hatched chicks made subnormal gains up to 20 weeks but above normal growth as they approached maturity. These variations in growth rates of early and late-hatched chicks appear to be associated with certain climatic conditions, particularly average maximum and mean temperatures for the periods.

Electric Brooding. J. C. Taylor and W. C. Krueger. New Jersey Stas. Hints to Poultrymen, Vol. 24, 1936-37, No. 2.

Certain practices which should be observed in the operation of an electric chick brooder are outlined.

Studies on the Creeper Fowl.—X, A study of the mode of action of a lethal factor by explantation methods. P. R. David. Arch. Entwickl. Mech. Organ., Vol. 135, 1936, p. 521.

Continuing this series from the [Connecticut] Storrs Experiment Station, study was made of the lethal mechanism of the Creeper gene by comparing the behaviour of tissues from homozygous Creeper and normal birds in culture. Fragments of heart tissue from *CpCp* embryos were markedly inferior in their growth rate to similar fragments from normal embryos. The difference in the growth of other tissues from normal and Creeper embryos was much less, if not negligible. Tissues from retarded non-*CpCp* embryos behaved in tissue culture much as tissue from *CpCp* embryos. In experiments in which tissues from 72- to 82-hour embryos were grafted on the chorio-allantoic membranes of 8- to 9-day embryos, the fragments from the abnormal embryos evidently had the same capacity to survive and grow as those from the normal embryos except in the case of the limb cartilage. It is concluded that the death of homozygous Creeper embryos before hatching is probably due to the dislocation of normal morphogenetic correlations on account of the disproportionate reaction of different developmental processes to the general retardation.

Genetical Differences in Eight-week Weight and Feathering. R. G. Jaap and L. Morris. Poultry Science, Vol. 16, 1937, p. 44.

Data are presented on the degree of feathering and weights at 8 weeks of age of birds hatched at the Oklahoma Experiment Station in the spring of 1936. The data differed from the findings of Schnetzler, Asmundson and Lerner, and others by showing that the 8-week weight of White Leghorns was greater than that of Barred and White Plymouth Rocks but less than that of Buff Orpingtons, White Wyandottes, and Rhode Island Reds. These results indicate that the first 8 week's growth is not necessarily associated with mature weight.

A statistical analysis of the total variance in 8-week weights indicated that 13 per cent. might be attributed to variety, 19 per cent. to sire, 27 per cent. to dam, and 23 per cent. to sex, with the residual of 18 per cent. due to several other conditions. Feathering was related to the 8-week weight, but 49 per cent. of the variance was not heritable. By selecting poorly feathered animals, strains of poor feathering were produced in Rhode Island Reds but selection for rapid feathering was less effective. Crosses of White Rocks and Buff Orpingtons increased the 8-week weight to that of the more rapidly growing parents.

Development of Fertility in young Barred Plymouth Rock Males. R. L. Hogue and E. E. Schnetzler. Poultry Science, Vol. 16, 1937, p. 62.

In studying the age at which young Barred Plymouth Rock cockerels attained sexual maturity at the Indiana Experiment Station, birds were sacrificed at 2-week intervals up to 20 weeks of age. Histological study showed the presence of mature sperm in the testes at 20 weeks of age. In individual matings with mature hens, some cockerels could fertilize the eggs at 16 weeks of age although others did not produce fertile eggs until 32 weeks of age. In pen matings, the age at producing fertile eggs varied from 21 to 30 weeks.

Loss of Weight of Hens' Eggs during Incubation under different conditions of Humidity and Temperature. E. M. Pringle and H. G. Barott. Poultry Science, Vol. 16, 1937, p. 49.

In tests conducted by the U.S.D.A. Bureau of Animal Industry, in which eggs were incubated in respiration calorimeters under carefully controlled conditions, loss of weight of fertile eggs during incubation was found to depend principally upon the relative humidity of the surrounding atmosphere. Rate of loss decreased in direct proportion to the increase in humidity within the tested range of from 8 to 85 per cent. at a constant temperature of 102° F.

When incubation temperatures were varied from 96° to 102·5° at a constant relative humidity of 60 per cent. a range of 96° to 99° had but slight effect on loss of egg weight, but at temperatures from 99° to 103·5° the weight loss became progressively greater with each degree rise in temperature, the total loss at the latter temperature averaging one-third greater than at the former. The daily loss of weight increased as incubation proceeded. A slight inverse relation was found between weight of eggs and loss of weight.

Effect of Incubation Temperature on time of death of Chick Embryo and relationship of Energy Metabolism to Mortality. E. M. Pringle and H. G. Barott. Journal of Agricultural Research, Vol. 54, 1937, p. 465.

From results obtained by incubating hens' eggs in a respiration calorimeter which permitted rigid control of all factors governing incubation, the following conclusions are drawn:—

There are two critical periods of mortality at incubation temperatures of 99° and 102° F., in which approximately two-thirds of all mortality occurs.

The first period occurs at the same time at either temperature, the peak of mortality being on the third day in the experiments conducted. The second period occurs shortly before the normal time of hatching. The peak of mortality was on the 20th day for eggs incubated at 99° and on the 19th day for those at 102°; at both temperatures high mortality occurred immediately after an abrupt change in energy metabolism. The results indicate a close relationship between the stage of development of the chick embryo and mortality.

A comparison of the energy metabolism and mortality curves of the growing embryo shows an association between rate of change in energy metabolism and mortality.

Broodiness in Poultry. F. A. Hays. Agricultural Experiment Station, Amhurst, Massachusetts, Bulletin No. 339, 1937.

Attempts are still being made to establish a genetically non-broody strain of Rhode Island Reds. The generation of birds hatched in 1935 and now having a complete first-year record was produced by two untested males mated for the most part to aged females that had not exhibited broodiness during their first laying year and some of these females had three complete years without broodiness. Out of five families of daughters sired by one male there were two families showing broodiness. From this male there was a total of 34 daughters, two of which became broody. The second male also produced five families of daughters, four of which exhibited broodiness. The total number of daughters was 30, and five of this number became broody in the first laying year. In the entire flock bred for egg production only 4·73 per cent. of the birds were broody during the first laying year. The mode of attack appears to lie in the use of aged males and females that have been shown by breeding tests to lack the dominant genes for broodiness.

Breeding Poultry for Egg Production. F. A. Hays and Ruby Sanborn. Agricultural Experiment Station, Amhurst, Massachusetts, Bulletin No. 339, 1937.

A number of phases of the problem of breeding for high fecundity have been studied during the past year. The flock has been constantly selected for high hatchability. The hatching records for 1936 show significant progress. From eight pedigree hatches at weekly intervals during March and April, a total of 6,604 eggs set gave a mean hatchability of fertile eggs of 84·31 per cent.

Body weight has increased in the flock, the mean weight at first egg being 6·2 lb. for a mean age of 194 days. Egg size has been significantly increased to a mean of 56·3 grammes from first egg to January 1. Broodiness stood at a new low figure of 4·73 per cent. Mean annual egg production for the flock just finished was 220·4 eggs. This mean is based on all birds that survive, without culling. Mortality rate of pullets in the laying houses was greatly reduced to the low level of 13·2 per cent. for the first laying year. The production-bred flock has also been improved in chick feathering.

Statistical Study of Heredity in Rhode Island Reds. F. A. Hays and Ruby Sanborn. Agricultural Experiment Station, Amhurst, Massachusetts, Bulletin No. 339, 1937.

Data have been prepared and published as follows: Studies on the Inheritance of Persistency, *Genetics,* 21, 519-524, 1936; Winter Pause in Rhode Island Reds, *Station Bull.*, 329, 1936; Time Interval Between Eggs of Rhode Island Red

Pullets, *J. Agric. Res.*, 52, 633-638; Numbers and Uniformity in Experimental Lots, *Poult. Sci.*, 15, 235-238, 1936; Inheritance of Sexual Maturity in Rhode Island Reds, *Proc. Sixth World's Poult. Cong.*, pp. 34-38, 1936; Hatchability as Related to Season and Hour of Laying (in press).

A Genetic Study of Rhode Island Red Colour. F. A. Hays. Agricultural Experiment Station, Amhurst, Massachusetts, Bulletin No. 339, 1937.

Two lines of exhibition stock have been maintained. One line has been bred for plumage colour alone and the behaviour of egg production character has been studied. The other line has been bred for characters affecting egg production without sacrificing desirable plumage colour. Neither line has reached a high production level but some promising families and individuals have appeared. The difficulty in making progress in small units constantly appears.

Rate of Feathering in Rhode Island Reds. F. A. Hays. Agricultural Experiment Station, Amhurst, Massachusetts, Bulletin No. 339, 1937.

Early feathered and late-feathered lines are being developed on the basis of back feathering at 8 to 9 weeks of age. After three generations of breeding the first line shows about 50 per cent. early feathered and the second line about 10 per cent. early feathered. The data point to two rather definite facts. First, that early feathered females cannot be distinguished from late-feathered females at 8 weeks of age. Second, that early feathering is recessive and depends not only upon a sex-linked gene but also on two or more autosomal genes.

Breeding for Low Mortality. F. A. Hays. Agricultural Experiment Station, Amhurst, Massachusetts, Bulletin No. 339, 1937.

Two generations of lines bred for high and low mortality in the laying houses have complete records. Each line has been selected entirely on mortality rate without regard to egg production characters. Laying house mortality in the first generation was 55 per cent. and 44 per cent. respectively for the two lines. The corresponding first-year egg production for the survivors was 192 and 230. The second generation hatched in 1935 gave a laying house mortality of 19 per cent. and 0 per cent. respectively for the high and low mortality lines. The mean annual records of the two lines were 209 and 257.

Chicken Vices. D. C. Kennard. Ohio Station Bimo. Bulletin No. 184, 1937.

The most common causes of feather picking and cannibalism are discussed, and effective prevention and control methods are suggested. Debeaking, *i.e.*, removing the tip of the upper beak, has proved the most satisfactory control procedure. The method whereby the beak tip is removed with comparatively little discomfort to the bird and practically no loss of blood is described.

The usefulness of winter and summer-fall Egg Yield Records as criteria of Poultry Breeder Selection. W. C. Thompson and F. P. Jeffrey. New Jersey Stas. Bulletin No. 612, 1936.

In conducting this study, the first year egg yield records of 2,028 pure-bred Single Comb White Leghorn pullets, entered in New Jersey egg-laying contests

during a typical year of operation, have been employed. The record year has been divided into three parts, namely, the winter season (October 1 to January 31), the spring season (February 1 to May 31), and the summer-fall season (June 1 to September 22). In comparing the winter egg production and the summer-fall egg production with annual egg yields it is shown that each of these seasonal yields bears a highly significant positive correlation to the annual yield, each being of curvilinear character and expressed by the regression equation $Y=136{\cdot}24 \log X—30{\cdot}79$ and $Y=133{\cdot}22 \log X—31{\cdot}62$, respectively, in which Y represents the annual and X the seasonal production. However, an insignificant degree of correlation was found to exist between winter yields and summer-fall yields, indicating that fowls inherit precosity or winter production tendency entirely separately from the factor of persistency or summer egg yield tendency. A combination of the winter and summer-fall records also bears a highly significant positive correlation to annual yield. This is a curvilinear relationship expressed by the regression equation $\log Y=0{\cdot}8367 \log X+0{\cdot}5653$. A remarkably close correlation was found to exist between the observed yield and computed annual yield by this method. It is concluded that trap-nest records for either the winter period or the summer-fall period may be employed with confidence in the selection of breeding stock and that the combined winter and summer-fall records are highly valuable in this respect, being possibly of somewhat greater accuracy for that purpose than the record of exact egg production performance over the full year.

Selecting Poultry Breeders by means of winter and summer-fall Egg Yield Results. W. C. Thompson and F. P. Jeffrey. New Jersey Stas. Hints to Poultrymen, Vol. 24, 1936.

This is a popular summary of the above.

Egg Size in relation to Growth of Narragansett Turkeys. H. M. Scott and R. E. Phillips. Poultry Science, Vol. 15, 1936, p. 435.

In this study at the Kansas Experiment Station 538 eggs ranging from 67·6 to 100·5 grammes in weight and representing approximately a normal frequency distribution were used for hatching. Correlating weight of turkeys at 24 weeks of age with egg weight showed a coefficient of correlation of $0{\cdot}179 \pm 0{\cdot}046$ for males and $0{\cdot}119 \pm 0{\cdot}046$ for females. It seems evident that egg weight in no way conditions the mature weight of turkeys, although a high correlation was noted between egg weight and day-old weight of poults.

The Lethal Nature of Flightlessness in the Fowl. D. C. Warren. Journal of Heredity, Vol. 28, 1937, pp. 17-18.

"Flightless" is a heritable defect in the fowl which causes abnormal feathers, particularly the larger ones, and this results in the flight feathers breaking off near the base when subject to strain. The author points out that this is an heterozygous condition, and that the homozygote is practically lethal, showing non-development of the feathers and deformed beaks and toes. It would appear that not all the homozygotes are born alive.

Thermal Effect on the rate and duration of the Embryonic Heart Beat of Gallus domesticus. A. L. Romanoff and M. Sochen. Anat. Record, Vol. 65, 1936, p. 59.

The [New York] Cornell Experiment Station has studied the effect of varying the environmental temperature above or below 37·5° C. on the rate and duration of the heartbeat of chick embryos at various stages of development. It is

shown that at normal temperature (37·5°) the pulse rate increased rapidly from the second to the eighth day of embryonic development and then remained almost constant during the remainder of the incubation period. Either gradual or abrupt exposure to extreme temperatures (high or low) resulted in linear changes in the rate of heartbeat. Eventually breaks occurred in the primary linear trend, followed by secondary linear changes. The sensitivity of the contractive impulses of the heart to temperature change decreased with advance in age of the embryo. In all cases of exposure to extreme temperature, except in the abrupt exposure to high temperature, there was a general increase in the duration of the heartbeat with advancing development of the embryo.

How to control the supply of fresh air in the Incubator. A. L. Romanoff. New England Poultryman, June, 1937.

On the whole, the consideration of these five factors, namely, the size of the egg, the stage of incubation, the number of eggs to the capacity of the incubator, the type of the incubator, and the condition of the air in the incubator room, constitutes the control of the supply of fresh air in the incubator, which plays an important rôle in the production of a complete and healthy hatch. In practice, however, it is one of the simplest problems of incubation in the hands of a thoughtful operator, who remembers that incubated eggs are living creatures, and they need fresh air as much as we do for health and comfort.

Effect of temperature, humidity and other factors on hatch of Hens' Eggs and on energy metabolism of Chick Embryos. H. G. Barott, Bureau of Animal Industry. 46 pp., illus.

The aim in the investigations reported in this bulletin is to ascertain the optimum condition for each of these factors for embryonic growth and for hatching. It is also desired to ascertain the specific effect on embryonic growth and on hatch of a change in any one of these factors.

Breeding for high Egg Production with special reference to the method of selection of the Breeding Males. A. E. Tomhave and C. W. Mumford. Agricultural Experiment Station, Newark, Delaware, Bulletin No. 188, 1934, p. 20.

Cockerels used in this project were selected on the basis of the performance of their full sisters from the beginning of egg production through January 31. The factor being studied this year, and which is intimately associated with egg production, is the factor of intensity of production. The sisters of one cockerel selected had a uniform high intensity of fall and winter egg production, while the sisters of another cockerel showed average high intensity, with greater variation in intensity. These cockerels have headed up two pens of pedigree hens as similar in breeding and production as it was possible to select from the hens available. Studies will be made of the resulting pedigree pullets to determine the value of the records of cockerels' sisters in the selection of cockerels.

Another cockerel was selected to head up a third group of pedigree hens because of the low mortality rate experienced by the full brothers and sisters of the cockerel from their date of hatch through January 31. The object of this pen is to improve the viability of chickens by the selection of breeding birds which appear to have a low mortality rate.

A fourth breeding pen is made up of pedigree hens 3 to 8 years old for the purpose of studying the relationship between the age of the breeding hen and the fertility and hatchability of eggs and viability of chicks.

Data accumulated during the past few years on poultry breeding are being summarized as rapidly as time will permit.

Breeding for high Egg production with special reference to the method of selection of Breeding Males. A. E. Tomhave and C. W. Mumford. Agricultural Experiment Station, Newark, Delaware, Bulletin No. 192, 1935.

This project is being continued as outlined. The data have not yet been sufficiently summarized for presentation. During the last breeding season four pens of pedigree hens were used.

Blood chemistry of the Chick Embryo during ontogenesis. C. M. Zorn and A. J. Dalton. Society for Experimental Biology and Medical Proceedings, Vol. 35, 1936, p. 451.

Values for blood sugar, uric acid, cholesterol, hæmoglobin, and red blood cells in the blood of chick embryos by one-day intervals from the ninth to the 20th day of incubation and from the first to the fourth day of post-incubation are presented in tabular form and briefly discussed.

Measurements of quantity and quality of Egg yield. W. C. Thompson, D. Philpott and H. C. Page. New Jersey Stas. Bulletin No. 614, 1936.

This is a revision of Bulletin 528 and presents essentially the same conclusions as those previously noted.

The Breeding Programme of the State Agricultural Department for Poultry and Herd Book Breeders. Das Zuchtsprogramm der Reichsfachgruppe Landwirtschaftliche Geflügel- und Herbuchzüchter im Reichsverband Deutscher Kleintierzüchter. D. Th. Brandt. Deutsche Landwirtschaftliche Geflügelzeitung, 1936, p. 621.

A well-organized breeding programme for the poultry industry in each country should have the following objects:—

1. To see that farm and industrial flocks kept for this purpose deliver eggs for human consumption.

2. A sufficient number of breeding flocks, composed of carefully selected hens and cocks of good breeding quality for the supply of eggs for hatching, which would produce hens of the best quality for delivery to farmers and commercial poultry breeders.

3. A small selected group from larger flocks which should consist of cocks and hens of excellent breeding quality, which would undergo hereditary tests with a view to obtaining the best breeding birds for delivery to hatching and breeding flocks and hens and breeding strains to farmers and poultry dealers.

German Breeds of Geese. Deutsche Ganzerassen. Qualitäts-Unterschiede deutscher Gänseschläge. Deutsche Landwirtschaftliche Geflügel Zeitung, 1934, No. 12.

The products of Silesian slaughter geese are of more value than those of geese from East Prussia.

The connection between Date of Birth, Commencement of the Lay and Egg-Production. Untersuchungen über Wechselbeziehungen zwischen Schlupfzeit, Alter bei Legebeginn

und Legetätigkeit. Thesis. Ilmgaudruck, Pfaffenhofen a.d.Ilm. Archiv für Tierkunde, Kleintier und Pelztier, March, 1935.

There is but a very small connection between the date of birth and egg production. Early hatching gives a somewhat higher production than later hatching. The older the hens are when they begin to lay the lower the production.

Fishponds and Duck Keeping. Teichwirtschaft und Geflügelzucht in ihren Wechselbeziehungen. Probst. Geflügel Börse, 1934, No. 100.

Water-fowl cause no damage to fish breeding in ponds. If well cared for a duck can contribute 1 kg. to the growth of the fish as the fæces of the duck are of great value to the growth of fish food in the pond.

Abnormal upper Mandible, a new lethal Mutation in the domestic Fowl. V. S. Asmundson. Journal of Heredity, Vol. 27, 1936, p. 401.

An eighth lethal factor in the fowl involving abnormal maxillæ of the upper mandible and associated conditions is described by the California Experiment Station. Few of the affected birds were able to pip the shell, and only one hatched. The condition appeared among the progeny of one hen, and about one-half of her normal daughters were carriers. As there was no significant departure from the normal in the sex ratio of the lethal chicks and there were produced 58 abnormals to 173 normals, the condition is evidently due to a recessive autosomal gene. Attention is called to the occasional appearance of a similar abnormality in pheasants, partridges and turkeys.

Poultry Breeding in Denmark, its History and Development. Fjerkraeavlen i Denmark. Dens Historie og Udvikling. W. A. Kock Ed.: H. Hagerup, Copenhagen, 1937.

Denmark's Poultry Association has celebrated its 25 years jubilee this summer with a Scandinavian Poultry Congress and has on this occasion published a commemorative writing composed by the Danish Government Adviser in Poultry Breeding, W. A. Kock.

The book is well illustrated and comprehends 156 pages in which is given a general review over the poultry breeding in Denmark from antiquity up to the present time. In special sections are mentioned poultry breeding from the Middle Ages until the allotment of the villages; poultry breeding from the allotment until about the middle of the last century; poultry breeding in modern times; directions carried out to promote poultry breeding; the different breeds of poultry in which the country takes interest; and the history of these breeds. Further, the development of the export of eggs and poultry, from which it appears that eggs occupy an important position among the leading agricultural products in Denmark and during a number of years have held the third place among the export articles, besides covering a large home consumption. Lastly, a general review of the development of poultry breeding in Denmark, statistically illuminated, is given.

The development of the breed of geese, ducks, turkeys and pigeons is also mentioned, but although there has been some development within these groups, it is the production of poultry and eggs which has been the matter of a considerable development during the last 25 years in Denmark.

NUTRITION

VITAMINS

VITAMIN A

Examination of the Pituitary Membrane of the Throat in A avitamosis. Untersuchungen über die Histogenese der " Pusteln " der Schlundschleimhaut bei der Nährschädenerkrankung (A Avitaminose) der Hühner. L. Claussen. Deutsche Tierärtzliche Wochenschrift, Vol. 45, 1937, p. 161.

Description of the microscopic examination of the typical changes in the pituitary membrane of the throat in A avitaminosis. The festerings are caused by regressive changes of the pituitary membrane glands. The epithelium and the dividing walls of the glands are destroyed, the gland content becomes full of congealed exudate and tissue remains and this mass is extruded in a cheese-like lump. Inflammatory processes are not present.

Changes by A avitaminosis. Zur Histogenese der Veränderungen bei A avitaminose. O. Seifried. Deutsche Tierärztliche Wochenschrift, Vol. 45, 1937, p. 450.

Claussen's experiments in connection with this subject are criticized. From other investigations it appeared that in A avitaminosis the epithelium of certain pituitary membranes and glands degenerates and is replaced by horn-like, flat epithelium (metaplasia). The festerings in the throat are caused by the growth and further differentiation of this epithelium. The presence of inflammation products is the result of secondary bacterial infection.

The part played by Vitamin A in the Life of the Cell. Contribution cytophysiologique à l'étude du role de la vitamine A. Ph. Joyet-Lavergne. Bulletin de la Société Chim. biologique Séance 4 fevrier 1936.

The part played by vitamin A is especially important in the formation of the epithelial cells. Vitamin A plays a part in the formation of the nucleoles and chondrosomes. The chondrosome is a catalyzer in the oxidase-reduction processes in the living cell and vitamin A also plays a part therein.

Biological Studies on the Role of the action of Vitamin A and D and Radio-active Water on the growth of Chicks. Biologische Studien über die Beziehung der Wirkung der Vitamine A und D und radioaktiven Wassers auf die Entwicklung von Kücken. Dr. A. Fleischacker and Prof. Dr. C. Kucera. Sbornik ceskoslovenske Akademie zemedelske, Vol. 12, 1937, p. 326.

In these experiments vitamins A and D had a favourable influence on the growth of the chicks, especially in the case of weakly and sick birds.

Radio-active water increases the favourable influence of vitamins A and D on the growth, but only in doses of ½ to 1 c.c. This combination acted more favourably with vitamin A than with vitamin D.

Vitamins A and D had a favourable influence on the assimilation of the minerals.

Radio-active water strengthened the assimilation of CaO which was promoted by the action of the vitamins. Radio-active water alone acted favourably on the resorption of minerals but to a lesser degree.

The Effect of varying levels of Vitamin A in the Hen Ration on the Vitamin A content of the Egg Yolk, on Hatchability, and on Chick Livability. G. E. Bearse and M. W. Miller. Poultry Science, Vol. 16, 1937, p. 39.

In these trials all groups of pullets reared on rations as described above were continued through their first laying period on rations containing the same levels of dehydrated alfalfa as employed during the growth period.

The vitamin A content in their egg yolk varied in proportion to the amount of vitamin A supplied in the ration, and the chicks hatched from the eggs lived and grew on vitamin A-deficient rations in proportion to the amount of vitamin A in the ration of the parent stock. Maximum hatchability was attained when 500 Sherman-Munsell units of vitamin A per 100 grammes of ration were fed.

The Vitamin A Requirements of Chicks with Observations on the comparative Efficiency of Carotene and Vitamin A. P. R. Record, R. M. Bethke and O. H. M. Wilder, Wooster, Ohio. Poultry Science, Vol. 16, 1937, p. 25.

In a series of feeding trials at the Ohio Experiment Station both prophylactic and curative types of feeding were employed to establish the minimum vitamin A requirements of growing chicks. Cod-liver oil, crystalline carotene, and alfalfa meal were used as sources of vitamin A, with the oil content of all rations kept constant by suitable additions of cottonseed oil. In the prophylactic trials the minimum requirement to promote normal growth and prevent symptoms of vitamin A deficiency to 8 weeks of age was established at from 50 to 100 μg (microgrammes) of carotene, or from 80 to 160 international units of vitamin A per 100 grammes of ration. In the curative trials it appeared that about 100 μg of carotent, or from 120 to 200 units of vitamin A every other day, were required to cure and prevent symptoms of vitamin A deficiency in depleted chicks to 10 or 12 weeks of age. Carotene was effectively utilized by the chicks as a source of vitamin A, the response being similar to that obtained when equivalent rat units of the vitamin were supplied. The vitamin A requirements increased with age, and it is suggested that the minimum requirements as determined in this experiment may not be the optimum level under practical feeding conditions.

The Relation of the Carotenoid Pigments of Feed to the Carotenoid Pigments of Egg Yolk. J. S. Hughes and L. F. Payne, Manhattan, Kansas. Poultry Science, Vol. 16, 1937, p. 135.

Four groups of four laying Leghorn hens received a ration devoid of carotenoid pigments until, after about 3 weeks, the egg yolks were almost colourless. The hens then received into the crop 10, 20 or 30 grammes yellow corn daily per head for a period. A further depletion period followed till the yolks were again colourless. All eggs were collected and the total pigments, divided into

alcohol phasic xanthophylls, and petroleum phasic carotenes and cryptoxanthene, were estimated spectrophotometrically. The pigments in the ration were similarly estimated. The group of hens receiving 10 grammes yellow corn deposited in their eggs 12 per cent. of the petroleum phasic and 17·4 per cent. of the alcohol phasic pigments administered. The corresponding figures for those receiving 30 grammes yellow corn were 4·8 and 23·5 per cent., while those receiving 20 grammes yellow corn showed intermediate values. The individual variations with the petroleum phasic pigments were very high, and, of these pigments, cryptoxanthene appeared to be more readily deposited than the carotenes.

The results were confirmed in a second similar experiment in which a group receiving 40 grammes yellow corn daily was included, and dehydrated alfalfa and green barley were also used as sources of carotenoid pigments.

The Effect of the Administration of large amounts of Vitamin A on the Vitamin A Content of the Hen's Egg. E. M. Cruickshank and T. Moore. Biochemical Journal, Vol. 31, 1937, p. 179.

When 10 per cent. cod-liver oil was added to a vitamin A-deficient diet for hens, the $SbCl_3$ test showed that the vitamin A content of the eggs was doubled. The effect ceased soon after the cod-liver oil was removed from the diet. High doses of vitamin A concentrate produced greater effects, but the proportion of the administered vitamin A which appeared in the egg was only 2 per cent. for cod-liver oil and 0·2 per cent. for the concentrate. At the end of the experiment the hens were killed and high concentrations of vitamin A were found in the livers, and considerable quantities in the kidneys.

The Vitamin A Requirements of White Leghorn Pullets during the growing period. The Effect of varying levels of Vitamin A in the Hen Ration on the Vitamin A Content of the Egg Yolk, on Hatchability and Chick Livability. G. E. Bearse and M. W. Miller, Puyallup, Washington. Poultry Science, Vol. 16, 1937, p. 34, 39.

1. When dehydrated alfalfa was used as a source of vitamin A for White Leghorn pullets for the first 24 weeks of life, 175 Sherman-Munsell units of vitamin A per 100 grammes ration were required to prevent death from vitamin A deficiency and to produce good growth and liver storage of the vitamin.

2. Dehydrated alfalfa was supplied to White Leghorn hens in varying quantities, and vitamin A appeared in the egg yolk in amounts proportional to the quantities supplied to the hens. The hatchability of the eggs increased with increases in the vitamin A content of the ration up to 500 Sherman-Munsell units per 100 grammes food. The eggs with the highest vitamin A content produced chicks with the greatest power of survival on a vitamin A-deficient diet.

A Crystalline Vitamin A Concentrate. H. N. Holmes and R. E. Corbet. Science, Vol. 85, 1937, p. 103.

In this preliminary note it is announced that a vitamin A concentrate distinctly crystalline to the naked eye has been prepared from the non-saponifiable matter of the Ishinagi-liver oil (*Stereolepis ishinagi*) by solution in a suitable solvent and fractionation by freezing at a temperature of solid carbon dioxide. Certain physical and chemical constants for the concentrate are given, with tentative values for carbon and hydrogen content.

Spectrographic Studies on the Antimony Trichloride Reaction for Vitamin A.—I, The relation between tintometer readings and spectral absorption of the blue solution. O. Notevarp and H. W. Weedon. Biochemical Journal, Vol. 30, 1936, p. 1705.

A series of reactions with antimony trichloride reagent (concentration 200 to 225 grammes per litre of chromogenic substance) was carried out at $18° \pm 0{\cdot}5°$ C., including one set made in a partial vacuum at about 30°, on samples of pure cod-liver oil and concentrates. The solutions were examined in the tintometer to determine blue values, and spectrographic measurements were made with 5 seconds as the standard time of exposure.

The blue solutions of the oils and concentrates in amounts varying from 0·05 to 0·4 c.c. followed Beer's law. This finding was confirmed spectrographically, and it is concluded that this lack of proportionality between blue readings and the concentration is a purely physical phenomenon. "The blue value, as read in the tintometer, of a solution with a given absorption maximum is 40 to 50 per cent. higher when the band lies at 618mμ than when it lies at 603 mμ. Even if the reaction were not inhibited by the oil, a concentrate should therefore always give a blue value nearly twice that of the corresponding oil if they are measured at the same reading."

VITAMIN B

The Multiple Nature of the Third Factor of the Vitamin B Complex. S. Lepkovsky, T. H. Jukes and M. E. Krause. Journal Biological Chemistry, Vol. 115, 1936, p. 557.

This contribution from the California Experiment Station presents definite evidence that the "third factor" of the vitamin B complex necessary to supply the requirements of the rat consists of two components. Details of the procedure for their separation are described. The first component prevented or cured acute dermatitis in rats but had no effect on chick dermatitis. The second component, previously described as the filtrate factor, prevented or cured chick dermatitis, but when fed in the absence of the first component aggravated the rat dermatitis. Both components are required by the rat for normal growth, and symptoms of the deficiency of the second factor are described.

In vitro action of Crystalline Vitamin B_1 on Pyruvic Acid Metabolism in Tissues from polyneuritic Chicks. W. C. Sherman and C. A. Elvehjem. American Journal Physiology, Vol. 117, 1936, p. 142.

In further studies the oxygen uptake of fresh minced brain and kidney tissue from both normal and polyneuritic chicks in pyruvate substrate has been determined. The respiration of the avitaminous brain and kidney tissue in this substrate was inhibited, particularly in the case of the latter. The addition of small quantities of vitamin B_1 to the pyruvate substrate increased the oxygen uptake nearly to the level of that of normal tissue. This reaction was accompanied by an increased removal of the pyruvate, although not to a normal level, suggesting that the effects observed in this trial may be secondary to the participation of the vitamin in some other reaction closely associated with pyruvate oxidation.

A Study of Anaerobic Glycolysis in tissues from polyneuritic Chicks: The negative action of Vitamin B_1. W. C.

Sherman and C. A. Elvehjem. American Journal Physiology, Vol. 117, 1936, p. 151.

In further studies on the carbohydrate metabolism of polyneuritic chicks it is shown that fresh samples of brain, heart, kidney, liver, and skeletal muscle *in vitro* readily form lactic acid from glucose or glycogen under anærobic conditions. There was no significant accumulation of pyruvic acid under these conditions. The addition of vitamin B_1 had no effect on the rate of anærobic glycolysis, indicating that this vitamin has no function in anærobic carbohydrate metabolism and its action is limited to the oxidative metabolism of these carbohydrate intermediates.

A Chemical Reagent for the Detection and Estimation of Vitamin B_1. H. J. Prebluda and E. V. McCollum. Science, Vol. 84, 1936, p. 488.

In this preliminary note it is stated that when a solution of either *p*-amino acetanilid or methyl-*p*-amino phenyl ketone (*p*-amino acetophenone) is treated with nitrous acid and the product formed by the reaction is treated under certain conditions with vitamin B_1 a characteristic purple-red compound is formed which is stable and highly insoluble in water. The coloured compound may be extracted quantitatively with a suitable solvent. The test is said to be extremely sensitive, the reaction taking place with quantities as small as several millionths of a gramme of the active material.

The Effect of Polyneuritis in Chicks upon the Vivo Rate of Removal of Pyruvate injected intravenously. W. C. Sherman and C. A. Elvehjem. The Journal of Nutrition, Vol. 12, 1936, p. 321.

In this phase of the study sodium pyruvate was injected intravenously into normal and polyneuritic chicks. Blood analyses indicated a very rapid removal of the pyruvate from the blood of the normal chick, while a much slower rate of removal was noted in the polyneuritic lot. These results confirm the view that in polyneuritis there is a failure in the tissue metabolism of pyruvic acid.

Effect of Vitamin B Deficiency on the Composition of Pigeon Muscle. Influence de l'avitaminose B sur la composition du muscle du pigeon. R. Duffau.

Effect of acute Alimentary Disequilibrium of Carbohydrate Origin on the Composition of Pigeon Muscle. Influence du déséquilibre alimentaire aigu d'origine glucidique sur la composition du muscle. R. Lecoq and R. Duffau. Comptes Rendus Académie Science, Vol. 204, 1937, p. 192.

1. The muscles of pigeons forcibly fed on a synthetic diet containing 66 per cent. glucose and deficient in B vitamins, with or without addition of varying amounts of yeast, were analyzed for total reducing sugars, lactic acid, orthophosphate, creatine-phosphoric acid, adenyl-pyrophosphoric acid, readily hydrolyzable esters, and total acid soluble phosphate. The results are compared with those obtained from pigeons on a natural diet, and previously published. The differences were not striking but it is concluded that complete vitamin B deprivation caused an increase in total reducing sugars, lactic acid, orthophosphate and total acid soluble phosphate: addition of 2 grammes of yeast daily to the synthetic diet

protected against all metabolic disturbances, but daily amounts of 0·5 or 1·0 gramme failed to prevent the ultimate appearance of metabolic disturbances. The lactic acid level in delayed polyneuritis in pigeons receiving 0·5 gramme yeast daily was as high as in acute polyneuritis.

2. An attempt was made to bring about an increase in the lactic acid content of the tissues of pigeons without attendant vitamin B_1 deficiency by procedure similar to that described above, except that galactose was substituted for glucose and the birds received 4 grammes yeast daily. Pigeons were killed after 2 to 6 days. There was an increase in muscle lactic acid, total reducing sugar, orthophosphate and total acid soluble phosphate, but a decrease in adenyl-pyrophosphoric acid. Emphasis is laid on the definite increase in muscle lactic acid.

The pH and Buffer Value of the Brain in normal and in Vitamin B_1 deficient Pigeons. Sur le pH et le pouvoir tampon du cerveau des pigeons normaux et en avitaminose B_1. I. I. Nitzescu and I. D. Georgescu. Comptes Rendus Société Biologie, Vol. 124, 1937, p. 155.

In vitamin B_1 deficiency the average *p*H of pigeon's brain was lowered from 7·3 to 7·0. There was also a slight diminution in the buffering value of the tissue.

Preponderating Effect of Deficiency of Vitamin B Complex in producing Testicular Atrophy in Beriberi in Pigeons. L'influenza preponderante della mancanza del complesso vitaminico B nel determinismo dell'atrofia testicolare nel beriberi dei colombi. A. Cannava. Bolletino Società ital. Biologia sperimentale, Vol. 11, 1936, p. 973.

The average weights of the testes of pigeons which received a diet of polished rise, a full normal diet, a normal diet restricted in quantity so that the loss in weight of the birds was about 20 per cent. as in those receiving polished rice, or no food at all were, respectively, 0·3, 2·2, 1·4 and 0·6 grammes. It is concluded that lack of the vitamin B complex specifically promotes testicular atrophy.

Effect of slight Undernutrition on the Testes of the Pigeon. Influenza degli stadii lievi dell'ipoalimentazione sul testicolo del colombo. G. Sanfilippo. Bolletino Società ital. Biologia sperimentale, Vol. 11, 1936, p. 980.

It was ascertained that the ordinary daily consumption of maize by adult male pigeons was about 20 grammes. Similar birds received an intake restricted to about 11 grammes daily for 4 weeks. They lost about 15 per cent. of body weight, but their sexual behaviour relative to hens and other cocks remained unaltered, and histological examination of the testes showed them to be normal. It is concluded that the loss of weight of about 15 per cent., which occurs in pigeons receiving a diet deficient in the vitamin B complex, is not the cause of the testicular atrophy.

VITAMIN D

A New Vitamin D_3. Ein neues Vitamin D_3. Kosmos, Sept., 1937.

The discovery of vitamin D_3 is due to the fact that it was observed that as a protection against rachitis, chickens needed a 400 times greater dose of vitamin D_2

than rats, while they also needed a dose of tunny fish oil extract 3 to 13 times as large as that administered to rats. From this it was concluded that natural oils contain a substance which, for rachitis in chickens, is much more valuable than vitamin D_2, *i.e.*, it has a greater protective quality against rachitis. At the General Chemical Institute of the Göttingen University, Dr. Hans Brockmann succeeded in segregating from tunny fish liver oil, a vitamin in crystallized form which possessed the quality mentioned above. The Nobel Prizewinner, Professor Dr. Windaus, Göttingen, and his fellow workers Scheuch and v. Werden, have already succeeded in producing this new vitamin synthetically. D_3 is superior to D_2 as a protective for chickens whereas the reverse is the case with rats (the ratio is about 5 : 8).

A New Source of Provitamin D. Windaus and Bock. Hoppe Seylers Zeitschrift f. Physiologische Chemie, 1937, p. 245.

Information regarding the presence of D provitamin in the organs of mammals. The skin proved to be the best source. From 100 kg. pig skin 30 grammes of raw sterols were obtained containing 4 per cent. provitamin D. Further chemical examination proved that this provitamin is identical with 7-dehydrocholesterol, so that it is expected that after treatment with ultra-violet rays this provitamin will produce a vitamin D suitable for chicks.

Comparison of Cod-liver Oil and Ultraviolet Irradiation as Sources of Vitamin D for confined laying Hens. R. B. Nestler. Journal of Agricultural Research, Vol. 54, 1937, p. 571.

Data on live weight, feed consumption, egg production, egg weight, hatchability of fertile eggs, weight of eggshells, and the chemical composition of eggshells were obtained on three groups of Rhode Island Red chickens kept in confinement for 2 years without access to direct sunlight. One group received cod-liver oil fed at a 2 per cent. level, another received ultra-violet irradiation administered for 15 minutes daily with a carbon arc, and a third received no vitamin D supplement. A definite level of phosphorus and a definite calcium-phosphorus ratio were maintained throughout each year. The same diet was fed for the duration of the experiment, except for a change in the mineral content at the end of the first year. Its vitamin A content was sufficient to meet the minimum requirements of a laying hen.

Cod-liver oil as a source of vitamin D gave better results in egg production, live weight of the hens, total weight of eggs produced per hen, weight of eggshells, and hatchability of fertile eggs, than did ultra-violet irradiation for 15 minutes daily. However, the differences in the results obtained from the two sources of vitamin D on the weight of eggshells and on the hatchability of eggs during the second year were not statistically significant. For maintenance of good egg weight, ultra-violet irradiation was nearly as efficacious as cod-liver oil. More feed was consumed per bird with cod-liver oil than with ultra-violet irradiation, but less feed was required for each dozen eggs produced.

The percentage of ash and calcium in the eggshells was practically the same for both sources of vitamin D. However, the percentage of phosphorus in the eggshells from the birds receiving cod-liver oil was somewhat lower than that in the eggshells from either the birds receiving ultra-violet irradiation or those receiving no vitamin D supplement.

The results thus show conclusively that 2 per cent. of cod-liver oil added to a good laying diet for strictly confined birds is superior, as a source of vitamin D, to ultra-violet irradiation for 15 minutes daily with a carbon arc. Either source of vitamin D yields better results than an inadequate supply of the vitamin.

Vitamin D Requirements of Growing Chicks as affected by the Calcium content of the Ration. J. R. Couch, G. S. Fraps and R. M. Sherwood, College Station, Texas. Poultry Science, Vol. 16, 1937, p. 106.

Varying amounts of vitamin D and of Ca were supplied to White Leghorn chicks in battery brooders. Criteria were: gain in weight, occurrence of macroscopic rickets and bone ash. The amount of Ca ranged from 1·31 to 1·71 per cent. in the ration of the vitamin D from 1·1 to 3·6 international units per 100 grammes feed. The best results were obtained with 3·6 international units of vitamin D, but with this amount of vitamin D no better results were obtained with 1·7 per cent. Ca than with 1·5 per cent.

Effect on Experimental Rickets of Folliculin irradiated with Ultraviolet Light. Azione della follicolina irradiata con raggi u.v.sul rachitismo sperimentale. C. Vacca. Bolletino Società ital. Biologia sperimentale, Vol. 11, 1936, p. 148.

Groups of chickens 2 months old received a rachitogenic diet alone or with addition of irradiated ergosterol or of 100 international units of vitamin D daily as folliculin irradiated with ultra-violet light. After 2 months, radiograms showed the negative control group to be rachitic, the bones of those receiving irradiated folliculin to be moderately well calcified and without deformities, and the bones of those receiving irradiated ergosterol to be fully calcified.

Similar experiments with rats confirmed the above result, and also showed that irradiation did not destroy the power of the hormone to hasten the opening of the vagina in female rats, but did injure the ability to inhibit testicular development in male rats.

The Effect of Storage on the Vitamin D value of Columbia River Salmon Fish Meal. J. S. Carver, V. Heiman and J. L. St. John. Poultry Science, Vol. 16, 1937, p. 68.

In chick feeding trials at the Washington Experiment Station salmon fish meal (17·4 per cent. fat) fed at either 2·9 per cent. or 5·7 per cent. levels in the all-mash ration gave complete protection against rickets. The same mixed ration after 1 year's storage still afforded protection at the same levels of feeding, but when the fish meal was stored separately for 1 year and then incorporated in the mix it gave protection at the 5·7 per cent. level but failed at the 2·9 level. It is suggested that the basal ration may have acted as an antioxidant in preventing loss of vitamin D in the salmon meal during storage.

VITAMIN K

The Quantitative Determination of Vitamin K.—I. F. Schönheyder. Biochem. Journal, Vol. 30, 1936, p. 890.

Continuing the investigation by Dam on the antihæmorrhagic vitamin of the chick (vitamin K), a test for its quantitative determination is described. This is a curative method, a unit of vitamin K being defined as the smallest daily dose of a test substance per gramme of chicken given for 3 days which is able to reduce the *S* value from over 1,500 to 10. The *S* value is a quantitative expression of the degree of sickness of the animal based on the comparative concentration of a clotting agent required to clot diseased and normal bloods within a given time. The methods for drawing blood from the carotid artery, determining the coagulation time, and calculating the *S* value are described.

The Occurrence and Chemical Nature of Vitamin K. H. Dam and F. Schönheyder. Biochem. Journal, Vol. 30. 1936, p. 897.

This contribution establishes green vegetables as particularly rich sources of vitamin K. With regard to the chemical nature of this vitamin, using extracts of hog-liver fat, it is shown to be quite thermostable. Its potency is greatly reduced by cold saponification and completely destroyed by saponification. Continued exposure to light and air also greatly reduced its potency, although it is not determined whether this was due to the action of light or to rancidity. Acetone has proved to be a particularly good solvent for extraction of the product. Adsorption on aluminium oxide, calcium carbonate, or cane sugar proved effective methods of concentrating the vitamin.

SUNDRIES

Report of the Vitamin Assay Committee of the American Drug Manufacturers' Association—Twenty-sixth Annual Meeting—May, 1937. I.—The practical application of the spectrophotometric method for assay of Vitamin A. A. D. Holmes, A. Black, C. R. Eckler, A. D. Emmett, F. W. Heyl, C. Neilsen and E. J. Quinn. Journal of the American Pharmaceutical Association, Vol. 26, No. 6, June, 1937.

Summary and Conclusions:

The data from the various laboratories show that individual laboratories can obtain consistent results, and that the results of different laboratories bear a fairly constant relation to those of other laboratories.

It is quite apparent from the results of this study that in order to correlate the data of different laboratories it is essential to refer the data of all laboratories to a standard of reference. The U.S.P. Standard of Reference Cod-liver Oil, which is being widely used for biological assays, is well suited to this need. The average "E value" obtained for this oil by the Vitamin Committee was 1·61.

The vitamin A potency of the U.S.P. Standard of Reference Cod-liver Oil has been officially designated as 3,000 vitamin A units per gramme. Hence, the tentative factor for converting vitameter E values into U.S.P. XI vitamin A units per gramme is 1,875.

It is apparent from the statistical discussion of the data obtained in this study that in conducting vitamin A assays each laboratory must apply a factor for converting its "E values" into U.S.P. Standard of Reference Cod-liver Oil biological vitamin A units.

In practical operation the vitamin A potency of a cod-liver oil may be computed in terms of U.S.P. XI units per gramme from the vitameter "E value" by

$$\frac{1{\cdot}61 \text{ times } 1{,}875 \text{ times "E value" of oil being assayed}}{X}$$

where X = the "E value" obtained by the individual laboratory for the U.S.P. Standard of Reference Cod-liver Oil.

Vitamin Deficiency in Chicks. 47th Annual Report of the Storrs Agricultural Experiment Station, Storrs, Connecticut.

In co-operation with the Bureau of Animal Industry, United States Department of Agriculture, a study was made of peculiar skeletal malformations of chicken embryos and newly hatched chicks produced by a vitamin deficiency. These deformities occurred only among the offspring of chickens that were fed certain diets. Generally the embryos died a short time before hatching, but in rare instances they hatched. The extremities of such specimens are very short and the head tends to be short and broad. Histologically, the principal feature of the abnormality appears to consist in an interference with the normal formation of periosteal bone. Some features of the condition are similar to those found in scurvy, while in other respects there are striking similarities to what is known as osteogenesis imperfecta in new-born infants. Newly hatched chicks with this condition, if kept on a normal diet, show gradual healing of the bone abnormalities by deposition of normal bone and resorption of the abnormal one.

MINERALS

Effect of the Calcium and Phosphorus Content of the Diet of Chickens on Egg Production and Hatchability. H. W. Titus, T. C. Byerly, N. R. Ellis and R. B. Nestler. Poultry Science, Vol. 16, 1937, p. 118.

In two experiments the P content of the diet was fixed at 1·2 per cent., while the level of Ca was adjusted to 1·2, 3·0 and 5·4 per cent. respectively. The groups were duplicated for each level of Ca, supplied in one case as $CaCO_3$ and in the other as $CaSO_4$. Pullets were used in the first experiment and hens in the second. Egg production was highest at the medium Ca level but the high level was much less harmful to the production of pullets than to that of hens. On the low Ca level hens gave a more satisfactory yield than pullets. Hatchability of eggs tended in all cases to be highest on the low Ca level, though this was less pronounced with pullets' eggs than with hens'. It was also more satisfactory with the carbonate as the source of Ca.

Similar results were obtained in a third experiment in which the level of Ca was varied as above for both pullets and hens. This trial included a parallel series with the P level reduced to 0·90 per cent. This reduction did not affect egg yield or hatchability except at the highest levels of Ca, where hatchability was depressed. A method of calculating the Ca requirements for a given rate of production is given.

PROTEINS

Milk Products in Poultry Foods. L'utilizzazione dei derivati del latte nell' alimentazione del pollame. Dr. M. Righi. Rivista di Avicultura, Vol. 6, 1936, p. 309.

Milk products promote the growth of chicks and decrease mortality. The vitamins and minerals in milk can replace cod-liver oil.

Why Feed Albumen? Warum Eiweissfütterung? Prof. Fr. Lehmann. Deutsche Landwirtschaftliche Geflügelzeitung, Vol. 40, 1937, pp. 359, 375.

To effect a proper saving it is necessary to find the smallest quantity needed to keep performance up to its highest level. The writer points out that in milk cattle and pigs proteins are easily saved, while hens can only regain the albumen of the eggs from the proteins proper contained in the food. Through the medium

of numerous examples he shows how unscientific wrong food is; in order to obtain 100 grammes egg compound from albumen-poor food 475 grammes of total nutritive matter are needed, while if the food is rich in albumen only 288 grammes of total nutritive food are required to obtain 100 grammes egg compound. The number of eggs produced in Germany to-day could, with proper feeding, be obtained from half the number of hens now kept. Given an equal production 1,000,000 tons of barley or barley value could be saved. For the production of an egg weighing 57 grammes it is necessary to provide 63 grammes of production food in addition to the life-supporting food (70 grammes grain or a mixture of equal value). The production food must contain 20 grammes of high value albumen food. The provision of this albumen food is a problem of great importance to the nation. Albumen is more necessary for the purpose of egg production than for any other branch of farming. The writer gives the quantities of albumen food necessary to obtain good results. The State should supply the German poultry industry with 100,000 tons of albumen food per year, of which one-half should consist of fish-meal and meat-meal and the rest of oil cake. By this procedure 1,000,000 tons of barley or barley value could be saved. The supplying of fish-meal and meat-meal should meet with no objection as the consumption of oil cake in Germany during 1936 amounted to only 5 per cent. of the total consumption.

Effect of adding protein supplements to Farm feeds for Laying Hens. Die Wirkung von Eiweissgaben auf die Legetätigkeit in Beispielen bäuerlicher Hühnerfütterung. R. Fangauf and A. Haensel. Archiv für Geflügelkunde, Vol. 11, 1937, p. 39.

Feeding experiments were carried out with White Leghorn pullets on rations designed to use the predominant home-grown food supplies of different parts of Germany. Addition of fish-meal or skim milk to cereal rations gave a marked increase in egg production and efficiency of utilization of food and a small increase in average egg size. Returns from a purely grain diet were very unsatisfactory. Hatchability was markedly lower in eggs from the fish-meal groups than in those from the cereal groups with or without milk. On the average skim milk also proved superior to fish-meal in reducing mash consumption and in increasing egg size and body weight.

Soybean Oil Meal prepared at different temperatures as a Feed for Poultry. J. W. Hayward, J. G. Halpin, C. E. Holmes, G. Bohstedt, and E. B. Hart. Poultry Science, Vol. 16, 1937, p. 3.

In a series of chick feeding trials at the Wisconsin Experiment Station the use of high temperature expeller soya bean oil meal (from 140° to 150° C. for 2½ minutes), medium or high temperature hydraulic soya bean oil meal (from 105° to 121° for 90 minutes) or solvent extracted soya bean oil meal (98° for 15 minutes) as the primary source of protein in the chick ration resulted in chicks weighing almost twice as much at 8 weeks of age as those receiving the ground raw soya beans or low temperature expeller soya bean oil meal (105° for 2 minutes), while low temperature hydraulic meal (82° for 90 minutes) gave intermediate results.

In trials involving various combinations of high temperature expeller meal, meat scrap, and dried milk in the ration of growing chicks and laying pullets, rations containing 16 parts of soya bean oil meal as the only protein concentrate proved inadequate, but a combination of 12 parts of soya bean oil meal, 2 parts of meat scrap and 2 parts of dried milk almost equalled an 8 : 4 : 4 or an all-animal protein 0 : 8 : 8 mixture with reference to growth of pullets at 20 weeks of age, and egg production of pullets over an 11-months laying period.

Protein Levels of Rations in Growing Chicks. A. E. Tomhave and C. W. Mumford. Agricultural Experiment Station, Newark, Delaware, Bulletin No. 192, 1935.

Eight pens of 200 White Leghorn chicks were used in this experiment. The chicks were fed rations ranging from 14·5 to 18·5 per cent. protein. The check pens were fed a ration containing 18·5 per cent. protein during the entire 20 weeks that the chicks remained in the brooder houses. The protein levels of the rations in the remaining pens were systematically changed at stated periods during the growing period.

By feeding a protein level of 18·5 per cent. for the first 12 weeks and 16 per cent. from the 13th through the 20th week produced gains equal to the check pens, which was 3 lb., gave the lowest mortality, produced the most uniform pen of pullets, and required the lowest amount of feed per lb. of grain. In this experiment the lower protein level rations produced the highest mortality and the least uniformity in the pens. The results of this trial indicate that the protein level of the growing ration influences growth, mortality, efficiency of the ration and feathering during the growing period.

At the close of the growing period 55 pullets from each brooder house were placed in the laying house to study the effect of protein levels fed during the growing season upon results obtained during the first laying year. The pullets not placed in these groups were leg banded and records of mortality will be obtained during the first year of production. These results will be given in the next report.

A preliminary trial was also conducted with Barred Rocks during the winter months. The results of this one trial do not warrant conclusions at this time.

This project is being continued this season with ten pens of chicks.

GRAINS

The Influence of germinated Grain on the Egg Production. Influenza dell'uso alimentare di embrioni di grano sulla produzione delle galline ovaiole. Dr. M. Mocenni. Rivista di Avicultura, Vol. 7, 1937, p. 2.

1. Experiments with 80 laying hens proved that the winter lay was improved by feeding meal and germinated grain. The average winter lay of the control group was 19·5 eggs and of the test group 24·4.

2. The control birds lost weight and the test birds gained weight during the experiment.

Is Stain poisonous? Beizmittel giftig? Döhler. Thesis. Leipzig, 1936.

The stain preparation used for protecting grain against mildew contains copper sulphate and arsenic. Döhler carried out experiments in connection with the poisoning of hens and pigeons by copper sulphate.

Feeding experiments with stained wheat resulted in loss of weight in the birds and a decrease in the laying capacity of the hens. Hens and pigeons avoid stained wheat when they can find other food. A 0·5 per cent. copper sulphate solution (equal to the stain solution) given as drinking water causes vomiting and diarrhœa (of a blackish-green colour), exhaustion and a falling out of the plumage in pigeons. Pigeons will rather die of thirst than drink the copper sulphate solution. Hens are not so particular.

A dose of about 1·0 gramme is fatal for pigeons and 1·0 to 4·0 grammes for hens. As in all bodily reactions age and constitution play a part. Copper sulphate poisoning commences clinically with blue-green diarrhœa, falling out of

plumage, loss of appetite and vomiting. Death is accompanied by cramp. *Post-mortem* examination reveals a bluish affectation of the stomach and intestinal pituitary membrane and a displacement in all organs. Copper was chemically proved in the liver, kidneys, blood and fæces. Chemical examination of the eggs for copper, however, gave negative results. After penetration of copper sulphate into the blood a clear lymphosis is noticeable.

The use of Substitutes for Sussex ground Oats in the Ration of the Laying Hen. J. H. Prentice. The Journal of the Ministry of Agriculture of Northern Ireland, Vol. 5, 1937, p. 149.

Sussex ground oats in a laying ration were replaced by coarsely ground oats, by bran and by maize meal. The use of each of these substitutes led to: (*a*) a higher rate of egg production; (*b*) increased food consumption; (*c*) lower feeding costs; (*d*) increased profit over the cost of food.

The use of maize meal produced a greater gain in body weight.

Notes on the use of a Higher Proportion of Grain to Mash in the Ration of the Laying Hen. J. H. Prentice. The Journal of the Ministry of Agriculture of Northern Ireland, Vol. 5, 1937, p. 143.

A ration consisting of grain *ad lib.* with 1 oz. per head per day of mash was fed to laying hens in comparison with an orthodox ration. The birds receiving the experimental ration maintained a high level of egg production. The amount of food consumed and the cost of feeding were reduced. The profit over the cost of food was increased.

The Value of Bran for Egg Production. Government of Northern Ireland, Ministry of Agriculture, Monthly Report, May, 1937.

The results from these tests at Greenmount College have demonstrated clearly that bran is an important and necessary ingredient in the ration for laying hens, particularly during the winter and early spring months, if the ration is to be fully efficient.

Constituents of Wheat Gray Shorts which prevent Slipped Tendons. R. M. Sherwood and G. S. Fraps, College Station, Texas. Poultry Science, Vol. 16, 1937, p. 109.

The incidence of slipped tendon or perosis was just as high with an ethylene dichloride extract of wheat grey shorts added to a basal ration as on the basal ration itself. Similarly there was no improvement when an alcohol extract was included. When the residue from the extraction was fed, however, or when the ash of the shorts was added, the incidence of perosis dropped almost to the level obtained when untreated wheat grey shorts were included. The results therefore strongly suggest that the factor in wheat grey shorts which prevents slipped tendons is a mineral and not an organic substance.

A Note on the Effect of different Cereals in the fattening Ration on the Composition of the Body Fat of the Fowl. E. M. Cruickshank, Cambridge. Journal Agricultural Science, Vol. 27, 1937, p. 309.

Groups of Light Sussex cockerels were fed for 12 days on a ration of 12 parts dried skim milk and 88 parts Sussex ground oats, maize meal or barley meal, the effect of these cereals on the composition of the fat being then measured by determination of the molecular weight and I value of the fat and of the composition, molecular weight and I value of the solid and liquid acids. Softest fat was produced by oats in mature birds and by maize in immature birds. Barley produced harder fat in both. Maize had no detrimental effect on the consistency of the fat in either mature or immature birds, when fattening was rapid and live weight gain satisfactory, but it produced a harder fat than that produced by a ration of mixed cereals with a protein supplement.

Germinated Oats for Laying Birds. A. E. Tomhave and C. W. Mumford. Agricultural Experiment Station, Newark, Delaware, Bulletin No. 192, 1935.

Continuing the study of the value of germinated oats in the laying ration, two pens of 50 yearling hens were selected for the experiment. Pen I was fed the regular laying ration used at the Station supplemented with 2 lb. of germinated oats daily per 50 hens. Pen II had ground oats added to the laying ration to give the same protein, fibre, fat and ash intake as Pen I. During the 274 days of the experiment, the production in Pen I averaged 101 eggs per hen as compared with 78 eggs per hen for Pen II. The feed requirement per dozen of eggs was 0·5 lb. less where germinated oats were used. The mortality, size of eggs laid, and weight of hens at the close of the experiment showed no differences between the two pens. This project is being continued at the present time with five pens of pullets.

Comparative Digestibility of ground and whole Grain. I. T. Maslieff and I. P. Denissoff. Biedermanns Zentbl., Abt. B, Tierernähr., Vol. 8, 1936, p. 613.

Results obtained in a series of trials with fowls indicate that in general grinding grain did not materially increase its digestibility. The digestibility of the fat in the ground grain averaged about 4·5 per cent. higher than in whole grain, but this is considered insignificant. A ground mash ration was digested more rapidly than whole grains as determined by rate of passage through the digestive tract, consequently mash feeding would permit a relatively larger feed consumption within a given time.

Preliminary Studies of a Cerebral Disorder of young Chickens. J. P. Delaplane, H. O. Stuart and C. P. Hart. Science, Vol. 84, 1936, p. 396.

This report from the Rhode Island Experiment Station notes the occurrence of a brain disorder in young chicks in the field under a wide variation of feeding and management practices, breeds and strains. The faster-growing chicks from 3 to 6 weeks of age seem most susceptible. This disorder shows a close resemblance to that described by Pappenheimer and Goettsch. Cultural tests indicate that it is not of an infectious nature and is probably of a nutritional type. In controlled experiments with a number of rations only one group on a ration in which corn was the main ingredient developed the typical symptoms and brain lesions. It is believed that some factor or factors in the corn were responsible for, or at least contributed to, this disorder.

A Field Condition resembling Nutritional Encephalomalacia in Chicks. E. Jungherr. Science, Vol. 84, 1936, p. 559.

This contribution from the [Connecticut] Storrs Experiment Station notes the occurrence of a brain disorder in brooder chicks, fed on a number of commer-

cial and home-mixed rations, which is indistinguishable from nutritional encephalomalacia inducible on simplified diets as described by Pappenheimer and Goettsch, and noted above. Comparatively large fast-growing chicks from 14 to 59 days of age are most susceptible. Symptoms of the disorder are discussed. Histological examination of certain organs was necessary to distinguish this field encephalomalacia from other non-microbial paralytic disorders in growing chicks.

Kaffir-corn in Poultry Rations. P. J. Serfontein, Glen. O.F.S. Farming in South Africa, Vol. 12, 1937, p. 136.

Comparative tests on egg production and on growth were made with hens on rations containing yellow maize and kaffir corn, either as grain or meal. No significant differences were observed in the two groups as long as there was adequate green feed included in the ration to supply vitamin A. When there was lack of green feed the hens receiving the kaffir corn fared less well than those receiving yellow maize. It is recommended that kaffir corn be used to replace maize, provided the ration is adequately supplemented with vitamin A.

SUNDRIES

Rations for Turkeys. 47th Annual Report of the Storrs Agricultural Experiment Station, Storrs, Connecticut.

During the season of 1932, New England Conference rations for chicks were fed to turkeys and checked against a manufactured turkey feed. The Conference ration was evidently deficient, probably in protein. The poults grew too slowly and feathered too poorly.

During the seasons of 1933 and 1934, the Conference ration was modified by doubling all the protein concentrates for the first 8 weeks, then reducing these concentrates 25 per cent. for the next 8 weeks. The original ration was fed for the third 8-week period. This modified ration was again checked against the same manufactured turkey feed. Bronze was the breed used in 1932, but Bourbon Reds have been used in each of the last two years.

Feed.	*Males.*	*Females.*	*Feed Consumption.*
	YEAR 1933.		
Conference	17·5 lb.	10·0 lb.	57·2 lb.
Manufactured ...	17·4 lb.	10·5 lb.	65·5 lb.
	YEAR 1934		
Conference	15·2 lb.	9·26 lb.	57·4 lb.
Manufactured ...	16·6 lb.	10·4 lb.	66·4 lb.

These figures seem to indicate that modifying the Conference rations for chicks, as indicated, makes a very efficient feed for turkeys.

Influence of Fat on the Quality of the Flesh and Eggs of Hens. Prof. Ch. Voitellier. La Revue Avicole, Vol. 45, 1934, p. 9.

The writer has divided the article into five separate chapters dealing with the following: Composition of the fatty raw materials, origin of the fat; particulars regarding the transformation of the fat in hens; influence of the food; action of the fat on the eggs, and finally the action on the organic qualities.

In practice it is very difficult to distinguish the triglycerides in their elementary composition, but one can easily account for their proportions in animal fat by taking the iodine and saponifying index into account.

For a long time now it has been known that animal fat, taking the length of time it remains good and its taste into consideration, can very easily be influenced

by the character of the food given to the animal. Halnan and Cruickshank have carried out extensive research work in this field and have come to the conclusion that when fattening and breeding hens it is advisable to avoid food in which there is too much olein.

On the basis of this research it has been revealed that the taste, odour and culinary quality of the flesh of hens is exclusively dependent upon the quantity and nature of the fat substance present in the quantities of food.

The use of Pellets in Feeding Poultry. M. Ponsignon. Vie à la Campagne, Vol. 31, 1934, No. 376.

Repeated experiments carried out by the writer at the Testing Station of the French journal *Vie à la Campagne* have frequently proved the importance of the use of pellets in chicken feeding.

These experiments showed that chickens fed with pellets grew quicker than chickens reared on ordinary food.

The feeding of pellets is not only of importance as regards chickens but for poultry in general, and is a good stimulant for laying.

In this article the writer considers this method of feeeding in regard to laying hens and the lay, which is an extremely delicate and important point. According to the writer himself, the stimulating of the lay, if it is true that this is advantageous, might also cause serious disturbance in the physiological balance of the organism. The choosing of the necessary food for laying hens should therefore be done with the greatest circumspection and the lay and all factors connected therewith must be taken into earnest consideration. One thing especially should not be forgotten, and that is the date of birth as, according to Ponsignon, this is of the greatest importance to the beginning of the lay and it is really true that the writer's own observations have confirmed the fact that early born hens also begin to lay earlier.

It is therefore not a question of giving such hens a stimulant for the lay but, on the contrary, something should be done to retard the lay.

According to the writer this is of special reference to Wyandottes, and he states that the best time for the lay to begin is from August 15 to October 15. In order to retard the lay a special food should be given in addition to the pellets.

If, however, the hens are born late, then the natural consequence is that the lay begins late, and in such cases it is necessary to give them stimulating food in the form of pellets.

Working in this way, *i.e.,* feeding the hens in accordance to their date of birth, excellent results are obtained.

Let it be sufficient proof that among the various entries from the Testing Station of the *Vie à la Campagne* for the National Laying Test were two late-born Wyandottes, which had been given stimulating food in the form of pellets and which were better classified than all their competitors and in the general classification were given first and fifth places.

On entry for the competition these hens weighed 2·750 kg. and 2·450 kg. and in 224 days they laid 153 eggs of 63 grammes and 169 eggs of 55 grammes respectively.

The Influence of Liver Feeding on the Growth of Chickens. Die Wirkung von Leberfütterung auf das Wachstum von Kücken. Prof. Dr. H. Tangl. Budapest.

The writer carried out experiments with a view to controlling the influence of liver on the growth of chicks. For this purpose he used two groups of 20 2-weeks-old chicks. The birds in one group received, besides their normal food, 10 grammes and later 20 grammes of fresh raw liver per 2 days up to the age of 2 months. The other group received, as an albumen-containing food, horse flesh. In order to vary the vitamin substance, both groups received plenty of cod-liver

oil and green fodder during the test period. The birds were weighed weekly. At the end of 10 weeks there was a great difference in the weights of the two groups, those fed with liver showing a 52 per cent. higher weight than the others. The result of these experiments proved that the feeding of liver to young hens acts in the same manner as the feeding of liver to white rats (an earlier experiment). From this experiment we learn, on the one hand, that liver contains certain substances which cause an increased appetite, so that the animals consume a greater quantity of food, and as a result show rapid increase of weight, and on the other hand contains such hormone-like bodies as influence both the bone formation and the activity of all the other organs and as a result promote growth. A comparative review shows that a bird which consumes 400 grammes of liver within 11 weeks gains an increase in weight of 300 grammes. The results of feeding with liver can therefore be condensed in the following facts: a more than 50 per cent. increase of weight as compared with normal feeding and a significant shortening of the time needed for rearing.

Leg Weakness in Chicks. La Paraplégie des Poussins de cinq à six semaines. P. Sebileau. Revue de Pathologie comparée, Vol. 35, 1935, p. 408.

Description of cases of paraplegia in chicks reared in batteries on laying mash for hens. Cure was effected by feeding grit, meat and cod-liver oil.

Field Feeding of Turkeys. Ueber das Weidefüttern der Puten. N. Westermarck. Maatalousr. Aikakauskirja, Vol. 8, 1936, *p.* 183. (Ref. Züchtungskunde, 1937.)

The writer controlled the consumption of food by turkeys from the day of hatching up to the time they were killed, and used the following three groups for his experiment. Group 1, in pens; Group 2, on cultivated land; Group 3, woodland. The two free-running groups were later put on to wheat stubble. The writer gradually divided the fields into square metres and compared the grazed parts with the ungrazed. On the wheat stubble he ascertained the weight of the fallen corn before and after grazing. The saving on food in both grassland and stubble was 40 per cent. The difference between cultivated and woodland was of no importance.

Effect of Grain Feeds and of Changing Feeds on Laying Hens. Beitrag zur Frage der Zuteilung des Körnerfutters und der Wirkung des Futterwechsels bei Legehennen. E. Lauprecht. Archiv für Geflügelkunde, Vol. 11, 1937, p. 19.

In a comparison of feeding wheat grain *ad lib.* as against a fixed daily allowance of 50 grammes per head no significant difference was recorded in either egg production or live weight. In another experiment changes were made at intervals in the nature of the protein concentrates and of the carbohydrate foods included in the ration. Replacement of animal proteins by vegetable proteins caused a fall in egg production, but changes in the carbohydrate foods had no significant effect.

Mangel Beets for the Poultry Farm. H. B. Sprague. Agricultural Experiment Station, New Brunswick, New Jersey, Circular No. 293, 1934.

Contents:

Varieties. Soil Adaptation. Seed Bed Preparation. Care of Crop. Harvest. Storage. Feeding.

Scientific Problems of the Poultry Industry : some aspects of poultry-nutrition. E. T. Halnan, Cambridge. Empire Journal of Experimental Agriculture, Vol. 5, 1937, p. 38.

A brief discussion is given of the comparative merits of long and short range research in poultry nutrition, and it is emphasised that, until much more information has been obtained on the nutritive value of different feeding-stuffs for the production of meat and eggs, it will be impossible to provide the poultry farmer with a flexible feeding system. The immediate need is for an accurate measure of the protein and energy requirements of chicks and fowls kept, under different conditions, and of the protein and energy yielded by the commoner feeding-stuffs. With this knowledge it would be possible to predict with more certainty diets that would suit any system of management and also to recommend changes according to fluctuations.

The Nitrogen Balance of Laying Pullets. A. J. Macdonald. Poultry Science, Vol. 16, 1937, p. 247.

Summary.

This paper outlines the results obtained from a balance experiment carried out with two Rhode Island Red pullets fed on a cereal *plus* mineral ration.

The variations observed in the nitrogen balance do not appear to be connected with the egg production, but rather with the appetite of the bird. A large food consumption over any one period usually resulted in a positive nitrogen balance. The results do not suggest that a high egg production during any period is preceded by a marked storage of nitrogen.

The results show that the nitrogen required for egg production can be drawn from the food supplied, even though the ration is considerably lower in protein than the accepted standards.

An estimate is made of the digestible nitrogen required by the birds during the experiment for maintenance and production and the figures show that maintenance and production can be supplied by rations containing considerably less digestible protein than the present accepted feeding standards.

Feeding Tests at Parafield Poultry Station. C. F. Anderson, Chief Poultry Adviser. Australian Journal of Agriculture, March, 1937, p. 663.

In continuing the experimental feeding tests at Parafield Poultry Station, a new series of tests commenced on April 1, 1935. Five tests each of 50 White Leghorn pullets were selected. The pullets were chosen as nearly even in age, type and maturity as was possible.

In order to gain further information on the various methods of feeding, some of the tests are similar to the series which concluded on March 31, 1935.

The following are the methods to be adopted, together with the results from April 1, 1935, to February 28, 1937.

FEEDING TESTS COMMENCED ON APRIL 1, 1935.

1. Wet mash, composed of crushed barley and crushed wheat, with green feed and meat meal; 2 oz. wheat per day.
2. Standard bran and pollard mash, with green feed and meat meal; 1½ oz. wheat per day.
3. Bran and crushed wheat mash, with green feed and meat meal; 2 oz. wheat per day.
4. Mash of crushed oats and crushed wheat with green feed and meat meal; 2 oz. wheat per day.

5. *Mash,* during autumn and winter.—Crushed barley, crushed wheat, chaffed green feed and meat meal. During spring and summer the mash is varied, bran being substituted for the crushed barley.

Grain.—2 oz. wheat per day.

	Total Eggs Laid April 1, 1935, *to February* 28, 1937.
No. 1 Test	13,065
No. 2 Test	13,034
No. 3 Test	13,857
No. 4 Test	11,151
No. 5 Test	12,033

The Evolution of a Sanitary type of Chick Feeder. L. van Es and J. T. Olney. College of Agriculture, Lincoln, Nebraska, Bulletin No. 306, March, 1937.

This bulletin gives descriptions and illustrations of chick feeders. It was found that feeder designs based on self-feeder principles should conform to the following specifications: (1) exclusion of all possibility of the chicks to use the feeder as a roosting place; (2) adequate feeding space and head room; (3) protection against the chicks' entering the feeder; (4) a maximum degree of prevention of feed wastage; (5) a ready passage of mash from hopper to feeding space; (6) simple and inexpensive construction; (7) in the case of outdoor feeders, protection against the entrance of precipitation water into hopper or feeding space.

ANATOMY AND PHYSIOLOGY

ANATOMY

The Feather, the Plumage. Additions to the general and practical Knowledge of Feathers. Die Feder, Das Federkleid. Beiträge zur allgemeinen und praktischen Gefiederkunde. Vols. 1 and 2. Dr. H. Trieling. Zeitschrift für Kleintierkunde und Pelztierkunde : Kleintier und Pelztier. Vol. 2, 1936, May and July.

Two books which give in a scientific and popular manner a summary of the knowledge of the feathering of birds. The books are richly illustrated and contain extensive reviews of literature dealing with this subject.

The following subjects are treated: The forming of the feathers; the various kinds of feathers; the colour of feathers; parasites which live on the feathers; the markings of the feathers; moulting, the feathers as a protection against external influences.

The Innervations of the Bird's Intestine. Beiträge zur Kenntnis der Innervation der Vogeldarmes. A. Abraham. Z. Zellforschung, Vol. 23, 1936, p. 737.

Histological research dealing with the intestines of *Gallus gallus* and *Passer domesticus*.

Researches in connection with the Composition of the Blood of Hens. Untersuchungen über das Blutbild des Huhnes. F. Huber. Thesis, Vienna. (Ref. Berliner Tierärtzliche Wochenschrift, 1937, p. 462.)

Blood tests on 30 hens and 20 cocks. The writer makes the following statements in connection with the strongly varied opinions regarding pseudo-eosinophils and azurgranula: The number of rod-shaped pseudo-eosinophils is greater in the cock (35·24 per cent.) than in the hen (19·48 per cent.). The pseudo-eosinophils are more numerous than the lymphocytes in cocks. The reverse is the case in hens. In spite of very extensive research azurgranula in the lymphocytes were only found in four hens and one cock.

Morphological Deviations in the Hen. G. Bisbocci. Nuovo Ercolani, Vol. 40, 1935, p. 449.

Description of a case of double cloaca, some cases of a right oviduct remaining, and a case of a cystic ovary in a hen.

A Case of Gynandromorphism. Un caso de ginandromorfismo bipartito con mosaico somatico nel pollo. A. Vecchi. Archivio Zoologico Italiano, Vol. 23, 1936, p. 377.

Vecchi describes an unsymmetric hen, in which the left side was smaller than the right, and in which the tarsus especially was considerably shorter. The left ear and wattle also had smaller dimensions. The neck feathers were of masculine form, while those of the loins and tail were female, with the exception of a few intermediates. The hen described was, however, symmetrical as regards down. The bird was complicated in so far that the right side, which the writer considered to be male, showed qualities of the "Transilvanian Bare Neck Breed," while the left side had the character of the ordinary Leghorn. On the right was a testis and on the left an ovotestis.

The investigation of the secondary sexual qualities lead one to classify the hen described as a somatic mosaic between two breeds.

The early Development of the Hypoglossal Musculature in the Chick. R. P. Hunter. Journal of Morphology, Vol. 57, 1935, p. 473.

The development of the hypoglossal musculature and nerves begins in the 20 somites stadium and originates in the myotomes 3 and 4.

Heterogeny in the Axial Skeleton of the Creeper Fowl. I. M. Lerner. American Nat., Vol. 70, 1936, p. 595. (Experment Station Record, Vol. 77, 1937, p. 361.)

The heterogenic constituents b and k for normal and creeper fowls in the formula $y=bx^k$ expressing growth of a part in relation to the whole body are presented by the California Experiment Station. The ratio for log b of normals and creepers was shown to grade regularly from proximal to distal. The study was based on Landauer's data.

A Study of the Chromosomic Elements of the Follicular Epithelium of the Ovaries of Birds. J. Homedes i Ranquini and J. Martin de Frutos. Arxius [Barcelona], n. ser., 2, 1936, No. 2, pp. 305-316, figs. 7 ; Eng. abs., p. 316. (Ref. Experiment Station Record, Vol. 76, 1937, p. 613.)

This report deals with hen and pigeon ovaries at different stages of ovulation. An abnormal behaviour of the chromosomes was observed in some of the miotically reproduced epithelial cells. In these cases the chromosomes are much shorter and thicker than normal, and the chromosome number is always inferior to the diploid, being generally nearer the haploid. The numerical variations observed ranged from 33 to 44 chromosomes in the hen and from 32 to 42 chromosomes in the pigeon. It is believed that these originate as a consequence of an increase or decrease of microchromosomes, with evidence that such anomalies are brought about by a mechanism of miotic type.

It is suggested that such deviation from the typical condition may be the result of an impregnation of the cells by the oestrogenic hormone, causing a miotic stimulus of pathological type.

PHYSIOLOGY

How Duck Eggs are Laid. Wie das Enten-Ei gelegt wird. Eier-Börse, 5th August, 1937.

According to research work carried out by Motohaschi, 71·3 per cent. of Peking and Khaki Campbell ducks lay their eggs with the pointed end first, the remainder with the blunt end first. It happens more frequently with ducks than

with hens that the eggs are laid with the blunt end first. The frequency of the manner of laying can also, according to the writer, be influenced by feeding and by the manner in which the birds are kept. Eggs laid with the blunt end first are of a rounder shape and are usually somewhat heavier. All the eggs in the oviduct have their pointed ends facing backwards, so that some of them must turn round before the laying. Two-year-old birds and hens at their highest production lay eggs with the blunt end first more frequently than one-year-old birds.

The action of Ultra-Violet Rays on Chickens. B. Hayashi. Japanese Journal of Zootechnical Science, Vol. 7, 1935, p. 255. (Ref. Jahresbericht Veterinär-Medizin, Vol. 59, 1936, p. 456.)

Chickens of three different breeds were treated with ultra-violet rays for varying periods. Longer than 60 minutes' treatment improved the growth of Leghorns. In other breeds treatment of less than 10 minutes resulted in better growth. Both the action of ultra-violet ray treatment and its duration varies for different breeds.

Augmentation of Nitrogen to the Egg White after the formation of the Shell Membranes in the Fowl. H. M. Scott, J. S. Hughes and D. C. Warren. Poultry Science, Vol. 16, 1937, p. 53.

In a study at the Kansas Experiment Station the absolute nitrogen content of laid eggs (each representing the first of a clutch) from 13 hens was compared with that in immature eggs from the same individuals (each representing the second egg of the same clutch intercepted in the isthmus). It was found that the immature eggs contained an average of 96 per cent. as much nitrogen as the laid eggs, although the former contained only 51 per cent. by weight as much white as the latter.

By determining the total nitrogen in the consecutively laid eggs from eight hens it was shown that the second-laid egg of a clutch averaged only 90 per cent. as much nitrogen as the first egg of the same clutch. It is concluded that differences in the nitrogen content of immature and laid eggs as noted by Pearl and Curtis were due entirely to the effect of clutch position and not to any infiltration of protein through the shell membrane. It is pointed out that according to the laws of physical chemistry protein would not pass from the uterine secretion of low protein concentration through the shell membrane into the egg white of higher protein concentration.

The surgical removal of the Gizzard from the Domestic Fowl. W. H. Burrows. Poultry Science, Vol. 15, 1936, p. 290.

This article from the U.S.D.A. Beltsville Research Centre describes a technique for the surgical removal of the gizzard from fowls. From 24 such operations 11 were successful, while 7 of the failures were believed to be due to feeding too soon after operation, resulting in rupture of the anastomosis of the proventriculus and duodenum.

Fluctuations of Calcium and inorganic Phosphorus in the Blood of the laying Hen during the Cycle of one Egg. J. G. Feinberg, J. S. Hughes and H. M. Scott. Manhattan, Kansas. Poultry Science, Vol. 16, 1937, p. 132.

Blood was drawn immediately after, 11½ to 13 hours after, and 26 hours after oviposition. The Ca in the blood was fairly constant, but the inorganic P greatly increased during the period of shell formation. It is suggested that bone material is mobilised for shell formation, the Ca used and P liberated. This view is in very close agreement with Common's theory.

A comparison of the Glycine Contents of the Proteins of Normal and Chondrodystrophic Chick Embryos at different stages of Development. A. R. Patton. Journal of Nutrition, Vol. 13, 1937, p. 123.

The glycine content of 60 normal and 83 chondrodystrophic chick embryos was determined. From the analytical data it is concluded that glycine is synthesised during development of the chick embryo, and that chondrodystrophic embryos contain less glycine than normal. The question whether the subnormal glycine synthesis is the result or cause of chondrodystrophy is briefly discussed.

Glucolysis without Phosphorylation in the Chick Embryo. J. Needham and H. Lehmann. Nature, Vol. 139, 1937, p. 368.

Evidence is adduced leading to the view that in the chick embryo there are two separate routes of carbohydrate breakdown: (1) a very active non-phosphorylating glycolytic mechanism in which glutathione is necessary and in which methylglyoxal, dioxyacetone and glycerol are not intermediates, and (2) a phosphorylating mechanism closely similar to that in muscle, but of low activity, dealing with glycogen and hexosediphosphate. In early embryonic development it would appear that the phosphorylating machinery has not been fully laid down.

Physiology of the Creeper Traits. 47th Annual Report of the Storrs Agricultural Experiment Station, Storrs, Connecticut.

Much attention has been paid in the past to the developmental physiology of the Creeper traits. Data from various sources all seemed to lead to the conclusion that the mechanism by which the Creeper mutation produces the characteristic Creeper traits consists in an unspecific retardation of embryonic growth in early development. It was decided to put this conclusion to an experimental test. This was done in co-operation with Dr. H. B. Fell (Strangeways Research Laboratory, Cambridge, England). It was the purpose of this work to find out if skeletal changes similar to those observed in homozygous Creeper embryos could be produced experimentally in genetically normal embryos by exposing them to growth-retarding agencies. The work was carried out by growing limb buds of normal embryos *in vitro,* in normal culture medium and in a growth-restricting medium containing only traces of embryo extract. The results obtained in this work may be taken as an experimental verification of the conclusion that the abnormalities of Creeper embryos are due to an unspecific growth retardation. The effects on cartilage formation and on ossification of limb buds grown in a growth-restricting medium are very similar in nature to the abnormalities found in homozygous Creeper embryos. It appears that there is a critical period in early development of the limb skeleton, and that during this period conditions which restrict growth also prevent subsequent ossification, while after this period the same conditions fail to have an effect on bone formation. As in the Creeper stock no significant abnormalities are observed in the membrane bones of the skull, so in these *in vitro* experiments, growth-restricting agencies failed to produce abnormalities in membrane bones.

Function of Oil Gland. 47th Annual Report of the Storrs Agricultural Experiment Station, Storrs, Connecticut.

It has been stated in the literature that the oil gland of chickens is necessary for normal growth and that its removal will cause rickets which cannot be prevented or healed by cod-liver oil. The correctness of this conclusion seems doubtful in view of the fact that in genetically rumpless chickens the oil gland is always absent and that these chickens do not exhibit any abnormalities of growth. An experiment in which the rump, including the oil gland, was removed in newly hatched chicks, gave conclusive evidence that normal growth will take place when the oil gland is absent.

HORMONES

The significance of the Thyroid Gland in the Development of the Plumage. Zur Analyse der Bedeutung der Schilddrüse im Entwicklungsprozess des Gefieders. A. A. Woitkewitsch. Biologisches Zentralblatt, 1936, p. 168.

The thyroid gland is to a certain extent necessary for the normal formation of the feathers, but it is not the chief factor in moulting. This also depends on the formation of the feather-building tissue.

The development of the wing and tail pinions is to a great extent just as independent of the action of the hormones as the smaller feathers of the rump. The pinions of the wings and the tail in pigeons grew again after repeated pluckings, which was not the case with the small feathers of the rump. These only return after administration of thyroid hormones.

The condition of the Endocrine System during the formation of the Plumage. Der Zustand des Endokrinsystems während des Prozesses der Gefiederentwicklung mit besonderen Berücksichtigung der Schilddrüse. A. A. Woitkewitsch. Inst. f. Exp. Morphogenese. Moscow. Biol. generalis, Vol. 12, 1936, p. 169. (Ref. Jahresbericht Veterinär-Medizin, Vol. 59, 1936, p. 619.)

A hyperfunction of the thyroid gland was observed during the formation of the feathers in young pigeons. This process is terminated on the 20th day of life and is at its maximum on the fifth day. The filling of the crops runs parallel with the formation of the feathers. After the 15th day of plucking the body weight of full-grown pigeons increases and during the fifth to tenth days a hyperplasia of the thyroid gland takes place. During this period the sexual glands lose weight.

The part played by the Thyroid Gland in the formation of Feathers of Chickens. Die Rolle der Schilddrüse im Prozess der Gefiederentwicklung bei den Hühnerkücken. I. N. Grektorsky and N. A. Kasmina. Moscow. Biologisches Zentrallblatt, Vol. 55, 1935, p. 16.

The writers removed the thyroid glands of chickens of from 25 to 50 days old. The growth, feather formation and moult of these birds were compared with those of control birds. The growth of the athyroidal birds was slower, the growth of the plumage was greatly retarded and the first moult began later than in the normal birds. The writers came to the conclusion that the thyroid gland hormone

has no specific action on the formation of the plumage, but that the changes in the feather formation are connected with the disturbance of the total growth.

Formation of Fur and Feathers. Mechanism and Metabolism. Formation de la fourrure et du plumage. Mécanisme et métabolisme. R. Jacquot. Bull. Soc. sci. Hyg. aliment., VII, 25, 1937, p. 78. (Ref. Nutrition Abstracts, Vol. 7, 1937, p. 102.)

This is a review dealing particularly with the relationship between hormonal (thyroid) action, S and N metabolism, and the production and loss of hair and feathers. The chemical composition of these is also discussed.

The Thyroid and other Endocrine Glands in relation with Plumage Colours in Fowls. A. M. Geriche. Grootfontein School of Agriculture, Middelburg, Cape. South African Journal of Science, Vol. 31, 1934, p. 415.

1. The feeding of desiccated thyroid extract in small doses produces a beautiful black colour with the green sheen in Australorp capons.

2. Feeding of large doses produces white feathers in females and reddish feathers in males.

3. Thyroid extract has a depressing effect on capons. The birds become nervous and are restless.

4. Thyroid feeding encourages moulting and activates the newly developing feather germs to a higher level of activity.

5. The feeding of this substance may serve a useful purpose to bring about uniform moulting in laying hens, and encourage feather growth in young stock.

Idiopathic Hypoparathyroidism and Tetany in the Fowl. F. B. Hutt and W. L. Boyd. Agricultural Experiment Station, Minneapolis, Minnesota. Endocrinology, Vol. 19, 1935, p. 398.

A description of a case in which a hen, after laying 11 eggs, became sick with paralysis of the legs and wing-cramp.

The hen recovered after injections of parat-hormone had been administered.

The writers considered this to be a case of hypocalcæmia and tetany caused by temporary disturbance of the parathyroids.

Inoculating hatching Eggs with Hypophysis Hormone. Esperienze di innesto di ipofisi anteriore sullo sviluppo dell' embrione di pollo. G. Pichini. Biochimica e Terapia sperimentale, Vol. 24, 1937, p. 187.

On the third day of brooding the writer grafted hatching eggs with hypophysiary tissue of the anterior part of the gland. This caused considerable acceleration of the development of the embryos.

Studies in connection with Sexual Temperament and Hypophysis. Studien über Geschlechtstrieb und Hypophyse. I. Frühzeitige Entwicklung der sexuellen Charaktere bei Hühnern die mit Geschlechtstrieb reizenden substanzen aus dem serum eines graviden Pferdes behandelt waren. Th.

Martins. Mem. Inst. Butantan, Vol. 8, 1934, p. 347. (Ref. Jahresbericht für Veterinärkunde, Vol. 59, 1936, p. 339.)

Extracts from the anterior part of the hypophysis act both on mammals and birds. The serum of horses in foal has the same action. The action of Prolan on mammals and birds is not so intensive.

Cytological Examination of the Hypophysis of Fowl. Cytologische Untersuchung des Hypophysenvorderlappen beim Geflügel. Y. Katoh and S. Nishida. Japanese Journal of Zootechnical Science, Vol. 8, 1935, p. 16.

Just as in mammals, three types of cells were observed in the anterior part of the hypophysis of fowl.

An increase of A cells was observed in growing and moulting, and of B cells in full-grown and castrated. From this is was concluded that the growth of the A cell forms growth hormones, and the B cell forms sexual hormones.

Absence of follicle-stimulating Hormone in Pituitaries of young Pigeons. O. Riddle and J. P. Schooley. Soc. Expt. Biol. and Med. Proc., Vol. 32, 1935, p. 1610. (Experimental Station Record, Vol. 77, 1937, p. 35.)

The testes of immature ringdoves were increased in size 100 and 300 per cent. respectively by the implantation of one rat pituitary daily for 10 days. Adult pigeon pituitaries produced a greater response but no detectable stimulation followed the implantation of as many as three pituitaries from immature pigeons daily for 10 days. These results substantiate the indication that the slow growth of the testes of pigeons immediately after hatching is due to the failure of the pituitaries of the young pigeon to secrete any of the follicle-stimulating hormone.

Is voluntary Sex Determination in the Hen possible through Sex Hormones? F. Oekland. Biologiche Zentrallblatt, Vol. 56, 1936, p. 147. (Ref. Experimental Station Record, Vol. 76, 1937, p. 616.)

In this experiment an attempt to control the sex in chicks by administering varying doses of the female sex hormone "ovifollin" to hens gave completely negative results.

Voluntary control of Sex by Hormone Injections.—I. Inversion of sex in the genetic male embryo. V. Dantchakoff. Bul. Biol. France et Belg., Vol. 70, 1936, p. 241. (Ref. Experiment Station Record, Vol. 77, 1937, p. 35.

Injections of folliculin into the embryos of fowls at 4 days of incubation were found to modify the gonads of males so that they showed female characteristics. It required about 3 days or more for the effects of the hormone to become evident. In general, the hormone caused proliferation of the left gonad, formation of ovarian tissue, and marked development of the oviduct on the left side as contrasted with the vas deferens on the right side.

Sex-modification in the Chick Embryo resulting from injections of Male and Female Hormones. B. H. Willier, T. F.

Gallagher and F. C. Koch. Natl. Acad. Sci. Proc., Vol. 21, 1935, p. 625. (Ref. Experiment Station Record, Vol. 76, 1937, p. 778.)

The effect of the male and female sex hormones on the development of the gonads and other sex organs in the chick during incubation were studied. The hormones were administered in doses of 0·1 c.c. into the egg albumen after 24 hours' incubation.

Theelin and theelol in the zygotically determined males produced a smaller testis than normal with the flattened form of the left ovary. The gonad thus contained both ovarian and testicular tissues. In females small doses affected the oviducts slightly, whereas large doses caused them to become much swollen. Injections of bull testis hormone produced no observable effects upon the form, size, and histology of the gonads of either sex. Human male urine injections resulted in the formation of a variable amount of cortex on the left testis and the gonad assumed a flattened form. The right testis, or ovary, was unaffected. The asymmetrical differences in the response indicated that the sex hormones do not originate a morphological component but merely activate one already normally present. The degree of intersexuality produced in males appeared roughly proportional to the quantity of female hormone injected. Evidently the male and female hormones stimulate, respectively, Wolffian and Müllerian sex ducts and are, therefore, sex specific. The differences in the response from bull testis hormones and human male urine extracts were not fully understood.

Testicular Hormones and Sebright Plumage. C. H. Danforth. Soc. Expt. Biol. and Med. Proc., Vol. 32, 1935. p. 1474. (Ref. Experiment Station Record, Vol. 76, 1937, p. 779.)

In a study of hen feathering in the Sebright Bantam, three 5½-months-old cockerels were selected. One testicle was removed from one and later part of the other testicle, and both testicles were removed from another. The partially castrated bird finally became cock-feathered, while the capon showed capon feathering. This suggested that the type of feathering of Sebrights is controlled by the amount of testicular tissue present. Grafting bits of Sebright testes on the breast of a Sebright capon caused the development of cock feathering but later injections of beef testes and rat gonadotropic hormone produced hen-feathered plumage. Evidently the extracts from the bull testes and the rat augmented the action of the hormones of the cock-feathered male.

On the relation between the site of Injection of Androsterone and the Comb response in the Fowl. A. W. Greenwood and J. S. S. Blyth. Quarterly Journal of Experimental Physiology, Vol. 25, 1935, p. 267. (Ref. Experiment Station Record, Vol. 76, 1937, p. 613.)

This report from the University of Edinburgh shows that the injection of a total of 2 mg. of androsterone (divided into five daily doses) directly into the comb of capons produced a greater response in increasing the size of the comb than was obtained from the same dose injected intramuscularly in the pectoral region.

In further tests injections of the hormone into the comb of normal hens caused an increase in comb size, although less than that obtained in capons, while intramuscular injections were ineffective. Intracomb injections into a normal male showed no reaction, while an incompletely castrated male gave a marked response.

Quantitative studies on the response of the Capon's Comb to Androsterone. A. W. Greenwood, J. S. S. Blyth and R. K. Callow. Biochem. Journal, Vol. 29, 1935, p. 1400.

Study was made of the influence of different conditions on comb growth in capons in response to the administration of five daily doses of androsterone. The comb response, measured as length-*plus*-height increase, was directly proportioned to the logarithm of the dose between the limits of 0·5 and 8 mg. Age and method of administration (subcutaneously or intramuscularly) were not important factors in causing variable results.

Growth and maintenance of the Fowl's Comb by Administration of Androsterone. R. K. Callow and A. S. Parkes. Biochem. Journal, Vol. 29, 1935, p. 1414.

The administration of doses of 0·5 to 5 mg. of androsterone per day to capons was found to induce comb growth above normal, and crowing and treading occurred. The normal comb condition could be maintained by doses of 1 mg. per day, but the hormone was not able to maintain the vas deferens as adequately. Comparative comb response showed capons to be more sensitive to androsterone than hens, and Leghorns were more sensitive than Plymouth Rocks.

The effect on the Chick of some Gonadotropic Hormones. W. R. Breneman. Anat. Record, Vol. 64, 1936, p. 211. (Ref. Experiment Station Record, Vol. 76, 1937, p. 614.)

This contribution describes a series of tests in which various gonadotropic hormones were administered to young chicks and their effects on gonad development noted. The follicle-stimulating hormones (pig) and pregnant mare serum stimulated maximum gonad development in both males and females. The luteinizing hormone and tannic acid preparations of pregnancy urine caused marked weight increases in both testes and ovaries, the response to each being similar. Prolactin did not significantly decrease gonad weights in either sex, and in a few cases there was evidence of stimulation. The stimulating action of the follicle-stimulating hormone is partially inhibited by admixture with any of the other extracts used in this series. It is evident that the chick ovary at from 5 to 15 days of age is readily susceptible to stimulation.

Action of Light on the Testicles of Birds. Ueber den Mechanismus der Wirkung von Licht auf die Hoden der Vögel (Passer domesticus). Ivanova Timirjaseff. Institut für Biologie, Moskau Naunyn Schmiedebergs Archiv, Vol. 179, 1935, p. 349.

Sparrows were treated with electric light under varying conditions. In some cases the eyes of the birds were covered and in others not. The light caused increase in the size of the testicles. It was assumed that the light not only acts on the testicles through the eyes but also through the surface of the body.

Results of the subjection of the Gonads of Cocks to Rays in connection with the Internal Secretion of the Testicles. Primi resultati di irradiazione delle gonadi del gallo per lo studio della base morfologica della secrezione interna testicolare. A. Scaccini. Bollettino di Zoologia, Vol. 8, 1936, p. 213.

The tests were made with Röntgen rays on young cocks, 4 months old. After about 14 days' treatment with 600 r. the growth of the comb and wattles ceased. Repeated treatment with 200 r. had the same result.

With the aid of micro-photographs a histiological picture of the testicles is described. This experiment did not assist in accurately determining the tissue in which the internal secretion of the testicles takes place.

Change of Male Chickens into Inter-sexes as a result of Injections of Folliculine. Sur la transformation des poulets males en intersexués par injection d'hormone femelle (folliculine) aux embryons. E. Wolff and A. Ginglinger. Archives d'Anatomie, Vol. 20, 1935, p. 219.

By means of injections of folliculine into the embryos the writers were able to change the gonads of male germs into female. Large doses of folliculine resulted in females and smaller doses in inter-sexes. A dose of at least 500 c.c. is necessary to obtain complete change and with doses of less than 25 v.l. there is no feminizing influence. The injection must be given before the eighth day of brooding as on the eighth day only weak feminization is possible with a dose of 2,500 v.l.

The writers look upon this from the point of view of cysto-sexual-determinism in accordance with which the sexual differentiation of the original indifferent gonocysts is dependent upon the surroundings.

Further Purification of Galactin, the Lactogenic Hormone. W. H. McShan and C. W. Turner. Soc. Expt. Biol. and Med. Proc., Vol. 32, 1935, p. 1655. (Ref. Experiment Station Record, Vol. 77, 1937, p. 35.)

A description is given by the Missouri Experiment Station of a method by which a ten-fold concentration of the lactogenic hormone from the anterior pituitary is brought about. The product brings about active proliferation of the crop gland in pigeons.

Auxin in the Chick Embryo. 1 Its presence and the change in concentration with age. T. W. Robinson and G. L. Woodside. J. Cell. Comp. Physiol., Vol. 9, 1937, p. 241. (Ref. Nutrition Abstracts, Vol. 7, 1937, p. 67.)

Auxin was extracted from tissues by means of chloroform, the chloroform extract evaporated to dryness and the active substance taken up in distilled water. Trials with other solvents gave much lower yields than this simple method. The activity of the aqueous solutions, tested by the coleoptile growth method, decreased rapidly on keeping, especially above a temperature of 30° C. and even at 5° C. in the dark. The auxin content of unincubated eggs was approximately 57 " plant units " per egg. Tests made after varying periods of incubation showed a progressive increase of auxin content, indicating synthesis in the embryo during development. This increase was gradual from the third to the 11th day, then more rapid, and maximal activity of 40,000 " plant units " per embryo was found at the 14th day, after which an actual decrease occurred.

Endocrine Glands of Frizzle Fowl. 47th Annual Report of the Storrs Agricultural Experiment Station, Storrs, Connecticut.

In continuation of the work with Frizzle fowl, an extensive study was made of the endocrine glands. This work was carried out in co-operation with

Dr. Sophie D. Aberle (Yale University School of Medicine). Frizzle chickens, as recorded previously, show many physiological disturbances such as increased metabolism, reduced water vaporization, subnormal body temperatures, accelerated heart rate and hypertrophy of the heart, abnormalities of the blood, frequent sterility, etc. The degree of expression of all these symptoms varies with the temperature of the environment. While the condition of Frizzle fowl in many ways resembles that of hyperthyroidism (experimental or as in Graves' disease), experimental evidence indicates that these animals are actually in a condition of hypothyroidism. They respond less to thyroid feeding than normal chickens. The endocrine glands were studied in three groups of Frizzle and normal chickens raised under different conditions of feeding and environment. It was found, among other things, that in the least favourable environment the thyroid of Frizzle shows signs of exhaustion atrophy, and that in a more favourable environment the thyroid is in a condition of hypertrophy and hyperplasia, while in the most favourable environment the thyroid is normal. The adrenals show an increase of medulla tissue, this again being most pronounced in the least favourable environment. No abnormalities were found in the hypophysis. The testes showed a striking increase in size when the birds were kept in an unfavourable environment, and this increase in size was linked with over-activity and exhaustion of the sperm-forming tubules. All these findings are consonant with the assumption, supported by much other evidence, that all the disturbances of physiological functioning in Frizzle fowl are brought about by an abnormally great loss of body heat. If this explanation is correct, newly hatched Frizzle chicks, having been in an environment with constant and favourable temperature before hatching, should show normal glands. It was found, however, that newly hatched Frizzle chicks have slightly but significantly enlarged thyroids. Does this indicate that the Frizzle gene in some way has an influence on size and activity of the thyroid? One experimental test of this question consisted in making reciprocal skin transplants between newly hatched normal and Frizzle chicks. The results show that there is no effect of the host on the feathers growing in the transplant. This seems new proof for the conclusion that the thyroid abnormalities are secondary in nature. Extensive studies of thyroid weight in newly hatched chicks from reciprocal crosses between normal and Frizzle chickens suggest that the increased thyroid weight in newly hatched Frizzle chicks is due to selection for large thyroid size. It is obvious that those Frizzle chicks which at hatching time have a larger or better functioning thyroid than the average will have a better chance to adjust themselves to the stress exerted on various organs and physiological functions as a consequence of the increased loss of body heat due to their defective plumage, and that they will have a better chance to survive. It appears that in this way special genes for large thyroid size have been accumulated in the Frizzle stock. On the whole, the findings in Frizzle chickens emphasize the great importance of the mechanism of heat regulation for the most varied physiological functions of the body and for reproduction.

An analysis of thyroid weight in a large number of newly hatched chicks has shown that females have slightly but significantly larger thyroids than males.

DISEASES

INFECTIOUS DISEASES

PULLORUM

Rapid Blood Test and Slow Serum Test in combating Pullorum Disease. La Siero-agglutinazione rapida e lenta nella diagnoso della pullorosi. Dr. F. Cattaneo. Rivista di Avicultura, 1934, p. 338.

1. The sero-diagnostic tests represent the simplest and surest method of ascertaining infection with *B. pullorum* in hens.

2. The rapid blood test, which makes it possible to isolate infected birds immediately, gives satisfactory results, but only when the treatment is applied by persons completely at home with the technique thereof.

3. The slow test and the rapid test give similar results when applied with technical precision.

4. Compared with the slow test the rapid test has undoubted advantages.

Detection of Typhoid Infection by means of the Rapid Blood Drop Method. Ueber Nachweiss der Geflügeltyphus-infektion durch die Vollblutschnell-methode mit gefärbter Emulsion. J. Katona. Staatliches Veterinär-hygienisches Institut, Budapest. (Ref. Jahresbericht Veterinär-Medizin., Vol. 59, 1936, p. 449.)

Emulsion of *B. gallinarum* in 12 per cent. salt solution, coloured with crystal-violet solution, was used as antigen. One thousand two hundred and sixty hens were examined. The reactions were also controlled by the serum slow test. It was proved that the rapid test was just as sensitive as the serum slow test.

Combating Pullorum Disease in Germany. Vorläufiges Ergebnis der Durchuntersuchung der Hühnerbestände auf weisse Kükenruhr. Dr. Grzimek. Landwirtschaftliche Geflügelzeitung, 8 July, 1937.

The official Poultry Health Department in Germany has commenced making investigations at various farms in connection with pullorum. Inspections are now being carried out at 1,017 farms, members of the association, with a total of 629,425 hens. The official rearing and breeding undertakings in Germany must all be examined for pullorum.

Both the serum and the rapid blood test are being used for this examination, some institutes working with the former method and others with the latter. The rapid blood test has many advantages.

Of the 629 farms already examined, 33·6 per cent. were free from pullorum, 6 per cent. had an infection figure of 0 to 6 per cent., 45 per cent. an infection of 1 to 15 per cent., 12·3 per cent. an infection of 15 to 40 per cent., and 2·5 per

cent. had an infection of more than 40 per cent. The sale of birds for breeding has been forbidden from the last mentioned.

At those farms were voluntary examination has been carried out for some years the percentage of infection was very small.

The antigen in Germany is standardized and is repeatedly controlled.

An investigation is also being carried out now in connection with Marek's paralysis.

The Infection of Human Beings and Badgers (Meles meles) with B. pullorum. Infektion vom Dachs (Meles meles) mit Bacterium pullorum Rettger. Münchener Tierärtzliche Wochenschrift, 1935, p. 439.

Description of a case of poisoning in several human beings which was ascribed to *B. pullorum*. Hen eggs had been used in the preparation of the infected food (potato salad).

Combating Pullorum Disease in Poland. K. Niklewska. Wiadom. Wet., Vol. 15, 1936, p. 31. (Ref. Jahresbericht Veterinär Medizin, Vol. 59, 1936, p. 450.)

In 1934-35 numerous free blood tests were made for the account of the Government. The blood of 11,959 head of poultry was tested, of which 10·05 per cent. reacted positively.

Diagnosis of Pullorum Disease and Leucosis. Die Diagnose der bakteriellen weissen Kükenruhr (Galinarum bazillose) und der Leukose mit den Auswirkungen für die anerkannten Vermehrungszuchten. Dr. H. Hartwigk. Deutsche Tierärtzliche Wochenschrift, Vol. 45, 1937, p. 136.

1. The necessity for combating pullorum disease by certain methods was indicated. The testing of the blood and the bacteriological examination of birds that have died should be in the hands of the organized health department. The sale of eggs for hatching, baby chickens and pullets can be allowed if the percentage of positive reacting birds is not more than 5.

2. The artificially transmissible and the intransmissible leucosis must be further studied. At the moment it is not desirable to make sales conditions for farms at which leucosis occurs.

Experiments in connection with Pullorum Disease and Fowl Typhoid. J. Brill, J. Ciura and A. Skoczek. Wiadomosci Wet., Vol. 14, 1935, p. 369. (Ref. Jahresbericht Veterinär-Medizin, Vol. 59, 1936, p. 450).

Examination of 24 strains of *S. gallinarum* (*S. pullorum*) proved that these strains contain only thermostable antigens and that both specific and non-specific thermostable antigens are absent. On gelatine at *p*H 7·4 two growth types were obtained. One type grew in very small colonies and the other in large colonies.

Contribution to the study of Pullorum Disease of the Fowl. Contribution à l'étude de la diarrhée blance bacillaire des poussins. M. Ferreol. Thèse Inaug., Univ. Zurich, 1935.

This contribution reports upon the clinical symptoms, pathology, epidemiology, occurrence in Switzerland, economic importance, and organization of control work against pullorum disease, presented with a list of 69 references to the literature.

The Pullorum-gallinarum Group in Comparative Bacteriological Tests. G. Pacheco and C. Rodrigues. Mem. Inst. Oswaldo Cruz, Vol. 31, 1936, p. 591. (Ref. Experiment Station Record, Vol. 76, 1937, p. 855.)

In the course of the work here reported 38 strains of the *Salmonella pullorum-S. gallinarum* group of micro-organisms from Europe, North America and Brazil were investigated to determine the fixity of their properties and the possibility of transforming one strain into another. Five types were recognized, namely, (1) gasogenic pullorum, (2) non-gasogenic pullorum, (3) intermedius, (4) gasogenic gallinarum, and (5) non-gasogenic gallinarum. A table which summarizes the more important characteristics of the five types, the first two and the last of which have been well known and recognized by specialists, the third was recognized by the author in 1935, and the fourth by Beck and R. Eber in 1927, is included. The changes produced on neutral red, H_2S production, fermentation of glycerol, isodulcitol, xylose, dulcite, sorbitol and maltose, activity upon Seignette salt, gas production, and appearance of the colonies are among the characteristics on which the distinction of these five types is founded.

"The gasogenic gallinarum type, on account of its action on sorbitol and xylose, and also on Jordan's medium, must be rather considered as a gasogenic intermedius type. Other biological characteristics, such as activity upon milk, milk whey, dextrin, etc., accepted by several specialists, appeared as of no practical value to the distinction of the different types of our strains. The strains kept their properties invariably during all the time of our investigations. The hypothesis of a possible transformation of one type into another has not been confirmed in any of the studied strains, and this justifies the idea of independence of each one of the accepted types. Some discrepancies in fermentation of maltose, as found by several authors in micro-organisms of this group, have not been confirmed in this paper. In blood horseserum a factor capable of transforming maltose was found, making it fermentative. This substance is thermostable and resistant to some antidiastatic substances. The serological analysis of the studied strains did not allow an antigenic distinction among the different types of the bacterial group."

A 6-page list of references is included.

Pullorum Disease control in New Jersey. R. A. Hendershott New Jersey Department of Agriculture. New England Poultryman, Aug. 15, 1937.

In New Jersey a flock, to become pullorum clean, must pass two consecutive non-reacting tests not less than 6 months apart.

A choice of two recognized tests, namely the tube and the whole blood plate tests, is provided. Experience has shown that baby chicks hatched from breeders subjected to the whole blood plate method are as free of pullorum disease as are those tested by the tube method.

The rapid whole blood plate method of testing has a number of advantages.

Studies of Incubation Factors in the Agglutination Test for Pullorum Disease. H. M. DeVolt and C. R. Davis. Maryland Station Bulletin, 402, 1936, p. 165.

A report is made of a study of some incubation factors in the tube agglutination test for pullorum disease as regards the possible effect of variations in

incubation methods, including manner of heating the tubes, incubation temperature, and length of the incubation period.

The work has led to the conclusion that convection currents induced by warm spots on the bottom or sides of a test tube are responsible for the failure of plain antigen suspensions and negative tests to settle out when placed close to the heating elements of an incubator or on a warm surface.

"This effect was sufficiently strong to cause slight inhibition of the agglutination reaction in 65 per cent. of a group of tests placed in the small incubator at 37·5° C. Inhibiting of the test became more pronounced with the rise in temperature. The speed of the reaction was increased at temperatures of 45° and 55° but not at 37·5°, 65° or 75° in the small incubator. Cloudy reactions occurred to a marked extent at 65°. The effect of time was at a minimum in changing the interpretation of tests after the 24-hour reading."

Pullorum Disease Eradication. H. Van Roekel, K. L. Bullis, O. S. Flint and M. K. Clarke. Agricultural Experiment Station, Massachusetts, Bulletin No. 339, 1937.

During the 1935-36 testing season a total of 255 flocks (including three flocks of poultry other than chickens) representing 344,233 samples (including 152 from fowl other than chickens) were tested. The testing results of the chicken flocks showed increases in tested flocks (8), tested birds (48,535), tests (42,194), and non-reacting flocks (17) over the previous season. The average percentage of positive tests was 0·30, which is the lowest attained during the 16-year testing period. Of the total birds tested, 95·6 per cent. were in 230 non-reacting flocks, a definite increase over the percentage (89·5) for the 1934-35 season. Furthermore, among the 315,215 birds in the negative flocks, 90·9 per cent. were in the 100 per cent. tested flocks.

The merit of annual testing is emphasized by the following data presented on 151 flocks which were tested for 3 or more consecutive years. Among 271,410 blood samples collected from 263,400 birds only 0·10 per cent. gave a positive test. The number of birds in flocks tested for 3 or more consecutive years represented 79·9 per cent. of the total birds tested.

The results for the 1935-36 testing season show steady progress in pullorum disease eradication. The data prove that poultrymen who follow a conscientious testing and disease-prevention programme are able to maintain a pullorum-clean flock.

Pullorum Disease Investigations.

(*a*) *Antigenicity Studies of* S. pullorum *Strains.*—The purpose of this investigation was to determine whether or not the agglutinative sensitivity of certain selected strains of *Salmonella pullorum* could be increased by serial passage through day-old chicks. Duplicate sets of three strains employed in the antigen for routine pullorum disease testing were selected. Day-old chicks were inoculated subcutaneously with viable fresh antigen and held for a short observation period. Each lot of chicks was inoculated with antigens prepared from cultures recovered from the preceding lot of chicks. The organisms were properly identified after each isolation. Antigens were prepared from the isolated strains and tested with known positive and negative sera. A standard stock antigen composed of the three strains was tested simultaneously with the same sera. Following the serial passage of the six strains of *S. pullorum* through 12 lots of chicks, no change was noted in the agglutinative sensitivity of the strains.

(*b*) *Viability of* S. pullorum.—Viability studies, which are still in progress, have shown that *S. pullorum* has remained alive in a dry piece of cloth for a period of 4½ years.

(*c*) *Whole-Blood Agglutination Test.*—During the past year investigations concerning the whole-blood test have been continued in order to improve its efficiency. A change in the technique consisting of more accurate measurements of whole blood and antigen was tried. Limited data suggest that the efficiency

of the whole-blood test is increased when a serological pipette is used to measure definite, constant quantities of whole blood and antigen.

(*d*) *Maltose-Fermenting* S. pullorum *Strains.*—During the past 6 years *S. pullorum* strains which were retained as stock cultures have been observed to acquire the property to attack maltose. The behaviour of these and other strains toward maltose has been studied. It was found that strains which possessed a potential tendency to ferment maltose could be identified by cultivating them in a maltose-peptone solution for a period of time. Some strains acquired this property much sooner than others. Strains undergoing a change in behaviour toward maltose would exhibit red and white colonies when plated on a modified Endo's medium (maltose substituted for lactose). Among 12 maltose-fermenting strains studied, only one failed to show white colonies on this medium, suggesting that complete conversion had occurred. Strains that produced both maltose-fermenting and non-maltose-fermenting colonies exhibited only non-maltose-fermenting colonies after being subjected to animal passage. An apparently pure maltose-fermenting strain did not lose this property when subjected to animal passage.

(*e*) *Pullorum Disease in Turkeys.*—Pullorum disease was encountered in two turkey flocks during the past year.

Flock 1.—Two consignments of poults were received from this flock. The clinical history which was reported for the first consignment and the lesions observed were suggestive of pullorum disease. A 25 per cent. mortality was experienced during the first 9 days after hatching. A second consignment, received approximately a month later, represented poults that were hatched on a later date. The poults were approximately 5 weeks of age and greatly stunted. The sera of five poults were tested with pullorum antigen in three dilutions (1 : 25, 1 : 50, 1 : 100). Three sera produced no agglutination, but two completely agglutinated the antigen in all three dilutions. *S. pullorum* was isolated from one of the five poults and the serum of this bird was also positive. Incomplete evidence suggests that the infection might have originated in a Customs hatchery. When the survivors of the outbreak were approximately 6 months old their sera were tested with pullorum antigen. Among 118 birds tested 28·81 per cent. exhibited reactions which varied in degree with a maximum titre of 1 : 320. Through the co-operation of the flock owner it was made possible to examine bacteriologically some of the reacting birds which had been dressed for the holiday trade. Cultures were taken from eight birds and *S. pullorum* was isolated from three. The agglutination titres of the three birds were 1 : 20, 1 : 40 and 1 : 320. A programme is in progress to eradicate pullorum infection from this flock through short-interval testing.

Flock 2.—Pullorum disease was diagnosed in 2-weeks-old poults which suffered approximately a 33 per cent. mortality. The history of the consignment revealed that losses were confined to a group of 200 poults which had been received from a mid-western State. The balance (1,800) of the flock did not appear to be infected.

The present status of Pullorum Disease in Turkeys. W. R. Hinshaw. Nulaid News, Vol. 14, 1936, p. 10.

Data obtained at the California Experiment Station have led to the conclusion that " baby turkeys (poults) are as susceptible to pullorum disease as are baby chicks, and show the same manifestations. The chief source of infection in poults is in the hatchery where turkey eggs and chicken eggs are hatched in the same incubator. Survivors from an acute outbreak apparently have a greater ability to absorb the infection than have chickens, and consequently fewer permanent carriers remain in the flock. Prevention of pullorum disease in turkey flocks can best be accomplished by the use of separate incubators for hatching turkey eggs and by avoiding all contact with chicks, either in the hatchery or in the brooder. In the light of our present knowledge, a general testing programme for turkeys is

probably not justifiable. Flocks that have accidentally become infected should be tested, however, if they are to be used for the production of hatching eggs."

PARATYPHOID

Food Poisoning by Duck Eggs. Lebensmittelvergiftungen durch Enteneier. Dr. Grebe and Dr. Gräning. Deutsche Tierärtzliche Wochenschrift, Vol. 45, 1937, p. 345.

Description of a case in which, after the use of the yolk of only one duck egg in the preparation of soup, three people became ill.

In another case 29 people became ill after eating minced meat, in the preparation of which one duck egg was used. Three of these people died.

The writer suggests that the trade in duck eggs should be forbidden or that duck farms should be thoroughly cleaned and controlled.

Food Poisoning and Poultry. Lebensmittelvergiftungen und Geflügel. Prof. H. Miessner and A. Köser. Deutsche Medizinische Wochenschrift, 1935, p. 1811.

Summary of cases of poisoning by paratyphoid bacilli in ducks, pigeons and duck eggs, and an extensive literary review of these diseases.

Duck Egg Regulations in the Netherlands. July, 1937.

The Netherlands Ministry for Social Affairs has issued a publication in which attention is drawn to the danger of poisoning which accompanies the consumption of duck eggs.

Duck eggs should be boiled for 8 minutes and should not be used for ice-cream, puddings, mayonnaise or for confections which are not baked hard.

New Law in Denmark against Paratyphoid in Ducks.

According to the Act of March 9, 1937, it is forbidden to sell or deliver eggs for hatching, chicks and full-grown ducks from farms infected with paratyphoid. The sale of implements is also forbidden unless disinfected under State control. Eggshells and unfertile eggs from incubators may not be used as food for other animals and eggs may not be given out to other farms for hatching. Extensive instructions are given for the destruction of intestines and other slaughter products.

Prevention of Food Poisoning by Duck Eggs. Verhütung der durch Enteneier verursachten Lebensmittelvergiftungen. Weber. Berliner Tierärztliche Wochenschrift, 1935, p. 649.

Examination of the blood and fæces is advised, as well as the isolation of sick and suspected ducks, regulation of the traffic in ducks from infected farms, disinfection, limiting the number of ducks kept in abattoirs and on dairy farms and the marking of foreign duck eggs.

Duck Salmonellosis as the cause of Food Poisoning in Human Beings. J. Jansen and K. de Koning. Antonie van Leeuwenhoek, Nederlandsch Tijdschrift voor Hygiene, Microbiologie and Serologie, Vol. 3, 1936, No. 3.

A very extensive study, divided into seven chapters with 75 references to literature. The rapid blood test method can be used for testing the serum and, with a view to the similar qualities of certain antigen components, a formol-suspension of *Salmonella pullorum* can be used. The writer is of opinion that simple but accurately carried out hygienic measures, accompanied by annual serum tests, would be sufficient, even at extensively infected farms, to combat the disease efficiently.

Salmonellosis in Ducks as the cause of Food Poisoning (Ice-cream) in Human Beings. K. de Jong.

After eating ice-cream a number of persons suffered from stomach and intestinal troubles. *B. paratyphoid ærtrycke* was cultivated from the fæces at the State Serological Institute.

De Koning found *S. typhi-murium* in duck eggs from the same farm as those that had been used for making the ice-cream. Moreover, 22 of the 24 ducks examined had positive serum-agglutination for these bacteria. The strain isolated by de Koning was determined by Jansen, who made a further examination of the ducks.

The problem of Bacteria Carriers at Poultry Farms. Zur Dauer Ausscheiderfrage in Geflügelbeständen. Dr. Weber. Berliner Tierärtzliche Wochenschrift, 1937, p. 348.

Description of a case of infection at a farm containing 22 hens, three turkeys and three ducks, all of which were infected with *Bact. enteritidis Breslaviense.*

The occurrence of Salmonella, Oranienburg Type, in an infection of Quail. P. R. Edwards. Journal of Bacteriology, Vol. 32, 1936, p. 259.

In work at the Kentucky Experiment Station the author identified an organism occurring in an epizoötic among baby quail, resulting in the death of large numbers on the State quail farm in Illinois, as *Salmonella,* type Oranienburg. It is said to constitute the first recognized occurrence of this type in diseases of animals.

Serological types of Salmonella isolated from Paratyphoid in Chicks. E. Jungherr and A. G. Borden. Journal of Bacteriology, Vol. 32, 1936, p. 127.

During the routine diagnosis of chick diseases at the [Connecticut] Storrs Experiemnt Station five cases of paratyphoid infection were observed in 1935 and 1936, although no cases had been diagnosed during the preceding 4 years. Paratyphoid-like organisms were isolated from several chicks of each specimen lot and recognized as the ætiological agents. Biochemical tests placed these organisms in the genus *Salmonella.* Strains determined to be smooth variants on the basis of morphology, colonial characteristics, boiling, salt sensitivity, and Pampana tests were subjected to serological analysis by the Kauffmann-White scheme. Two of the organisms were found to resemble the one recently isolated by Jungherr and Wilcox and by Edwards. "These organisms belong to Group B and are now known as *S. typhi-murium* var. *storrs.* Two of the isolated organisms were shown to belong to Group C, resembling *S. choleræ suis* in the specific phase, and one strain was found to belong to Group E, resembling *S. london.* The Group C organisms differed from true *suipestifer* strains in fermenting arabinose, and the Group E culture differed from *S. london* in failing to ferment inositol. The Group E organism was able to absorb all antigenic factors from a known *S. london* serum and *vice versa,* but further tests are necessary to establish identity."

Paratyphoid infection of Fowls. P. R. Edwards. Journal of American Veterinary Medical Association, Vol. 90, 1937, p. 403.

This contribution from the Kentucky Experiment Stations reports on some of the newer developments in the knowledge of paratyphoid infection in fowls and calls attention to the direction which study of the problem is taking. It is concluded that, since four types of Salmonellas are definitely known to be transmitted through the egg in several species of domestic fowls, there can be little doubt that other species may be egg-borne.

CHOLERA

Cholera in Greece. Sur l'épidémiologie du choléra aviaire en Grèce. G. Debonéra and E. Mathaiakis. Reçueil de Médecine Vétérinaire, Vol. 111, 1935, p. 476.

Cholera accounts for many victims in Greece. The disease practically disappears in summer, but from the end of August it gradually increases again. It is most frequent in November. It remains at a steady level until May and then disappears again.

Fowl Cholera. L. Van Es. Journal of American Veterinary Medical Association, Vol. 90, 1937, p. 446.

A practical summary of information on fowl cholera.

The Immunizing Value of Commercial Hemorrhagic Septicemia Aggressins. L. Van Es and J. F. Olney. Agricultural Experiment Station, University of Nebraska, Lincoln, 1936, Research Bulletin, No. 87.

The treatment of fowls with hæmorrhagic septicæmia aggressin failed to induce an adequate protection again a subsequent inoculation with the fowl cholera bacillus.

In fowls treated with aggressin a marked influence on mortality or survival periods by the length of time elapsing between the aggressin treatment and the administration could not be observed. The injection of more than one dose of aggressin into fowls failed to bring about a degree of protection different from that of the birds treated only once.

An adequate degree of immunity was not induced in aggressin-treated fowls exposed to fowl cholera by swabbing their palatine clefts with virulent material. In one group of fowls exposed to fowl cholera in the manner indicated, the aggressin-treated birds showed a markedly lower mortality rate than the virus control birds, although their degree of protection cannot be regarded as adequate.

Of the aggressin-treated fowls which were exposed to fowl cholera infection from 22 to 29 days and had survived, 50 per cent. were shown to still harbour the virus; whereas of the corresponding virus control birds only 23·8 per cent. were shown to harbour the infection.

There is no reason to believe that the hæmorrhagic septicæmia aggressins of commerce can be depended on as a means of protection of livestock actually exposed to *B. bipolaris* infection.

TUBERCULOSIS

Intradermal Avian Tuberculin Test in Ducks. J. F. Craig and G. O. Davies. Veterinary Record, Vol. 49, 1937, p. 29.

The tests of ducks with avian tuberculin here reported have led to the conclusion that the tuberculin test as applied intradermally to the web of the duck's foot is of no practical value in the diagnosis of tuberculosis.

NEUROLYMPHOMATOSIS

Changes in the Iris of Hens in connection with organic Diseases. Irisveränderungen beim Huhn in Zusammenhang mit Organkrankheiten. K. Müller. Thesis, München, 1936.

Organic diseases accompanied by changes in the iris occur in hens. The secondary inflammatory symptoms of the iris, which occur after both acute and chronic processes, play the greatest part herein. No connection could be proved between parasitic diseases and changes in the iris. In the metabolic disturbances of visceral lumbago changes in the iris occur which are caused either by uric acid crystals or toxins.

The changes in the iris in Marek's paralysis are of an inflammatory character and depend on degenerative loss of pigment. A sympathetic heterochromia occurs in hens, human beings and mammals.

Abnormal pigment spots are not organic symptoms but hereditary conditions which cannot serve the knowledge of internal organs. No trustworthy diagnosis of organic diseases can be made from changes of the iris alone.

Changes in the Eye in Marek's Paralysis. Die Augenveränderungen bei Marekscher Geflügellähme. Prof. Dr. Jaensch and Prof. Dr. Lerche. Archiv für Opthalmologie, Vol. 131, 1934, p. 359.

In paralysis, eye changes occur clinically as iridocyclitis. An histological examination of 37 eggs from 22 sick birds showed inflammation of the uvea. Cell accumulations occur in the iris around the surface blood vessels. After this, infiltration with round cells and changes in the iris occur, in a thick tissue rich in cells. The muscle tissues are destroyed, the pigment-epithelium degenerates and the fat in the sphincter often disappears. In the ciliary processes the changes are but small. Cells are destroyed and infiltration with round cells occurs. The walls of Schlemm's canal are filled with round cells and swollen. Dilatation of blood vessels and inflammation occur in the choroid as in lymphatic leukæmia in human beings. Fat-containing histiocytes and free fat occur in the suprachoroidea. The retina pigment epithelium can loosen from the choroid and lymphocytes, histiocytes and pigment cells can enter the retina.

The nerves and tractus opticus and chiasma are infiltrated with lymphocytes and histiocytes.

Vaccination against Paralysis. Versuche zur aktiven Immunisiering von Hühnern gegen Mareksche Hühnerlähme (Neurolymphomatosis). Dr. H. Hartwigk. Halle. Zeitschrift für Infektionskrankheiten der Haustiere, Vol. 50, 1936, p. 34.

1. It was not possible to immunize 12-weeks-old cocks against neurolymphomatosis by an intramuscular injection of vaccine from sinews, brains and vertebral marrow of paralyzed hens.

2. Both the dry and the glycerinated vaccine remained inactive. Glycerinated vaccine caused infection in the vaccinated birds.

3. A histological examination showed that only 18 of 44 sick birds (41 per cent.) were clinically sick, 26 birds (59 per cent.) showed no clinical symptoms although they were examined regularly until the age of 13 months.

4. A clinical examination of hens, carried out by veterinary surgeons, does not allow of an opinion on paralysis. In order to distinguish the disease at a poultry farm all sick and deceased birds should be examined for neurolymphomatosis.

Pathological Anatomy and Histology of Paralysis. Die pathologische Anatomie und Histologie der Geflügellähme. R. Glaser. Thesis, München, 1935.

Description of the various deviations in paralysis. Various causes of paralysis are described.

Observations on Fowl Paralysis (lymphomatosis). T. Dalling and G. H. Warrack. Veterinary Journal, Vol. 92, 1936, p. 310.

The authors' investigations have led to the conclusion that lesions of lymphomatosis may be found in practically all tissues, including those of the nervous system, and that they may occur only in the nervous tissues or in other tissues or in both in the same bird. " Intestinal parasitic infestation plays on essential part in the causation of lymphomatosis in fowls. Clinical and histological evidence of lymphomatosis may be found in fowls at ages varying from 2 to over 38 months. In the older affected birds there is evidence that the condition did not occur at an earlier age. There is some evidence that the injection of tissues from affected birds into healthy normal stock may play a part in transmitting lymphomatosis. Much seems to depend on the type of bird injected; some strains appear to be more readily susceptible than others. In some birds the injection of tissues from healthy birds seems to be followed by the occurrence of lymphomatosis. There is no evidence that lymphomatosis is transmitted by contact of potentially affected chicks or affected adults with healthy young chicks.

" Breeding experiments carried out in 1934 lead us to conclude that incubation and rearing play no part in the causation of lymphomatosis, for all hatches were treated similarly and the incidence in them did not differ materially."

The Etiology of Fowl Paralysis, Leukemia, and allied conditions in Animals. V, VI. M. W. Emmel. Florida Station Bulletin, No. 305, 1936.

The continuation of this contribution is presented in two parts.

V. *The Oral Exposure of Chickens Infected with Various Species of* Eimeria (*Coccidia*) *to* Salmonella ærtrycke.—Experiments are reported which show that the inflammation created by coccidia in the intestinal tract of the chicken creates an avenue of infection for the causal micro-organism, in the present case *S. ærtrycke.*

" The single intravenous injection of *S. ærtrycke* into 20 8-weeks-old parasite-free birds resulted in one case of fowl paralysis. The repeated daily oral exposure of parasite-free 10-weeks-old birds to *S. ærtrycke* for periods of 30 and 90 days resulted in hæmocytoblastosis but no other pathologic manifestation. The single

oral exposure of 20 parasite-free 2-weeks-old chicks to *S. ærtrycke* resulted in one case of fowl paralysis. The repeated (three doses) oral exposure of 20 parasite-free 2-weeks-old chicks to the same causal micro-organism resulted in two cases of fowl paralysis and one case of lymphatic erythroleucosis. The oral exposure of birds previously artificialy parasitized to *E. præcox, E. necatrix* and *E. maxima* and two groups of naturally parasitized birds affected with mixed coccidial infection to *S. ærtrycke* resulted in a high percentage of cases of the pathologic manifestations, *i.e.,* fowl paralysis, 'light' and anæmia, lymphomatosis and leukæmia. Fifty-two of 90 birds so exposed developed one of the pathologic manifestations, more cases developing in naturally parasitized birds than in the ones artificially parasitized.

"Two experiments are reported which indicate that partial recovery or recovery from hæmocytoblastosis results in a certain degree of immunity and that exposure shortly thereafter to *S. ærtrycke* failed to cause a development of pathologic manifestations even though the birds were affected with a mixed coccidial infection at the time of exposure to the causal micro-organism. There was a relative increase in the length of the incubation period with advancement in age. The incubation period for fowl paralysis varied from 17 to 63 days, lymphomatosis from 45 to 104 days, erythroleucosis from 73 to 91 days, myeloid leukæmia from 81 to 104 days, and light and anæmia 14 days."

VI. *The Oral Exposure of Chickens Infested with* Ascaridia, Tænia *and* Capillaria *to* Salmonella ærtrycke.—Sixty-two of 98 birds that were orally exposed to *S. ærtrycke* during chronic intestinal parasitism by *Ascaridia, Tænia* and *Capillaria* developed one of the pathologic manifestations, five others developed a complication of two manifestations, and 24 control birds remained normal. "The incubation period for fowl paralysis was 29 to 57 days, lymphomatosis 52 to 85 days, light and anæmia 18 days, myeloid leukæmia 70 to 172 days, and erythroleucosis 86 to 171 days. Four complicated cases of fowl paralysis and leukæmia developed in 54 to 86 days, while one case of fowl paralysis and lymphomatosis developed in 58 days."

The details of this contribution in 18 tables and a list of 44 references to the literature cited are included.

Differentiation of Paralysis in Chicks. E. Jungherr. Poultry Science, Vol. 15, 1936, p. 415.

In this further contribution from the [Connecticut] Storrs Experiment Station on paralysis, differentiation by histologic means is considered. Chicks sacrificed for examination and found to be free from demonstrable bacterial or parasitic diseases served as the source of tissue material. The results are summarized in a table. Of the conditions listed, namely, gout, crazy chicks, A avitaminosis, G avitaminosis, epidemic tremor, neurolymphomatosis and field encephalomalacia, all except field encephalomalacia have been described in the literature. Although the true cause of gout is regarded as unknown, the work of other investigators and the author's observations indicate that sodium bicarbonate can cause a disease indistinguishable from it. It is pointed out that the term "crazy chick," popularly applied to various conditions, should be restricted to the nephritic ataxia described by Dunlap, it being rarely found if histologic changes in freshly killed chicks are used as the diagnostic criterion. The hitherto undescribed field encephalomalacia of unknown ætiology was the most interesting condition encountered. Well-grown birds between 3 and 7 weeks showed droopiness, retraction of head or trembling of legs, and, at autopsy, characteristic gross affection of the brain by œdema and cerebellar hæmorrhages. The condition resembles in gross and histopathologic features the nutritional encephalomalacia of Pappenheimer and Goettsch, but seems to differ in occurring on feeds, presumably containing the anti-encephalomalytic factor, and in being influenced therapeutically by methylene blue instead of vegetable oils.

A study of Fowl Paralysis. Barber. Cornell Veterinarian, Vol. 27, 1937, p. 42.

The macroscopical and microscopical changes are not always present in paralysis. Infection tests were carried out on 434 chickens varying in age from 3 to 17 weeks. The percentage of chickens affected by paralysis was but little higher than in the control birds. The incubation period fluctuated between 1 and 18 months.

The experiments gave no proof of the transmission of paralysis.

Observations on an outbreak of Fowl Paralysis. J. W. Johnston and J. E. Wilson. Veterinary Journal, Vol. 93, 1937, p. 13.

The history of an outbreak of lymphomatosis in poultry is described and attempts to control and elucidate the nature of the disease are discussed. Feeding skimmed milk reduced mortality between 3 and 8 months of age from 60 to 45 per cent. The result is attributed to the prolongation of life in paralyzed birds owing to the accessibility and ease of consumption of milk rather than to any increase in the birds' resistance to the disease. Wet and dry mash feeding methods were compared. The advantage of wet mash was small. The general conclusion drawn is that the state of nutrition of the birds had no appreciable influence on the incidence and intensity of the disease.

Breeding for high and low Resistance to Fowl Paralysis. F. A. Hays, W. C. Sanctuary and J. H. Vondell. Agricultural Experiment Station, Massachusetts, Bulletin No. 339, 1937.

The studies to date indicate that different degrees of resistance to fowl paralysis exist. Since the mode of transmission is little understood, progress has been slow. Recurrent waves of the disease are difficult to explain in stocks of birds bred under uniform conditions from year to year. Specific phases of this disease are now being investigated.

DIPHTHERIA

Cultivation of Fowl Pox Virus in Tissue Culture. Die Züchtung von Geflügelpocken Virus in der Gewebekultur. Bierbaum and Gaede. Archiv für wissenschaftliche und praktische Tierheilkunde, Vol. 69, p. 441, 1935.

The great difficulty was to make the pigeon-pox virus bacteria-free. Filtration through Seitz and Berkefeld candles (Bierbaum and Gaede) did not give good results; it was not possible to kill the bacteria with yatren.

The affinity of pox virus for nerve tissue made it possible to purify pigeon vaccine of bacteria when administering intracerebrally to pigeons.

It was not possible to cause encephalitis in mice by administering pigeon-pox virus.

Bacteria-free pox virus was cultivated with positive results in ground hen embryos (10 days) diluted with pigeon-serum-Tyrode in six passages. Twelve passages succeeded with the Herzberg method (previous brooding of diluted ground embryos for 2 days).

Vaccination against Fowl-Pox. Ueber die Vaccination gegen Hühnerpocken. L. Grebenaroff. Vet. Sbirka, Vol. 39, 1935, p. 269. (Ref. Jahresbericht Veterinär-Medizin, Vol. 59, 1936, p. 1591.)

1. Pigeon-pox virus remained virulent for 3½ months in an 80 per cent. glycerine solution.

2. The dried virus can be diluted 1 : 50 with 50 per cent. glycerine solution and is a good vaccine for fowl-pox.

3. The vaccine gives good immunity against spontaneous infection but uncertain immunity against artificial infection.

Vaccination against Pigeon Pox. Beiträge zur Schutzimpfung und Therapie bei Taubenpocken. Dr. H. Wittmack. Zeitschrift für Infektionskrankheiten der Haustiere, Vol. 50, 1937, p. 180.

1. The action of bile, carbolic acid or formol on pigeon virus causes a decrease in the content of the virus and kills it eventually. There is, however, no qualitative change in the virus.

2. Such vaccines cannot be used either cutaneously or subcutaneously as they sometimes cause an intense vaccination reaction or no vaccination reaction whatever.

3. After cutaneous infection of numerous feather follicles with virulent pigeon virus, immunity occurs in pigeons, but many pigeons become ill and die as a result of the vaccination. Cutaneous injection of from 1 to 4 follicles causes almost absolute immunity against pox. This must not take place with pigeons younger than 3 months as it sometimes causes vaccination diphtheria. The best place to administer the injection is near the shoulder joint.

4. A mixed virus of fowl-pox virus and pigeon-pox virus is not suitable as a vaccine against pigeon-pox after one to four passages on fowl.

5. A fowl-pox virus, which was administered to pigeons through 114 pigeon passages, was not weakened in its virulency against pigeons after 12 passages on fowl.

6. Canary virus possesses no immunizing qualities against pigeon-pox.

7. Injections of hexamethyl-tetramin have no curative action on sick pigeons.

The colouring of Pox Elementary Bodies. Beitrag zur Färbung der Vogelpocken - Elementarkörperchen. H. Köster. Deutsche Tierärtzliche Wochenschrift, Vol. 45, 1937, p. 469.

A description of the technique of colouring.

Pox in Partridges. Geflügelpocken beim Rebhuhn. Dr. R. Weitzenberg. Berliner Tierärtzliche Wochenschrift, 1937, p. 53.

Description of a case of pox in a partridge. Experiments on various birds (canary, pigeon, hen) proved that fowl-pox virus was the cause.

Studies on certain Filtrable Viruses. I. Factors concerned with the egg propagation of fowl-pox and infectious laryngotracheitis. C. A. Brandly. Journal of American Veterinary Medical Association, Vol. 90, 1937, p. 479.

The susceptibility of the developing avian egg to infection, the inoculation of eggs of various species with infectious laryngotracheitis virus, factors influencing the infectivity of virulence of fowl-pox and of laryngotracheitis virus for developing eggs, and the effect of continued egg passage upon infectivity and filtrability of the viruses are considered in this contribution, the author's findings being based upon work conducted in part at the Kansas Experiment Station and in part by the division of animal pathology and hygiene, University of Illinois.

It is concluded that the finding of variations in susceptibility, to infection among different species, as well as within the species of egg employed, may bear considerable significance. Various factors influence the infective potency or virulence of fowl-pox and infectious laryngotracheitis viruses in so far as continued egg propagation is concerned, and failure to recognize such factors may complicate the application of the relatively simple technique of developing egg cultivation of the viruses.

Fowl-pox Vaccination of day-old and older Chicks.—Second report. R. E. Lubbehusen and J. R. Beach. Journal of American Veterinary Medical Association, Vol. 90, 1937, p. 430.

This further contribution reports upon a comparison of the effects of vaccination of chicks at the ages of 1 and 27 days and of the weight gains and mortality of chicks vaccinated at the age of 1 day with those of non-vaccinated controls to the age of 10 weeks, the vaccination of chicks at the ages of 1, 13 and 28 days compared on the basis of weight gains and mortality with non-vaccinated controls, and the vaccination of chicks at the ages of 1, 21 and 42 days and of groups of chicks at the ages of 1, 75, 89, 103 and 117 days, the details being given in five tables.

Vaccinating day-old and older Chicks. R. L. Lubbehusen and J. R. Beach. Nulaid News, Vol. 14, 1937, p. 35.

This practical contribution is based upon the work above noted, which is summarized as follows:—

"(1) Fowl-pox vaccinations of day-old chicks resulted in a systemic reaction sufficient to cause a temporary inhibition of growth gains and a lowering of vitality for variable periods thereafter. During the period of lowered resistance, exposure to unfavourable environment or concurrent disease may result in excessive mortality. (2) Vaccination between the ages of 2 and 6 weeks was followed by a systemic reaction of slower onset and one that became less and less severe as the age at vaccination increased, compared with the reaction of day-old vaccinated groups. (3) Vaccination between the ages of 75 and 117 days, even though the birds were vigorous, was followed by a systemic reaction which became increasingly severe as the vaccination age increased. This systemic reaction caused a temporary inhibition of growth gains. In birds vaccinated at these ages, as in those vaccinated between the ages of 1 and 42 days, the mortality following vaccination shock is largely dependent upon the vigour of the birds and the unfavourable factors to which they may be subjected."

The Transmission of Fowl-Pox. A. L. Brody. Cornell Station Mem. No. 195, 1936. (Ref. Experiment Station Record, Vol. 76, 1937, p. 853.)

Following a brief consideration of the methods by which fowl-pox is spread, experiments on the transmission of the disease by contact and by intermediate hosts are reported upon at length, the details being given in tables covering 15 pages. The following methods of spread are considered to have been proved:—

" Direct contact between diseased and healthy birds is one certain method by which fowl-pox is spread within a flock. By contact the virus may spread not only to the epidermis of the head but also the mucous membrane lining the oral and associated cavities. Non-blood-sucking flies of the family Calliphoridæ probably do not transmit fowl-pox. This conclusion is drawn from observations recorded in the foregoing pages and from unrecorded observations. *Aedes stimulans* may transmit pox by intermittent feeding. This insect may also harbour viable virus in or on its body for at least 2 days following the infective meal. *A. ægypti* can definitely transmit the disease more than once during its life. Mosquitoes which had been able to transmit the disease within 1 hour after their infective meal were still able to transmit it from 39 to 41 days later. The inoculation of the bodies of mites (*Liponyssus silviarum*), 4 days after their last association with a diseased bird, produced pox on a susceptible bird. Adult mites, when fed on a healthy bird 4 and 11 days after their last association with a diseased bird, did not cause pox. Mosquitoes can best transmit the disease if they feed on pox lesions which are [from] 5 to 17 days old. (This conclusion is based in part on work with *Aedes vexans* and *A. ægypti* not reported in this paper.) The virus remains viable on inanimate objects for at least 42 days. In these experiments the virus could not be demonstrated on inanimate objects 61 days after contamination.

" The virus may be found in or on any part of the body of an infected mosquito during the first 3 days of the incubation period. By the fifth day at least the virus localizes in or on the proboscis and the head. The virus can still be found in or on the proboscis or the head, or both, for at least 15 days even when the insect has fed on three birds during that period."

There is said to be definite evidence that the fowl-pox may arise at previously uninjured areas of the comb, although the greater number of lesions will arise at injured areas.

A list of 20 references to the literature is included.

The Immunological Relationship between Kikuth's Canary Virus and Fowl-pox. F. M. Burnet and D. Lush. British Journal of Experimental Pathology, Vol. 17, 1936, p. 302.

The authors have found that the viruses of fowl-pox and Kikuth's canary disease can be accurately titrated by the pock-counting method on the chorio-allantoic membrane. Cross-neutralization tests indicate that the two viruses, though not identical, are serologically very closely related. There is no cross reaction with vaccinia virus.

PEST

Attenuation of the Fowl Pest Virus by X-ray. B. S. Levin and I. Lominski. Comptes Rendues Académie Science, Vol. 203, 1936, p. 287.

The authors have found that the pathogenicity of the fowl pest virus can be completely attenuated by X-ray irradiation at a dosage of from 1·5 to 2 million r-units.

Investigations regarding Fowl Pest Virus pathogenic for Mice, its affinity for Neoplasms. Recherches sur le virus de la peste aviaire pathogène pour la souris, ses affinites pour les neoplasmes. C. Levaditi and P. Haber. Revue d'Immunologie, Vol. 3, January, 1937.

When the avian pest virus, pathogenic for mice, is injected into mice which are carriers of epithelic neoplasms, it becomes localized and multiplies in the neoplastic cells, where it causes a massive necrobiosis preceded by changes in the nuclein chromatin. Subcutaneous grafting results in the recovery of the virulence of the tumours but they do not multiply.

Infectiousness of Pest Virus which has been applied to Mice. Voies de pénétration de la peste aviaire adaptée à la souris. P. Haber. Presse médicale, 1936, p. 1212.

Avian pest virus is pathogenic for mice if injected into the nasal cavity, the ear passage, the stomach or the testicles. It is inactive if injected on the cornea and in the anterior chamber. This virus should therefore be classed with the ultra-germs which cause epitheliosis and reticulo-endotheliosis.

OTHER INFECTIOUS DISEASES

Brucellosis in Fowls. La Brucellose chez volailles et leur rôle dans la propagation de la maladie. P. Pavloff and M. Vaprarova. Veterinarna Sbirka, Vol. 40, 1936, p. 193. (Ref. Bulletin Office International des Epizooties, Vol. 13, 1936, p. 304.

1. Hens are not so easily infected as mammals but they easily transmit the disease to mammals.
2. The infection in hens can be proved by agglutination and allergy.
3. In infected poultry the agglutination is highest after 2 months. Two months later the agglutination has disappeared. There is no difference in agglutination between the Bang bacillus and *B. melitensis.*
4. In artificially infected poultry the allergy control should be carried out 8 hours after the infection.
5. The diagnosis by agglutination can be carried out 3 months after the inoculation.
6. The disease can be transmitted by eggs.
7. No clinical symptoms occur in infected poultry.
8. Hens are more easily infected than pigeons.

Infectious Diseases of Fowls. Infektionskrankheiten der Hühner und deren Bekämpfung. H. Miessner and R. Berge. Deutsche Tierärtzliche Wochenschrift, 1936, p. 516.

Report on experiences in combating infectious diseases during the last 3 years.

Anthrax in Birds. Anthrax beim Vogel. H. Sch. Almeyew. Deutsche Tierärtzliche Wochenschrift, Vol. 44, 1936, p. 375.

Infected food did not cause anthrax among healthy hens. Ducks are more sensitive (25 per cent. of the birds were affected) and all pigeons suffered. The writer describes the symptoms in anthrax and also a case which occurred in an eagle.

Studies of Plasmodium Gallinaceum in Hens. Etude expérimentale du Plasmodium gallinaceum parasite de la poule domestique. Transmission de ce germe par Stegomyia

fasciata et S. albopicta. E. Brumpt. Annales de Parasitologie, Vol. 14, 1936, p. 397.

A strain of *P. gallinaceum* from Ceylon can be cultivated in 23 passages in birds. The parasite is capable of causing fatal diseases in hens, geese and pheasants. Canaries, pigeons and ducks are insensitive. The disease is not accompanied by increase of temperature. The injection prescribed is very active. The parasite is transmitted by *S. fasciata* and *S. albopicta.* Culex sorts do not transmit the parasites.

Epidemic Tremor in Chicks. H. van Roekel, K. L. Ballis, V. S. Flint and M. K. Clarke. Agricultural Experiment Station, Massachusetts, Bulletin No. 339, 1937.

During the past year chicks were received from 29 affected flocks, in some of which mortalities were reported to be greater than in outbreaks observed previously. In some cases, maximum losses amounted to 50 per cent. of the chick flock.

From 14 pullets which were survivals of naturally infected chicks received in the spring of 1935, a total of 239 chicks were hatched. The majority of chicks were held for observation up to 6 weeks of age or longer. None of the chicks exhibited the symptom complex observed in "epidemic tremor," although a few of the birds, as they became more mature, developed an eye condition which has also been observed in naturally infected birds. The gross pathological changes consisted of an apparent enlargement of the eyeball, degenerative changes in the lens (marked degree of opacity), and a seemingly fixed pupil. Some birds appeared to be totally blind. Hatching experiments are being repeated with a group of pullets obtained as chicks in 1936.

Attempts to transmit the disease artificially have been successful.

Epidemic Tremors (trembling chick disease). C. A. Bottorff, A. E. Tepper, C. L. Martin, T. B. Charles and F. D. Reed. New Hampshire Station Circular No. 51, 1936.

This contribution following a brief history of the disease first described by Jones in 1932, and again in 1934, reports upon transmission experiments, breeding and management studies, and the clinical history of epidemic tremors. This is an affection of the nervous system of poultry that results in a distinct and rapid tremor of the head and neck and in some cases the tail, and in a majority of which there is an ataxia, with a mortality running from 0 to 65 per cent.

The transmission studies conducted, which included the placing of affected and non-affected chicks together and intracranial inoculations of brain suspensions from affected chicks, failed to indicate how the disease is spread. The results of the breeding studies indicate that the disease is not hereditary. It occurred under four different types of brooding systems where normal brooding conditions were maintained; it also occurred in chicks fed all types of feed of varying protein level. Variations in incubation or hatching temperatures were not found to be a cause under the conditions observed. The affected birds studied showed no significant difference in body temperatures or blood counts. Attempts at treatment proved to be valueless.

Congenital Tremor in Young Chicks. F. B. Hutt and G. P. Child. Cornell University. Journal of Heredity, Vol. 25, 1934, p. 341.

Summary:

Chicks affected with congenital tremor exhibit degrees of agitation varying from a shaking so extreme that they cannot stand, down to a barely perceptible

tremor. In most cases this movement disappears when the chick squats at rest. The rate of tremor varies from 16·5 to 10 complete (double) vibrations per second in chicks 1 and 2 days old. The affliction is most extreme at hatching and gradually disappears in the few chicks which survive to a month or more.

Eighty-eight per cent. of affected chicks died within a month of hatching and only one out of 35 was raised to sexual maturity.

Growth of chicks with tremor was greatly retarded and fecundity was unusually low in the one bird raised to laying age.

Twenty-three fowls producing the defect yielded in matings to carrier males a total of 408 normal chicks and 39 with tremor. The deficiency of affected chicks below the number expected for a simple recessive character is shown not to be caused by embryonic mortality in these matings.

Of 35 affected chicks 19 were males and 16 females.

A duplicate-factor genetic basis is shown to account for the observed ratios fairly well, but it is considered a more likely interpretation that the character is a simple autosomal recessive character having an unusually low degree of penetrance because of the effects of modifying genes.

Other evidence is adduced to show that the defect is definitely hereditary.

The similarities and differences between hereditary tremor in the fowl and similar conditions in other species are briefly considered.

Aegyptianellosis and Leg-weakness of the Goose. J. D. W. A. Coles. Journal of South African Veterinary Medical Association, Vol. 8, 1937, p. 98.

An *Ægyptianella pullorum* infection has been described in two geese. In one case the organisms were transmitted successfully to two ducks, which died.

Both geese showed pronounced leg weakness, but evidence has been adduced to indicate that ægyptianellosis and paralysis are two separate conditions transmitted by *Argas persicus*. It is only natural that both should often appear in one and the same victim.

Coryza of Fowls. G. Kernohan. Nulaid News, Vol. 14, 1936, p. 6.

A discussion of the respiratory affections of the fowl.

Favus in Sparrow birds. Favus bij Muschvogels. Prof. D. L. Geurden. Vlaamsch Diergeneeskundig Tijdschrift, Vol. 6, 1937, p. 157.

Summary:

Description in two sparrow birds (chaffinch and bullfinch) of cases of favus, that experimentally could be carried over to a hen.

Infectious Tracheitis and allied Respiratory Diseases of Poultry. 47th Annual Report of the Storrs Agricultural Experiment Station, 1934-1935. Storrs, Connecticut.

Immediately following the appearance of infectious tracheitis in one of eight pens of birds located in a single long house at the College poultry plant, the birds in each of the remaining pens were divided into three groups. One group was vaccinated by the cloacal method, one by injection of live virus into the wattle and the third group was left as a control. The average mortality for all seven pens during the following three weeks was 30 per cent. in the control group, 8 per cent. in the birds vaccinated by the wattle method, and 2 per cent. in the birds vaccinated by the cloacal method.

PARASITES

COCCIDIOSIS

Infection of Chickens by Rabbit Coccidia. Experimentelle Untersuchungen über die Uebertragung der Kaninchencoccidie auf Hühnerkücken. C. Stefanescue. Thesis. Bucarest, 1935.

Intestinal coccidia of rabbits (*Eimeria perforans*) were brought to sporulation in a chromic acid solution of 1 : 1,000 at 37°. Typical coccidiosis was caused in chickens by these cultures. The oöcysts occurred in the fæces of the chickens 15 to 18 days after administration. Further infection of chickens increased the virulence. Chickens of 3 days old were more sensitive than 3-weeks-old chickens. Period of incubation was 14 days. The death-rate was very high. The chickens sometimes recovered.

Research in connection with Prophylaxis and Therapy of Chicken Coccidiosis. Versuche über Prophylaxe und Therapie der Kükenkokzidiose. M. Yosikawa. Journal of the Japanese Society of Vet., December, 1936.

In the combating of chicken coccidiosis in Japan the iodine preparation "Jodinol" gave very good results. Quantities of from 2 to 3 c.c. (according to age) of a solution of 0·125 per cent. were administered, both prophylactically and therapeutically, in the drinking water. Decrease of the symptoms of the disease followed quickly after such administration. An examination of the fæces of the birds treated showed formation of vacuoles in the oöcysts and also bursting of the cyst walls. After about 10 days the symptoms of the disease had disappeared completely.

Coccidiosis and Fowl Paralysis. 47th Annual Report of the Storrs Agricultural experiment Station, 1934-1935. Storrs, Connecticut.

The causal relationship of coccidiosis to fowl paralysis was investigated by injecting birds that had never been exposed to coccidiosis with tissues collected from cases of true fowl paralysis and allied conditions such as "osteoperiostitis" and certain tumours. Fowl paralysis, osteoperiostitis and lymphomatotic tumours were found to be transmissible by blood and tissue extracts in fresh and dehydrated conditions.

Serial transmission experiments gave evidence of the morphologic range within which a given strain may manifest its characteristic disease-producing power. Thus, a transmissible strain of osteoperiostitis produced osteoperiostitis in some experimental birds, fowl paralysis (neurolymphomatosis) in others, and visceral lymphomatosis without nerve or bone involvement in a third set of birds. On further transmission experiments with material from visceral lymphomatosis cases, osteoperiostitis again appeared in association with ovarian tumours.

The data suggest that osteoperiostitis and fowl paralysis are neoplastic conditions caused by transmissible agents which are resistant to freezing and dehydration *in vacuo*. The fact that neoplastic conditions can be incited under laboratory conditions in the absence of coccidiosis would indicate that coccidiosis is not in direct causal relationship to neoplastic conditions.

Effects of Sulphur on Coccidiosis in Chickens. C. A. Herrick and C. E. Holmes. Veterinary Medicine, Vol. 31, 1936, p. 390. (Ref. Experiment Station Record, Vol. 76, 1937, p. 856.)

In work at the Wisconsin Experiment Station flowers of sulphur added to the dry mash and hopper fed prior to infection with coccidia has been found to be effective not only in reducing but also in preventing the effects of coccidia on chickens under experimental conditions. When fed for only 2 days before infection there was little, if any, effect of the sulphur on the coccidia, but when the sulphur was administered for 4 days before infection was established its effect was marked. The mortality was 42, 22 and 19 per cent., respectively, for the controls and those receiving 10 and 20 per cent. sulphur. When 20 per cent. sulphur was fed for a period of 6 days there was a reduction in the severity of the lesions and no mortality from an infection of coccidiosis which was fatal to 70 per cent. of those that were not given sulphur. The feeding of 10 per cent. sulphur, although preventing visible lesions in one-third of those treated, did not prevent all mortality.

It is concluded that much work remains to be done before the method can be recommended as a practical means of controlling coccidiosis. There was no evidence that the administration of sulphur has any curative effect on coccidiosis in poultry after the infection has become established.

Studies in Coccidiosis in Chickens: Calcium carbonate additions and coccidia. C. E. Holmes, C. A. Herrick and G. L. Ott. Poultry Science, Vol. 15, 1936, p. 416.

In the further study of coccidiosis at the Wisconsin Experiment Station, Single Comb White Leghorn chicks were brooded in sterile cages, fed sterilized rations, and reared under conditions that made infection impossible. "Zero, 3 and 6 per cent. of chick size oystershell was added to the rations of the three groups in each trial, and controlled infections of coccidiosis were made at three different ages. Infection was accomplished by pipette feeding of measured amounts of sporulated oöcysts of a pure culture of *Eimeria tenella.* These trials seem to indicate that excessive mineral additions are likely to be detrimental to growing chicks if the chicks become infested with coccidiosis.

Coccidiosis in Chickens and other birds. A. J. Durant. Columbia University Missouri College of Agriculture. Agricultural Experiment Station, Bulletin No. 372, Dec., 1936, p. 12.

The disease and the conditions for its occurrence are described. Feeding a special ration containing a high percentage of milk in some form is the main method of treatment recommended. Details of the rations recommended are given. It is emphasized that such dietary treatment, to be successful, must be combined with measures of strict sanitation.

OTHER PARASITES

Studies on Blackhead. II. Mode of infection. D. Niimi, Agricultural School, Kitasaku, Nagano, Japan. Journal of Japanese Society of Veterinary Science, Vol. 16, 1937, p. 23.

The causative agent of blackhead could not be found by other authors in the body of the worm *Heterakis papillosa.* Author found the agent in the eggs of

the worms, and this worm must be considered as a true vector of the blackhead organism. The causative organism may survive in the worm's eggs longer than 1 year, perhaps for 3 to 4 years.

It is evident that blackhead infection spreads among fowl by ingestion of contaminated eggs of *Heterakis papillosa.*

The use of Anthelmintics for the control of Avian Parasites. Arkansas Station Bulletin No. 337, 1936.

The work of the year by W. I. Bleecker and R. M. Smith, is briefly noted.

Experiments in the treatment of Poultry Parasites in Puerto Rico. W. H. Wright. Puerto Rico Station Agricultural Notes No. 73, 1936. (Ref. Experiment Station Record, Vol. 76, 1937, p. 856.)

Observations of the internal parasites of poultry from January 6 to April 2, 1936, and the results of the administration of anthelmintics for their control, conducted by the U.S.D.A. Bureau of Animal Industry and the station, are reported upon.

Seven species of nematodes, namely, *Capillaria annulata, Tetrameres americana, Cheilospirura hamulosa, Strongyloides avium, Ascaridia galli, Capillaria retusa* and *Heterakis gallinæ*; five species of tapeworms, including *Davainea proglottina, Amœbotænia sphenoides, Hymenolepis cantaniana, Raillietina tetragona* and *Raillietina* sp.; and a trematode (*Postharmostomum* sp.) were found in island poultry. Gentian violet, azamine, brillian green and mercurochrome (220 soluble) showed more or less promise for the removal of certain species of tapeworms from poultry. Gentian violet in repeated treatments also proved of value for the control of *S. avium.*

An Ectoparasite Census of Ducks and Geese (Anatodae) in Uganda. G. B. Thompson. Journal of Animal Ecol., Vol. 4, 1935, p. 192. (Ref. Jahresbericht Veterinär-Medizin, Vol. 59, 1936, p. 601.)

A review of ectoparasites, principally mallophages, which were found in nine kinds of *Anatidæ.* Five species of *Mallaphages* are described.

Worm Diseases of Poultry in India and their Control. G. D. Bhalerao. Agriculture and Livestock, India, Vol. 6, 1936, p. 48.

The following tapeworms occur: *Choanotænia, Davainea, Raillietina, Cotagnia, Hymenolepsis* and *Amœbotænia.* Of the roundworms the following are often found: *Ascaridia galli* and *Heterakis gallinæ. Capillaria* kinds are also found. The trachea worm and the eye filaria, *Oxyspirura mansoni,* are widespread. The following occur in the head: *Gongylonema ingluvicola* and *G. sumani.*

Ectoparasites and Bird Diseases. C. M. Herman. Bird-Banding, Vol. 7, 1936, p. 163. (Ref. Experiment Station Record, Vol. 76, 1937, p. 856.)

The relation of ectoparasites to the transmission of avian diseases is reviewed.

A Pentatrichomonas associated with certain cases of Entero-hepatitis or "Blackhead" of Poultry. E. A. Allen.

American Micros. Soc. Trans., Vol. 55, 1936, p. 315. (Ref. Experiment Station Record, Vol. 76, 1937, p. 855.)

A description is given of a trichomonad of the genus *Pentatrichomonas* which has been observed during a period of 6 years in turkeys, chickens and guinea-fowls in cases that showed pathological changes closely resembling those of blackhead and in cultures made from such cases. This flagellate was grown in cultures isolated from the cæca of infected birds.

" Following the feeding of cultures of the *Pentatrichomonas*, isolated from the cæca of infected poults, to turkeys, the birds developed lesions in the liver, and two turkeys, which died, had typical blackhead lesions in the cæca. A saturated solution of thymol added to iodine-eosin caused the flagella of the organisms to spread out, so that the counting of flagella was greatly facilitated. Quinanil, 1 : 10,000, reduced bacterial growth in the cultures.

" The evidence presented in this study indicated that various contentions that have appeared in the literature in regard to the ætiology of ' blackhead ' may have justification, in that it is probable that each of two species of flagellates, *Histomonas meleagridis* and a species of *Pentatrichomonas*, may produce similar lesions in the liver and cæca of poultry."

A list is given of 11 references to the literature.

TUMOURS

An unsaturated Fatty Acid Fraction in Pig Pancreas which inhibits the Growth of Chicken Sarcoma. M. Helmer. Journal of Experimental Medicine, Vol. 64, 1936, p. 333.

It is well known that high fatty acids hinder the growth of tumours. The action of fresh pancreas tissue depends on the action of unsaturated fatty acids. Oil acid hinders also the growth of chicken sarcoma tumours.

Pseudomyxoma peritonei. Pseudomyxoma peritonei beim Huhn. R. Baumann and E. Krenn. Archiv für Tierheilkunde, Vol. 71, 1936, p. 101.

Large quantities of slime were found in the abdominal cavities of two hens. This originated from perforated tumours in the small intestine. The slime caused peritonitis. Such diseases often occur in human beings, but are scarce in animals.

Action of Röntgen Rays on the Virus of Leucosis. Wirkung der Röntgen Strahlen auf das Blutbild und das Virus der übertragbaren Hühnerleucosis (Erythroleukose). E. Forfota. Allatorvosi Lapok, 1936, p. 311.

Röntgen rays caused no changes in the course of the disease in hens which had been artificially infected, neither was the composition of the blood affected. The formation of tumours in the spleen and liver was not hindered.

The rays had no effect on the virus. This confirms Jannai's opinion, namely, that the cause is a dead fermentation-like matter. As regards the action of Röntgen rays, the cause of fowl leucosis agrees with Rous-Sarcoma.

The Phosphorus in the Bloodplasma of hens suffering from Sarcoma. Ueber das Verhalten der Phosphorfraktionen in

Blutplasma sarkomkranker Hühner. F. Pentimalli and G. Schmidt. Biochem. Zeitschrift, Vol. 282, 1935, p. 62.

The content of lipoid phosphorus and phosphorus soluble in acids is increased in the blood of hens suffering from sarcoma. The total phosphorus is increased by 30 per cent.

Changes in the Skin during Leucosis. Ueber die Hautveränderungen bei der Hühnerleukose. H. Csermely. Allatorvosi lapok, 1936, p. 279.

Description of two cases of changes in the skin during leucosis. Swellings of various sizes, covered with a brownish-red crust, appeared on the feathered skin. The swellings proved to consist of lymphocytes in a fine net of connective tissue. The difference between these and lymphosarcomatosis is discussed. In the internal organs only microscopical changes occurred. This referred especially to the liver and bone marrow. According to Nägeli a leukæmic skin infiltration occurs oftener in aleukæmic blood than in typical leukæmia.

Leucemia of Fowls. C. A. Brandly, R. Graham and V. M. Michael. Illinois Station Circular No. 467, 1937.

A practical account of leukæmia which has, during the last few years, become one of the most serious diseases affecting poultry flocks in Illinois. It is pointed out that, while chickens of all breeds and ages are susceptible to the disease, the largest percentage of infections has been observed in birds between the ages of 2 and 18 months. Leukæmia occurs in both acute and chronic forms and is usually fatal. The symptoms and lesions are highly variable, making diagnosis difficult in many cases. Prevention is based upon general sanitary measures of disease control.

SUNDRY DISEASES

Combatting Poultry Diseases. Beobachtungen bei der Bekämpfung von Geflügelkrankheiten in Holland. Dr. B. J. C. te Hennepe. Deutsche Tierärtzliche Wochenschrift, 1936, p. 533.

In the Netherlands the State Serum Institute is the centre for combating poultry diseases. From 1930 to 1936, 28,224 head of poultry were sent in for examination. From the information obtained in connection with *post-mortem* examinations, various methods for fighting diseases were discussed.

Attention was paid to the occurrence of the diseases in certain seasons and among the various breeds of poultry.

The Diseases of Hens. Le Malattie degli animali da cortile. S. Paltrinieri. Opera Nazionale Combattenti. Roma.

In this book the author has collected the most important notes concerning diseases in poultry and rabbits and has paid great attention to those diseases which form the greatest threat to intensive keeping of these animals.

After a synthetic and clear explanation of the general knowledge regarding infection, the administration of serum, and vaccination, the author discusses the individual diseases. Further, in the simplest terms, he gives a description of the lists used in clinics, indicates the methods for making a diagnosis, for curing, and the manner of preventing diseases.

The whole work is illustrated with demonstrative photographs.

Competition organised by the Poultry Health Service in Germany.

The Department of Health of the Ministry of Food Provision in Germany has organized two competitions, each with a prize of 1,000 marks, for answering the following questions:—

1. How can the losses, occasioned by gout and diseases of the laying organs, be limited by means of feeding and keeping, without harming normal laying?

2. How is Marek's paralysis transmitted from one hen to the other?

The answers must be supported by experiments on own birds. They must be sent in before November 15, 1939.

The Significance of Veterinary Control of Poultry Farms. Die Bedeutung der tierärtzlichen Gesundheitskontrolle der Hühnerzuchtsbetriebe für die Bekämpfung der wichtigsten Krankheiten. H. Hartwigk. Deutsche Tierärtzliche Wochenschrift, 1936, p. 526.

Articles dealing with the combating of infectious poultry diseases.

Poultry Diseases in Latvia. M. Rolle. (Ref. Jahresbericht Veterinär-Medizin) Vol. 59, 1936, p. 155.

The most dangerous disease in Latvia is tuberculosis, followed by lymphadenosis and sarcomatosis. Chicken coccidiosis and intestinal parasites cause much damage among hens. Avitaminosis is of frequent occurrence.

Post-mortem Examination at the Laboratory of the Veterinary Faculty at Utrecht. Overzicht der onderzoekingen van het uit de praktijk ingezonden ziektemateriaal in 1936. Dr. J. Jansen. Tijdschrift voor Diergeneeskunde, 1937, p. 752.

Out of 148 birds sent, infection by *Salmonella typhi-murium* was found in 21 and trichomoniasis in 23. A fair number of cases of enteritis were caused by *Capillaria columbæ.* Tuberculosis was found once in a wild pigeon.

Both in the 18 ducks and in the canaries sent in, cases of infection with *S. typhi-murium* were found.

Of the hens, 7 per cent. proved to have died of tuberculosis and 32 per cent. of neurolymphomatosis. Pullorum was the principal cause of death in chickens, the figure being 42 per cent., and coccidiosis occurred in 23 per cent. of the cases.

Examination of the Blood in Pigeons suffering from Poison Gas. Blutuntersuchungen bei Kampstoffvergifteten Tauben, zugleich ein Beitrag zur Morphologie des normalen Taubenblutes. G. Lührs. Zeitschrift für Veterinärkunde, Vol. 48, 1936, p. 129.

The composition of the blood of 57 healthy pigeons and of pigeons which had died of poison-gas was examined. The great powers of resistance which pigeons possess against chemical matters is proved by the small influence that poison gas has on the blood.

Torsion of the Intestine and Obstipation in Pigeons. K. Bakos Budapest. Allatorvosi Lapok, Vol. 59, 1936, p. 44.

Description of a case of torsion of the intestine in a hen and of a case of obstipation in a cock due to a tumour in the intestine.

The Mortality Problem. Some reflections through the laboratory mirror. H. P. Hamilton. Harper Adams Conference, Eggs, Aug. 11th, 1937.

In the last two periods (June 1, 1934, to May 31, 1936) the percentages of deaths caused by infectious diseases were 10 and 6·7 respectively.

Lymphomatosis was the most prevalent trouble, being diagnosed in 20·5 per cent. and 38·0 per cent. of all birds examined. From June 1, 1936 to May 31, 1937, the percentage was nearly 50. Paralysis is but one symptom of lymphomatosis. This disease has been found in 16 different organs of the body and in many cases produced no distress until it had involved to a great extent one or more vital organs. Its true cause, if there be any one true cause, still remains a mystery.

Speaker propounded a scheme for the establishment of a central co-ordination board for poultry disease incidence.

A six-point general Sanitation Programme for Poultry. P. W. Allen. Poultry Science, Vol. 15, 1936, p. 414.

Poultry sanitation investigations conducted by the Tennessee Experiment Station during the last 6 years have led the author to emphasize the importance of several factors, namely, the freedom of poultry from contact with disease-producing microbes and parasites, supply of fresh water and fresh feed free from contamination, use of litter in clean houses, and the prevention of contact with infected or infested fowls.

Disinfection of Poultry Yards. E. C. McCulloch. Veterinary Medicine, Vol. 31, 1936, p. 386. (Ref. Experiment Station Record, Vol. 76, 1937, p. 857.)

This discussion, which is based upon the work previously noted and a review of the literature, is presented with a list of 20 references.

Work in Avian Pathology by the Iowa Station. Iowa Station Report, 1936.

The work of the year with diseases of poultry briefly referred to includes the ætiology of range paralysis and the egg as a possible mode of its transmission, both by C. Murray, C. D. Lee and H. L. Wilcke; breeding for resistance to fowl typhoid, by W. V. Lambert and N. F. Waters; and genetic investigation of resistance and susceptibility to typhoid-like diseases in laboratory animals, by Lambert.

Contributions on Diseases of Poultry. Md. Agr. Soc. Farm Bur. Fed. Report, Vol. 20, 1935. (Ref. Experiment Station Record, Vol. 76, 1937, p. 853.)

Contributions on diseases of poultry include the following: Economic Aspects of Mortality in Poultry, by C. R. Davis; Diet and Disease in the Domestic Fowl, by H. Bunyea; Breeding and Disease in the Domesticated Fowl, by G. D. Quigley; and History of Diseases in the Domestic Fowl, by R. H. Waite.

Diseases of Poultry. Tratado de doencas das aves. J. Reis, P. Nobrega and A. S. Reis. (Ref. Experiment Station Record, Vol. 76, 1937, p. 853.)

The diseases and parasites of poultry are dealt with according to their ætiology as follows: Filterable viruses, bacteria, fungi, protozoa, helminths, arthropods, nutrition, and organic alterations. A list of references to the literature accompanies the account of each disease.

Occurrence of Diseases in Poultry. S. Wall. Skandinavisk Veterinär-Tidskrift, Vol. 26, 1936, p. 477.

The occurrence of diseases of poultry in Sweden, based upon examinations of 4,419 fowls from 1925 to 1935, is reported upon.

EGGS AND TABLE POULTRY

EGGS

YOLKS

Colouring Matter in the Yolk. Beitrag zum Studium der Schwankungen des Farbstoffgehaltes im Hühnereigelb. T. Radeff. Revue Vétérinaire Slave, Vol. 2, 1935, p. 53.

The writer went into the question as to whether the content of carotinoids in the eggs of one and the same hen varied when the method of feeding remains constant. For a period of 13 days experiments were carried out on 10 hens. The quantity and percentage of carotinoids in the eggs fluctuated greatly. The more irregular the lay the more the content fluctuates. Eggs laid after an inactive period contained more carotinoids. There is no connection between the size of the egg and the carotinoid content.

Carotinoid Pigments in Eggs. Die Menge der Karotinfarbstoffe in Eiern von Hühnern, Puten, Enten und Fasanen. T. Radeff. Züchtungskunde, 1936, p. 35.

The writer first gives a summary of the carotinoids and discusses the chemical composition. The capacity for absorbing carotinoids from food varies in individual birds. In tests with hens, ducks and turkeys it was proved that these three classes of birds used almost the same quantity of carotinoids from the food for colouring the yolks.

Variation in the content of Carotinoids in the Yolk. Sulle variazioni del contenuto di carotinoidi del tuorlo d'uova. Dr. A. Ghetti. Rivista di Avicultura, 1937, p. 33.

The decrease in carotinoids which takes place during an intensive laying period is not gradual, but between the lesser coloured eggs appear others more strongly coloured.

The percentage of pigment is not dependent on the greater or lesser fecundity of special hens. There are hens which lay very many eggs of which the yolks contained a high percentage of carotinoids. The contrary also occurs. The capacity to absorb carotinoids from the food varies in individuals.

Influencing the Colour of the Yolk and Mimicry of the Egg-Shell. Die Beeinflussung der Dotterfarbe durch Verfütterung von künstlichen und vegetabilen Farbstoffen sowie das Mimikry der Eischalen. O. Roemmele. Zeitschrift für Fleisch- und Milchhygiene, Vol. 45, 1935, p. 225.

Every kind of food which contains colouring matter that is soluble in fat gives the yolk a more or less darker colour. The feeding of artificial colouring matter should be looked upon as food adulteration. There are certain vegetable

products which may be used, such as the annatto-fruit, which is very rich in vitamin A.

During a snowfall the writer noticed that the shell became paler, and looks upon this as mimicry.

Is the colouring of Yolks by feeding colouring matter an adulteration of Food. Ist Eidotterfärbung durch Verfütterung künstlicher Farbstoffe Lebensmittelfalschung? Holthöfer. Deutsche Nahrungsmittel Rundschau, 1935, p. 105.

On the basis of legal consideration the writer arrives at the following conclusions: Eggs, of which the yolks have been artificially coloured, should only be brought into circulation when it is clearly indicated that they have been so treated. Whoever causes such eggs to be put into circulation without giving information as to the origin of the eggs, adulterates eggs in the sense of the Foodstuffs Act. Without the influence of the colouring matter added to the future foodstuff the hen would lay a quite normal egg. If this adulteration is made for trade purposes, without publicity on a large scale, or for the purpose of deceiving the trade, the Foodstuffs Act is contravened. This legal opinion is applicable to foodstuffs in a general sense so that eggs, such as are described above, should also fall under this Act.

WHITES

The Problem of the Watery White Eggs. The South African Poultry Magazine, Dec., 1936.

Summary:

The author summarizes as follows: Data presented here, together with information previously available, raises the question—What is a watery white? There is at most only a small difference in per cent. moisture between a "watery" and a "firm" white, or between "thin" and "thick" white. The thin white is better for whipping than thick white, and watery whites are apparently as good or better for whipping than firm whites. Thin white is better for the baking of cake. Thin white may be satisfactorily poached or fried. No information seems to be available to show that "watery" and "firm" whites do not keep equally well in storage, and, in fact, since candling does not show "wateriness," it is not certain that such information could be secured. Individual eggs show a large variation in the relative amount of thin and thick white present, which is not correlated with "watery" appearance after breaking.

Thus on the basis of the assumption which has been made that a so-called "watery" egg contains a greater proportion of thin white, it appears to identify "watery" white either by candling or by observation of the broken egg.

Each of the six foregoing abstracts constitutes a different aspect of the "watery white" problem. The main points are as follows:—

1. Only slight variation in the percentage firm white in the eggs of the individual hen.
2. Great variation between the eggs of different hens.
3. Great variation between the eggs of different breeds.
4. Great seasonal variation.
5. The probability of "wateriness" being an inherited character. The fact that there is a tendency to return to the normal rather minimises the genetic factor.
6. There is no relationship between shell weight and percentage firm white.
7. The failure of the candling process as a test of wateriness.

8. Rupture of the firm white envelope as the cause of "watery white." It is suggested that the rupture of the firm white envelope may occur in the process of breaking out eggs.

And, finally (9) the question as to whether "watery whites" are, in fact, in any way inferior as a commercial product to firm whites.

SUNDRIES

Observations on the Relation of the Percentages of the different layers of Egg Albumen to observed interior Egg Quality. A. von Wagener and H. S. Wilgus. Cornell University. The U.S. Egg and Poultry Magazine, June, 1934.

Summary:

The results presented indicate that the determination of the proportions of the various layers of egg albumen should be supplemented by that of the observed condition in order to present a more complete picture of egg albumen quality. Efforts should be directed towards reducing this observation to terms adaptable to measurement.

The Interrelationship between dietary Egg White and the requirement for a protective factor in the Cure of the nutritive disorder due to Egg White. H. T. Parsons, J. G. Lease and E. Kelly.

A Comparison in five types of Animals of the effect of dietary Egg White and of a specific factor given orally or parenterally. J. G. Lease, H. T. Parsons and E. Kelly. Biochem. Journal, Vol. 31, 1937, pp. 424, 433.

1. Experiments with rats and chicks showed a definite relationship between the amount of egg white in the diet and the quantity of the protective factor needed. The latter was given either in the ration as pork kidney, or parenterally or orally as a potent extract. It is obvious, therefore, that the injurious effects of egg white cannot be attributed to destruction of the protective factor by the protein in either the ration or digestive tract, and it is suggested that the interrelationship is metabolic in nature. It was noteworthy that, with a basal ration containing 40 per cent. of egg white, injection of 4·5 ml. of extract, containing only 0·78 gramme solid matter brought about a nearly complete cure in the rat in 14 days. The non-identity of the protective factor with any of the B vitamins was further confirmed. The chick's requirement for the protective factor was higher than the rat's.

2. Egg white injury has been previously demonstrated in rats and chicks. It is now shown that rabbits and monkeys also exhibit a similar syndrome after ingestion of egg white in large quantities. The points of similarity and difference in the symptoms shown by these four species are discussed. Guinea-pigs proved to be less susceptible, showing transient non-specific symptoms only.

Hen Eggs containing Iodine. T. Chrzazcz. Wiad. farm., Vol. 62, 1935, p. 481. (Ref. Nutrition Abstracts, Vol. 7, 1937, p. 236.)

The I content of eggs may be increased by appropriate feeding, but eggs become smaller. I accumulates largely in the yolk.

Biological Collection of Halogens in Eggs and the therapeutical use of halogenised Eggs. Ueber die biologische Speicherung der halogenen Elemente in Hühnereiern und die therapeutische Verwendung der halogenisierten Eier. H. Berkesy and R. Gönczi. Magyar Orvosi Archivum, Vol. 34, 1933, p. 402. (Ref. Berliner Tierärtzliche Wochenschrift, 1934, p. 442.)

In the eggs of hens to which iodine had been administered it was possible, by applying Fellenberg's method, to show 2,000 to 4,000 gamma iodine. By means of intravenous injections of iodine it is possible to increase the normal value of the iodine content 20 to 50 times, but this increase disappears rapidly when treatment is stopped.

In the animal organism the liver and brains contain the biggest quantity of iodine. The feeding of iodine-eggs shows good results in the hyperfunction of the thyroid gland and it increases the content of iodine in the blood.

Minerals in Eggs. Recherches sur la Fixation du Potassium (Oiseaux et Poissons). A. Leulier and F. Paulant. Bulletin de la Société de Chimie biologique, Vol. 17, 1935, p. 1124.

Hen eggs contain 115 to 156 mg. potassium per 100 grammes egg content (without shell), thus 63 to 76 mgr. per egg. In ducks these figures are 140 to 163 per 100 grammes; in turkeys 120 to 132; in pigeons 116 to 133. In hen eggs there are 90 mgr. per 100 grammes in the yolk as against 160 mgr. per 100 grammes in the albumen. During hatching the embryo consumes 80 per cent. of the potassium.

Iodine in Eggs. Contributo allo Studio della Produzione delle Uova iodiche. Dr. Th. Davalle. Rivista di Avicultura, 1935, p. 253.

Conclusions:

1. It is possible to obtain eggs with a large iodine content if the hens are fed with liquid iodine-glutine mixed with the food.
2. This feeding with iodine appears to have no influence on the health condition and seems to make them more immune against disease.
3. With an average of 3 mgr. of this product it is possible to obtain 5 mgr. of iodine in the eggs.

Iodine Eggs. Jodeier. L. Freund. Münchener Tierärtzliche Wochenschrift, 1935, p. 315.

Iodine can be given to hens for a lengthy period without any ill-effects. Young hens are more sensitive than old hens. Large doses of iodine result in smaller eggs (from 50 grammes to 37 grammes) and laying is suspended. The limit is 0·3 gramme per day and per hen. Accurate information regarding the dose of iodine is looked upon as a trade secret.

The normal content of iodine in eggs is very small, *viz.*, 1·04 to 8·75 gamma per egg. Dried seaweed, thyroid, fish meal, oyster-shells, iodine-potassium (2 to 5 mgr. iodine) can increase the iodine content from 75 to 150 times. Wevers calculated 500 gammas per egg. The content of iodine in the yolk is greater than that in the albumen. As there is an enormous variation in the content of iodine the uncontrolled consumption of such eggs is dangerous for human beings. The question arises as to whether the production of iodine-eggs results in the increase of the price of a simple curative.

Investigations regarding the Chemistry of Eggs. Untersuchungen über die Chemie des Eies. Eier Börse, May 17th, 1937.

Grossfield and Peter have published an accurately analytic work on the recognition and detection of bad eggs.

It has been proved that the decrease in lecithine which sometimes occurs in confections which have been stored, *i.e.,* a decrease in the analytic solid lecithine, can be attributed to colloid-chemical changes in the mixture of flour substance and lecithine. This fact was substantiated by the methodical work carried out at the German Experiment Station for Foodstuffs Chemistry of Diemaur, Mayr and Taufel (*Zeitschrift für Untersuchung der Lebensmittel,* 1935, Vol. 69, p. 1). A biological disintegration of the lecithine plays but a minor part. Both carbohydrates and albumen also share the deterioration of the lecithine, but fat does not.

According to von Kluge, the proportion of stearine to lecithine-phosphoric acid in the yolk differs greatly from that in vegetable-lecithine preparations. This difference can serve to help to recognize vegetable lecithine in confections, whereby, however, numerous other chemical investigations can be involved.

The Study of Eggs. Contribution à l'Etude des Oeufs. Dr. N. Mihailesco. Annales de l'Institut National Zootechnique de Roumanie, Vol. 5, 1936, p.1.

1. The first eggs of young hens are 1 to 10 grammes lighter than the eggs laid by the same hen at a later age.
2. All the eggs laid at the beginning of a laying cycle are not heavier than those laid at the termination.
3. The weight of the eggs is greater in the cold months than in the summer. The heaviest eggs are laid in April.
4. The shape of the egg is variable. A hen can lay normal and abnormal eggs. Some hens lay only abnormal eggs.
5. Sometimes a hen lays eggs of various colours although a certain colour dominates.
6. Eggshells are sometimes mottled.
7. On the majority of eggs one observes spots and rough places caused by protruding pieces of chalk.
8. The size of the air-cell is independent of the breed. The air-cell is usually situated at the blunt end of the egg with a slight inclination to the lateral side.

Are Eggs with Mildew Spots suitable for Consumption? Sind Fleckeier und Eier mit Schimmelflecken gemusstauchlich? Prof. Dr. Lerche. Zeitschrift für Fleisch- und Milchhygiene, Vol. 45, 1935, p. 561.

1. Eggs in which the yolk adheres to the shell membrane are unsuitable for consumption.
2. Eggs with mildew spots are also unsuitable for consumption.

Are Eggs with Spots and Mildew Spots Unusable? Sind Fleckeier und Eier mit Schimmelflecken untauglich? Wundram and Schönberg. Zeitschrift für Fleisch- und Milchhygiene, Vol. 45, 1935, p. 443.

In an article written by Professor Lerche it is stated that eggs with mildew spots are unusable. The writer states that when these spots are removed the eggs are quite suitable for bakers, etc.

Mildew in Eggs. Recherches sur les Champignons produisant des alterations dans les oeufs destinés à la consommation. M. Baeza. Ann. parasitol. hum. et comp., Vol. 12, 1934, p. 543. (Ref. Zentralblatt für Bakteriologie, Ref. Vol. 119, 1935, p. 432.)

There were three different kinds of abnormal eggs among 250. Two kinds infected by mildew and one kind affected by bacteria. The majority of infections occur after laying. The majority of the known mildews will not grow in a temperature of 40° C.

Investigations regarding the Freshness of Eggs. Ricerche sul controllo della Freschezza delle Uova. Dr. P. Braccini. Nuovi Anuali dell' Agricoltura, Vol. 15, 1935.

The writer investigated various methods for ascertaining the age of eggs. By means of the *p*H determination with thymol-blue the age, in days, could be ascertained with sufficient accuracy. This was not possible with other methods.

The Size of the Air Cell in Eggs. Untersuchungen über die Grösse der Luftkammer von Eiern und die Altersbestimmungen von Eiern in ultravioletten Licht. Dr. Wundram. Berliner Tierärtzliche Wochenschrift, Vol. 52, 1936, p. 49.

Notes in conjunction with publications by Professor van Oyen and Dr. Molanus. From these it appeared that the air-cells in ordinary storage are not larger than 5 mm. after 4 to 7 days. The air-cells were much larger by auto-transport, at least they appeared to be larger, but whether they contained more air is a question. The size of the air-cell by auto-transport therefore has no value when judging the age.

It was not possible to distinguish fresh from cold store eggs by means of Hanau's lamp.

Conservation of Eggs. Versuch einer Nachprüfung der Eierkonservierung mittels Oelbades nach dem amerikanischen Patent 1 862508 von W. C. Howard, Chicago. Dr. G. Fleischhauer. Berliner Tierärtzliche Wochenschrift, Vol. 51, 1935, p. 476.

It is not possible to control the American method as the nature and composition of the oil are unknown. No statement as to the value of the method can be made until extensive tests have been made.

Examination of Eggs. R. Baetslé and Ch. de Bruyker. Edition of the Royal Flemish Academia, 1934, Ledeberg, Gent.

Contents:

Composition of the Eggs. Various Kinds of Eggs. The Shell Examination by Candling. Examination after Opening the Eggs. Boiling. Chemical Analysis. Summary and Conclusions.

Marking of Eggs. Sulla marcatura delle Uova. F. Villanis-Audifredi. Annali della Sperimentazione agraria, Vol. 21, 1937, p. 97.

The marking of eggs is usual in the international egg trade. The marks must be indelible. The writer has examined various inks used for marking and has found the following: (1) Ink made from Arabic gum and glycerine; (2) Ink made from dried albumen and glycerine; (3) Ink prepared with a mineral oil and colofonium.

The writer mixed these three kinds of ink with various colouring matters, both organic and inorganic.

Certain commercial inks of unknown composition were also used in the tests.

After being marked the eggs were washed in hydrochloric acid. Tests were also made to ascertain the depth to which the ink penetrated the shell. None of the three inks mentioned above satisfied the requirements. Only one ink under a trade name gave satisfactory results. This penetrated deeply into the pores and resisted treatment with acids and alkalis.

A Colossal Egg. Un oeuf colossal, Extrait du " Petit Marseillais " du 11 fevrier, 1936. La Révue Avicole, 1936, p. 109.

It was certainly the biggest egg in the world that was laid by the 3-years-old White Leghorn hen No. 794 on December 14, 1935, at the Elevage des Pignolets à Saint-Julien-le-Montagnier (Var.).

This enormous egg, which is a veritable curiosity, has been examined by the Director of the Pasteur Laboratory in Paris. It weighed 320 grammes and was single yolked. The weight was confirmed in the Laboratory Bulletin of December 18.

It is being kept in the Museum of Curiosities at the Laboratory and will certainly arouse the wonder of all who see it. The hen that laid it weighed 1,900 grammes when 10 months old and often laid eggs weighing 80 to 100 grammes.

The Result of Egg Standardization. Der Erfolg der Eierstandardisierung. Deutsche Landwirtschaftliche. Geflügelzeitung, 1935, 16.

Since the coming into force of the Egg Decree, in which the requirements for standardization were laid down, about 14,000,000 eggs have been rejected as unfit for consumption.

Diseases transmitted to Human Beings by Eggs. Les Maladies infectieuses transmisès à l'Homme par les Oeufs. Prof. J. Verge. Reçeuil de Médecine Vétérinaire, Vol. 110, 1934, p. 705.

Contents:

An extensive literary review. (*a*) Eggs and Avian Tuberculosis; (*b*) Egg and Avian Paratyphoid; (*c*) Eggs containing Germs of the *Pullorum sanguinarium* Group; (*d*) Eggs and Other Microbes.

Temperatures in Eggs during Boiling and Frying. Ueber die in Eiern beim Kochen und Braten entstehenden Temperaturen. H. Ilzhöfer and C. Müller. Archiv für Hygiene, Vol. 114, 1935, p. 341.

The temperatures in hen and duck eggs are thermo-electrically ascertained. It is not certain that tubercle and enteritis bacilli are killed after 5 minutes' boiling. After 8 to 10 minutes' boiling they are so weakened that they are no longer harmful to human beings. The germs are not destroyed by the temperatures attained during the preparation of soft fried eggs.

Investigations on the Shell Strength of Hen Eggs. R. G. Baskett, W. H. Dryden and R. W. Hale. The Journal of the Ministry of Agriculture of Northern Ireland, Vol. 5, 1937, p. 132.

An account is given of an investigation carried out in 1931 and 1932, and using over 5,000 eggs, to determine causes of variations in the shell strength of hen eggs. A special apparatus for determining this strength was developed and is described. The eggs were produced under various conditions and were tested weekly by candling until they were found to be "rejects" according to the definitions applied to the egg trade by the Ministry of Agriculture for Northern Ireland. The keeping qualities of the eggs were measured by the number of weeks they took to become seconds and also by the number of weeks to become rejects. The shell strength of each egg was determined when the keeping test was completed.

The conclusions arrived at may be summarized as follows:—

1. The apparatus used did not give very accurate results for comparing one egg with another, owing to the variations in strength from place to place on the shell. It was, however, quite satisfactory for measuring the average strength of large groups of eggs.

2. The rations fed to the hens, and the systems of management, of which examples were investigated, were not the causes of any noteworthy variations in shell strength.

3. The shell strength of hens kept under similar conditions throughout the year tends to fall during the first half of the year and to rise again during the second half, but the decrease in strength during the summer is not large enough to be of any great commercial significance.

4. The tests on hens of the White Wyandotte, White Leghorn and Rhode Island Red breeds did not show any variations of importance amongst the breeds as regards shell strength.

5. Individual characteristics of particular hens appeared to be more important than the other factors investigated in causing variations in shell strength.

6. The shell strength did not have any measurable effect on the keeping qualities of the eggs, slight positive correlations between shell strength and keeping qualities being reduced below the level of significance when the seasonal movements of the two series were eliminated.

Investigations on the Keeping Qualities of Hen Eggs. W. H. Dryden and R. W. Hale. The Journal of the Ministry of Agriculture of Northern Ireland, Vol. 5, 1937, p. 70.

Summary and Conclusions:

This paper gives an account of observations made throughout 1931 and 1932, chiefly at the Agricultural Research Institute of Northern Ireland, Hillsborough, County Down. Eggs were collected from certain of the experimental pens at Hillsborough, from the Ministry of Agriculture's Laying Tests at Stormont, and from various poultry farms in Northern Ireland. The quality of the eggs when fresh was judged by candling and they were then kept under ordinary room conditions at Hillsborough. They were candled at weekly intervals to determine how long it took them to become "seconds" and "rejects" according to the standards laid down in the Marketing of Eggs Regulations for Northern Ireland. Samples of eggs were sent through normal trade channels in standard cases and

were returned to Hillsborough, for testing and storing, in order to observe the effects of handling such as eggs usually receive in commerce.

The methods and results are described in detail, and the conclusions are found to be in general agreement with such work on similar lines of which the results have been published. The main conclusions arrived at in the investigation may be summarized as follows:—

1. Differences in systems of feeding and management such as are found on good commercial poultry farms do not affect the quality of the eggs produced to any appreciable degree. A slight but ill-defined difference in quality in favour of the hens having the most exercise was noted, but it was certainly not large enough to affect the commercial value of the eggs.

2. The season of the year caused the most important variation in keeping qualities, but the reduction during summer was probably due to the higher storage temperatures and not to any intrinsic inferiority of the eggs as laid.

3. The hens' rate of production does not seem to have any effect on the quality of the eggs, but individual hens differ considerably amongst themselves in this respect.

4. There are no differences amongst the three chief breeds of hens, namely White Wyandottes, Rhode Island Reds and White Leghorns, as regards quality of eggs when laid or as regards keeping qualities.

5. The appearance of an egg when candled soon after being laid is very little guide as to its keeping qualities. The "normal" or best type of egg in this investigation kept very little better than the common types. The presence of running and of tremulous air-cells was not found necessarily to denote eggs of poor keeping qualities.

6. The transportation of eggs causes serious deterioration in their appearance and keeping qualities, which is very much accentuated when the eggs are not packed with the broad end uppermost. One-third of the eggs packed broad-end down were actually seconds after handling similar to what they would have received during export to England. The shaking and jolting of transport tended to produce running and tremulous air-cells, particularly amongst eggs packed broad-end down.

Further Investigation into the Keeping Quality of Eggs. W. H. Dryden. The Journal of the Ministry of Agriculture of Northern Ireland, Vol. 5, 1937, p. 113.

I. The Quality of Fresh Eggs in Transit.

1. Egg quality in transit is apparently influenced to a considerable extent by the construction of the package and the type of pulp board used during warm periods.

2. Egg quality appears to suffer in transit from the effect of ventilation during warm periods.

3. The need for establishing and maintaining a more uniform and, in most cases, a higher standard of testing throughout the trade in Northern Ireland.

4. When eggs are packed in plain fillers and flats surrounded by waxed board "liners," thereby causing a comparatively non-ventilated package, the quality of eggs in transit was superior to the quality of eggs packed in No. 3 Standard cases.

5. When eggs are packed in waxed fillers and flats inside waxed board "liners," the quality of the egg in transit during warm periods is very little affected over a period of one week after packing in Northern Ireland.

However, the difference in quality of eggs packed in plain fillers and flats or waxed fillers and flats inside waxed board "liners" is very little for commercial purposes over a period of one week after packing. The extra cost involved in providing a board possessing similar characteristics to waxed fillers and flats would not be justified.

6. The keeping quality of eggs in transit may be greatly improved if fillers and flats are constructed from pulp board possessing non-absorbent properties.

However, the extra cost involved in providing a board of such quality would not be justified by the improved keeping quality of the eggs over that found in ordinary fillers and flats inside "liners" possessing non-porous, non-absorbent properties.

In conclusion, it might be mentioned that the experiment included a fifth test. Observations were made on eggs packed in corrugated fibreboard cases. The board known as corrugated fibreboard is constructed by placing strawboard between two layers of fibreboard, and this material possesses considerable absorbent properties. However, against the inner layer of fibreboard was fixed a thin layer of paper which the manufacturers claim to possess non-porous and non-absorbent properties. This part of the experiment was dropped at an early stage because of the excessive breakage due to the fact that the board used in the construction of the cases was not strong enough to withstand the ordinary buffeting in transit.

II. Egg Quality in Cold Storage.

1. Egg quality in cold store is apparently influenced to a considerable extent by the construction of the package and the type of pulp board used.

2. Egg quality in cold store appears to suffer from the effect of ventilation.

3. When eggs are packed in plain fillers and flats surrounded by waxed board "liners," thereby causing a comparatively non-ventilated package, the quality of eggs in cold store was superior to the quality of eggs packed in No. 3 Standard cases.

4. When eggs are packed in plain fillers and flats inside "Kraft" bags the quality of the eggs in cold store is liable to be affected by the appearance of mould growth, which may be due to the material of the bags.

5. When eggs are packed in waxed fillers and flats inside "Kraft" bags a considerable amount of mould growth will be experienced.

III. The Quality of Cold Store Eggs in Transit between Northern Ireland and Great Britain.

1. The egg quality of cold-stored eggs in transit is apparently influenced to a considerable extent by the construction of the packages and the type of pulp board used.

2. The egg quality of cold-stored eggs appears to suffer in transit from the effect of ventilation.

3. When eggs are packed in plain fillers and flats surrounded by waxed board liners, thereby causing a comparatively non-ventilated package, the quality of cold-stored eggs in transit was superior to the quality of cold-stored eggs packed in No. 3 Standard cases.

4. When eggs are packed in fillers and flats of a non-porous and non-absorbent nature surrounded by liners or bags possessing similar properties, the quality of cold-stored eggs in transit appears to suffer to a considerable extent, due to the rapid growth of mould.

5. The keeping quality of cold-stored eggs in transit may be greatly improved if fillers and flats constructed from ordinary pulp board are surrounded by "liners" possessing non-absorbent and non-porous properties.

Measurement of the Viscosity of Eggs by the use of a Torsion Pendulum. J. V. Atanasoff and H. L. Wilcke. Iowa Agricultural Experiment Station, Journal of Agricultural Research, Vol. 54, 1937, p. 701.

It may be concluded that the torsion pendulum method yields results which are in general agreement with results obtained by grading eggs before the candle; that is, that eggs which have a low total viscosity index are, in general, of poor

quality as judged by yolk movement and yolk shadow. When individual eggs are studied, however, there is more variation in the results than would be desirable from an experimental viewpoint.

Variations in Egg-quality Characters in certain Breeds, Varieties and Strains of Chickens. A. van Wagenen, G. O. Hall and H. S. Wilgus. Journal of Agricultural Research, Vol. 54, 1937, p. 767.

Summary and Conclusions:

The eggs of the Barred and the White Plymouth Rock showed significantly poorer condition of the firm albumen than did the eggs of the Single Comb White Leghorn, Single Comb Rhode Island Red, and New Hampshire at the central and western New York egg-laying tests.

The Single Comb White Leghorn showed greater variability between pens than within pens, indicating strain differences for the condition and percentage of firm albumen. The American breeds did not show greater variability between pens than within pens.

The percentage of firm albumen and shell strength did not differ importantly among the breeds with the exception of the Barred Plymouth Rock, which showed slightly weaker shell strength.

Eggs from the American breeds studied showed a much greater incidence of meat spots than did those from the Single Comb White Leghorn. No differences in the occurrence of blood spots were observed among the breeds.

With the exception of the association between the height and the score of the condition of the firm albumen, none of the egg quality characters studied showed biologically significant interrelation with each other or with production, although mathematically significant association existed in some instances.

These data confirm previous observations by the authors that, for the most part, the characters used as measures of interior egg quality are independent of each other and are relatively constant for the individual.

Formation of the Chalazae in the Hen's Egg. H. J. Almquist. Poultry Science, Vol. 15, 1936, p. 460.

In this study at the California Experiment Station the author has noted that, in 520 White Leghorn eggs in which both chalazas were normal, the chalaza at the large end of the egg invariably had a clockwise twist and the one at the small end a counter-clockwise twist. As an explanation of this condition it is postulated that the egg is invariably located in the uterus small end caudad, that the egg as a whole rotates in a counter-clockwise direction, and that the yolk rotates less frequently than its envelopes, thus causing the opposite twists in the mucin strands which comprise the chalaza. This condition, together with the syneresis in the firm albumen, results in these strands shrinking together into a twisted cord-like structure.

The Nutritive Value of Eggs. W. C. Russell. Agricultural Experiment Station, New Brunswick, New Jersey. Circular 332, 1934.

Contents:

Eggs as a Source of Proteins. Fats in Egg Yolks. Mineral Constituents of Eggs. Vitamins in Eggs. Energy Value of Eggs.

Relationship between Yolk Index, Percentage of firm White, and Albumen Index. V. Heiman and L. A. Wilhelm.

Agricultural Experiment Station, State College of Washington. Journal of Agricultural Research, Vol. 54, 1937, p. 551.

The yolk index, the percentage of firm white, and the albumen index show changes upon storage which are due to deterioration in the interior quality of eggs. The albumen index is closely related to the observed grade of eggs; whereas the yolk index and the percentage of firm white bear little, if any, relation to the observed grade or to each other in freshly laid eggs or in eggs which have undergone the same amount of deterioration.

TABLE POULTRY

The Value of White Leghorns as Table Poultry. Rilievi sulla resa alla macellazione dei polli di razza livornese bianca. Dr. G. Giusti. Milano. La Clinica Veterinaria, Vol. 59, 1936, p. 251.

The organs, blood, etc., of 50 pullets and 50 cockerels were weighed. The weight of these in hens of 1·150 kg. was 75·2 per cent. of the total body weight and in cocks of 1·825 kg. 78·6 per cent.

The Plucking of Birds and the Pumping of Air under the Skin. Rupfen des Geflügels. J. Hohl and G. Petrov. Revue Vétérinaire Slave, Vol. 2, 1935, p. 52.

The infusion of air under the skin of freshly killed poultry neither eases nor accelerates plucking.

The Value of Eggs and Table Poultry. Die Verwertung von Eiern und Schlachtgeflügel durch den Erzeuger. Dr. B. Grzimek. 1937, 28 pictures, Price RM.2.—Publ. Eugen Ulmer, Stuttgart S. Olgastr. 83.

How can the breeder get the best out of eggs and table poultry by adopting the new ideas of recent years? This question is answered in the above-mentioned booklet. The writer is the originator of a mass project to introduce a steady increase and control of the good handling of eggs, which is new for Germany. Thanks to this measure, millions of German eggs are now yearly placed in cold storage and with very little loss, whereas a few years ago German eggs were not suitable for the wholesale trade and the German cold stores were full of foreign eggs. The contents of this book are much more extensive than the title would lead one to believe. If one wishes to know something about Duck Egg Poisoning, Artificial Yolk Colouring, Iodine Eggs, the Breeding of Fat or Lean Geese, the Cure for Crooked Breastbones (which results in a decrease in the value of table poultry), How to Keep Eggs Fresh, the Making of Poultry Conserves, the Handling, Sorting, Preparation, Marking, Packing, Retail Trade, then it can be found in this book. Nothing has been forgotten. This first volume of the new "Poultry Breeding Library" promises very much for what is to come.

Supplying Germany with Table Poultry during 1932-1933. Die Versorgung Deutschlands mit Geflügelfleisch in den Jahren 1932 und 1933. Dr. Th. Schulz. Berlin-Dahlem. Züchtungskunde, Vol. 9, No. 9, 1934.

Th. Schulz refers to previous publications by von Wessler (without reference to table poultry) on the supply of meat in Germany.

He writes: The consumption of table poultry is not only of importance with regard to home supplies but also in regard to providing employment in the poultry fattening industry. It is also of special importance on account of the market precedence which table poultry has over the egg trade. In an extensive collection of figures it is shown what the average consumption was of hens, geese and ducks, of both home and foreign origin, in the years 1925-27, 1928-31 and 1932-33.

From the figures it was seen that since 1925-27, after an initial increase in the last two years, a small decrease took place in the total consumption of table poultry; there is a steady increase in the home production of geese and ducks and a simultaneous decrease in the numbers imported. If consumption in the years 1932-33 is compared with the averages in 1925-27 and 1928-31, it will be seen that, compared with 1925-27, there was an increase in the later years, but compared with the years 1928-31 there was a decrease.

Individual tables are given. The biggest fluctuations were in the consumption of home-bred ducks, although on the whole the figures for home-bred birds showed smaller fluctuations than imports.

The consumption of table poultry per head of the population compares favourably with the supply; the consumption of home-bred geese per head of the population shows a steady increase. Extensive tables are given showing the consumption per head.

The percentage of the consumption of table poultry as shown in the figures for the general consumption of meat per head is remarkable; it amounts on the average of the years to 3 per cent., which is twice as much as the consumption of mutton, ten times that of goat-flesh and about half the consumption of veal, whereas of the general total pork takes 60 per cent. and beef about 29 per cent.

The importance of the supply of table poultry as compared with the general meat supply is made especially clear in a table calculated according to the value of the imports of living and dead poultry. It shows that in the years 1932 and 1933 36 per cent. of the value of all live animals imported was accounted for by poultry, while the figures for beef varied between 42 and 25 per cent. Of the total value of imported meat, 35·3 per cent. and sometimes 37·4 per cent. is accounted for by poultry.

Finally, means are discussed for providing Germany with sufficient home-bred table poultry.

The writer gives the following figures for 1934: Total consumption of table poultry, 100,237 tons, of which 70,433 tons was home-bred and 29,804 tons imported. The total consumption of table poultry per head of the population is given as 1,528 grammes, of which 1,074 grammes was home-bred and 454 grammes imported. The import figures for 1924 showed 24·04 per cent. live and 48·0 per cent. dead poultry.

The above shows clearly the importance of table poultry in connection with the consumption of meat in general.

Table Poultry Production. A. J. Macdonald and M. R. McMurray. Harper Adams Agricultural College, Newport, Bulletin No. 10, 1934.

Summary:

Details are given of the results of experiments involving a total of 5,474 chickens, dealing with methods of brooding, rearing, feeding and fattening table chickens.

Breeds Used.

Brown Sussex x Light Sussex, Rhode Island Red x Light Sussex, and Bresse x Light Sussex chickens were used in the experiments reported.

Fertility and Hatchability.

The average percentage of fertile eggs obtained from the three crosses used in different years varied considerably, ranging from 70 to 83 per cent. With each cross the fertility was higher during the spring than during the autumn and winter.

There was very little difference in the hatchability of all eggs set for the three crosses. Satisfactory hatches of fertile eggs were obtained from eggs stored for 2 weeks.

Rate of Growth.

At 14 weeks the Brown Sussex x Light Sussex and the R.I.R. x Light Sussex pullets weighed from 3 to 3½ lb., and the cockerels about 4 lb. each. At the same age Bresse x Light Sussex pullets weighed 2¼ to 2¾ lb. and the cockerels 2½ to 3 lb. each.

Quality of Chickens.

The colour and quality of the flesh of the Brown Sussex x Light Sussex and the R.I.R. x Light Sussex chickens was very good. For a 4-lb. chicken the cockerels from these crosses had rather large frames, and it is probable that a greater proportion of flesh to bone would be produced by rearing the birds for a longer period than 14 weeks prior to fattening. For a 3½-lb. chicken the pullets from both these crosses carried a good proportion of flesh to bone.

The Bresse x Sussex chickens were small-boned, plump birds with a good quality flesh, but the greyish colour of the skin and the dark shanks of the pullets were serious disadvantages.

Good returns were obtained from the Brown Sussex x Light Sussex and the R.I.R. x Light Sussex, and these crosses would seem to be very suitable for the market requirements.

The Bresse x Sussex chickens were not so popular on the market and gave lower total returns and a lower price per lb. than the other two crosses.

Feeding.

A ration made up of:—

49	parts	yellow maize meal
14	,,	bran
20	,,	thirds
5	,,	dried skim milk
5	,,	meat and bone meal
5	,,	soya bean meal
1	part	cod-liver oil
1	,,	common salt

fed from hatching to 14 weeks gave a satisfactory rate of growth. The average food consumption for the Brown Sussex x Light Sussex and the R.I.R. x Light Sussex chickens to 14 weeks varied from 14 to 15 lb., and for the Bresse x Light Sussex to 13½ weeks from 12 to 13 lb.

Battery Brooding and Rearing v. *Floor Brooding and Range Rearing.*

It is possible to get good results with battery brooders and coolers when the chickens are not crowded and the batteries are well managed.

The results suggest that the type of chicken and the degree of crowding may influence the results obtained in the batteries, as to rate of growth, food consumption, and mortality.

The R.I.R. x Light Sussex chickens, to 8 weeks, grew slightly faster in the batteries than in the floor brooders, but the cockerels on range from 8 to 14 weeks made better gains than those in the coolers. The final weights of the cockerels from the floor brooders and range were greater than those from the battery brooders and coolers. The final weights of the pullets were similar for both methods of rearing. The Bresse x Sussex chickens made better gains in weight in the batteries and coolers than in floor brooders and on range.

The fattening results from both systems of rearing showed little difference, and the prices obtained for the chickens when marketed were similar for both methods of rearing.

Battery Brooding v. *Floor Brooding.*

The average weight of the Bresse x Sussex chickens brooded in batteries to 8 weeks was slightly greater than the average weight of the chickens reared in the brooder house, but the weights of the chickens in the brooder house were less variable than the weights in the battery brooder.

Observations indicate that better results are obtained with battery brooders when they are rested periodically than when they are used continuously.

The rate of growth on range from 8 to 14 weeks was not influenced by the previous method of brooding.

Chickens brooded in batteries to 8 weeks and reared on range made as good gains during fattening as chickens brooded in floor brooders and there was no difference in the price obtained for the chickens from the two methods of brooding.

The quality of chickens cold stored for a period of 8 months was not affected by the system of brooding and rearing.

Chickens that are to be cold stored should be killed by sticking and bleeding and not by dislocation of the neck. Chickens killed by dislocating the neck were discoloured after a period of cold storage.

Fattening.

The results obtained with 18 days' trough feeding and with 12 days' trough feeding and 6 days' cramming, using R.I.R. x Light Sussex and Brown Sussex x Light Sussex chickens, were not satisfactory since the birds made small live weight gains and correspondingly poor utilization of the food consumed.

In another experiment 12 days of trough feeding, or 2 days of trough feeding and 10 days of cramming, gave better results with R.I.R. x Sussex chickens. The trough-fed cockerels made gains ranging from 6·8 to 9·8 oz., and crammed cockerels gains from 7·1 to 14·8 oz. The trough-fed pullets made gains ranging from 3·3 to 8·5 oz. and the crammed pullets from 4·3 to 9·3 oz. Food utilization was better for this system of fattening.

Twenty days of trough feeding with Bresse x Sussex chickens gave gains ranging from 11 to 16·6 oz. for the cockerels, with an average of 13 oz., and gains of 5 to 8·6 oz. for the pullets, with an average of 7·2 oz. Ten days of trough feeding and 10 days of cramming gave gains ranging from 17 to 20·5 oz. with an average of 18·5 oz. for the Bresse x Sussex cockerels, and gains ranging from 7 to 13·7 oz. with an average of 10·8 oz. for the pullets.

The food consumption per unit of gain under both systems was low for the cockerels, ranging from 4·7 to 5·1 for the crammed birds and from 5 to 7·1 for those trough fed. The pullets under both systems consumed more food per unit of gain, ranging from 7·6 to 10·8 for those trough fed and from 5·9 to 9·2 for those trough fed and crammed.

All chickens gave increased gains in weight with a final period of cramming, but in all the experiments the margin between trough feeding and trough feeding and cramming was considerably greater for cockerels than for pullets.

During the fattening period of 10 days of trough feeding and 10 days of cramming consistent gains in weight were obtained at each weighing during the final period of fattening. The results obtained with 20 days of trough feeding show that with well-grown birds a period of 15 to 17 days of fattening gave as good results as 20 days' fattening.

In none of the fattening experiments was there any appreciable difference in the price obtained per lb. between trough-fed birds and those that had been trough-fed and crammed.

In our opinion cramming can only be recommended where highly skilled labour is available. Where such is not the case, the simpler method of trough feeding could be used, and is capable of producing table birds of first-class market quality.

During the summer months chickens trough fed on range made as good gains in weight as chickens trough fed in the fattening shed. The colour of the range-fattened birds was not as good as the colour of the birds fattened in the shed, but this did not affect the prices realized.

The Determination of the Effect of Fattening on the Carcass of the Chicken. W. A. Maw and J. E. Puddington. Scientific Agriculture, 1937, p. 540.

Summary:

Perimuscular fat is defined as the intermuscular fat intimately connected with the fascia, and the layer of fascial fat on the external surfaces of the muscles.

In studies of the distribution of fat in the body, perimuscular fat is believed to be a logical part of the sample of the breast or thigh muscles for the determination of the fat content of such groups of muscles, where the removal of all perimuscular fat is practically impossible.

There are significant differences in the fat content of the breast and the thigh muscles where two different methods of sampling are used, the one including the perimuscular fat and the second the muscular fat only.

Facts and Figures on Squab Production. C. S. Platt and R. S. Dare. Hints to Poultrymen, Vol. 22, 1935, No. 6.

Contents:

Feed Mixture and Method of Feeding. Feed Consumption. Egg and Squab Production. Squab Weights and Financial Return. Pedigreeing of Breeding Stock.

The use of Wax in the Plucking of Poultry. N. H. Grace. Ottawa: National Research Council and Dominion Department of Agriculture, 1935. (Ref. Experimental Station Record, Vol. 76, 1937, p. 841.)

This publication gives a detailed description of the various operations involved in the wax plucking of poultry. The methods have proven practical for use on the farm and in the small plant.

Use of Pullet Eggs. Influences associated with Table Poultry production. F. C. Bobby. Eggs, Aug. 11th, 1937.

"Although we have found no method whereby it is possible to avoid entirely the use of pullet hatching eggs, we have felt the desire for definite information as to the effect these eggs may have on the financial aspect of table bird production. In consequence, experiments were conducted for the purpose of supplying practical answers to the three following questions:—

1. Is it sound economically to hatch from pullet eggs which are below the generally accepted standard (for hatching eggs) of 2 oz.?
2. To what extent is it an advantage to hatch from hen eggs in preference to pullet eggs?
3. If we use a cock bird, or second-season male, instead of a cockerel when breeding from pullets, will the subsequent chickens benefit by the additional maturity of their male parent?"

Admittedly this is purely an empirical method of obtaining a comparison; nevertheless it does take into account all the principal factors connected with production, with one exception—the quality of the birds when ready for market. In my opinion, had it been a feasible proposition to assess each group on a quality basis, in addition to the factors already accounted for, the order of merit would have remained the same as that given in the table.

And so we have some material upon which to base the answers to the three questions.

(*a*) To the first dealing with size in pullet eggs, I would say that, after 2 years' experimentation, I am satisfied that there is every justification in condemning the use of eggs which are under 2 oz. in weight.

(*b*) Hens appear to have an obvious advantage over average pullets as breeders during the autumn and winter—even when the latter appear to be mature and are laying eggs of 2 oz. and over. This statement does not infer, however, that a profit cannot be made out of table poultry produced from pullet-bred chicks.

(*c*) While wishing to be guarded on the question of the relative values of cockerels and cock birds, I would say that there is sufficient evidence in the experiment reported to cause anyone handling large numbers of stock males annually to give every consideration to the retention of cockerels for a second season. I refer here, of course, to males used in table poultry day-old chick production and not to cockerels on the pedigree breeder's farm.

EGG LAYING TESTS

Observations on the Results of Six Great Egg-laying Contests of Japan held during the Past Year (1935-1936). Tohru Matsumoto and Takejiro Uragami, Officials of the Egg-laying and Breeding Contest of the Central Poultry Association, Tanashi, near Tokyo. Japan Poultry Bulletin, No. 21, 1937.

1. These observations were made for the purpose of raising the average egg production of this country.

2. The annual egg records (1935-36) of the six contests were obtained from the monthly reports which were sent in from the Central Poultry Association of Tokyo and from five contests of the Department of Agriculture and Forestry held in Aomori (in the north of Japan), Ohmiya (near Tokyo), Okazaki (near Nagoya), Harima (near Kobe) and Higo (near Kumamoto).

3. In all the contests, through culling or decease, there were many eliminations before the end of the term of the contest, especially in the five contests of the Department of Agriculture and Forestry, in which hens that had no possibility of producing 300 eggs or more in 365 days were eliminated on the 350th day.

The percentage of hens completing the full term of the contest of the C.P.A. was about 60.

4. From the monthly percentages of egg production in each of the six contests we plotted curves for: (1) the "egg-purpose" breeds, and (2) the "general-purpose" breeds.

We also plotted a curve of the monthly mean egg production of all six contests in each of the following breeds: "egg-purpose," "general-purpose" and ducks.

5. But, because of the eliminations described above (*see* 3), we were unable to show in these charts the exact monthly changes and local differences in the egg production of all the hens in these contests. We therefore plotted separate curves of the monthly egg production percentages for those hens that completed at least 350 days of the contest.

6. The "egg-purpose" breeds started with about 50 to 60 per cent. in October or November, reached 80 per cent. in April, and dropped to 40 per cent. in October. The Aomori Contest was exceptional in that the top was reached in May and this level was held longer than was the case with the other five contests.

7. In the case of the "general-purpose" breeds, in the contest of the C.P.A. the maximum was also reached in April. The results in the other contests were not considered valid because the number of hens in the "general-purpose" group was too small.

8. As regards the seasonal differences in the mean percentages of all six contests between the "egg-purpose" breeds and the "general-purpose" breeds, no large difference is indicated until March, but thereafter the "general-purpose" curve drops until July, the maximum difference being 30 per cent. After July, the mean difference becomes smaller till the end of October.

9. The mean egg production records of some individual pens were very good and rather better than other pens which included outstanding individual hens, for example, the pen including the 361-egg hen. It is noteworthy that in several contests the records of pens belonging to the same owner have, in three or four cases, shown a very high degree of similarity in egg production and mean egg

weight, a fact suggesting that egg production character is generally fixed in each strain.

10. The histograms covering 350 days of the six contests, which show the distribution of the egg records, are generally similar.

The histogram of the Aomori contest is exceptional in that it has two modes. This strange fact seems to require more study.

Storrs International Egg Laying Contest. 47th Annual Report of the Storrs Agricultural Experiment Station, Storrs, Connecticut.

The 24th annual contest concluded on October 23, 1935, with an average production of 214·1 eggs per bird. This is 9½ eggs per hen under the lay in 1934, but within a fraction of an egg of the average for the preceding 5 years.

The fact that Rhode Island Reds outlaid White Leghorns may not be significant but it is certainly out of the ordinary. The comparison is based on practically equal numbers, the one making up 39 per cent. of the 1,000 birds entered and the other 38 per cent. During this 5-year period Rhode Island Reds have twice finished in first place and four times in second place. One may conclude that during recent years Rhode Island Red breeders have made relatively more progress toward their goal of higher egg yields.

In the last Director's report there was a statement to the effect that there had been a definite upward trend in egg size since the adoption of the point system of scoring. This increase in egg weight has continued into the fifth year. From an average of 23·7 oz. per dozen in 1931, egg size has risen to 24·6 oz. per dozen in 1934, an increase of 4 per cent. or practically 1 oz. per dozen.

The Connecticut General Assembly, in the closing days of its 1935 session, appropriated $18,000 for construction of a new Storrs contest plant. This provided for 52 houses 12 ft. square. All are built on concrete foundations and have cement floors. The doors open outwards by way of making the coops more nearly weather-proof. Glass windows have replaced cloth curtains in front. Smaller windows at each end are placed 2 ft. above the floor to get summer ventilation on the floor where the birds are. There is a double cellar sash under the droppings board, thus each house is lighted from all four sides. The inside is sheathed with building board, so that corners and pockets are eliminated and the cleaning problem is considerably simplified. Windows disappear between these double walls, the front ones sliding down and end ones sliding up. The rear window is hinged at the top and opens outwards.

Ventilation is provided by the so-called slot system, a narrow opening over the top of the front plate. Inside features include metal trap-nests, fresh flowing water and a two-circuit electric system in underground cables. The whole plant can be lighted with a single switch and yet each house has an independent circuit that serves other purposes. This excellent new equipment so long needed will add greatly to the efficiency of the contest.

6th Bavarian Egg Laying Competition. Erding 1933-34. *Sechste Bayerische Leistungsprüfung für Hühnerstämme, Erding 1933-34.* Dr. L. Weinmiller. Wochenblatt der Landesbauernschaft Bayern, 6 Dec., 1934.

The competition lasted from October 16, 1933, till September 30, 1934. The total entries consisted of 30 pens of five hens each; grain food consisted of 50 grammes per hen per day. Mash consumption varied, 75 grammes per day for the heavy breeds and 48·8 grammes for the light breeds, with an average of 64·6 grammes for the heavy and 56·9 grammes for the light breeds. The average production per hen during the 11½ months was 200·7 eggs, the average weight of the eggs being 57·4 grammes. One pen of Rhode Island Reds laid an average of 225·4 eggs with an average weight of 60·9 grammes.

Pens in which mortality occurred as a result of insufficient powers of resistance were penalized by being awarded fewer points at the judging. Three pens were returned to the owners as the birds did not appear to have sufficient powers of resistance. The total mortality amounted to 11·1 per cent. At three different times the weights were as follows: heavy breeds, 2,170, 2,500 and 2,400 grammes; light breeds, 1,670, 1,870 and 1,830 grammes.

Report on Egg-Laying Test, 1935-36. Government of Northern Ireland. Ministry of Agriculture, Stormont, Belfast, Nov., 1936.

The average egg production of the birds which lived was as follows in respect of the tests indicated:—

Year of test.	1935/36	1934/35	1933/34	1932/33	1931/32	1930/31	1929/30
Average No. of eggs.	187·9	196·3	194·8	200·2	192·3	192·8	189·5

PRODUCTION AND MORTALITY.

In Table II are given particulars of production and mortality in respect of each breed represented in the test under review. The percentage mortality amongst the birds of the different breeds in the previous test is also given for comparison:—

TABLE II.

Breed.	*No. of Pullets entered.*	*Avg. total No. of eggs per pullet.*	*% of eggs under 1st grade.*	*No. of deaths.*	*Mortality per cent.*	
					This test.	*Last test.*
White Wyandotte	288	171·4	14·7	43	14·9	8·7
White Leghorn ...	120	174·5	11·6	22	18·3	18·4
Rhode Island Red	420	184·0	11·8	37	8·8	9·3
Light Sussex ...	66	161·9	21·4	5	7·5	4·5
Barred Rock ...	6	176·0	33·1	1	16·6	16·6
Buff Rock ...	6	140·6	20·7	1	16·6	None entered.
Welsummer ...	6	139·6	17·3	—	—	

Burnley (Australia) 26th Egg-laying Test, 1936-1937. H. F. Clinton. The Australasian Poultry World, May, 1937, p. 493.

An interesting table is shown which says that in 1925 the percentage of first-grade eggs was 79·8, but last year it is recorded as 97·6, the highest yet. In 1925 the percentage of underweights was 20·2, but now has dropped to 2·4.

Mortality in 1935-36 was 8·9 per cent., Burnley's highest record, but last year it dropped down to 6·1 per cent., the lowest for 4 years.

Taking 641 birds for the full period of 48 weeks, arrived at by noting those that died after the full 656 were penned, the feeding costs were computed.

The birds laid 120,601 eggs in the period, an average of 188·1 eggs per bird (including underweight). The average return was 13d. per dozen, and the return per bird was 16s. 11¾d. The cost of food was 8s. 3d. per bird, therefore the margin of profit over food costs was 8s. 7¼d. per bird.

Final Report of the Scottish Egg-laying Test, 1935-1936. Department of Agriculture for Scotland.

The following are the annual statistics, since the beginning of the Test, of (1) egg production ; (2) cost of food, grit and litter, and (3) revenue from eggs :—

Year of test.	Number of birds.		Average number of eggs laid per bird.		Percentage of eggs laid of the various grades.					Cost of food, grit and litter.				Return for eggs sold.
					Pullets.			Ducks.						
	Pullets.	Ducks.	Pullets.	Ducks.	First grade.	Second grade.	Under Weight.	First grade.	Under Weight.	Total. Pullets.	Total. Ducks.	Per bird per week. Pullets.	Per bird per week. Ducks.	
					%	%	%	%	%					
1935–36	553	—	175·06	—	87·2	11·8	1·0	—	—	£200	—	1·5d.	—	£583
1934–35	492	—	187·18	—	86·3	12·7	1·0	—	—	£196	—	1·6d.	—	£518
1933–34	495	45	199·11	222·96	92·4	7·4	0·2	99·3	0·7	£191	£22	1·6d.	2·1d.	£624
1932–33	500	45	195·25	225·20	93·2	6·6	0·2	99·3	0·7	£202	£24	1·7d.	2·2d.	£744
1931–32	495	45	198·53	204·76	93·5	6·3	0·2	97·8	2·2	£217	£27	1·8d.	2·5d.	£767
1930–31	500	45	188·99	174·93	83·6	15·4	1·0	98·5	1·5	£216	£29	1·8d.	2·7d.	£640
1929–30	500	45	189·06	143·91	78·6	20·7	0·7	92·0	8·0	£233	£31	2d.	2·9d.	£1,057
1928–29	495	55	188·59	169·19	83·5	16·1	0·4	89·6	10·4	£272	£45	2·3d.	3·4d.	£1,086
1927–28	500	45	193·67	184·58	78·0	20·6	1·4	96·6	3·4	£340		2·6d.		£1,059
1926–27	490	40	189·65	210·85	78·7	20·5	0·8	98·3	1·7	£276		2·2d.		£1,100
1925–26	516	96	182·46	163·05	73·0	24·6	2·4	97·0	3·0	£282		2·2d.		£1,027
1924–25	402	108	187·68	150·34	64·8	32·3	2·8	98·0	2·0	£306		3d.		£913

One hundred and thirty pullets—equal to 19·58 per cent. of the whole flock—died. The causes of mortality are all given in a list.

Percentage Death-rate of Each Breed at Each Test.

Test.	*W.L.*	*W.W.*	*R.I.R.*	*All Breeds.*
1924-25	9·31	7·40	2·56	7·46
1925-26	7·62	5·95	1·10	7·17
1926-27	13·02	6·52	3·03	6·97
1927-28	10·21	6·25	2·27	6·50
1928-29	6·57	7·97	2·27	5·50
1929-30	10·48	8·69	6·79	8·30
1930-31	11·10	9·72	5·50	9·00
1931-32	13·25	7·94	7·74	10·00
1932-33	12·64	6·32	9·14	9·60
1933-34	18·23	17·30	8·80	15·16
1934-35	20·57	19·84	13·33	17·26
1935-36	20·45	16·78	22·27	19·58

Number of Birds Entered and Number of Copper Rings Awarded, expressed according to Breeds as a percentage of the Number of Birds Alive at the End of the Test.

	1934-35 Test.		*1935-36 Test.*	
BREED.	*Number of Birds entered.*	%	*Number of Birds entered.*	%
White Leghorns	210	27·9	222	26·3
White Wyandottes	126	21·0	143	12·6
Rhode Island Reds	210	23·2	234	12·8
Buff Rocks	24	17·0	36	13·8
Light Sussex	18	23·1	30	11·1
Australorps	6	0·0	—	—
Black Leghorns	6	0·0	6	16·6
All Breeds	600	23·7	671	17·2

Register of Records in Laying Trials recognised by the National Poultry Council. Vol. X, 1935-1936 Trials. Editor: Ian Macdougall, 73, Southampton Row, London, W.C.1.

Contents:

List of Laying Trials recognized by the N.P.C. for 1936-37. Analysis of Entries. Casualties and Copper Rings at the 1935-36 Open, County and Government-controlled Laying Trials recognized by the N.P.C. Analysis of Entries, etc. Ducks. Table and General Averages of Hens and Ducks.

Massey Agricultural College, Egg-laying Contest, 1936-1937. Annual Report. J. H. Kissling. Poultry Department, University of New Zealand, Palmerston North, April, 1937.

Contents: Egg-laying Contest:

Average Production.—The average egg yield, excluding the scores of birds withdrawn or which died, was as follows: Section A, 197; Section B, 216; Sections C and D, 160; and for all the competing pullets the average was 167·9 eggs. If the scores of those birds that died and which were withdrawn are included in the average figures, these would read as follows, respectively: 166, 210, 147 and 153.

Mortality.—Without withdrawals the mortality rate for all of the entries was 13·3 per cent., and including the withdrawals as deaths (which is, of course, unfair)

the rate was 16·5 per cent. Whilst this rate is quite high enough, it shows little increase on last year's figures, and in view of the unfavourable year is considered very satisfactory. A survey of the causes of deaths is presented elsewhere. Every bird that died was thoroughly examined in the laboratory by Mr. W. M. Webster, M.R.C.V.S., B.SC., the college veterinarian.

The Preparation of Pullets for Egg-laying Contests; Functions of the Poultry Department.

Hawkesbury (Australia) Egg-laying Test, 1936-1937. C. E. Houghton. The Australasian Poultry World, May 1, 1937, p. 493.

The egg-laying competitions conducted by the Hawkesbury Agricultural College ended 35 years of service with the closing of their 1936-37 tests.

In Section A, for light breeds, there were 50 groups, comprising 300 White Leghorn pullets, and in Section B, for heavy breeds, there were 31 groups, comprising 186 Australorps (5 groups), with 30 Langshans, and 4 groups with 24 Rhode Island Reds.

The total scores, published elsewhere, show only those teams which qualified by laying the required number of full-weight eggs. Seventeen individual birds and 9 groups in heavy breeds and 21 individuals and 8 groups in light breeds, failed to qualify.

Food Costs and Returns.—The 540 birds in the competition consumed wheat, 356 bushels; maize, 190 bushels; pollard, 744 bushels; bran, 372 bushels; meat meal, 12 cwt.; salt, 327 lb.; shell grit, 23 cwt.; green feed, 107 cwt.; and Epsom salts, 51 lb. The cost of food consumed, at Sydney market prices *plus* freight, was £234 19s. 5d., equal to 8s. 8d. per bird.

The value of eggs laid, calculated at Sydney ruling prices for new-laid eggs, averaged 13½d. per dozen net, exclusive of freight, commission, etc.

The rations used were: Morning—mash, pollard, 60 lb.; bran, 34 lb.; meat meal, 6 lb. Mid-day—green feed. Evening—wheat, 66 lb.; cracked maize, 34 lb.

Average Production.—Taking all birds of all breeds, the following average production is recorded: White Leghorns, 202·1 eggs; average weight per dozen, 25·6 oz.; value of eggs per bird, 18s. 11d. Australorps, 200·3 eggs; 25·2 oz.; value, 19s. Rhode Island Reds, 182·3 eggs; 25·6 oz.; value, 16s. 11d. Langshans, 201·3 eggs; 25·2 oz.; value, 19s. 1d.

Mortality and Sickness.—The record was slightly better than in the previous year. Casualties due to death and sickness only totalled 50 birds (9 per cent.), as against 54 in 1935-36. All but four of the birds putting up the highest scores increased their weight.

GENERAL

ANNUAL REPORTS

Calendar for Poultry Breeders, 1937. Kalender für Geflügelzüchter 1937. Editor: Fritz Pfenningstorff, Berlin, W.35.

This is the 39th edition of this calendar. During recent years great changes have occurred in Germany, also in the field of poultry breeding, and various problems have been studied with great care at different institutes, and this calendar gives important information of the results of the research work carried out.

Contents: Review of the Organization of Poultry Keeping in Germany, by Karl Vetter; Pedigree Poultry Breeding, by A. Riedel; Poultry Exhibitions, by Salzwedel; Summary of Laying Tests 1934-35, by K. Taut; Results of Research Work at various Experimental Stations; Review of the World Poultry Congress at Leipzig; the Rearing of Chickens; Albumen Foodstuffs, by Dr. L. Weinmiller; Composition and Nutritive Value of Foodstuffs, by Professor F. Lehmann; Cultivation of Green Fodder Plants Rich in Albumen; Description of Various Diseases, by Dr. Hoppe; Review of Poultry-keeping in Germany, by Dr. Schultz.

Poultry in Japan. The Japan Year Book, 1935.

The total head of poultry at the end of June, 1933, numbered 50,910,994, which showed a decrease of 3,395,125 (6·2 per cent.) as compared with the previous year. During the last 10 years, however, the number of poultry in Japan has increased by 100 per cent.

At the end of June, 1933, the total egg production amounted to 3,408,888,000 hen eggs and 12,227,000 duck eggs.

During the last 10 years there has been a considerable increase in the egg production and especially hen eggs. The production in 1931 was twice as large as in 1933.

Total number of Poultry in Canada increased by over two million.

According to the latest census the total number of poultry in Canada in June, 1936, was 2,650,100 higher than in June of the previous year. The increase has taken place only in hens; all other poultry show a small decrease. The figures for live poultry in Canada in June, 1935, and 1936 were as follows:—

	1935. *Head.*	*1936.* *Head.*
Hens and Chicks	53,062,900	55,717,000
Breeding Hens	2,066,200	2,039,900
Geese	918,100	859,000
Ducks	721,600	682,300
Total	56,768,800	59,298,200

Poultry Census in Norway. Die Geflügelzucht in Norwegen. Eier-Börse, 18 March, 1937.

The census of poultry, excluding young birds, taken on June 20, 1936, showed a total of 3,471,933 head. There have been small fluctuations during recent years, as will be seen from the following table:—

1936	3,471,933
1935	3,436,544
1934	3,512,716
1933	3,543,658
1932	3,503,001
1931	3,323,991
1930	3,098,184

Small increase of the number of Laying Hens in Estonia. Geringe Zunahme der Legehennen in Estland. Internationale Eier-Börse, 25 March, 1937.

The census of poultry taken in Estonia at the middle of June showed that during the last 3 years there has been a slight general increase. The number of laying hens also increased, as will be seen from the following table:—

	Number of Laying Hens in Thousands.
1934	995·3
1935	1,009·3
1936	1,047·5

Yearbook Lancashire Utility Poultry Society, 1937.

Contents:

Intensive Turkey Rearing. Some Points in Connection with Laying Batteries. International Egg-laying Test, 1933-34; the test contained 2,112 birds; average production 160·08 eggs. The test, 1934-35; 1,554 birds; average production 157·22 eggs. Vaccination against Pox. When, at which Age, and How it is Carried Out. Constitution and Rules of the Society. List of Members.

The number of Poultry in Germany. Züchtungskunde, Vol. 10, 1935. Dr. E. Lauprecht.

Summary of the number of poultry in Germany, from which the following figures are taken:—

Poultry.	1912.	1930.	1931.	1932.	1933.	1934.
1. Hens (total) ...	63,970,300	87,937,284	84,058,565	84,119,187	87,052,549	85,320,226
2. Of which laying hens	—	69,510,800	67,346,968	68,318,921	63,917,539	57,898,734
3. Of which young hens not started laying on the day of census ...	—	—	—	—	—	20,892,583
4. Of which cocks and chicks	—	—	—	—	—	6,356,870
5. Geese	5,850,775	6,230,393	5,676,698	5,784,556	6,134,895	5,838,932
6. Ducks	2,086,330	3,886,422	3,543,895	3,523,889	3,470,186	2,820,830
7. Hens, geese and ducks together ...	71,907,405	98,054,099	93,279,158	93,427,632	96,657,630	93,980,008

From these figures it appears that in 1934 there was a decrease of about 2·8 per cent. in the number of poultry, but that compared with 1913 there is an increase of 30·6 per cent. The decrease in geese was 4·9 per cent.; in ducks 18·8 per cent., although this figure is still 35·2 per cent. higher than in 1913. The number of hens in 1934 showed a decrease of 2 per cent and for laying hens 9·5 per cent. It will be noticed, however, that the number of hens is still 33·3 per cent. higher than in 1913.

Annual Report and Stud Book. Agric. Research Institute of Northern Ireland. Hillsborough, Co. Down. Northern Ireland Pedigree Poultry Breeding Station, Vol. 4, 1936.

Contents:

Introduction. Hens. Cockerels. Recording and Wing-banding. Guarantee. Report on the 1936 Breeding Season. 1936 Stud Book.

Decrease in Stocks. Fewer birds of all grades except Scottish Turkeys. Poultry World, Aug. 13, 1937.

Ministry of Agriculture returns for the year ended June 4, 1937, show that in England and Wales poultry of all classes are reduced in numbers compared with the previous year. A similar state of affairs prevails in Scotland, except that turkeys show an increase of 21·0 per cent.

The figures are as follows:—

	England and Wales.			
	1937.	1936.	*Decrease.*	
	No. Thous.	*No. Thous.*	*No. Thous.*	*Per cent.*
Fowls :—Over 6 months old	24,517	25,362	845	3·3
Under 6 months old	28,038	32,382	4,344	13·4
Total	52,555	57,744	5,189	9·0
Ducks	2,281	2,606	325	12·5
Geese	552	634	82	12·9
Turkeys	687	707	20	2·8
	Scotland.			
			Decrease.	
Fowls :—Over 6 months old	3,650	3,780	130	8·2
Under 6 months old	3,650	4,174	534	
Ducks	217	236	19	8·1
Geese	24·6	26·1	1·5	5·7
			Increase.	
Turkeys	117·1	96·8	20·3	21·0

Annual Report of the Swiss Federation of Poultry Breeders, 1936. Rapport Annuel de la Fédération Suisse d'Aviculture.

This report gives a summary of the activities of the organization for poultry keeping in Switzerland. The following are also discussed: Work of the Breeding Stations; Laying Tests and the Poultry College at Zollikofen-Bern.

Hawaii Station Report, 1936.

Contents:

The Use of Batteries for Laying and Breeding Hens. The Value of Freshly Cut Alfalfa *v.* Alfalfa Leaf and Blossom Meal. The Effect of Variations in

Relative Humidity on Hatchability. The Value of Artificial Illumination for the Laying Flock. A Comparison of Colony Houses and Battery Brooders for Growing Chicks. The Use of Molasses in the Ration. Cross-breeding for Meat and Egg Production.

Livestock investigations in West Virginia. West Virginia State Bulletin, 278, 1936.

Data are reported on the effect of age on egg production and egg weight, and the inter-relations between age of maturity, rate of production and longevity; methods of feeding grain to pullets; the effect of high protein mash for laying hens; and the influence of diet on the incidence of perosis in chicks.

Livestock investigations in California. California Station Report, 1935-1936.

The poultry studies reported deal with selection for production, inbreeding turkeys, the requirements of chicks for two new fat-soluble vitamins, the relation of certain vitamins to dermatitis in chicks and turkeys, the protein requirements of chicks and turkeys, the effect of cold storage and high temperature on eggs, the cause of " pink white " and " olive yolk " deterioration in eggs, and factors affecting the candling of eggs.

Oklahoma Station Report, 1935-36.

Poultry studies gave results on the value of dried grasshoppers in turkey feeding, by L. Morris; an inexpensive evaporation cooler for preserving eggs over short periods, by R. B. Thompson and C. Roberts; the effect of forcing breeding hens on hatchability, low protein *v.* high protein for egg production, and the influence of fibre in the ration of chicks, by R. Penquite; capon production from low cost chicks, by Penquite and Roberts; the influence of time of hatching on young and adult characteristics, by Morris and Thompson; soya beans for laying hens, and feeding for egg yolk colour, both by Thompson; the incidence and prevention of perosis and the influence of variety, dam, and sex on weight and feathering of broilers, both by Penquite and V. G. Heller; cross-breeding studies, by R. G. Jaap and Morris; and feed and egg costs since 1929, by F. Z. Beanblossom.

Wyoming State Report, 1936.

Poultry studies yielded information on the relation of pauses in winter egg production to the number and size of eggs produced, the use of rye in the chick ration, the use of soya bean meal as a partial substitute for meat meal in the chick ration, the relation of the shape of roosts to breastbone deformity in turkeys, and cod-liver oil, alfalfa meal, and long alfalfa as supplements to a basal ration for pullets.

South Carolina Station Report, 1936.

Poultry studies by R. C. Ringrose, C. L. Morgan and J. H. Mitchell gave results on factors affecting the physical quality of eggs, and the balance between intake and outgo of certain elements in the nutrition of the hen.

Investigations with Livestock in South Dakota. South Dakota Report, 1936.

Poultry studies yielded data on the value of corn, oats and millet grains in poultry rations; alfalfa leaf meal as a vitamin A supplement to red proso millet and amber cane; the relative values of common grain varieties and their effects upon egg quality and poultry carcase quality; ground wheat as a substitute for

bran and middlings; the utilization of corn, wheat, oats and barley in turkey rations; turkey egg hatchability; and the practicability of caponizing cockerels in South Dakota, all by W. E. Poley.

Investigations with Livestock by the Cornell Station. Cornell Station Report, 1936.

Poultry studies yielded results on the vitamin G requirements of poultry, by L. C. Norris; the relative vitamin G content of feeding stuffs used in poultry rations, by H. S. Wilgus, junr., Norris and G. F. Heuser; the nutritive properties of ground soya beans and of corn gluten meal, by Norris and Heuser; the protein requirements of laying hens, and the nutritive requirements of turkeys, both by Heuser; the cause and prevention of perosis in chicks and pheasants, by Wilgus and Norris; a genetic study of inferior egg quality, by G. O. Hall; and the effect of temperature, relative humidity and mechanical jarring on egg quality after short storage periods, by Hall and A. Van Wagenen.

Florida Agricultural Experiment Station Report, 1936.

In tests with poultry, information was obtained on lecithin synthesis in hens on a vitamin A- and lipoid-free diet; a comparative study of corn and liquid milk *v.* a grain and mash ration in feeding for egg production; a comparative study of the value of meat scrap, fish meal and milk solids as sources of protein for egg production; lights *v.* no lights for egg production on Single Comb White Leghorn pullets and hens; and at the West Central Florida Sub-station on the use of peanuts and peanut products in rearing turkeys; confinement *v.* range rearing of chicks; importance of range rotation in poultry production; egg production and mortality of pullets reared under confinement *v.* range conditions; comparative study of the value of milk solids, ground peanuts with hulls, meat meal and fish meal in fattening broilers and fryers; and all-night lights *v.* no lights on Single Comb White Leghorns.

Utah State Bulletin 276, 1936.

Poultry studies gave results on the desirability of forced summer moult in Leghorn hens, optimum levels of animal protein supplement in the laying ration, and the comparative values of soft white wheat *v.* hard red wheat and barley *v.* corn for hens, and the costs of feeding turkeys, all by B. Alder.

Livestock investigations in Pennsylvania. Pennsylvania Station Bulletin 336, 1936.

Reports of poultry tests include factors affecting quality in eggs, by J. E. Hunter, D. R. Marble and W. J. Rudy; the relation of nutrition to perosis in poultry, by Hunter and H. C. Knandel; the nutrition of turkeys, by Marble and Hunter; breeding for increased livability, by Marble; and the propagation of ring-necked pheasants, by E. W. Callenbach, Hunter and R. R. Murphy.

Livestock investigations in Delaware. Delaware State Bulletin 205, 1936.

Data are reported on the necessity of breeding for desirable factors in high egg production and viability, protein levels of rations in growing chicks, and germinated oats for laying pullets, all by Tomhave and C. W. Mumford.

Livestock investigations in Iowa. Iowa State Report, 1936.

Poultry investigations gave results on the effect of diet on the quantity of vitamins A and D occurring in hens' eggs, by Thomas; the biological value of

meat scrap and milk combinations for egg production, and the value of egg yolk and chicken fat as preventives of rickets and slipped tendons of chicks, both by E. W. Henderson; a comparison of avian growth rates, by Henderson and T. T. Milby; and the effect of various levels and sources of protein and inorganic elements in the ration upon slipped tendons in chicks and poults, caponizing turkeys, and artificial lights for turkeys, all by H. L. Wilcke, Henderson, C. Murray and C. D. Lee.

Livestock investigations in New Mexico. New Mexico State Report, 1936.

Experiments on the influence of different range crops and rations on egg quality, production and mortality.

Livestock investigations in Arkansas. Arkansas State Bulletin 337, 1936.

Results are reported on factors affecting the storage quality of eggs, and rice by-products in the laying ration, both by R. M. Smith.

Livestock investigations in Michigan. Michigan State [Biennial] Report, 1935-36.

Results of poultry studies are reported on a comparison of electric and coal brooders in the production of winter broilers; the influence of varying amounts and qualities of proteins, minerals and vitamins in baby chick rations; a comparison of different pasture crops for growing poultry; the effect of various rations on the cost of producing turkeys; and chick metabolism studies, with special reference to factors influencing the incidence of perosis.

Livestock investigations in Missouri. Missouri State Bulletin 370, 1936.

Poultry tests yielded results on the nutritional requirements of poultry, grit in the all-mash chick ration, the normal growth rate of chicks, and the influence of time of hatch on growth, all by H. L. Kempster and E. M. Funk; the feed-purchasing power of the eggs laid by a hen, by Kempster; and temperature changes in eggs, the relation of the length of the incubation period to livability of chicks and growth of turkeys in confinement, all by Funk.

Reported results of nutrition studies include synthetic rations for chicks, by Hogan; the effect of ultra-violet rays on vitamin B carriers, and anæmia caused by de-aminized casein, both by Hogan and L. R. Richardson.

SUNDRIES

Final Report of the 6th World Poultry Congress, Berlin-Leipzig. Schlussbericht des VI. Weltgeflügelkongresses, Berlin-Leipzig. 530 pages with illustrations. Published by the State Ministry of Food and Agriculture, edited by the General Secretariat of the 6th World Poultry Congress. Can be obtained through Fritz Pfenningstorff, Berlin W.35.

The final volume of the extensive Congress books has appeared. From this volume it is possible once again to obtain an insight of the amazing many-sided lectures held during the Congress, which are of great interest to poultry breeders.

Besides the speeches made during the Congress ceremonies, the book contains a record of the prizewinners in the competition for the International Championship, a record of the resolutions made during the scientific sessions, and a list of the roughly 1,300 members of the Congress. Part II gives a summary of the reports given in the Congress speeches, to which is added a record of the discussions. A few reports not published in the previous volume are reviewed in this volume. Various illustrations of the opening ceremonies and of the exhibition itself complete the book.

The price of the full edition of the Congress publications, including the final volume, which cannot be obtained separately, has been fixed by the Secretariat of the Congress at 12 RM., including postage. Taking into consideration the extensiveness of the matter offered, this price is so low that many a breeder will not hesitate to purchase a copy, as a reminder of this most important event in the annals of the poultry industry. This publication offers the poultry breeder an insight into the most important results of research work carried out all over the world, in a form as concentrated as the price is low. The way in which the edition has been published is also worthy of praise.

Figures for the Poultry Industry in Germany and the World. Zahlen zur Geflügelwirtschaft Deutschlands und der Welt. Dr. Th. Schulz. 18 illustrations. Publ: Fritz Pfenningstorff, Berlin, 1937. Price RM.2,50.

In the introduction the writer states that the conclusion of the first 4 years of the National Socialist regeneration, which was also the beginning of a new Four Year Plan, was a good time to give a review of the development of the poultry industry since 1933 and to make plans for further work. Dr. Schulz has spared no pains to make this work as complete as possible, so that the book gives a splendid graphical review of the development of the German poultry industry from 1933 up to the spring of 1937. The following subjects are treated: Production; Export; Prices and the Share of Poultry in the General Agricultural Industry in Germany. The book describes the development of the poultry industry in all its aspects; production and consumption of eggs; production and consumption of poultry flesh; the world trade and Germany's import of eggs in shell; world trade and Germany's import of egg-products; world trade and Germany's import of poultry flesh and feathers; prices of German eggs; prices of eggs abroad; prices of poultry flesh in Germany. Although the writer draws no conclusions of his own he still succeeds in destroying all stigma of dullness, which the book might otherwise possess, by the way in which he handles the individual statistics. The work discussed is a fine stimulant for further work in connection with the poultry industry in Germany. The book will be of service to all who, in connection with their work, need to use statistics dealing with the poultry industry and who have not the time to collect these from all kinds of sources.

Number of Poultry, Consumption of Eggs and Poultry in various countries and in Poland. Le nombre de volaille et la consommation des oeufs et de la volaille dans différents pays et en Pologne. M. S. Gutowska. Higjena Production zwierzecyck. Vol. 2, 1937, p. 33.

The writer gives a summary of the statistical data from various countries obtained from the Fifth and Sixth World's Poultry Congresses. From this it appears that the figures published for various countries are not complete. An

increase of the consumption of eggs and poultry and an increase of the production of the poultry in various countries is observed.

The consumption of poultry products appears to be very small in many countries, but most of them show an inclination to increased consumption.

Turkeys and Guinea Fowl. Galline di Faraone e Tacchini. Prof. A. Ghigi. Bologna. 494 pages with 178 illustrations and 8 coloured plates. Editor: Ulrico Hoepli, Milano, 1936.

This book is really a continuation of the report on turkeys which Professor Ghigi published at the World's Poultry Congress at Ottawa in 1927. In this book the author has collected his practical experience of turkey breeding during half a century. He has also included his scientific researches and the later studies he made at the Zoological Museums in Berlin, London and Paris.

Besides turkeys there is also a section of the book devoted to guinea-fowl.

Both sections contain extensive literature reviews. The book is the best and most modern work on turkeys and guinea-fowl yet published.

Goat Keeping and Poultry Industry. Ziegenhaltung und Geflügelwirtschaft. Dr. H. Müller. Gundorf-Leipzig. Kleintier und Pelztier, Vol. 10, No. 4, p. 59.

The writer considers that poultry keeping alone is not very profitable and suggests that goats should be kept simultaneously, and gives as his reason the fact that goat milk is extremely valuable for feeding chicks and young birds. It should be diluted with water, and with the dry fodder produces a moist-crumbly mixture which can be given in addition to all kinds of finely chopped green fodder.

Sheep Farming and Poultry Breeding. Schafhaltung und Geflügelzucht. Dr. H. Müller. (Ref. Züchtungskunde, Nov., 1935, p. 428.)

The grass in the runs should be kept as short as possible so that young grass, which is of such great value to the birds, is always present. This can very easily be attained if sheep are kept, as they keep the grass short and tread the ground hard. Whether one should keep ewes or fat sheep is a question for the individual to decide. The writer describes various practical experiences and results from which he has composed tables of figures. In his opinion, if sheep and hens are kept simultaneously, it will be to the good of the undertaking.

Artificial Illumination of Poultry. L'Illuminatione dei pollai in rapporto alla produzione delle uova. Dr. E. Mennucci. La Clinica Veterinaria, Vol. 59, 1936, p. 425.

Extensive review of the literature dealing with artificial illumination. This is only in the experimental stage in Italy.

German Carrier Pigeons. Die edle deutsche Reisebrieftaube. Dr. K. Dorn and Jos. Müller, Schleiden-Julich. Editor: J. Stercken, Aachen.

A monograph on carrier pigeons is long overdue. The collective works of H. J. Lenzen and K. Russ are somewhat antiquated as they were published in the 'sixties of the previous century. Since then, in all the extensive German literature on carrier pigeons, not one book has been published which treats the breeding of German carrier pigeons in the progressive manner in which this subject should be treated. In this book the carrier pigeon is thoroughly handled; also pictures

of our numerous birds of prey in flight are given. Besides the two principal authors of this 350-page work, co-operation has been given by 13 first-class experts, amongst whom is Dr. A. Menn, of the Veterinary Institute of the Leipzig University (Diseases in Pigeons). Only the choicest of matter is given, both in word and picture. When one of the authors thinks that he must believe in the hereditariness of one or other quality, then this must be looked upon as a scientific controversy and not opposed; there are really cases which cause one to doubt. In the sections dealing with the sense of orientation and the war service of pigeons the book becomes really exciting reading.

The Significance of Poultry Exhibitions for State Industries. Die volkswirtschaftliche Bedeutung der Geflügelausstellungen in Deutschland. Geflügel Börse, 1934, No. 90.

Poultry exhibitions are a source of income for many industries: Hotels, with a turnover of 3,000,000 marks; State Railways, 500,000 RM.; Post Office, 100,000 RM.; printers, at least 400,000 RM.; wire ware industry, 100,000 RM.; and for other industries a further 200,000 RM. can be calculated.

The cause of Odd Wings in Ducks. Neueste Forschungsergebnisse über die Ursache der Kippflügelmissbildung bei Enten und Gänsen. Dr. N. Peters. Zoological Museum, Hamburg. Geflügel Börse, 12 Jan., 1934.

The writer attributes the cause to weak hand-joints in ducks. If the ducklings are allowed to swim freely and find their natural food the sickness does not occur. The cause must be attributed to the food, probably lack of minerals and vitamins.

The New Jersey multiple unit Laying House and Bill of Material. G. R. Gross and H. E. Besley. Agricultural Experiment Station, New Brunswick, New Jersey, Circ. 318, 1934.

Contents:

Summarized Bills of Material: No. 1, For a Complete Single Unit House; No. 2, For Each Unit Added to No. 1. Itemized Bills of Material: No. 1, For a Complete Single Unit House; No. 2, For Each Unit Added to No. 1. Suggestions on Construction.

Ventilation of Poultry Houses. E. R. Gross. Agricultural Experiment Station, New Brunswick, New Jersey, Circ. 306, 1934.

Summary:

When preparing a poultry house for ventilation see that the walls and roof are tight and free from air leaks, apply insulation to walls and ceiling, and see that all edges are supported by studdings or nail ties. Fit the windows and doors snugly and use glass or a glass-substitute for all windows, since muslin or fabric of any kind allows too much heat loss. Build a flue of ample size according to instructions. Keep the full number of birds in each unit. Regulate the intake openings according to the weather. The outtake flue may usually be left fully open. It requires a damper only when the house is partly filled. If the cost of complete insulation seems too great, at least the ceiling must be insulated if results are expected. Wall insulation may be added later.

The success of ventilation depends largely upon good management. The system of ventilation should not be expected to save labour but rather, by careful manipulation, it should improve the living conditions of the birds and maintain profitable production.

PRINTED IN GREAT BRITAIN BY H. R. GRUBB, LTD., CROYDON.

TOME X. 1937 No. 4

INTERNATIONAL REVIEW OF POULTRY SCIENCE

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EDITOR:
Dr. B. J. C. TE HENNEPE
ROTTERDAM (Holland)

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THE SEVENTH WORLD'S POULTRY CONGRESS

By PAUL MANDEVILLE

U.S. Egg and Poultry Magazine, January, 1397.

In so short an article it is not possible, and at this preliminary stage of organization it may not be desirable, to consider in details the programme making for the Seventh World s Poultry Congress to be held in the United States in 1939.

Two thoughts stand out from all details in the work before this country which is now host to the Seventh Congress. The first is that the World s Poultry Science Association has not yet secured the measure of governmental support which has been accorded by treaty to a number of international societies. The respective governments of the leading countries interested in poultry do not contribute regularly to it. This, if done, would establish the World's Poultry Science Association and the triennial congresses as a permanent institution.

The second is that not even in Canada and certainly in no other country where the congress has been held are there so many or so large industries which look to the feathered tribe for profitable business as in the United States. What the poultry world may see when it visits this country has been spread by story until, we now know, we shall have to break many precedents set by former congresses if we are to properly dramatize this story for the thousands of foreign visitors and hundreds of thousands from the United States who may be expected to attend.

World Industrial and Scientific Congresses.

The importance of international understanding will be conceded. History has abundantly shown that both commerce and industry to the extent they overstep national boundaries in a friendly way are among the most effective agencies of international understanding favourable to peaceable settlement of economic problems that are often the causes of wars. This has been recognized by our country among others and it has accordingly participated as a nation in fostering certain international societies, including some which are devoted chiefly to the dissemination of knowledge.

We need only to cite a few examples such as the International Institute of Agriculture at Rome ; International Bureau for Protection of Industrial Property ; International Statistical Bureau at The Hague ; International Bureau of Weights and Measures ; American International Institute for the Protection of Childhood ; Permanent Association of International Road Congresses ; International Office of Public Health ; International Map of the World on the Millionth Scale. All of the above are supported internationally by the governments interested, and the United States in its fiscal year 1937 paid various sums from $75,000 for the support of the first-named institute to $50 for the support of the last-named project.

At the close of the third World s Poultry Congress, held at Ottawa in 1927, the Dominion government appropriated a substantial sum, with the promise of an annual appropriation, for support of the World s Poultry Science Association, conditioned only on the United States joining it in heading the list of nations which might be approached. The United States not responding, nothing more in this direction has been done to date. *Only the skeleton, so to speak, of an international organization, the World's Poultry Science Association, continues to functon between the triennial congresses, depending for financial aid upon the host country holding the next succeeding congress.*

BREEDING

The Connection between the Rate of Maturity and the Egg Production of White Leghorn Pullets. Tr. J. B. van der Meulen. Landbouwkundig Tijdschrift, Vol. 49, 1937, Sept.

SUMMARY:

1. The connection between the rate of maturity (number of days between birth and production of the first egg) and egg production of 938 White Leghorn pullets, hatched and reared on the Experimental farm of the Oliefabrieken Calvé-Delft was investigated. The pullets were of various strains and received widely differing treatment as regards feeding.

2. There is a curvilinear correlation between rate of maturity and to talproduction and also between rate of maturity and winter production. It is, therefore, not correct to calculate with rectilinear correlations or regressions.

3. The conditions, obtaining during the rearing, influence not only the rate of maturity, but also the connection between the rate of maturity and egg production.

4. It is, therefore, impossible to state any generally acceptable rules concerning the way in which the existing connection can be used to raise the average production by the elimination of certain birds.

5. Even when the pullets have been carefully culled either before or at the commencement of production, it is possible to raise the average production still further by eliminating those birds, which come into production last. A considerable number of bad producers are found among the birds with the slowest rate of maturity.

6. No connection was found between rate of maturity and mortality.

7. Neither was there any connection between rate of maturity and the average weight of the eggs produced after December.

8. For the 514 birds which began production after 30th September, 1935, a rectilinear correlation of $+0.66 \pm 0.02$ was found between rate of maturity and the average weight of the first ten eggs produced. The regression-co-efficient of this "inception egg-weight" to rate of maturity in $+0.16 \pm 0.02$.

Breeding for Egg-Production. Reaseheath experiments. Eggs, July 7th, 1937.

Experiments are being carried out at Reaseheath, Cheshire. Report by the Ministry of Agriculture for the annual period, 1936–7. The results for the 1935 matings point in the same direction as those for 1934, viz., the superiority of the cross, vis-a-vis the pure bred. A summary of these results is as follows :—

	Pure RIR	WLx RIR	RIR xWL	Pure WL
Age at maturity, days	207.6	178.5	190.6	181.3
Weight at maturity, ozs.	83.3	68.3	71.3	60.0
Egg production, first 16 weeks ..	55.1	55.1	59.0	47.3
Annual egg production	192.1	199.5	185.5	209.0
Average egg weight, drams ..	32.5	32.6	32.8	32.3

Mortality continued at a disappointingly high level, but the cumulative records on this score are yielding useful information, *e.g., the progeny of parents which themselves died appear to have suffered more severely than those from parents which survived.*

Interrelationships of Egg Production Factors as Determined for White Leghorn Pullets. I. M. Lerner and L. W. Taylor. California Agricultural Experiment Station. Journal of Agricultural Research, Vol. 55, 1937, p. 703.

A biometric analysis of the egg-production records of two selected non-pausing population of Single Comb White Leghorn pullets reveals that :

(1) 55.3 to 91.4 per cent. of the variance in annual egg record as measured by 365-day or by biological laying-year production can be accounted for by the variation in age at first egg, age at last egg, and winter or spring or summer and fall rate.

(2) The variance of these factors is to a considerable degree genetic in nature.

(3) Of the factors considered age at last egg is the most important single factor affecting egg production.

(4) Net summer and fall rate of production is not an adequate measure of intensity, the use of spring or winter rate giving more accurate estimates of the annual production.

Breeding Problems. M. S. Pease. University of Cambridge. School of Agriculture Memoirs, No. 9, 1937.

Data are here presented to show that mortality of both chicks and adults hatched from pullets which lived at least one year after the date of their first eggs was equal to the mortality of the progeny of hens and older birds. But the mortality of both chicks and adults in the progeny of pullets which died before the end of their first laying years was very much greater. It appeared that the death or survival of the *male* parent had no effect on the mortality of his progeny ; this could not be explained as due to genes in the unpaired sex-chromosome.

Egg Production, Monthly Costs and Receipts on New Jersey Poultry Farms. L. M. Black and J. C. Taylor. Agricultural Experiment Station, New Brunswick, N.Y. Hints to Poultrymen, Vol. 23, 1936.

Records are complete in all details and these records are tabulated in summary form and appear in the accompanying table. The records are fairly representative of all sections of New Jersey and include flocks of varying sizes from the strictly commercial poultry flock to the side-line or part-time flock. The summary should be of considerable importance as a basis of comparison and to indicate the situation under present conditions on the farms of those sufficiently interested in their poultry flocks to endeavour to keep complete records on them.

A comparison of the per bird data with that obtained in 1928, shows some rather interesting differences. Egg production in pullet flocks has risen slightly. Total feed consumption has decreased somewhat, scratch grain consumption being about nine per cent. less, mash consumption about eleven per cent. greater, but miscellaneous feed more than fifty per cent. less. Of great interest is the fact that total feed consumption is lower while average egg production per bird is higher, indicating a possible increase in feeding efficiency. Feed costs were considerably under those of 1928 as were egg prices. This more unfavourable feed-price egg-price ratio resulted in lower returns above costs.

One outstanding problem is common to the data of the years compared and that lies in flock decreases. Evidently, some progress is being made, for the total decrease in birds was 13 per cent. less in 1934 than in 1928, while the decrease in pullet flocks was 19 per cent. less. There was a decrease in hen flocks to the extent of 2.7 per cent.

Relative Growth and Hereditary Size Limitation in the Domestic Fowl. I. M. Lerner. Hilgardia, Feb., 1937, No. 13.

Investigations of heterogonic growth relations reveal that the growth of the pectoralis major of the leg bones in relation to the growth of the entire organism follows a similar course in the Plymouth Rock and the Minorca breeds of fowl. Hybrids between these two breeds including first generation crosses as well as backcrosses of these to both parents, possess the same pattern of growth of the structures studied as the parents. Sex differences are noted in the values of the co-efficient of heterogonic growth, with the females showing a higher value for the pectoralis major with respect to body weight and a lower value for the leg length with respect to body weight than the males.

Comparison of the data presented with the material of other investigators suggests the hypothesis that the basic genetic complex for the type of growth of parts with respect to the growth of the whole is common to the different breeds of poultry with the exception of the Bantams. The Bantams, a number of which are also included in this study, show a type of heterogony possibly different from that observed in the larger-sized breeds. While in the latter hypergony was indicated both for the muscle investigated and for the leg bones, in the Bantam hypogony was present in the leg bones, with an approximation to isogony in the muscle. It is thus suggested that the Bantams probably possess growth-retarding factors which affect not only total body size but also the relative rate of growth of the parts studied.

Growth gradients based on length measurements were observed in the posterior limb, with the distal bone (tarsometatarsus) growing at a more rapid rate in relation to the rate of body growth, the median bone (tiboitarsus) presenting an intermediate rate of growth, and the proximal bone (femur) the slowest.

Record of Performance and Poultry Approval. Agricultural Experiment Station, Durham, New Hampshire. Bulletin No. 296, 1937.

Record of Performance work is officially supervised trapnesting and breeding on poultry breeding farms. The supervisor, a representative of the Experiment Station, makes eight annual visits to each farm giving it official recognition, and assisting the poultryman in his breeding problems. Record of Performance certificates are issued for birds producing 200 or more 24 ounce eggs, and Advanced certificates are given for birds laying 240 or more standard sized eggs.

The Record of Performance Association has ten members (two of Barred Rocks, one of White Rocks and seven of New Hampshires.) The Association has affiiliated itself with the National Poultry Improvement Plan, which should stimulate further interest in R.O.P. R. C. Durgin is in charge.

Poultry Approval, which was formerly called Poultry Certification, has also become one of the steps in the National Poultry Improvement Plan. This stage entails the handling of a flock of birds by the inspector who grades the birds into two classes, breeders and culls. The superior individuals as to type, colour, producing qualities and freedom from inherited disqualifications, are held for breeders.

There will be about 50,000 U.S. Approved birds on at least 35 New Hampshire farms during the breeding season of 1937–38.

Breeding for desirable Factors necessary for High Egg Production and Viability with Special Reference to the Method of Selection of the Breeding Males. A. E. Tomhave and C. W. Mumford. Agricultural Experiment Station, Newark, Delaware. Bulletin No. 205, 1930.

1. Fall and winter intensity of egg production.

Continuing this study, two sister-tested cockerels were selected to head two pens of pedigree hens. The following table presents the background of the two cockerels used during the 1935 breeding season :—

Number	Egg Prod. dam	Per cent. Intensity dam	Per cent. Intensity family of dam	Per cent. Intensity Sisters
H.9186	200	72.5	72.3	77.5
H.947	214	71.4	65.2	69.6

The two pedigree pens were composed of hens similar in annual egg production and fall and winter intensity of production. Ten of the breeding hens in each pen were closely related as they were selected so that a full sister or half sister was placed in each pedigree pen, and the sisters had similar egg production records and similar intensity of fall and winter egg production.

The progeny of the sister-tested high intensity cockerel had a fall and winter intensity of production of 72.3 per cent, as compared with 69.9 per cent. for the progeny of the sister-tested low intensity cockerel. Grouping the progeny pullets according

to the records of the hens used in the breeding pens, showed a higher intensity of fall and winter egg production for the pullets sired by the sister-tested high intensity cockerel than by the pullets sired by the sister-tested low intensity cockerel, regardless of how the grouping was arranged. This phase of the project is being continued.

2. Mortality in the laying flocks :—

A study is under way to determine if mortality in laying flocks can be reduced by following certain procedures in the selection of the breeding birds. This work has not progressed sufficiently to warrant discussion of results.

3. Relationship of the age of breeding hens to the viability of the progeny —

The pen of pedigree hens of various ages is being continued to study the relationship between the age of breeding hens and hatchability and viability of the resulting chicks.

The Dissection of a Frequency Distribution into two Normal Components. W. A. Hendricks. Poultry Science, Vol. 16, 1937, p. 129.

This note from the U.S.D.A. Bureau of Animal Industry is a critique of an article by Hays on the same object.

Fecundity and Reproductive Ability in Closely Confined Fowl. S. Bird. Scientific Agriculture, Vol. 17, 1937, p. 359.

Average egg yield of birds in individual cages was less than that of birds kept intensively in large groups, but the variation within the group was not so great. While caging, therefore, allowed the poorer birds to do better it limited the production of the superior birds. Shell quality and hatchability of eggs were frequently abnormally low in the caged group and the consumption of oyster shell grit was often inadequate. It is suggested, therefore, that the production of the good layers may be limited by deficiency of Ca.

Relationship of the Age of Breeding Hens to the viability of the Progeny. H. E. Tomhave. Annual Report Agricultural Experiment Station, Newark, Delaware. Bulletin No. 207, 1937.

The pen of pedigree hens of various ages is being continued to study the relationship between the age of breeding hens and hatchability of eggs and viability of the resulting chicks.

Genetics of the Fowl.—VI. A tentative chromosome map. F. B. Hutt. In Neue Forschungen in Tierzucht und Abstammungslehre [Duerst Festschrift]. Bern : Verbandsdruckerei AG., 1936.

Continuing this series, the location of genes for head spot, inhibitor of dernal melanin, barring, brown iris, light down, silver and slow feathering in the sex chromosome ; crest, dominant white and frizzling ; creeper, rose comb and uropygial ; silkie and flightless ; and pea comb, marbling in down, and naked neck in other groups are postulated with a presentation of a map for these five chromosomes in the fowl.

The Inheritance of Shank Colour in Chickens. P. D. Sturkie, C. B. Godbey and R. M. Sherwood. Poultry Science, Vol. 16, 1937, p. 183.

In studies at the Texas Experiment Station, crosses were made of White Leghorn, White Orpington, and Brown Leghorn hens with Black Langshan roosters to determine the inheritance of colour. In explaining the results it is suggested that the sex-linked gene *D* for shank colour produces predominantly light shanks and is independent of the inhibitor *I*, colour *C*, and extension *E* genes. The action of the *D* gene is delayed until about 2 months of age. In combination with the gene for extension of melanic pigment, *d* birds may vary in shank colour with variability in

heterozygous (*Ee*) individuals from black to blue. In combination of recessive *e* and dominant *D*, the shanks are perfectly white or yellow. The action of the extension factor on the shanks and down of chicks is inhibited by the gene *I*. The barring gene *B* almost completely inhibits melanic shank colour.

The Inheritance of Egg Production in the Domestic Fowl. I-IV. Scientific Agriculture, Vol. 16, 1936, pp. 376-591.

I. General Considerations. S. S. Munro

Four papers are given.

General considerations regarding the inheritance of egg production and the influence of gene-gene and gene-environment interactions with methods of measuring the variability in Mendelian populations are presented. The necessary effort involved in phenotypic selection is not considered warranted by the results that may be expected.

II. Increases in Production, their extent and Characteristics with a discussion of Causal Factors. S. S. Munro.

A statistical analysis of the production records of Barred Plymouth Rocks from 1920 to 1935 showed that the mean increased in succeeding years, but the standard deviation was practically unchanged, although there was some skewness in the distribution of the production in later years. The increases in production which have occurred are considered to be due, in the main, to nongenetic causes.

III. Differences in Transmitting Ability of Dams, and the Degree of Dam-daughter Corrulation. S. S. Munro, S. Bird, J. W. Hopkins.

An analysis of the variance in the egg production of 1,165 Barred Plymouth Rock pullets from seven Dominion experimental farms when grouped by sire and dam, showed that there were considerable differences in the production of daughters from the same sire from different dams. As the significance could not be shown in the smaller groups, it is considered that the genetic differences played a relatively small part in determining the total variations. The correlation between the production of all dams and daughters of 0.152, although statistically significant, was so small as to be of little practical importance in the selection of dams on the basis of their production.

IV. Riliability of Progeny Tests of Sires. J. W. Hopkins, S. S. Munro, and S. Bird.

The egg records of the Barred Plymouth Rock pullets in the above studies were analysed to determine the variance in the production of full and half sisters and the proportion of the variance which was due to environmental conditions, locality, and season. The number of eggs that must be laid by different numbers of dams and daughters in excess of a set standard for a 5 per cent. level of significance under the same and different environmental conditions are tabulated.

Investigation of the Inheritance of Blood Group Antigens in Fowls. II. O. Thomsen. Hereditas, Vol. 22, 1936, p. 129. (Ref. Experiment Station Record, Vol. 77, 1937, p. 611.)

Further study of this problem is reported, based on intermixtures of blood from the parents and the progeny, with data on the agglutinations.

Some Effects of Breeding on Mortality. W. L. S. Hindhaugh. Breeding Station, Reaseheath. Harper Adams Utility Poultry Journal, Vol. 22, 1937, p. 498.

In the case of sires which died, the pure-bred progeny had a lower mortality than the cross-bred progeny, whilst in the case of sires which survived the cross-bred progeny had the lower mortality.

Informations with pure and cross-bred Cambars suggest that the fate of the male has no significant effect on the mortality of the progeny.

Among adult pullets the mortality was 50 per cent. for the progeny of dams which died in the year of mating, and 29 per cent. for the progeny of dams which survived to 1937, the data strongly suggests that the fate of the dam is of some importance in its effect on the survival of the progeny.

The Relation of Antecedent Egg Production to the Sex Ratio in the Domestic Fowl. M. O. Khorosh. Vsesoiuzn. Inst. Zhivotn. [Moskva], Uspekhi Zootekh. Nauk (All-Union Sci. Inst. Anim. Husb., Adv. Zootech. Sci., Vol. 2, 1936, p. 95. (Ref. Experimental Station Record, Vol. 77, 1937, p. 323.)

A study of the sex ratios of chicks produced by nearly 300 hens, in contradiction of data presented by Jull, indicated no relation between the sex ratio and the antecedent egg production of the dams.

The Hen's Egg not Fertilized in the Ovary. C. G. Hartman. Science, Vol. 85, 1937, p. 218.

From an analysis of the results of other investigators, including especially those of Warren and Kilpatrick, the author concludes that the hen's egg is not fertilized in the ovary.

Genogeography of the Domestic Fowl. A. S. Serebrovsky. Vsesoiuzn. Inst. Zhivotn. [Moskva], Uspekhi Zootekh. Nauk (All-Union Sci. Inst. Anim. Husb., Adv. Zootech. Sci., Vol. 1, 1935, p. 85. (Ref. Experiment Station Record, Vol. 77, 1937, p. 318.)

An account of the genes carried by the fowls native to different regions of the Balkans.

Further Data on Genetic Modification of Rumplessness in the Fowl. L. C. Dunn and W. Landauer. Journal of Genetics, Vol. 33, 1936, p. 401.

Further studies of the genetics of rumplessness in the fowl at the Storrs Experiment Station have demonstrated the presence of multiple and recessive modifiers toward the normal of the rumpless condition in both heterozygotes and homozygotes. These may in some cases extinguish all external character differences between heterozygotes normals, a condition discovered only on dissection.

Force-Moulting. Some interesting facts and figures. R. P. Feltwell. Eggs, April 7th, 1937.

It is seen that force moulting can be carried out effectively, but one must remember that stock and management are the headlights to success. Failure in either one or the other of the essential points will lead not only to bad language, but also to bad results, with a consequent breakdown of the system and a diminished bank account.

Note on a Bronze-Bourbon Red Mosaic. V. S. Amundson. University of California, Davis. Journal of Genetics, Vol. 35, 1937, p. 25.

A mosaic occurred in the F_2 generation of a cross of a Bronze male on a Bourbon Red female. This bird was bronze on the head, neck, shoulders, tail, and part of the rump, with some patches of bronze feathers surrounded by red on the wings. The rest of the bird was covered with feathers typical of the Bourbon Red variety, which thus formed a continuous band around the middle of the body.

The difference in the plumage colour of the two varieties was found to depend upon a single pair of autosomal genes, the ratio in the F_2 generation being approximately 1 Bronze to $2F_1$ pattern to 1 Bourbon Red. The hybrids resembled the Bronze variety more than the Bourbon Red, particularly in down pattern and adult plumage, but were readily distinguished from both parental varieties.

The possible mechanisms that may account for this case are discussed.

Half and Half, Male right, Female left. Eggs, Nov. 10th, 1937.

Description, with photo, of a bird one-half of which was a perfect male bird, possessing all masculine organs internally, and the other half was pure pullet, with well developed ovary. The bird was actually laying, a completely shelled egg being present in the oviduct. Externally, the bird was just as perfectly male and female on its different sides as it was internally. The bird is now preserved at the Liverpool University.

Heterogony in the Axial Skeleton of the Creeper Fowl. T. M. Lerner. The American Naturalist, Vol. 70, 1936, p. 595.

The writer, in the course of a study of heterogonic growth in the posterior limb of normal fowls, has found that a definite distal-proximal gradient exists in the leg of chickens after hatching time. The detailed data of Landauer, presented in an appendix to his publication, afforded an opportunity to determine the existence of the same gradient in the embryonic period. Concurrently, it was possible to determine the heterogony constants for the Creeper chickens. The results of these calculations tend to throw additional light on the results obtained by Landauer.

Blasting and Incubation. E. Hadlington. New South Wales Government. Poultry, 1937, p. 1263.

This is the first properly controlled test carried out in any part of the world. Having regard to all factors, the only conclusion which can be drawn from these experiments is that heavy blasting, even in close proximity to incubators, does not materially affect hatching results.

Effect of Temperature, Humidity and other Factors on Hatch of Hen's Eggs and on Energy Metabolism of Chick Embryos. H. G. Barott. Poultry technologist, Bureau of Animal Industry. Technical Bulletin No. 553, 1937.

The optimum conditions for incubation and for growth of the chick embryo, as determined by energy metabolism, so far as the physical factors are concerned are temperature 100° F., relative humidity 61 per cent., oxygen 21 per cent., and carbon dioxide below 0.5 per cent.

The temperature should vary not more than 0.5° F. from the optimum. The relative humidity may vary 10 per cent. with very little detrimental effect. The carbon dioxide should not be allowed to accumulate to a greater concentration than 1 per cent., or the oxygen to drop below 21 per cent. It should be emphasised that the results here reported apply only when the conditions of the temperature and of the atmosphere, as related to carbon dioxide and oxygen, are as indicated in this bulletin.

The results are not considered applicable to sectional type and home incubators in which it is not usually possible to control effectively the conditions mentioned.

Studies in Hatchability. J. B. Smith. Ontario Agricultural College. The Canadian Poultry Review, Vol. 61, 1937, p. 295.

For a number of years the value of summer sunshine in raising the hatch has been repeatedly observed from these experimental trials. To secure good hatches it is necessary to substitute for a lack of sunshine in the winter months by the use of cod liver oil and other fish oils which have been found to carry sufficient amounts of vitamin 'D' for this purpose.

Some animal protein supplements such as meat meal and fish meal have shown to be deficient in the hatchability factors when used in the diet of the hen, but are greatly improved by the addition of either milk or liver meal, or grass range. Milk in its various commercial forms has consistently given good winter hatches from these experimental feeding trials during the past ten years.

However, when liver meal was added to the straight milk ration (milk powder as the animal protein in the diet) improved hatchability resulted. Even with our

most successful winter hatching rations, from an experimental standpoint, there is usually an increase in the hatch when the birds are allowed out on early spring grass. When birds are out of doors it must be remembered there is available in the spring, in addition to short tender grass, ideal sunshine, good earth, the worms and insects, etc. There is not an available supply of liver meal for poultry rations at the present time.

Experiences in Incubation with Duck Eggs. J. Pulleyn. Harper Adams Utility Poultry Journal, Vol. 22, 1937, p. 506.

In the light of my own experience I think that spraying is just so much waste of time and money in labour costs. I feel sure that:

1. The weather plays a most important part in the production and fertility of duck eggs.
2. That an incubation system can be blamed for failures which are really the fault of conditions which have nothing whatever to do with incubation, as, for example, the natural breeding season of the particular breed of duck and its housing conditions.
3. That the process of incubation is really one of controlled evaporation within certain limits of temperature, and that this evaporation is not depicted by a line indicating a consistent process but by one indicating a very pronounced curve towards the end of the incubation period.
4. That a more exhaustive study of the habits of the wild bird during the incubation of her eggs, and the conditions she chooses under which to incubate them, would be of great service to those who make incubators, and of still more service to those who buy them.

Hatchery Problems. W. D. Evans. Harper Adams Utility Poultry Journal, Vol. 22, 1937, p. 452.

Having collected my circle of breeding farms and impressed upon them that their interests and mine are one, I hand over the disease and breeding control of these farms to a laboratory.

My contract with the flock owners gives him complete control, and in four years this has brought about an extraordinary average rise in quality.

Records are of vital importance because on these rest both quality and disease control. Each flock has a flock-number, and every consignment of eggs from each flock retains this identity just as though eggs were being custom hatched. As the orders for chicks are filled in the despatch department, as far as possible each order is filled with chicks from one flock only, the flock number is recorded on the despatch note and the chicks go to the buyer just as though he had bought them direct from the flock owner.

With each consignment goes a free post-mortem service coupon, so that in case of any trouble the buyer may have with the chicks, he can send them up to the laboratory for a post-mortem.

Accurate figures are kept for every consignment from every flock as to fertility and hatchability, and these are transferred to graphs for each flock and are compared with the average results for that breed over the whole hatchery for the corresponding week. These graphs are of the greatest possible help in maintaining breeding condition.

By these methods, the results from each hatchery flock can be taken separately and any hatchery flock not giving really good results can be dropped at once, or if disease should break out, that source of trouble can be completely eliminated in a much more definite way than if the same touble broke out on one section only of a large farm.

The Cross Method for Determining the Sex of day-old Chicks. Geslachtsbepaling by eendagskuikens. Prof. Dr. G. Van Assche and Dr. De Troyer. Vlaansch Diergencesskundig Tijdschrift, Vol. 6, 1937, p. 269.

The authors give a survey on historic, basis, technic, results, advantages and disadvantages of the cross method for determining the sex of day-old chicks.

Inheritance of Egg Shape, Shell Colour and Shell Texture. F. A. Hays, Massachusetts State College. U.S. Egg and Poultry Magazine, Jan., 1938.

Eight generations of Rhode Island Reds in three lines have been produced. Normal egg shape appears to depend upon dominant genes, though modifying influences may at times produce abnormal shapes. Shell colour covers a wide range with varying blends, which will be illustrated. Selective breeding will definitely produce deeper shades of shell pigmentation. Shell texture is an individual characteristic, but does vary through the year. Thin shells and thin ends appear to depend largely upon inheritance when the state of nutrition is satisfactory.

Sexing day-old Chicks. T. Murari. Agriculture and Livestock in India, Vol. 6, 1936, p. 63.

A description of the method of determining the sex of day-old chicks.

Some Effects of Artificial Light on Time of Laying. L. E. Card, B. R. Burmester and H. M. Scott. University of Illinois. The U.S. Egg and Poultry Magazine, Jan., 1938.

White Leghorn pullets have been subjected to various lighting schedules and to several different intensities of illumination under controlled conditions in which all natural daylight could be excluded. Some of the effects to which specific attention was given were :

1. The effect of reversal of the natural day and night cycle.
2. The effect of shortening the interval between successive light or dark periods, to produce 23-hour, 22-hour, and 21-hour " days."
3. The effect of repeated changes from a 12-hour day to continuous lighting, and vice versa.
4. The effect of successive reductions in light intensity to a minimum level of less than one-tenth the initial illumination.

Latitude and Seasonal Egg Size Variations. D. C. Warren. Kansas State College. U.S. Egg and Poultry Magazine, Jan., 1938.

Data have been collected from 10 different localities extending from Florida to Nova Scotia. Individual egg size records were secured from experiment stations and egg laying contests. From such records a curve of mean daily egg size was constructed for each locality, together with the curve of daily maximum temperatures. The general form of the curve is dependent upon the physiological maturity of the birds of the flock and the summer temperatures. When the maximum daily temperatures consistently remain above 70 degrees Fahrenheit the egg size curve begins to recede. Sharp rises of summer temperatures are usually accompanied by corresponding declines in egg size. Where birds do not encounter maximum temperatures higher than 70 degrees Fahrenheit, the maximum egg size is reached in July and August. Those birds subjected to high summer temperatures never reach the potential maximum egg size during the pullet year, except when continuing to lay very late in the fall, when temperatures have fallen. The results definitely indicate that the summer decline in egg size encountered in many localities is due to high environmental temperatures and not to any fatiguing influence coming at the end of the laying year.

Hatchability as Related to Seasons and Hour of Laying. F. A. Hays. Poultry Science, Vol. 16, 1937, p. 85.

Data are presented on the hatching of eggs laid at different times of the day and at different seasons by hens and pullets over a 20-year period at the Massachusetts Experiment Station. The results showed that hatchability increased as the hatching season advanced for the hens but not for the pullets. Forenoon and afternoon eggs did not differ in fertility, mortality, or hatchability of the fertile eggs.

Sex of Brown Leghorn Chicks. Die Geschlechtsbestimmung bei rebhuhnfarbigen Italienerkücken. J. Prüfer. Deutsche landwirtschaftliche Geflügelzeitung, 1935, Vol. 39, p. 71.

For some years now commercial breeders have been offering one day-old Brown Leghorn chicks of uncertain sex. In 1935, at Hohenheim, the writer undertook the sorting in sexes of Leghorn chicks. He divided the birds into four groups according to their appearance—cocks or hens. Group 1, very clearly distinguishable ; group 2, clearly distinguishable ; group 3, probably distinguishable ; group 4, uncertain. He then ascertained that from cock group 1 some of the birds developed into hens and that some birds with clearly expressed typical cock appearance, later developed into hens, and vice-versa. As a result of his researches the writer draws attention to the fact that remarkable differences exist between individual breeds ; he recommends that similar investigations as those carried out at Hohenheim be made at undertakings which sell Leghorns of uncertain sex.

Confinement Brooding. Kentucky Agricultural Experiment Station.

A report of the effect of confinement brooding on growth and subsequent egg production. Some of the chickens were raised in battery brooders, some were started in batteries and transferred to a colony brooder house at the end of three weeks, and some were raised in a colony brooder house with access to bluegrass range and direct sunlight.

There were no great differences in rate of growth under the three sets of conditions, but the pullets and cockerels raised in colony brooder houses were more vigorous and active, and healthier in appearance than the confined birds. The cockerels raised indoors developed abnormally large combs, and had smaller testes than those having outdoor range. During the first laying-year the mortality was considerably higher among the pullets which had been raised indoors than among the other lots. Furthermore, the eggs laid by the pullets raised indoors were smaller and fewer in number than were those laid by the other pullets.

The Influence of Summer Temperatures on the Growth of Chickens. H. L. Kempster. University of Missouri. U.S. Egg and Poultry Magazine, Jan., 1938.

Growth studies are of economic importance to the poultry raiser. The Missouri Agricultural Experiment Station has established growth standards for White Leghorn, Rhode Island Red, and White Rock pullets. Having established normal growth curves for these three breeds and having determined how much the normal chicken increases in weight, these figures can be used to note the fluctuations of various groups of chickens with respect to growth. The early hatched chicks grew much faster when young than did those chicks hatched in April or later. At the age of 20 weeks the early hatched pullets were from 14 to 20 per cent. heavier, depending upon the breed.

The extreme difference in weight between early and late hatched pullets which occurred at the age of 20 weeks gradually disappeared until at the age of 28-32 weeks the pullets hatched in early February were no larger than those hatched in April. This behaviour illustrates a fundamental principle of growth which is that when retarded growth occurs it is compensated for by accelerated growth later, when conditions are favourable. In these studies the conclusion has been reached that the high maximum temperatures that prevail during the summer months is largely responsible for the retarded growth of the late hatched pullets. The retarding effect of high temperatures is more pronounced with the larger chicks.

Size of Egg and Size of Chick. Wisconsin Agricultural Experiment Station, 1937.

Since it has long been known that there is a high correlation between size of egg and size of chick at hatching time, it has been only natural for poultrymen to assume that the selection of large eggs for hatching would be advantageous for broiler producers as well as for egg farmers. Studies made at the Wisconsin Agricultural Experiment Station have shown that such an assumption is not always sound.

The broiler producer is primarily interested in rate of growth rather than in size of chick at hatching time. Since these two characters are independent of each other in heredity, rapidly-growing chicks hatched from small eggs will be larger at four or six weeks of age than will slow-growing chicks hatched from large eggs. The ideal is, of course, rapidly-growing chicks from large eggs.

It was found that some hens which lay large eggs produce chicks that grow slowly during the first 12 weeks of life, but that eventually attain large size. Such hens might be very desirable breeding stock for the egg farmer, but would not be at all suited to the production of broiler chicks. The obvious conclusion is that poultrymen cannot be sure of producing large broilers at an early age by the simple procedure of selecting large eggs for hatching.

Heat Requirements for Brooding Chicks. W. T. Ackerman, T. B. Charles, G. M. Foulkrod, A. E. Tepper and R. C. Durgin. Agricultural Experiment Station, Durham, New Hampshire, Bulletin No. 296, 1937.

Following the indications from the previous year's work that insulation in the brooder house in either walls, ceiling or floors produced no appreciable improvement in operating characteristics of the brooders, attention this year was directed toward the conditions close to the brooder unit. The constant presence for the past two years of a ring of moisture in the litter just outside the edge of the brooder indicates that this is the dew point and therefore the outer extremity of the area where temperature is to be controlled.

Extensions 12 inches wide were made of plywood and attached to the outer edge of each brooder, with an additional curtain at this point, thereby increasing the cubic contents, floor area and outer rim protection for each brooder. Temperature variations under the brooder were thus considerably reduced, for the most part being held within a 10° F. range.

In order to determine the amount and effect of floor draughts, several types of artificial floors were placed under the brooders : elevated wire mesh, raised floor pad and floor pad with heating elements. Of these, the elevated wire mesh floor showed erratic and great changes of temperature. The same characteristics, with some modifications, appeared in the case of the raised floor pad (½in. off floor) in previous years. The floor pad giving under heat showed the greatest effect in stabilizing temperature, maintaining a 5° to 7° regulation, which is somewhat better than that gained with the extension rim on the hover.

Reviewing the comparative value of (1) housing conditions and, (2) brooder design and characteristics as affecting the regulations of temperature under the brooder, the past three years' results indicate that, of these two factors, the second is the more important.

The chicks under the three brooder conditions, namely, heat pad, raised wire floor and brooder extension, averaged to weigh over one pound at six weeks of age—practically the same in all groups. Only slight differences in total feed consumption between groups were noted. In the brooder extension group the average mortality was 3.3 per cent. for the six week experimental period. The other groups, brooder plus raised wire floor and brooder plus floor heat pad, showed 2.07 and 2.03 per cent. mortality, respectively.

The average total consumption of electricity required for the groups brooded with the use of floor heat pad was 483 kw. hrs., of which 123 kw. hrs. were consumed by the floor pad. Adjustment for the amount of top heat was not made to allow for extra heat provided by floor pad. In the groups with raised wire floor the average consumption was 457 kw. hrs. In the case of the brooder extension groups the average consumption was 361 kw. hrs. The average total kilowatt hours per chick for the three conditions listed was 2.276, 2.149 and 1.703, respectively.

The Hatchability of Chicken Eggs as Influenced by Environment and Heredity. W. Landauer. Storrs Station Bulletin No. 216, 1937.

This is a comprehensive summary based on a critical examination of the whole field and presents not only the results of investigations at the station, but also a general review, including a great deal of data from other sources. In successive sections of the bulletin are discussed the physical environment of hatching eggs, the chemical

environment during incubation, egg traits which influence hatchability, nutrition, age and reproductive activity of parent stock and metabolism of laying hens as factors in hatchability, genetic factors affecting hatchability, and embryonic development and hatchability. An extensive bibliography is appended.

The Comparative Growth Rates of Turkeys, Ducks, Geese and Pheasants. T. T. Milby and E. W. Henderson. Poultry Science, Vol. 16, 1937, p. 155.

Chickens, turkeys, and pheasants grew at practically the same rate during each period of constant growth, the chief difference being that each period was more prolonged for the turkey than for the chicken and pheasant. The two latter from the time of incubation to 19 weeks grew at parallel rates, but then while the pheasants stopped growing, chickens continued to increase in weight. The rates of increase in ducks and geese, both of which are migratory, were closely related. During the first few weeks they were practically double that of the turkeys, while the decline occurred earlier and was much more pronounced.

On the whole the food consumption per unit gain was fairly constant for the different species, except that geese during the early growth period showed a remarkable efficiency.

Some aspects of Poultry Breeding at the Livestock Research Station, Hosur. T. Murari. Agriculture and Livestock in India, Vol. 7, 1937, p. 180. (Ref. Experiment Station Record, Vol. 77, 1937, p. 683.)

The comparative performances of various imported and native breeds of chickens in the Tropics and at latitude 55°N. are noted. Data are presented on the average egg size, adaptability and resistance to disease for the various breeds. The results indicate that because of their superior adaptability and disease resistance more attention should be paid to the improvement of indigenous breeds.

A criterion for Testing the Accuracy of Trap-Nest Records. W. A. Hendricks. Journal of Agricultural Research, Vol. 54, 1937, p. 461.

This contribution from the U. S. D. A. Bureau of Animal Industry points out a weakness of the existing methods of testing the accuracy of trap nest records in poultey record-of-performance work, in that there is a lack of information regarding the amount of variability to be expected under normal conditions. A new test is proposed which is free from this defect and might be used to supplement those tests in present use. This test involves the calculation of a statistic which under normal conditions is distributed in the same manner as the well-known X^2 criterion of goodness of fit as applied to frequency distributions. The number of monthly inspections corresponds to the number of degrees of freedom which specifies the form of the latter distribution.

Use of Artificial Light for Poultry. C. S. Platt. New Jersey Stas. Hints to Poultrymen, Vol. 24, 1937.

The stimulating effect of light on egg production is discussed, and suggestions are offered as to when to use artificial light and how to feed the flock receiving it.

Growth Standards for New Hampshire. A. E. Tepper. New Hampshire Station Circular No. 52, 1937.

This circular sets forth tentative standards for normal weight, growth, and feed consumption for the New Hampshire breed of chickens. A chart is presented for estimating the spread or margin of profit to be derived from birds sold for meat purposes based on varying meat prices and varying feeding costs.

NUTRITION

VITAMINS

VITAMIN A

The Effect of the Administration of Large Amounts of Vitamin A on the Vitamin A Content of the Hen's Egg. E. M. Cruickshank and T. Moore. Biochemical Journal, Vol. 31, 1937, p. 179.

The administration of cod liver oil to a laying hen at the rate of 10 per cent. of the diet, which was otherwise low in vitamin 'A' and carotene, caused the vitamin 'A' content of the eggs, as determined by the antimony trichloride method, to be doubled. The vitamin 'A' content of the egg resumed its normal level soon after the withdrawal of the cod liver oil from the diet.

The intensive administration of a vitamin 'A' concentrate raised the concentration of vitamin 'A' in the egg to about five times the level found on the basal diet alone. In this experiment the limits of absorption by the intestine appeared to have been reached, since a considerable proportion of the ingested vitamin was recovered from the excreta.

In spite of these considerable increases in the vitamin 'A' content of the eggs the proportion of the vitamin 'A' ingested which appeared in the eggs amounted to only 2 per cent. and 0.2 per cent. for cod liver oil and concentrate feeding respectively. The transference of vitamin 'A' to the egg is therefore limited, and decreases as the intake increases. This limited transference of vitamin 'A' to the egg recalls the similar limitation which is usually found in the amounts of vitamin 'A' made available to the young animal during pregnancy and lactation.

At the conclusion of the egg-laying experiments the hens were killed and the distribution of vitamin 'A' in the various organs determined. High concentration of vitamin 'A' was found in the liver. Much lower, but still considerable concentrations were found in the kidneys. In the other organs examined negative results were obtained in the case of the bird given cod liver oil, while small traces were found in some organs of the bird given concentrate. These results suggest that the rôle of the liver in the vitamin 'A' economy of the bird is essentially the same as in the mammal.

Cod Liver Oil. Dr. E. M. Cruickshank. Harper Adams Utility Poultry Journal, Vol. 22, 1937, p. 480.

In every instance definite guarantees of vitamin potency in terms of International Units should be insisted upon.

The purchaser should demand a cod liver oil which conforms to the following specifications :

(1) Vitamin A.—A minimum of 1,000 International Units per gramme.
(2) Vitamin D.—A minimum of 100 International Units per gramme.
(3) Blue Value.—Not less than 10.
(4) Free fatty acid content.—Below 0.6 per cent.
(5) Unsaponifiable. Matter content.—Below 1.5 per cent.

The optimum level of cod liver oil for intensive poultry feeding is between 1 per cent. and 2 per cent.

Vitamin A Content of Cod Liver Oil. A comparison of spectrophotometric and chemical methods. A. D. Holmes, F. Tripp and G. H. Satterfield. The E. L. Patch Cy., Boston, Mass. Industrial and Engineering Chemistry, Vol. 9, 1937, p. 456.

Summary.

The vitamin 'A' potency of thirty-two samples of cod liver oil was determined by the Hilger vitameter 'E' value and the antimony trichloride blue value methods.

A comparison of the results obtained by the two methods indicated that in general they were of the same order. The oils that gave high 'E' values also gave high blue values, while those with the lowest 'E' values also gave the lowest blue values.

The blue value : 'E' value ratio was between 9.0:1 and 11.0:1 for the majority of the samples under consideration.

The fatty acid content of an oil has no direct relationship to the amount of red colour or yellow colour produced by the action of the antimony trichloride solution on the oil.

The results obtained for free fatty acid and unsaponifiable material showed that the amount of free fatty acid and unsaponifiable material present in an oil is not correlated with its 'E' value or blue value ; there is no consistent relationship between the vitamin 'A' potency and the free fatty acid or unsaponifiable material present in cod liver oils.

Vitamin A Requirements of Growing Chicks at various stages of Development. A. E. Tepper and R. C. Durgin. Agricultural Experiment Station, Durham, New Hampshire. Bulletin No. 296, 1937.

Results over the six weeks feeding period :

1. Increased Vitamin 'A' consumption tends to increase feed consumption.
2. There appears to be a relatively high Vitamin 'A' requirement during the initial starting period.
3. The Vitamin 'A' consumption per 100 grams of feed consumed for most economical results should be at least 108 U.S.P. × (1934) units.

Action of Carotene in experimental hyperthyroidism in Pigeons. Die Wirkung des Carotins bei experimentell erzeugter Hyperthyreose an Tauben. M. L. Rochlina. Bull. Biol. méd. exp. U.R.S.S., Vol. 3, 1937, p. 362. (Ref. Nutrition Abstracts, Vol. 7, 1937, p. 304.)

Three groups of pigeons were given a single dose of 5 g. dried thyroid gland, or 1 ml. of colloidal carotene solution every other day for 20 days, or the single dose of thyroid followed by the carotene doses. Those receiving only thyroid moulted severely in 3 to 5 days, but those receiving carotene and throid did not begin to moult for 11 to 13 days, while those receiving only carotene remained in good condition. At the end of the experimental period all the birds were killed, and histological examination of their thyroid glands showed definite variations between the three groups which were interpreted as evidence that the presence of vitamin 'A' inhibited the effect of excess of thyroid.

Vitamin A in Eggs and Food. W. C. Russell and M. W. Taylor. New Jersey Agriculture, Vol. 17, 1935, No. 4.

Eggs from hens receiving no pigmented foods contained less vitamin 'A' than those from hens receiving yellow maize and lucerne, cod liver oil being given in both cases. Egg yolk colour is not regarded as a reliable index of vitamin 'A' content. With pigmented foods a greater proportion of the vitamin 'A' consumed appeared in the eggs.

Alfalfa Leaf Meal as a Source of Vitamin A for Growing Chickens. B. W. Heywang and H. W. Titus. Journal of Agricultural Research, Vol. 54, 1937, p. 559.

The first phase of this study by the U. S. D. A. Bureau of Animal Industry was directed toward devising a suitable vitamin 'A'-deficient basal ration for chicks. Feeding trials established a ration consisting of white corn meal, wheat middlings, casein, pure dried yeast, ground limestone, steamed bonemeal, viosterol solution, and salt 64 : 15 : 10 : 4 : 3 : 1 : 2 : 1 as satisfactory for studying the vitamin 'A' potency of various alfalfa products. In the second phase of the study feeding trials compared the vitamin 'A' potency of Arizona, California, and Colorado sun-cured alfalfa leaf meals, California alfalfa powder, and California and Oklahoma dehydrated alfalfa leaf meal. Positive control rations variously contained fresh alfalfa, cod liver oil, or fresh carrots, and the unsupplemented new basal diet served as the negative control.

It is concluded that the vitamin 'A' potency of alfalfa leaf meals varied greatly, with about as much variation occurring between different samples of a given type as among the different types studied. As little as 1.5 per cent. of the best alfalfa meals in the ration supplied adequate amounts of vitamin 'A' for good viability and growth, but it is recommended that not less than 5 per cent. of alfalfa meal of unknown potency be used in the chick growing ration. Evidence obtained indicated an increase in the vitamin 'A' requirements per unit of feed with increasing age of the chicks.

To the knowledge about the Carotenoid Pigments in the Eyes of Birds and Fishes. E. Lonnberg. Ark. Zool., Vol. 29, 1937, No. 4, p. 3. (Ref. Nutrition Abstracts, Vol. 7, 1937, p. 289.)

The carotinoid pigments were extracted with acetone from the fundus of the eye, the iris being excluded, and examined spectrographically. The eyes of 7 species of birds and of 7 of fishes were examined, and evidence was obtained of the presence in the retina of xanthopyll or some carotenoid closely resembling it.

Vitamin A Vision and Phototropism in Chickens. Vitamin A. die Sehfunktion und Richtungsbewegungen von Küken, A. Pletnjev. Ztschr. Vitaminforsch, Vol. 1, 6, 1937, p. 140.

A new test is proposed for vitamin 'A' which depends on the phototropic reactions of chickens when passing through a specially constructed chamber with two windows, one with a red light filter and another with a blue of equal intensity. Normally fed chickens which had been kept in the dark turned to the blue window and those which had been previously in the light turned to the red. Chickens receiving a diet deficient in vitamin 'A' tended to turn to the red window, whether they were kept in the light or in the dark. From the proportion of birds in any group which, after being kept in semi-darkness, turned towards the blue window, it was considered possible to calculate the proportion of vitamin 'A' in the diet. Results were obtained with birds deprived of vitamin 'A' for 5 to 10 days.

Vitamin A and Fat Metabolism. N. K. Basu. Zeitschrift Vitaminforschung, Vol. 6, 1937, p. 106.

Rats (no numbers given) receiving a fat-free diet deficient in vitamin 'A' failed to respond to curative doses of vitamin 'A' or carotene, and examination of the fæces showed a high excretion of the vitamin. In a second experiment, when the rats were depleted on the fat-free diet, and the vitamin 'A' doses were then given dissolved in linseed, sesame, olive, arachis, mustard or coconut oil, all the animals showed increase in weight, the greatest increase being with linseed oil and the least with arachis oil. Very little vitamin 'A' was excreted by those receiving linseed oil and about 90 per cent. of the amount administered, by those receiving arachis oil. A further series of experiments in which the oils were fed as supplements to rats on a diet of milk and puffed rice showed the greatest growth response in the linseed oil group, and least in the arachis oil group, but the results in the other groups could not be correlated with

the linoleic acid content of the oils. From this it is considered that linoleic acid is not absolutely essential for satisfactory nutrition of rats, but that vitamin 'A' cannot be absorbed from the intestine unless a suitable fat or oil is present, the suitability apparently depending on the degree of unsaturation.

Reports on Biological Standards. IV. The standardisation and estimation of vitamin A. E. M. Hume and H. Chick. [Great Britain] Medical Research Council, Spec. Rpt. Ser. No. 202, 1935.

This report, which includes the complete report of the Second International Conference on Vitamin Standardization of the League of Nations, summarises the work of the vitamin 'A' sub-committee and presents a collection of technical information, most of which is not available elsewhere, concerning the properties and use of the international vitamin 'A' standard. It is intended for the information of competent workers already practiced in the usual methods for the quantitative estimation of the vitamin.

The material is presented in three main sections dealing respectively with carotene as the international standard for vitamin 'A,' the spectrophotometric method of estimating vitamin 'A' by means of the extinction co-efficient at 328 mμ, and the use of cod liver oil as a subsidiary international standard for vitamin 'A'.

The Relative Vitamin A Content of three varieties of North-Western Dent Corn. Manitoba grown red, yellow and American Yellow. M. C. Herner. Scientific Agriculture, Vol. 18, 1937, p. 32.

Conclusions.

The evidence shows : (1) that both Manitoba Yellow and Manitoba Red corn are fully equal to American Yellow in vitamin 'A' content ; (2) that 20 per cent. of either of these two varieties provided sufficient vitamin 'A' in these rations to promote healthy growth ; (3) that the addition of more corn of these two varieties did not produce any acceleration of growth. It might be added that there is a suggestion that 20 per cent. of American Yellow corn did not furnish quite as much vitamin 'A' as the same amount of each of the Manitoba varieties, and a slight indication that this amount of American Yellow corn did not meet the vitamin 'A' requirements of growing chicks up to 8 weeks of age.

The data on the protein content of these rations suggests the possibility of the Manitoba Red variety being lower in protein than the other three varieties in all three rates of feeding.

VITAMIN B

Vitamin B Deficiency in Indigenous and Sussex Fowls. Avitaminose du complexe B chez les poules indigènes et de race Sussex. G. Nichita, N. Tuschak and G. Iftimesco. Ann. Inst. Nat. Zootec., Roumanie, Vol. 5, 1936, p. 83. (Ref. Nutrition Abstracts, Vol. 7, 1937, p. 323.)

Further researches on indigenous and Sussex fowls confirmed the earlier results obtained on Rhode Island Red and Leghorn fowls, that fowls of all races are very susceptible to lack of 'B' vitamins.

Possibility of Producing prolonged Beriberi in Pigeons by means of Oryzatoxina. Sulla possibilitiá di ottenere fenomeni beri-berici durevoli mediante l'orizotossina nel colombo. G. Solarino. Quad. Nutrizione, Vol. 4, 1937, p. 57. (Ref. Nutrition Abstracts, Vol. 7, 1937, p. 323.)

The problem is discussed, and the author adduces a small amount of fresh evidence to show that chronic paretic symptoms, characteristic of beriberi, can be produced by injection of oryzatoxin in pigeons, both fasting and adequately nourished with maize.

Oxidation-reduction Processes and Experimental Beriberi in Pigeons. Processi ossido riduttivi e beri-beri sperimentale nel colombo. G. Aragona and G. Sturniolo. Quad. Nutrizione, Vol. 4, 1937, p. 72. (Ref. Nutrition Abstract, Vol. 7, 1937, p. 323.)

Groups of 8 to 14 pigeons received a normal diet, one deprived of ' B ' vitamins, and water only. When the deprived birds showed symptoms of polyneuritis all were killed and the oxidative capacity was estimated by the rate of bleaching of methylene blue according to Thunberg's method, for tissue from the brain, heart, lung, liver, kidney, testis and pectoral muscle. The bleaching time was increased by 39 per cent. in polyneuritic muscle tissue and reduced in the tissue from polyneuritic organs. For muscle tissue from birds in inanition it was increased by 4.2 per cent., and in the tissue from their organs it showed values decreased and intermediate between those for normal and polyneuritic organs. Individual variations were great.

Vitamins and Minerals. Feathered World, Jan. 28th, 1938.

At Cornell University, U.S.A., it has been estimated that a breeding hen requires 230 units of vitamin 'G' per 100 grams of feed. As a matter of fact, this only concerns the person who keeps poultry intensively. If hens are fed a good cereal diet containing 10 per cent. white fish meal and 5 per cent. soya bean meal, and fed as two-thirds whole grain and one-third wet mash, plus grass range, the 230 units of vitamin 'G' are provided.

The Vitamin G Requirements of Laying Hens. H. J. Davis, L. C. Norris and G. F. Heuser, Cornell University. Abstract of Papers presented at the 28th Annual Meeting of Poultry Science Association. The U.S. Egg and Poultry Magazine, 1937, No. 1.

The purpose of this investigation was to secure further information on the influence of vitamin 'G' upon egg production, fertility and hatchability, and to determine quantitatively the requirements of laying hens for this vitamin.

The basal ration used in this work was composed of cereals, casein purified of its vitamin 'G' content, cod liver oil and mineral supplements. Dried whey or purified extracts prepared from dried whey were used as sources of vitamin ' G.'

The average hatchability of fertile eggs from hens receiving a vitamin ' G ' deficient ration was found to be around 15 per cent. The average hatchability of fertile eggs from hens receiving a comparable ration to which had been added vitamin 'G' was approximately 65 per cent. Considerable variation in the hatchability occurred among the individuals receiving the vitamin 'G' deficient ration.

Egg production, fertility and the general health of the birds were not influenced by the vitamin 'G' content of the ration. There was little or no change during the experiment in the body weight of the birds receiving the ration deficient in vitamin' G.' The birds receiving sufficient vitamin 'G' showed a heavier average body weight at the end of the experiment.

Vitamin 'G' deficient embryos grew slower and showed higher mortality than normal embryos. This difference in growth rate gradually increased from the beginning of the incubation period to the 16th day of incubation, at which time the deficient embryos were approximately 27 per cent. smaller than normal embryos of the same age. The greatest percentage of mortality in the deficient embryos occurred on the third and seventh to tenth days of incubation. In the normal embryos most of the mortality occurred on the third and sixteenth days of incubation, which is approximately normal.

Growth studies with chicks which hatched from eggs produced by hens receiving a vitamin 'G' poor, and a vitamin 'G' rich ration, indicated that there was a

difference in their body storage of vitamin ' G.' Chicks from the two groups of hens were brooded under comparable conditions on a ration deficient in vitamin ' G.' Those chicks hatched from eggs produced by hens receiving a vitamin ' G ' poor ration grew much slower and died earlier in the experiment than chicks hatched from eggs produced by hens receiving a vitamin 'G' rich ration.

Quantitative studies were conducted in which purified extracts of vitamin ' G ' were hand-fed to the birds individually in quantities of 300, 600, 900, and 1200 gamma per bird per week. These studies showed that 300 gamma of vitamin ' G ' per bird per week was insufficient to give optimum hatchability. However, when 600 gamma of vitamin 'G' per bird per week was fed in addition to that contained in the basal ration (approximately 1 gamma per gram of feed) normal hatchability of fertile eggs were obtained.

A comparison of the average hatchability of fertile eggs from different families of Leghorn pullets receiving a vitamin ' G ' deficient ration showed that there were significant differences between families in their response to a ration low in vitamin ' G.'

Effect of the Stage of Maturity and Method of Curing upon the Vitamins B and Vitamin G Content of Alfalfa, Clover, and Timothy Hays. Ch. H. Hunt, P. R. Record and R. M. Bethke. Ohio Agricultural Experiment Station, Wooster. Journal of Agricultural Research, Vol. 51, 1935, p. 251.

Alfalfa, clover, and timothy hays cut at different times and cured under different conditions were tested for vitamin 'B' and ' G ' with rats as the experimental animals. The results show that these hays contain significantly more vitamin ' G ' than vitamin ' B.' The vitamin 'B' and vitamin ' G ' content of the hays decreased as the plant matured and, in general, were correlated with the leafiness, greenness, and protein content of the plant.

The exposure of alfalfa to the weather (day and night) for 96 hours, over half of which was sunshine, without rain, did not affect the vitamin 'G' content. Rain (0.68 inch), on the contrary, removed as much as 50 per cent. of this vitamin.

Timothy and clover, cut early, may have as high a vitamin ' G ' content as alfalfa cut later, and with a much greener colour. The method of testing for vitamin ' G ' by growth and incidence of leg paralysis in chicks compared favourably with the rat assay method.

Ten per cent. of an alfalfa leaf meal containing 13 rat units of vitamin ' G ' per gram was required to induce good growth in chicks and prevent the occurrence of leg paralysis.

Further Studies on Vitamin G in Chick Nutrition with special reference to Flavins. R. M. Bethke, P. R. Record and O. H. M. Wilder. Poultry Science, Vol. 16, 1937, p. 175.

In these chick-feeding experiments, reported from the Ohio Experiment Station, a basal experimental ration of yellow corn 58, ground wheat 20, wheat bran 5, Argentine casein 12, steamed bonemeal 3, salt 1, and cod liver oil 1, was used, mostly for an 8-week feeding period.

When the Argentine casein was replaced by domestic casein, domestic or Argentine casein washed with acidulated water, or purified (Labco) casein, the domestic product gave better growth and less leg disorder than the Argentine product, while the Labco product gave somewhat poorer results. Washing the domestic casein reduced its effectiveness but had only slight effect on the Argentine product. Adding 3 per cent. of liver meal or replacing wheat with wheat germ in the basal diet greatly accelerated growth, and wheat middlings proved superior to wheat in the ration.

In a study of the effect of pH control in autoclaving on the growth-promoting and leg disorder factor the autoclaving of dried pork liver or yeast at an acid reaction for 6 hr. at 15-17 lb. pressure did not destroy this factor, while at an alkaline reaction the factor was totally inactivated in the liver and partially destroyed in the yeast. When dried pork liver was subjected to different concentrations of cold ethyl alcohol, this factor was found to be soluble in 20 per cent. strength, partially soluble in 70 per cent., but insoluble in 95 per cent.

Adsorption experiments showed that the factor was adsorbed by Fuller's earth from an extract of dried liver or dried whey, indicating that flavines were the principal factor involved. Feeding lactoflavine to chicks which had been on the basal diet for 2 weeks greatly stimulated growth and prevented the onset of the leg disorder. It is concluded that flavines are essential in chick nutrition, and that the beneficial effects from feeding meal, yeast, liver, etc., to poultry are largely due to the flavine content of these products.

The Vitamin G Requirement of Poultry. V. Heiman and J. S. Carver. Agricultural Experiment Station, Pullman, Washington. Bulletin No. 342, 1936.

An experiment is in progress to determine the vitamin 'G' requirements of breeding hens and the effect of vitamin 'G' and related factors on hatchability. Four lots of 20 hens each, run in duplicate, are used in this work.

Another experiment is in progress to determine the vitamin 'G' complex (growth factor) content of alfalfa stems, leaves, and hay taken from plants cut when 10in. and 24in. tall and sun-cured. Twelve duplicate lots of 15, depleted and standardized White Leghorn cockerels are used. The alfalfa products are being compared with dried skim-milk as a standard.

Differentiation between Vitamin B_4 Deficiency and "Encephalomalacia" in Growing Chicks. C. A. Elvehjein, P. H. Phillips and E. B. Hart. Société Experim. de Biol. and Med. Proc., Vol. 36, 1937, p. 129. (Experiment Station Record, Vol. 77, 1937, p. 838.)

In a previous report it was stated that a form of chick paralysis resulting from vitamin 'B_4' deficiency in the ration was probably the same as that described by Pappenheimer and Goettsch. This article describes and illustrates the type of chick paralysis due to vitamin 'B_4' deficiency, and also describes an encephalomalacia-like paralysis produced at the Wisconsin Experiment Station. The two forms are clearly differentiated, and the latter type appears to be very similar to that described by Pappenheimer and Goettsch.

The Vitamin G Potency of Dried Milk Products. V. Heiman and J. S. Carver. Agricultural Experiment Station, Pullman, Washington. Bulletin No. 342, 1936.

Five lots of 15 day-old sexed White Leghorn cockerels were fed in triplicate. The vitamin 'G' supplements included dried neutralized whey, dried skim-milk, and dried sweet cream buttermilk, all manufactured from similar raw materials. An accurate standardized method of determining the vitamin 'G' content (growth factor) of feedstuffs was developed by the use of a two-week depletion period, followed by a four-week experimental period. It was found that the sample of dried neutralized whey contained 11 per cent. more vitamin 'G' than the sample of dried skim-milk, and the dried sweet cream buttermilk contained 94 per cent. more than dried skim-milk. The dried sweet cream buttermilk contained 58 per cent. more vitamin 'G' than the dried whey.

VITAMIN D

Investigations on Hypervitaminosis D with Chicks. Over den invloed van zeer groote hoeveelheden antirachitisch vitamine van dierlijken oorsprong bij kuikens. Dr. J. van Niekerk en F. Franken. Landbouwkundig Tijdschrift, Vol. 49, 1937, p. 742.

Assays on hypervitaminosis 'D' with chicks are described, in which the effect on the growth and the mortality of the animals is controlled. Groups of 1-day old

chicks, Blue Dutch, are treated during 5 weeks with antirachitic vitamin of animal origin, prepared from mussels, in doses of respectively 5000, 50000, and 500,000 international (rat) units per 100 grammes mash.

In comparison with a large group of control animals, the first group appears to be hardly inferior in weight. The two other groups, on the contrary, stayed behind considerably, resp. very seriously in development, whilst amongst those animals the mortality was considerable.

In groups of other chicks, a dose of 100,000 international units vitamin ' D ' per 100 grammes mash caused slower growth or loss in weight. Doses of 300,000 and 500,000 international units vitamin ' D ' per 100 grammes mash caused loss in weight and high mortality.

In view of the concentration in which this vitamin ' D ' is sold, there is no fear for any danger in practical poultry feeding, even if mistakes are made. An assay with a number of chicks suffering from hypervitaminosis-' D ' has shown that after the feeding with mash with the high concentrates of vitamin ' D ' of animal origin had been stopped, growth continued normally again.

Methods are shown for quantitative estimation of the toxicity of antirachitic preparations, for which chicks can serve as test animals.

The Utilization of Fish By-Products for Poultry. J. S. Carver and V. Heiman. Agricultural Experiment Station, Pullman, Washington. Bulletin No. 342, 1936.

When Columbia River high-fat salmon fishmeal was mixed with the basal ration and stored for one year the vitamin ' D ' value was greater than from salmon fishmeal stored under the same conditions separately. From these results it is not improbable that the basal ration could have acted as an antioxidant to prevent losses of vitamin 'D' during storage. From these preliminary experiments it appears that the high fat fishmeals can be manufactured and stored for at least one year and used to supply the vitamin 'D' in poultry rations if fed at sufficiently high levels.

From extensive studies on the comparison of several commonly used methods of determining the vitamin 'D' potency of different products with chickens, it appeared desirable to develop a new type of standardized technique for these studies.

Effect of Charcoal and Length of Storage on the Calcifying Property of Cod Liver, Sardine (Pilchard), and Concentrated Cod Liver Oils. L. L. Lachat and H. A. Halvorson. Poultry Science, Vol. 16, 1937, p. 147.

This describes a series of chick feeding trials in which the effectiveness of various rations tested were measured in terms of growth, percentage of mortality, bone ash content, and the reaction of bone sections to silver nitrate staining. In all cases where fed in combination, three times as much charcoal as oil was used.

In a trial with 9 groups of chicks on the A. O. A. C. rachitic ration in which a poor quality of cod-liver oil was fed at varying levels with and without charcoal, the charcoal exerted no appreciable effect either on the calcifying or growth-promoting properties of the oil. A series of trials was conducted with a basal ration composed of a mixture of 8 commercial feeds typical of commercial chick-growing mashes except that they contained no charcoal or cod-liver oil. Additions of poor quality, good quality, and concentrated cod-liver oils, and sardine (pilchard) oil, each separately and in combination with charcoal, were made to lots of the basal ration, and each was fed to groups of chicks over an 8-week growth period when the ration and supplements were freshly mixed and after 6 months' and 12 months' storage. This basal ration supplemented with charcoal but no vitamin [produced subnormal growth and bone calcification. None of the above additions of oils or oil-charcoal mixtures showed any demonstrable effect on the growth-promoting or calcifying properties of the ration, either when newly mixed with it or after the storage periods.

Comparison of Cod Liver Oil and Ultraviolet Irradiation as sources of Vitamin D for Confined Laying Hens. R. B. Nestler. Journal of Agricultural Research, Vol. 54, 1937, p. 571.

Six pens, each containing 15 young Rhode Island Red pullets with cockerels, were maintained for 2 years indoors behind glass, on an all mash ration, of which only the mineral content was slightly modified after the first year to meet the changing needs of the fowls. Two pens received no addition, 2 received 2 per cent. cod liver oil in the diet, and 2 were irradiated 6 times a week for 15 minutes daily at 3 feet distance from a specially cored carbon arc lamp. The survival rate, body weight, number and weight of eggs, both absolutely and relatively to food intake, the shell weight and percentage hatchability were better in the cod liver oil groups than in those receiving ultraviolet light, and, in the untreated groups, were far inferior to either of the treated groups.

A Quantitative Method for the Assay of Vitamin D with Chickens. O. N. Massengale and C. E. Bills. Journal of Nutrition, Vol. 12, 1936, p. 429.

A quantitative method is described for the assay of vitamin 'D' with chickens based on the determination of the femur ash, the significance of the ash percentage being interpreted by comparisons with master response curves either for cod liver oil or irradiated ergosterol. It appears that equivalent rat units from cod liver oil and from irradiated ergosterol for chickens are not broadly comparable, their relative efficiency fluctuating widely with varying degrees of calcification. In feeding tests a diet containing a calcium-phosphorus ratio of 2 : 1 gave good calcification when containing 18 international units of vitamin 'D' as cod-liver oil per 100 g. of ration.

The Multiple Nature of the Vitamin D of Fish Oils. C. E. Bills, O. N. Massengale, M. Imboden and H. Hall. Journal of Nutrition, Vol. 13, 1937, p. 435.

The authors have assayed the liver oils of 25 species of fish for vitamin 'D' potency in comparison with cod liver oil on both rats and chickens. The relative effectiveness of the vitamin 'D' for chickens, rat unit for rat unit, is expressed on the basis of cod liver oil=100. On this basis, oils from the bluefin tuna of California were relatively the least effective for chickens, while the oil from the white sea bass of California was approximately 18 times as effective. Other oils covered a lesser but wide range of effectiveness, some of them closely resembling cod-liver oil. It is concluded that these observed differences in effectiveness were due to the existence of two or more forms of vitamin ' D.' Irradiated ergosterol was less effective for chickens than any of the fish oils. Irradiated 7-dehydrocholesterol was about the same as cod-liver oil or irradiated ordinary cholesterol but inferior to that of white sea bass liver oil.

VITAMIN E

New Cure for Range Paralysis. What experiments with wheat germ oil have shown. Dr. A. J. Pacini. Poultry, Feb. 15th, 1938.

Vitamin 'E' in the form of wheat germ oil apparently cures and prevents that type of range paralysis more properly known as fowl leukemia. Experiments which led to this conclusion were easily and simply devised as follows :

Actual flocks of birds, generally White Leghorns, where range paralysis produced a steady loss, were studied for many months. At a given time the flocks were split, half the birds being allowed to continue as usual in respect of feeding, housing, management and the like.

The other half, on the same farm, were permitted to receive exactly the same care, except for one change—wheat germ oil was fed liberally. This was added to precisely the same kind of ration which the untreated control birds were receiving.

Always, under such method of testing, the birds receiving wheat germ oil responded immediately. The incidence of leukemia stopped abruptly and almost completely. The results were impressive and unquestionable.

Month.	Number of Birds.	Deaths due to leukemia.	Per cent. dead.
January, 1937	1775	89	5.0
February	1686	64	3.8
March	1622	88	5.4
April	1534	77	5.0
May	1457	81	5.6
June	1376	44	3.2
July	1342	79	5.9

Location of farm : Plains, Mont. Breed : White Leghorns obtained as chicks from Washington State.

At the end of July the flock was split. About half received wheat germ oil. Half did not. Everything else, as far as possible, remained as it had been. The record continues :

Month.	Birds without Wheat Germ Oil.			Birds with Wheat Germ Oil.		
	No.	Death due to leukemia.	% loss	No.	Death due to leukemia.	% loss.
August	625	34	5.4	635	4	0.6
September	601	32	5.3	619	2	0.3
October	589	33	5.6	593	2	0.3

It is clear that merely the addition of wheat germ oil to the ration in this flock brought about an immediate response, which has persisted. The results of the test are more quickly apparent from a study of the graphic chart at the head of this article.

Twenty-five selected cases of markedly paralysed birds in this flock were separately treated by hypodermic injections of wheat germ oil, together with reinforcement of the food with wheat germ oil. Over three months later, eighteen of these birds had been returned to production and are continuing in a recovered and apparently normal condition.

Four died, the autopsy confirming the clinical diagnosis of fowl leukemia. Three birds are still living, but they have not completely recovered from paralysis, although they show a reasonably marked improvement.

Adamstone produced symptoms and lesions in chicks by removing the vitamin 'E' from their diet, the lesions closely resembling those of fowl leukemia.

The resemblance was so close as to have occasioned the comment by Adamstone that the similarity of the lesions produced by purposeful vitamin 'E' deficiency and those of naturally occurring fowl leukemia cannot be overlooked.

Butler and *Warren* treated afflicted birds successfully and were the first to show that just as the destruction of vitamin 'E' in the chick's diet produces leukemia, as Adamstone showed, so does the purposeful feeding of vitamin 'E' (wheat germ oil) to leukemic birds cure, and more particularly prevent the disease.

The Influence of Vitamin E on Hatchability. Dr. M. J. L. Dols. Archives Neérlandaises de Physiologie de l'homme et des Animaux, Vol. 22, 1937, p. 371.

The purpose of this research was to investigate whether the addition of vitamin 'E' in the form of wheat germ oil to a normal practical ration can improve the breeding results, especially under those conditions in which the fowls are allowed out during the day and received green fodder in abundance.

In these investigations no influence of the administration of wheat germ oil to the birds could be demonstrated, neither on the fecundation of the egg, nor on the hatchability of the fertile eggs incubated.

SUNDRIES

Recent Studies of Vitamins Required by Chicks. T. H. Jukes. Journal of Nutrition, Vol. 13, 1937, p. 359.

This review covers primarily those investigations dealing with new essential dietary factors and recent reports of quantitative experiments with the older and better known vitamins in poultry nutrition. An extended bibliography is appended.

The Gizzard Factor of the Chick. H. J. Almquist and E. L. R. Stokstad. Journal of Nutrition, Vol. 13, 1937, p. 339.

This report essentially confirms previous findings by the authors. The results definitely indicate that gizzard erosions or lesions of the chick are caused by a deficiency in the diet of a fat-soluble factor which is not identical with any of the known vitamins. The comparative potencies of a considerable number of supplements with reference to their ability to prevent hæmorrhagic and gizzard erosions are indicated, with evidence that the two factors can be clearly differentiated. Fresh and dried greens and wheat bran are considered the best practical sources of the gizzard factor. It appears to be quite unstable, being readily destroyed by heat and by alcoholic potash. It is readily absorbed from hexane solution by activated magnesium oxide and appears to be in the saponifiable fraction. It is concluded that the presence or absence of gizzard erosions or of the gizzard factor in the ration does not appreciably affect the growth rate of chicks.

Studies on the Mode of Action of Vitamin K. H. Dam, F. Schonheyder, and E. Tage-Hansen. Biochemical Journal Vol. 30, 1936, p. 1075.

In this phase of their vitamin 'K' investigations the authors show that it is possible to precipitate prothrombin from the plasma of normal chicks (methods described), while the corresponding precipitate from the plasma of 'K'-avitaminous chicks gave no evidence of prothrombin activity. The precipitate from the normal plasma remained active after extraction, either with acetone and ether or alcohol and ether, while the lipoid fraction removed by such extraction showed no prothrombin activity. A concentrate of vitamin 'K' did not accelerate the clotting in vitro when tested against plasma and thrombokinase. The lipoid fraction and the prothrombin fraction of a very yellow plasmata were found to contain 323 and 142 units of vitamin 'K' per gram, respectively, but further study is needed to determine whether vitamin 'K' is a constituent of more concentrated prothrombin preparations.

MINERALS

The Effect of certain Calcium Intake Levels on Hatchability and Egg Shell Formation. Rhode Island State Report, 1936.

When mash rations containing 1.99, 2.93, and 5.2 per cent. calcium without oystershell, and 1.46 per cent. calcium plus oystershell *ad lib* were fed to laying hens, the average calcium content of the eggshells was 1.57, 1.69, 1.79, and 1.96 g. respectively.

Added Sulphur does not aid Chicks' Growth.

Letters addressed to the Wisconsin Agricultural Experiment Station asking for advice on the feeding of sulphur to chickens led to nutritional studies attempting to answer the question of whether chickens can utilize elemental sulphur in building protein in eggs and feathers. An industrial fellowship sponsored by the Thiophene Products Company made it possible to carry on a thorough investigation of the problem.

Elemental sulphur was fed to Barred Plymouth Rock chicks in amounts varying from 0.25 per cent. to 2 per cent. of the ration. The results indicated that the addition of sulphur does not improve a chick ration, and also that the addition of as much as 2 per cent. does not do any harm. The rate of gain was about the same in all lots of chicks. A preliminary trial with two types of soluble sulphur showed a similar lack of effect.

A decided odour of sulphur was observed with some of the eggs produced by hens receiving sulphur, but whether this was caused by absorption of the odour through the shell, or from being carried by the blood to the egg-forming organs, was not determined. There was no flavour of sulphur when the eggs were eaten, nor was there any flavour of sulphur in the flesh of hens so fed. The investigation is being continued.

Phosphorus Requirement of Laying Hens.

From the Western Washington Experiment Station comes a report of the effect of different levels of phosphorus in the diet of laying hens, as measured not only by health and egg production of the hens, but also by the quality of eggs laid.

Egg production was influenced by the level of phosphorus in the ration. In this experiment, the highest production was obtained on rations containing about 0.80 per cent. phosphorus. This is close to the optimum level reported by other workers.

Egg shell quality, egg weight, and mortality did not appear to be influenced by the level of phosphorus feeding. Egg shell quality declined progressively throughout the laying year, but individual hens tended to retain their relative positions in this respect. This result would be expected if one assumes that egg shell quality is inherited.

High-producing hens tended to lay eggs with thinner shells and rougher shells than did low-producing hens. Eggs with thick shells tended to be smoother, and to have less mottling than eggs with thin shells.

In view of the findings on progressive change in egg-shell quality, it seems worthwhile to suggest that selection of hens in terms of shell quality can best be made at the end of the year. This will tend to eliminate not only the hens which have shown absolutely the lowest shell quality, but also those which have declined from an initial high shell quality at the beginning of the laying year.

PROTEINS

Rearing Chickens on Skim Milk with special reference to the Month of Hatching. Kükenaufzucht mit Magermilch, mit besonderer Berücksichtigung verschiedener Schlupfmonate. E. Mangold and H. Damkohler. Archiv für Geflügelkunde, Vol. 11, 1937, p. 121.

In 3 groups each of 60 Rhode Island chickens hatched at monthly intervals in March, April and May respectively, 30 chickens in each group received, as sole protein source, skim milk and 30 received instead fishmeal, the experiment lasting from the day of hatching until the end of the first month of the laying period. The common part of the ration consisted of crushed mixed grain (wheat, barley, oats) with grit, crushed shells and spinach. No restriction was placed on the amount of food consumed and it was found that the proportion of protein consumed as skim milk was nearly the same as that given as fishmeal except that the chickens on skim milk of the May hatching gradually increased slightly the proportion of skim milk in their ration. The amount of skim milk consumed during the first 5 months was 12 litres per chicken in the March hatching, 13 litres in the April and 14 litres in the May. In both the fishmeal and skim milk groups the rate of increase of weight was at first greater in the March than in the May hatching but, after 4–5 months, chickens of the May hatching overtook those of the March. The egg production of both the skim milk and fishmeal groups was low and it is concluded that after the 5th or 6th month skim milk alone no longer suffices as protein source since there was no increase in the proportion of skim milk consumed after laying began.

Dried Milk Better than Skim. Feathered World, Nov. 26th, 1937.

A 2½-lb. (dead) pullet is cheaper to produce than a 2½-lb. cockerel, but a 3½-lb. cockerel is cheaper to produce than a 3½-lb. pullet. So said Captain E. T. Halnan at the Suffolk Federation Conference. Amount of food required to produce 1-lb. of flesh (dead weight) in a Light Sussex cockerel of 5-lb. was 4.59-lb. per lb. of flesh.

In a 4-lb. pullet it was 5.09-lb.

Milk, Captain Halnan pointed out, was better than any other protein food fattening mash, and, despite its cost, it was worth feeding.

A mash consisting of 5 per cent. milk and 95 per cent. S.G.O. gave as good results as one of 20 per cent. milk and 80 per cent. S.G.O.

Dried milk gave better results than skimmed fresh milk, even when price was considered.

The Protein Requirements of Poultry. A. J. Macdonald. The Harper Adams Utility Poultry Journal, Vol. 22, 1937, p. 487.

In our experiments we found that the maximum rate of growth could be obtained after eight weeks by feeding cereals and providing separate fountains of water and milk. Prentice reports that the feeding of milk hastened sexual maturity by about forty days.

It is commonly accepted that birds which come into production at an early age produce smaller eggs and do not lay as well as those which come into production at a greater age, but I have not found this to be so in actual practice. In all the growth experiments I found that rations which gave the fastest rate of growth and the earliest date of sexual maturity also gave the most economic egg returns.

Numerous experiments have shown that the maximum benefit from milk is obtained during the first eight weeks of the chicken's life and that other cheaper protein supplements will give good results in the later rearing period. It has also been shown that the various milk products have similar growth-promoting values, when fed at equivalent protein levels. The poultry farmer should study the relative prices and use the product which gives the cheapest protein unit. (1 lb. dried milk or dried buttermilk is roughly equivalent to 1 gallon of separated milk).

Experiments carried out at Belfast and Aberdeen demonstrated that extracted soya bean meal plus minerals gave as good results in the ration of chickens as separated milk. Later experiments, however, with the use of soya bean meal and minerals proved rather disappointing, due to deficiency of B2, and that normal results could be obtained by the substitution of 5 per cent. dried milk in place of an equivalent amount of soya bean meal.

A mixed protein supplement of equal parts of dried skim milk, soya bean meal and meat meal, gives results equal to those obtained from milk.

There is still some doubt as to the optimum levels of protein necessary during the brooding and rearing periods. The Institute is at present investigating the problem with ten hatches of table chickens. Each hatch, containing approximately 300 chickens, was divided into up two equal groups at day-old ; one group, A being fed on a medium protein ration (15 per cent. mixed proteins) and the other group, B, on a high protein ration (21 per cent. mixed proteins). At 8 weeks of age group A was divided into two equal groups A1 and A2, and group B into two equal groups B1 and B2. Group A1 was continued on the medium protein ration and group A2 was fed on a low protein ration (9 per cent. mixed proteins). Group B.1 was fed on the medium protein ration and group B2 on the low protein ration.

No Experimental Differences.

There was no appreciable difference between the weights of the chickens in the different groups at 6 weeks, 8 weeks or 14 weeks. No definite conclusions can be made until all the results from all the hatches have been analysed, but the results to date indicate that a ration containing 17 per cent. total protein gives as good growth results during the first 8 weeks as a ration containing 18.2 per cent. total proteins, and that from 9—14 weeks a ration containing 15.6 per cent. total proteins gives as good growth results as a ration containing 17 per cent. total proteins.

From the end of the eighth week to 14 weeks a ration containing 15.6 per cent. total proteins gave as good results as a ration containing 17 per cent. total proteins. It is possible that lower levels of protein during the different stages of growth might give satisfactory results, but further experiments will be necessary.

SUMMARY OF LOW *VERSUS* HIGH PROTEIN (40 WEEKS).

Protein Ration.	Low.	High.
Average egg production	120.90	123.00
Average egg weight (drams)	32.10	32.00
Average food consumption (oz.) ..	4.46	4.34

In this experiment a mash containing 14.2 per cent. total protein in conjunction with a grain ration containing 10.8 per cent. total protein gave as good production as a mash containing 20.8 per cent. total protein plus a grain ration containing 10.8 per cent. total protein. The total protein in the low protein ration was 12.5 per cent. and in the high protein ration 15.4 per cent.

It is evident from the above figures that satisfactory egg production can be obtained from birds fed on rations containing considerably lower protein supplements than those generally recommended and that cereal rations plus minerals will give satisfactory results under intensive conditions.

The Protein Requirements of Chicks. J. S. Carver and V. Heiman. Agricultural Experiment Station, Pullman, Washington. Bulletin No. 342, 1936.

This experiment was planned to determine the optimum protein requirements of growing chicks brooded and reared under commercial conditions. Fifty day-old White Leghorn Pullets were placed in each of the 18 lots in the 200-foot nutritional house. Nine lots of sexed pullets, run in duplicate, were brooded under 200 chick electric brooders and reared in the same pens with wire sun porches until they were 22 weeks of age. The nine duplicate lots were fed the same basal ration supplemented with varying quantities of protein supplied from Alaska herring fish meal. Different combinations of 13, 15, 17, and 19 per cent. protein levels were fed to the different lots for varying periods of time. At six weeks of age the best results in growth and appearance were obtained in the lots fed the 19 per cent. level of protein. By eight weeks there was practically no difference between the weight and appearance of the lots fed the 17 and 19 per cent. levels of protein. At about 16 weeks of age the lots fed the 15 per cent. level of protein showed practically as good results in growth and appearance as those fed the two higher levels of protein. At the end of 22 weeks there was no significant difference in growth between the lots with the exception of the 13 per cent. level, which showed slightly poorer growth. There appeared to be no substantial differences between the average days to maturity, per cent. mortality, average egg weight of the first three eggs laid, and albumen index of the first three eggs.

Protein Levels of Rations in Growing Chicks. A. E. Tomhave and C. W. Mumford. Agricultural Experiment Station, Newark, Delaware. Bulletin No. 205, 1936.

A protein level in the growing ration of 18.5 per cent. for the first 12 weeks and 16.2 per cent. from the 13th through 20 weeks, resulted in greater weight at 20 weeks than a protein level of 18.5 per cent. for the entire 20 weeks, or 18.5 per cent. for the first 12 weeks, 16.2 per cent. 13–16 weeks, and 14.2 per cent. 17 through 20 weeks, or 18.5 per cent. for the first 8 weeks, and 16.2 per cent. from the 9th through the 20 weeks. No advantage was found in starting White Leghorn chicks on a 22 per cent. protein level in the growing ration and gradually decreasing the protein level to 15.2 per cent. by the time the chicks are 20 weeks old. Feed required to produce a pound of gain was lowest, 4.9 pounds, in the group of birds fed a protein level of 18.5 per cent. for the first 12 weeks and 16.2 per cent. level from the 13th through 20 weeks. All the growing birds were confined to the brooder house and sun porch throughout the 20 weeks of the experiment. Some picking occurred in the pen where the protein level was reduced to 14.2 per cent. at the 13-week period.

This project is being continued with nine pens of chicks during the present growing season.

Protein Levels of Rations in Growing Chicks. A. E. Tomhave and C. W. Mumford. Annual Report Agricultural Experiment Station, Newark, Delaware. Bulletin No. 207, 1937.

This project was continued with 9 lots of White Leghorn chicks. Lowering the protein level of the ration from 18.2 per cent. to 16.0 per cent. at 10 weeks of age resulted in gain in weight and efficiency of gains equal to the results obtained where the protein level was lowered to 16.0 per cent. at 12 weeks. Lowering the protein level of the growing ration at 8 weeks resulted in slightly lighter weight pullets at 20 weeks of age than where the protein level of the ration is lowered at 10 or 12 weeks.

Because of the high price of dried milk, soybean oil meal was substituted for dried milk in one lot of growing chicks. Substituting soybean oil meal for the dried milk did not influence mortality during the growing period or gain in weights of the birds at 20 weeks, but did result in somewhat rough feathering during the growing period.

Protein Requirements of Chickens at various stages of Growth and Development. A. E. Tepper, R. Durgin and T. B.

Charles. Agricultural Experiment Station, Durham, New Hampshire. Bulletin No. 296, 1937.

Tentative conclusions advanced to date are as follows :—

1. No relationship appears between percentage protein content of feed and total feed consumed.

2. Body weight of birds within all groups did not advance regularly as age increased, but was subject to occasional weekly decreases.

3. The groups fed fish meal as the sole source of animal protein were most efficient in feed consumption, as measured by number of pounds of feed required to produce one dozen eggs. The groups receiving dried skim milk were least efficient.

4. Mortality was relatively heavy. Those groups receiving dried skim milk as the sole source of animal protein experienced the lowest mortality.

5. The groups receiving fish meal as animal protein supplement averaged to lay at the greatest rate of production with the mixture, meat scrap and dried skim milk groups following in the order named.

6. No significant relationship appears between percentage protein fed and size of egg laid.

Report of Experiments on the Feeding of Poultry with High, Medium and Low Protein Rations. J. O. Thomas. Welsh Journal of Agriculture, Vol. 13, 1937, p. 272. (Ref. Nutrition Abstracts, Vol. 7, 1937, p. 489.)

Young birds benefited by a fairly high percentage of protein in the ration, but after maturity, they could be more economically fed at a slightly lower level. It was observed that the quantity and composition of the pasture in the runs were affected by the level of protein supplied to the birds. On low protein rations birds kept down the herbage, which, at the end of the experiment, consisted mainly of grass, the clover and weeds having been selected in preference.

Liver in Poultry Rations makes Eggs Hatch Better. U.S. Egg and Poultry Magazine, Vol. 43, 1937, No. 1.

Packing-house by-products, such as meat meal, meat and bone meal, beef scrap, blood meal and " stick," in the poultry ration increase egg production, but in some instances the eggs do not hatch so well as they should, tests by poultry nutrition specialist of the Bureau of Animal Industry have shown.

Rhode Island Red pullets were used in the tests, which included studies of the effect of diets containing these by-products on live weight, feed consumption, egg weight, and embryonic mortality.

Although most of the packing-house by-products gave relatively good egg production, some of them, especially ground-dried lean meat, blood meal and stick, and liquid stick, led to the production of eggs which did not hatch well. Liquid " stick " is the concentrated liquor from the steam rendering of fatty animal tissue.

If the meat-scrap supplement contained a fairly large proportion of liver, the hatchability, as well as the production, was good. But the liver content of meat scrap at the present time is not shown on the label. In recent years liver has been recognized as having unusual food values and its price has increased with the result that comparatively little of it now goes into ordinary meat scrap.

In these tests meat scrap made according to the following formula promoted good hatchability as well as good egg production : Carcasses, 20 per cent. ; livers, 10 ; spleens, 10 ; skulls, 10 ; beef rennets, 15 ; tripe trimmings, 10 ; hashed pecks, 15 ; and beef-cutting scrap, 10.

In general the tests confirm previous evidence regarding the value of meat scrap as a protein supplement for poultry and, at the same time, they indicate the desirability of eliminating the variability of packing-house by-products by using definite formulas in their preparation.

Protein Supplements in Poultry Rations. 8. *Optimum amount of mungo which may be used in a normal ration for growing chicks.* F. L. Rodriguez. Philippine Agriculture, Vol. 25, 1936, p. 541.

Shrimp meal used as sole protein supplement at a level of 25 per cent. of the mash was superior to all mixtures in which mungo (*Phaseolus aureus*) served as partial or total substitute. Fair results were obtained by replacing 20–40 per cent. of the shrimp meal by mungo. Use of mungo as sole protein supplement caused high mortality and small size in chicks.

The Influence of Salt on the Nitrogen Balance of Hens. J. S. Willcox. Biedermanns Zentralblatt, Tierernährung, Vol. 9, 1937, p. 121.

N balance data are given for 4 Rhode Island Red hens over a period of 29 days. Day-to-day variations showed no correlation with either egg laying or loss of feathers during moult. Addition of NaCl to the food caused increased intake of food and N without any regular increase in N retention. The observation that birds lay and moult only when their body weight is increasing was confirmed. Such birds tend to make increasing use of their food N despite a tendency to decreased N intake.

Protein Supplements for Laying Hens. M. W. Miller and G. E. Bearse. Agricultural Experiment Station, Pullman, Washington. Bulletin No. 347, 1937.

Egg production and egg weight were not singificantly affected by the various combinations of protein supplement fed.

The variation in mortality could not be explained by the rations fed.

No great differences were noted in albumen quality, yolk colour, yolk shadow, or commercial candling grades between the various lots. Hatchability and albumen colour were higher in all combinations of protein supplements containing dried skim milk. Feed cost per dozen eggs was lower on protein supplement combinations which did not contain dried skim milk. The quality of eggs when observed fresh was an accurate index of their quality after shipment to New York and after shipment and storage. Yolk colour and yolk shadow darken in storage.

Ground Sweet Lupins as a Feed for Hens. Süsslupinenschrot als Hühner futter. R. Fangauf and A. Haensel. Archiv für Geflügelkunde, Vol. 11, 1937, p. 161.

During a period of 9 months (Nov.–July) 3 groups of hens received a ration of 20 g. potatoes daily. During the first 4 months 10 g. daily of germinated oats, together with a mixture containing 25 per cent. each of ground wheat, ground beet and wheat bran were also given, This ration was supplemented with 25 per cent. fish meal for the 1st group, 25 per cent. ground sweet lupins for the 2nd, and 15 per cent. ground sweet lupins with 65 g. skim milk and 3 per cent. minerals for the 3rd. The average weights of dry matter consumed per hen per day were 49.2 g., 39.6 g. and 41.6 g. for the 3 groups respectively. The corresponding weights of eggs produced were 7973 g., 5764 g. and 7175 g. respectively and the amounts of total nutrients consumed per 100 g. of egg produced were 244 g., 292 g. and 256 g. The changes in body weight at the end of the experimental period were +28 g., —81 g.— and 14 g. respectively. Of the fertilised eggs the percentages hatched were 74, 81.4 and 91.7 respectively. The results show that vegetable protein requires to be supplemented with animal protein if satisfactory egg production is to be attained.

Meat Scraps and Dried Milk in Rations for Starting Chicks. R. E. Roberts and C. W. Carrick. Indiana Station Bulletin No. 421, 1937.

The results of four series of experiments are reported. In all cases either Barred Plymouth Rock or Single Comb White Leghorn chicks were used. They were placed in experimental pens at from 24 to 48 hr. of age, and in most cases the trials extended over a 10-week period. The mixed rations were fed as a dry mash and kept before the chicks at all times, and water was provided *ad libitum.*

In the first experiments, designed to determine the optimum amounts of protein supplements to be used in the rations, it was found that 15 per cent. of meat-and-bone scrap and 5 or 6 per cent. of dried milk produced more rapid growth and the amount

of feed required per unit of gain was less than when 12 per cent. of meat-and-bone scrap and 4 per cent. of dried milk were fed. The higher rate of gain was, however, approximately offset by the increased cost of the ration. No differences in mortality could be attributed to the type of ration.

In a study of the optimum proportion of meat-and-bone scrap and dried milk in the ration, ratios of 3 : 1, 1 : 1, and 1 : 3 were maintained. At these levels no differences in rate of gain, mortality, or feed required per unit of gain were observed, and males and females were equally efficient in converting feed into gain.

A comparison of dried buttermilk and dried skim milk as supplements to the starting ration indicated little difference in their relative feeding value. A slight advantage in favour of dried buttermilk was of doubtful significance.

A comparison of dried milk and dried whey as supplements indicated that the dried milk was superior when the two were fed in equal amounts, but when fed at such levels as to provide equal amounts of protein they produced practically the same rate of growth. There was no difference in mortality or in feed required per unit of gain on the two rations.

The Utilization of Food Elements by Growing Chicks. I. A comparison of protein concentrates from animal and vegetable sources. C. W. Ackerson, M. J. Blish and F. M. Mussehl. Nebraska State Research Bulletin No. 90, 1937.

Four lots of 15 newly hatched White Rock chicks each were used in this study, the paired feeding technic being employed. A basal mixture made up 85 per cent. of each ration and mixtures of dried buttermilk, fish meal, meat scraps, and cornstarch, 4.5 : 4.5 : 4.5 : 1.5 and soybean meal, corn gluten meal, wheat gluten meal, and tricalcium phosphate, 7.5 ; 3.38 : 3.38 : 0.75, respectively, comprised the remaining 15 per cent. of the rations. The two rations were very similar in chemical composition. The results were measured in terms of growth over a 60-day feeding period and comparative slaughter tests involving the determination of nitrogen, calcium, and phosphorus in the bodies of the chicks. The percentage rate of gain and the gain per gram of nitrogen fed were greater in the lot fed the animal protein concentrate.

There was no difference between the lots with respect to calcium and phosphorus contents in the chick bodies, but the nitrogen content of the group receiving animal protein was somewhat greater. Nitrogen retention was somewhat higher on the animal protein diet, but calcium and phosphorus retention was lower than on the vegetable protein diet.

GRAINS

Wheatmeal Feeding Experiments. E. Hadlington. Poultry Notes. Department of Agriculture, N.S.W., July, 1936.

Although these experiments have not been carried far enough to establish definitely the comparative values of the rations, from an egg production point of view the results show that the egg yield is certainly not adversely affected by feeding large proportions of wheatmeal. It will be noted, however, that in order to balance the ration the quantity of wheatmeal was increased in accordance with the larger quantities of wheatmeal fed.

The question as to whether wheatmeal may be used extensively or not is largely a matter of its cost, compared with mill offals.

These experiments will be continued in order to establish, if possible, which ration is most effective. The figures quoted emphasise the necessity for caution in accepting the results of any feeding experiments with fowls, unless the tests are repeated under the same conditions over at least several years.

The Value of Bran for Egg Production. Journal of the Ministry of Agriculture, Government of Northern Ireland, 1936, p. 42.

The results from these tests at Greenmount College have demonstrated clearly that bran is an important and necessary ingredient in the ration for laying hens, particularly during the winter and early spring months, if the ration is to be fully efficient.

Germinated Oats for Laying Pullets. A. E. Tomhave and C. W. Mumford. Agricultural Experiment Station, Newark, Delaware. Bulletin No. 205, 1936.

Continuing this study, germinated oats slightly increased average egg production, but not sufficiently to be of economic value. In this experiment, when ground oats were mixed in the mash in quantities to supply the nutrients contained in the germinated oats fed, the ground oats fed pullets average 173 eggs per bird during the 333 days of the experiment as compared with 161 eggs per bird for the pullets fed germinated oats.

This project is being continued to determine the value of germinated oats for breeders.

The Value of Germinated Oats in the Laying Ration for Pullets and breeding Hens. A. E. Tomhave and C. W. Mumford. Annual Report, Agricultural Experiment Station, Newark, Delaware. Bulletin No. 207, 1937.

Continuing this study with pullets, the use of germinated oats in the laying ration appears to have little influence on egg production or mortality during the laying year.

A study is now in progress to determine the influence of germinated oats in the laying ration upon the hatchability of eggs and the egg production of yearling hens.

It is planned to conclude this project at the close of the present year.

Digestibility Trials with Poultry, VII, VIII. E. T. Halnan. Journal of Agricultural Science [England], Vol. 27, 1937, p. 126.

VII. *The digestibility of wheat offals, with a note on the apparent discrepancy between the digestibility co-efficients and nutritive values of these products.*—Trials were conducted to compare the digestibility of broad bran, straight-run middlings, and fine middlings, each product being fed as the sole diet to four Light Sussex cockerels in the respective trials, each of which extended over a 16-day collection period. The digestibility of crude fibre was very low in all products, while digestibility of other constituents was relatively low in the bran, much higher in straight-run middlings, and highest in fine middlings, with the exception of crude protein digestibility which averaged highest in the straight-run middlings. In addition brief feeding trials with growing chicks are reported, giving evidence that the inclusion of bran in the chick ration is justified on diatetic grounds in spite of its relatively poor value as measured by digestion trials.

VIII. *The digestibility of dried molasses sugar-beet pulp.*—Employing the same experimental procedure as above, the digestibility of a mixture of 10 parts of dried molasses beet pulp and 40 parts of fine wheat middlings was determined. Using the digestibility values for fine middlings as determined in the previous trial, the apparent digestibility of the dried beet pulp was extremely low, averaging 17.5 per cent. for organic matter, 33.5 for crude protein, 22.1 per cent. for nitrogen-free extract, and 0 for crude fat and crude fibre. These findings are discussed with reference to the possible depression of the digestibility of middlings in the mixture, and are briefly compared with the findings of other investigators.

SUNDRIES

A Study of Individuality in the Nutritive Instincts and of the Causes and Effects of Variations in the Selection of Food. Dr. W. F. Dove. Experiment Station, University, Orono, Maine. The American Naturalist, Vol. 69, 1935, p. 469.

This paper is a first report on a study of the genetics and physiology of the nutritive instincts and associated phenomena, based upon a number of years of laboratory experiments in which the rat, the chick and the dairy calf were used as experimental subjects.

On the basis of these experiments and inferences derived therefrom, the following working principles or laws of the nutritive instincts are here proposed :

I. The nutritive instincts, manifest in a choice of food, are measurable and distinctive characteristics of the individual with a consistency that indicates the existence of biological principles guiding their expression.

II. The expressions of the nutritive instincts *vary* from individual to individual—some individuals appear wise and others unwise (less wise) in their choice of food.

This fact contra-indicates against the *group* technique of free-choice feeding recently recommended for both animals and children.

Choice of food is not entirely the result of experience and habit. In fact, the nutritive instincts are principally innate, " purposive " or directive reactions expressed with varying degrees of accuracy from the first contact with food and altered with the altered demands of the organism.

III. Variations in the nutritive instincts from individual to individual are due principally to innate differences. These innate differences may be accentuated or modified by imitation, limitation of opportunity and social adjustment, and may be stabilized by habit.

IV. Regardless of the origin or cause of individuality in expression of the nutritive instincts, the choice of nutrients varies in direct mathematical relation with the demands for bodily development and functional activity. This co-variability between choice of nutrients and form or function may be expressed equationally, and when so expressed and re-applied to the feeding of groups of individuals genetically similar, may be used to modify that form or function within the limits of the phenotype.

Such an equational expression of choice of nutrients and genetic response may be used :

(*a*) To determine the optimum nutritive requirements, both qualitative and quantitative, for a particular genotype—a mathematical expression of the interrelation between heredity and environment.

(*b*) To determine the minimum and the maximum potential expression of the character resulting from the interaction of the specified genes with certain specified nutrients.

(*c*) To constitute a technique :

(1) For the detection of causes of nutritional deficiency diseases, and the nutritional factors which contribute to longevity and other desired characteristics of the organism ;

(2) For the biological assay of complex food substances ;

(3) For the analysis of the complementary action of foods ; and

(4) For the rationing of animals and men of different genotypes.

(*d*) To discover the combination of nutrients best adapted to each new genotypic complex as it is modified through genetic selection or as it shifts naturally in the process of evolution.

(*e*) Either to restrict or to stimulate development or function, and, as a consequence,

(*f*) To transcend all known existing values in the controlled production of the infrabeast and the inframan as well as in the realization of the superbeast and the superman.

V. The foregoing laws may be applied as a cosmic principle to all phenomena in which both a controllable individuality and a conditionability exist—not alone to those biological activities classed as instincts, reflexes, drives and wishes, but also to the higher faculties as of the intelligence, to the will, to group factors (social, educational and religious) and to all conative processes—and through their application the optimum genetic potentialities of the individual may be realized, even the character of the genetically superior may be stamped in part upon the inferior, and the superior itself may be transcended.

The general Nutritive Value (Energy Value) of Foods for Poultry. J. Axelsson. Agricultural High School, Upsala, Sweden. Harper Adams Utility Poultry Journal, Vol. 23, 1938, p. 43.

The effect of fibre-content in depressing the general digestibility of the food is brought out in a table. For every rise of 5 per cent. in the fibre-content of the dry matter of the food, the digestibility of the food (organic matter) falls by 8 per cent. in the case of the fowl, and 4 per cent. in the case of the ruminant.

Within the range of fibre-content that prevailed in author's experiments, variation in fibre-content of the ration had little or no influence upon the proportion of nett to total (available) energy. Author defines the Food Unit for Poultry as being K.G. of normal barley or that weight of other food which, under equal conditions, provides in the feeding of poultry the same number of nett calories as the barley.

The daily maintenance requirement of the full-grown fowl of live weight 2.0 k.g. may be placed at 190 nett calories (or 0,080 F.U.P.) per head. About 1.05 k.g. of usual grain and mash feed is equal to 1 F.U.P.

The energy value per k.g. of the " increase " steadily rises with advancing age from an initial figure for both sexes of 1250 kal. to a maximum of 3740 kal. for females and 2750 k.g. for males. 1 F.U.P. furnishes 1660 nett calories.

The total energy content of 1 k.g. weight of eggs will be 1639 kal., of which 1513 kal. will be " available." In these experiments 1.03 F.U.P. was required per 1 k.g. eggs. The standards given apply to birds in their first laying year.

Scientific Principles of Poultry Feeding. E. T. Halnan. Ministry of Agriculture, London. Bulletin No. 7, 1936.

For the 4th edition of the Ministry's Bulletin No. 7 the author has incorporated the new knowledge that has been acquired since the appearance of the 3rd edition. As a result, several sections of the work have been rewritten, and much new material has been added. In the new sections dealing with poultry dietetics, the relation of feeding to the quality of eggs and flesh, the relation of nutrition to the moult, the relation of minerals to growth and egg production, and the factors affecting palatability, have been given special attention.

Evidence continues to accumulate to indicate that a ration that is deficient in certain constituents may be directly responsible for the appearance of certain diseases. There is, in fact, reason to suppose that, in some instances the progress of disease in infected birds may be checked by an appropriate ration. Apart from this question of the more direct preventive or curative influence of diet on disease, it is of great importance that the nutritive requirements of the fowl, whether for the production of normal growth, eggs, or flesh, should be satisfied. Research into the problems of poultry nutrition has lagged behind similar work in connection with larger farm animals. With the establishment of the National Poultry Institute a few years ago, the position in this respect has been largely remedied, and recent investigations throw considerable new light on the subject.

The Bulletin is divided into several main sections—The Essential Constituents and Functions of Food ; The Anatomy of the Digestive System of the Fowl and its relation to Diet ; Digestibility from a Practical Standpoint ; The Anatomy of the Egg-producing Apparatus of the Fowl and its Relation to Egg Production ; Poultry Dietetics ; Feeding Standards in Relation to Poultry Production ; and The Quantitative Requirements. In addition, there is described a system of table poultry production suitable for farmers, and some short notes on feeding stuffs for poultry are given.

Search for Cheaper Poultry Foods. E. T. Halnan. Feathered World, 1937, p. 85.

A popular article, but containing a new method of calculating and assessing the relative cheapness or dearness of poultry foods.

Essential Points in Poultry Feeding. E. T. Halnan. Ministry of Agriculture Adv. Leaflet, No. 90, 1937. Price 1d. net.

Contains a simple explanation of the points to be observed in poultry feeding, and a selection of specimen rations for use under varying management conditions.

The Value of Succulence in Poultry Rations. M. W. Miller, Western Washington Experiment Station. U.S. Egg and Poultry Magazine, Jan., 1938.

Three rations were fed in duplicate to six lots composed of 60 Single Comb White Leghorn pullets each. Ration 1 received 5 per cent. artificially dried alfalfa as a sole source of greenfeed. Ration 2 received both artificially dried alfalfa and succulent greenfeed, while ration 3 was fed succulent greenfeed as the sole greenfeed supplement. The greenfeed supplement was kale for the first three 28-day periods, carrots for the second three periods, and lawn clippings for the last periods of the trial. Yellow corn and cod liver oil supplied additional quantities of vitamin A to bring the total vitamin A intake above the requirement of laying pullets. Results based on egg production, egg weight, mortality, body weight, and egg quality showed that the succulent quality of greenfeed is of no value in poultry rations that are supplemented with 5 per cent. dehydrated alfalfa and which supplies the vitamin A requirements of the pullets.

Does Charcoal help with Growing Cockerels. F. C. Bobby. Feathered World, Jan. 14th, 1938.

The experiments of Mangold and Damkohler in Berlin suggested that the inclusion of 10 per cent. charcoal to a fattening ration resulted in increased live weights as compared with control birds not receiving charcoal.

The results obtained by the author with cockerels were not only that the charcoal birds failed to beat the control birds in live weight gains during each of the three tests, but lower gains were recorded for these specially fed birds. The charcoal birds were inferior in condition as compared with the control groups. Charcoal is obviously of no value to the fattener when used at a rate of 10 per cent., and is likely to result in a financial loss if added to an average English fattening ration. Results with 5 per cent. charcoal did not indicate that any benefit was obtained by this addition to the mash. Neither in growth up to 15 weeks nor in health were the charcoal-fed birds superior to the control pens.

Poultry Feeds and Feeding. G. Robertson and H. S. Gutteridge. Canada Department of Agricultural Pub. 541, 1936.

This bulletin presents information on the physical and chemical nature of a wide range of feeding stuffs suitable for poultry feeding, along with practical suggestions on the compounding of rations and methods of feeding different types of fowl.

Poultry Rations. Agricultural Experiment Station, Durham, New Hampshire. Ext. Circular 190, Oct. 1936.

Contents: Rations for pullets and hens. Rations for chicks. Rations for turkeys. Suggestions for vitamin supplement.

Growth and Feed Standards for New Hampshires. A. E. Tepper. Agricultural Experiment Station, Durham, New Hampshire. Circular 52, April, 1937.

In order to set tentatively some suggested standard for normal weight, growth and feed consumption of birds of the New Hampshire breed, definite records on these factors were taken by this Station in 1934 on an original group of 1,427 New Hampshire baby chicks. These chicks were brooded under electric brooders in four colony houses provided with wire sun porches. The records presented are average figures on the 1,427 chicks up to six weeks of age, at which time males and females were separated and representative lots of 200 males and 200 females were continued for the duration of the test period—six months.

Rate of growth may be influenced by many variable factors, including breeding, management, feeding and environment. Therefore, the figures as presented should be used only as a relative measure or guide and not as an absolute characteristic of the breed.

All birds were fed the New England College Conference mash and grain rations. This dry mash was available in separate feeders from the start of the test period. Grain was provided at the start of the second week in separate feeders and made available continuously from that date. The rations as fed are given.

Methods and Rations for Fattening Poultry. H. S. Gutteridge. Scientific Agriculture, Vol. 17, 1937, p. 340.

Results of two fattening trials are given. It was shown in the first that dry mash and milk fed separately *ad lib.* gave much less satisfactory gains than when the two were mixed in the proportions of 2 parts skim milk to 1 part mash and supplied as two feeds per day. But the latter method gave optimum results only if the birds were kept in crates. A ration of equal parts mash and chopped raw potatoes mixed with skim milk in the proportion of 1 : 1 was also slightly inferior to the standard wet mash mixture.

In another trial it was found that yellow maize was superior as a fattening meal to wheat or to the standard ration of 2 parts oats and 1 part barley. The latter was slightly improved by the addition of 10 per cent. meat meal, but the addition of 50 per cent. cooked potatoes rendered it the least satisfactory in this test. There was no advantage in allowing the wet mash to remain before the birds for more than 15 minutes. Analyses of birds from three groups fed respectively on maize, wheat, or oats and barley indicated that the quantity and distribution of the fat were similar. It is therefore argued that any improvement in finish must be the result of an increase in the gross amount of fat or of a change in the nature of the fat deposited according to the degree of saturation of the fats fed.

Methods and Rations for Fattening Poultry. II. Experimental technique and comparative value of fattening rations. H. S. Gutteridge, Central Experiment Farm, Ottawa. Scientific Agriculture, Vol. 18, 1938, p. 198.

Conclusions.—Technique.

1. The most valuable criteria of the quality of a feed or treatment to fatten poultry, namely, gain in body weight and increase in fat, have consistently been found to be so variable that the following measures of technique are considered to be necessary :

(*a*) The use of a relatively large number of individuals in each experimental group (at least 40 under the conditions of these tests) ;

(*b*) The reduction of variability and the adjustment of means for the effect of correlated variables, such as feed consumption, initial body weight, initial level of fat, etc., which, if not adjusted for, seriously affect the validity of the comparisons made.

2. An efficient technique for estimation of the increase in body fat during fattening tests has been determined and may be used to very satisfactorily assay this criterion of fattening ability.

Fattening Trials.

1. The addition of 5 per cent. mutton fat to a fattening ration increased the gain by 18 per cent., the efficiency of use of feed by 27 per cent., the increase in percentage of fat by 15 per cent., and the percentage of 'A' grade birds by 17 per cent.

2. The addition of 5 per cent. calcium carbonate (ground oystershell) to a fattening ration improve palatability, as indicated by an increase in feed consumption of 10 per cent.

3. The addition of 5 per cent. of molasses to a fattening ration did not affect gain in weight, feed consumption or increase in fat. Fewer 'A' grade birds by 10 per cent. were produced by this addition, however.

The Influence of some Distillery By-Products on the Production of Chicken Fat. G. D. Buckner, W. M. Insko, Jr., J. Holmes Martin and Amanda Harms. Kentucky Agricultural Experiment Station. U.S. Egg and Poultry Magazine, Jan., 1938.

Distillers' dried grains or distillery slop in varying amounts were fed as part of rations to chicks raised in battery brooders. The comparative quantities, qualities and proximate chemical analyses of fats deposited in several places in 10 weeks-old chicks raised under the different feeding conditions were determined. Among other things, the results indicated that the displacement of ground yellow corn in a satis-

factory all-mash ration, even in part by distillery slop, caused smaller quantities of fats to be produced in the chicks.

The quantitative differences produced by the substitution of distillers' dried grains for corn in the mashes were not so great.

The comparative analyses of the fats produced by the different feeds was discussed.

Feed Consumption in relation to Egg Production. J. R. Cavers. Chanticleer, Jan., 1938.

Summary.

How much feed does a laying flock require ? The flocks herein considered have ranged from 20 pounds of feed per day per 100 birds (25 per cent. production), to 31 pounds per day (72 per cent. production). A general average of 25 pounds of feed per 100 birds per day, or 7½ pounds per bird per month, or 90 pounds per bird per year, might be assumed for Barred Rock pullets. This assumption is 6 pounds short of the actual daily consumption of 31 pounds of feed at the above 72 per cent. production. With feed at 2½ cents per pound this would be 15 cents short of the actual daily feed cost of the 72 eggs produced, or 2½ cents per dozen eggs.

On a yearly basis 25 pounds of feed per 100 birds per day probably would be a fairly close average for Barred Rocks producing from 40 to 60 eggs a day under general Ontario conditions.

From the standpoint of feed cost, however, one should remember that the annual country-wide increase in rate of egg production in the spring months brings with it lower prices for eggs. If better appetites on the part of the birds accompany the higher production, the margin of profit becomes still less. The poultryman who keeps an accurate record of his own flock is the only one who really knows what the eggs cost.

Studies of Individual Layers. D. C. Kennard and V. D. Chamberlin. Ohio Agricultural Experiment Station. U.S. Egg and Poultry Magazine, Jan., 1938.

Studies of dietary habits of individual layers reveal surprising variations. This might be expected in view of the fact that practically all information concerning poultry feeding is based upon flock averages which obscure the interesting variations of the individuals.

In free choice feeding wheat was generally preferred to corn or oats. One layer had a special liking for wheat bran. During 12 weeks in 73 per cent. egg production her bran consumption was 31.6 per cent. of total feed with a water intake 3.34 times the weight of feed. The 31 weeks following with 26 per cent. egg production she consumed 43.5 per cent. of total feed as bran with a water intake four times the weight of feed. During a third period of 41 weeks in 65 per cent. egg production this layer received a ration of free choice whole grains and a mash concentrate which reduced the bran intake to 5.1 per cent. The water intake during this period was 1.67 times the weight of feed. Obviously the water intake was directly affected by the amount of wheat bran consumed.

The studies of individual layers disproved the popular belief that body weight declines during heavy egg production. Contrary to this, body weight was maintained or gradually increased during heavy egg production. Likewise feed and water intake was generally maintained until egg production ceased, after which there was generally a sudden interruption of feed and water intake, which was usually followed by a decline in body weight.

Feeding Tests at Parafield Poultry Station. Journal of Agriculture, Aug., 1937.

A new series of feeding tests was commenced at Parafield Poultry Station on the 1st April, 1937. Five tests have been arranged each of 50 White Leghorn pullets. The principal object of these tests is to collect some accurate date concerning the results obtained from the soaked grain method of feeding in different ways, also the production of the birds under the various methods of feeding. The following is a list of the tests that have been arranged :

A.—Morning—Soaked wheat at rate of 8lbs. grain per 100 birds, meat meal ½lb. per 100 birds, greenfeed same quantity as dry grain. Afternoon.—Same as morning, but meatmeal ¼lb. per 100 birds.

B.—Morning.—Soaked wheat at rate of 8lbs. per 100 birds, ¼lb. meat meal per 100 birds, ¼lb. linseed meal per 100 birds, greenfeed same as No. 1 test. Afternoon.—Same as morning, but without the ¼lb. linseed meal.

C.—Morning.—Soaked wheat once a day at rate of 8lbs. per 100 birds, meat meal ¾lb. per 100 birds. Afternoon.—Dry wheat at rate of 1¼ozs. per bird.

D.—Morning.—Soaked barley twice a day at rate of 8lbs. per 100 birds, greenfeed same quantity as dry grain, meat meal ¼lb. per 100 birds. Afternoon.—Greenfeed same quantity as dry grain, meat meal ¼lb. per 100 birds.

E.—Morning.—Soaked wheat and barley at rate of 4lbs. wheat and 4lbs. barley per 100 birds, greenfeed same bulk as dry grain, meat meal ½lb. per 100 birds, linseed meal ¼lb. 100 birds. Afternoon.—Dry grain at rate of ¾oz. wheat per bird and ¾oz. barley per bird.

The quantity of food, as stated in the test, will vary from time to time according to the requirements of the birds. The quantities stated in the tests are given as a basis, but are also liable to alteration according to the requirements of the stock.

Distillery Slop in Chick Rations. W. M. Insko, Jr., G. D. Buckner, J. H. Martin and A. Harms. Kentucky Station Circular 46, 1937.

In a series of experiments in which distillery slop was fed at varying levels in a growing ration for chicks, thin distillery slop proved unsatisfactory as a supplement to an all-mash ration. Three separate trials were conducted in which thick distillery slop containing from 8.5 to 9 per cent. solids and prepared from mash which contained approximately three times as much corn as other grain replaced approximately one-half, four-fifths, and all of the corn in the chick-growing ration.

The slop was fed *ad libitum*, in separate containers, except for one lot where the slop was mixed with the mash in the proportion of 1 part of mash to 2 parts of the slop. In all cases the ration containing the slop produced birds of greater average weight at 10 weeks of age than those on the all-mash ration. The amount of slop required to replace 1 lb. of mash varied considerably in the different trials, averaging about 16lb. in the first and 24lb. in the third trial. Cooking and flavour tests with broilers showed individuals from all lots to be exceptionally tender and of good flavour. Birds on the all-mash ration and those which received mash mixed with the slop had a higher percentage of fat than birds receiving the slop *ad libitum*.

ANATOMY AND PHYSIOLOGY

ANATOMY

The Anatomy of the Male Genital Ducts in the Fowl. J. C. Gray. Journal of Morphology, Vol. 60, 1937, p. 393.

A description of the microscopic anatomy of the tubuli contorti, tubuli recti, rete testis, ductuli efferentia, and epididymal ducts of the testes, and the vas deferens in male fowl.

Chemical Compositions of the Blood of the Hen during its Life Cycle. V. G. Heller and L. Pursell. Journal of Biological Chemistry, Vol. 118, 1937, p. 549.

Pullet chicks were placed when 4 weeks old on a well-balanced ration, and blood samples were taken (by heart puncture) at monthly intervals over a 2-year period. The constituents studied, which included urea N.N.P.N. creatinine, glucose, Na, plasma and cell Cl, showed no significant changes. Uric acid was independent of age and varied apparently with food intake. Urea was lower, uric acid and glucose higher, than in mammals.

Abnormal Upper Mandible. A new lethal mutation in the domestic fowl. V. S. Asmundson. University of California, Davis. Journal of Heredity, Vol. 27, 1936, p. 401.

Embryos with deformed upper mandible were obtained from an inbred strain of White Leghorn chickens. The upper maxillæ of affected embryos were absent, or very much reduced, while other facial bones were usually comparatively little affected. Only 1 out of 58 affected individuals hatched, the beak usually being too weak to pip the shell. Abnormal individuals can be readily distinguished from those with normal beaks by the twelfth day of incubation.

Abnormal upper mandible is a simple autosomal recessive. The beaks of heterozygous birds look like those of homozygous normal individuals.

A Comparison of the Glycine Contents of the Proteins of Normal and Chondrodystrophic Chick Embryos at different stages of Development. A. R. Patton. Cornell University. Journal of Nutrition, Vol. 13, 1937, p. 123.

This report is an extension and substantiation of work previously noted. Definite evidence was obtained that glycine is synthesized during the development of White Leghorn and Barred Plymouth Rock chick embryos. Chicks that died of chondrodystrophy during development contained less than normal amounts of glycine, although the relation between chondrodystrophy and the low value for glycine has not been established.

PHYSIOLOGY

Serum Phosphatase in the Domestic Fowl. R. H. Common. Journal of Agricultural Science, Vol. 25, 1936, p. 492.

The serum phosphatase activity has been studied in (1) normal birds from hatching to maturity, (2) laying birds receiving vitamin D supplement in the ration, (3) laying birds receiving high and low calcium rations, and (4) rachitic chicks.

Normal laying hens and hens in a period of suspended egg production were found to have a higher and more variable serum phosphatase value than cocks, while pullets which had never laid showed values similar to those for cocks. Serum phosphatase in chicks rapidly increased to a maximum at from 10 to 12 days after hatching followed by a rapid decline to 3 weeks of age, beyond which there was a gradual decline until maturity in cocks and a similar decline in pullets until the onset of laying. Administration of Vitamin D concentrate did not reduce the range of variation of serum prosphatase in laying birds. The incresae in phosphatase was much greater during laying for pullets receiving low calcium than for those on a high calcium intake level. Phosphatase values were greatly increased in rachitic chicks.

Glutathione Concentration and Hereditary Size. VI. Comparative post-hatching studies with Barred Plymouth Rocks and White Leghorns. P. W. Gregory, Harold Goss and V. S. Asmundson. University of California, Davis, California. Growth, Vol. 1, No. 2, April, 1937.

1. Comparative studies of gluthatione and absorbic-acid concentration were made of the whole carcass of Barred Plymouth Rock and White Leghorn chickens from 2 to 14 days of post-hatching development. The eggs from each breed, paired for weight were incubated simultaneously in the same incubator ; and the hatched chicks were placed in the same brooder pen at the same time. Two different series of Rocks and Leghorn chickens were investigated in this manner. Weights and increase in weights were also studied.

2. As shown by the analysis of weight, the Leghorns were slightly heavier at 2 and 4 days after hatching, but after 4 days of age the Rocks took the lead in weight. The difference in weight between the breeds diverged more as the chickens grew older and was becoming significant in the later ages.

3. The comparative glutathione analyses on the basis of age clearly indicate that the Rocks, the breed of the greater adult weight, had a consistently greater concentration of glutathione than the Leghorns throughout the period from 2 to 14 days of post-hatching development. When the logarithmic regression formula is applied to glutathione and body weight the Rocks have a slightly higher k value than the Leghorns, but the difference is not statistically significant. The data presented, however, may not be sufficient to settle definitely the question of heterogony.

4. The comparative analyses of the ascorbic-acid fraction on the basis of age show that the Leghorns had a consistently higher concentration than the Rocks. When the heterogonic formula is applied to ascorbic acid and body weight, the differences in k values of the two breeds are not significant.

The Effect of Radioactive Phosphorus upon the Blood of Growing Chicks. K. G. Scott and S. F. Cook. Proceedings of the National Academy of Sciences of the United States of America, Vol. 23, 1937, p. 265.

1. Because of the importance of phosphorus to living animals, its artificially prepared radio active isotope (15 p. 32) is a valuable tool to biological investigations.

2. The administration of radio active phospheric acid (White Leghorns were used as experimental animals) gives rise to effects upon the constituents of the blood that are not obtained with X-rays.

3. The lymphocytes which are sensitive to X-irradiation were not particularly affected.

4. The polymorphon nuclear leucocytes were greatly increased in numbers after the administration of radio active phosphorus.

5. This specific effect upon polymorphonuclear leucocytes is attributed to the selective deposition of radio active phosphorus in the bones, which allows bombardment of the bone marrow with beta rays.

6 The basophiles and monocytes were not appreciably affected, although an increase in eosinophiles was noted.

7. Birds treated in this manner grew normally and any permanent ill effects resulting from the administration of the radio active phosphorus were not observed.

HORMONES

Influence of Oestrone (Menformon) on the Sex of Chicken Embryos. J. H. Gaarenstroom. Acta Brevia Neerlandica, Vol. 7, 1937, No. 8/10.

Author treated 200 eggs with menformon. The injection was given into the albumen. On the 19th day of incubation the embryos were killed and the sex was examined at autopsy. The results indicate that treatment with menformon :

1. Reduces to a remarkable extent the number of males.
2. Engenders a large quantity of intersexes.
3. Increases to slightly above the normal the percentage of females.

A number of left gonads were investigated histologically. The influence upon sex, already evident at microscopic inspection becomes increasingly apparent after histological examination.

Injection of the first days produced a number of males always considerably, below normal, the number of females is invariably above 60% if the injections are given during the first 4 days of incubation. The percentage of males and intersexes fluctuates to a certain degree.

The Modification of Sex Development in the Chick Embryo by Male and Female Sex Hormones. B. H. Willier, T. F. Gallagher and F. C. Koch. Physiological Zoology, Vol. 10, 1937, p. 101. (Ref. Experiment Station Record, Vol. 77, 1937, p. 470.)

A more detailed account of experiments.

Observations concerning the Mechanics of Ovulation in the Fowl. R. E. Phillips and D. C. Warren. Journal of Experimental Zoology, Vol. 76, 1937, p. 117.

From a study by operative technic at the Kansas Experiment Station, of 33 normal ovulations in 1- and 2-year-old White Leghorn hens, it was concluded that ovulation was due, at least in part, to pressure resulting from the prolonged tension of the muscle fibres of the follicular membrane, but the stimuli to the contraction of the fibres were not determined. None of the following factors was responsible for follicular rupture : Last-minute deposition of yolk, enzymatic action, vacuolization of cells in the follicular membrane, and blood pressure. Intervals between successive eggs averaged 26.3 hr. and oviposition and the next ovulation, 32.2 min.

Some Responses of the Immature Female Fowl to Injections of Mare Gonadotropic Hormone and Oestrin. V. S. Asmundson, C. A. Guna and A. A. Klose. Poultry Science, Vol. 16, 1937, p.194.

Summary.

Young Leghorn and crossbred (Rhode Island Red × Plymouth Rock) female chickens were injected for five to 42 days with pregnant mare's serum and/or oestrin and killed when 10 to 100 days old. The combs of Leghorns responded more quickly than those of crossbreds although the crossbreds had large, turgid combs after prolonged injection with pregnant mare's serum.

The ovaries of birds injected with pregnant mare's serum were enlarged. In the crossbred birds injected for 10 days and killed when 10 or 15 days old, there was an increase in interstitial tissue but no apparent effect on the follicles. The ovaries of the older females injected for five to 42 days and killed when 30 to 100 days old were hyperemic, had increased interstitial tissue and enlarged follicles. No refractoriness was observed with increasing length of injection period but there was less response to a given amount of hormone in the older than in the younger birds.

The oviduct was enlarged after injection with pregnant mare's serum or oestrin. Prolonged injection (21 to 42 days) caused perforation of the vagina and secretion by the glands of the duct in birds that were 42 and 63 days old at necropsy.

The bursa of Fabricius was reduced in size after injection with oestrin or pregnant mare's serum. The tibia tarsus was shortei in birds injected for 42 days with serum than in uninjected birds of the same age (63 days).

The changes in the oviduct, bursa and long bones of the legs were presumably caused by the secretory activity of the ovary.

DISEASES

INFECTIOUS DISEASES

PULLORUM

A Study of Naturally Infected Field Cases of Avian Typhoid. H. C. Gauger. North Carolina Station Technical Bulletin, No. 53, 1937.

Studies on seven fatal and eight carrier cases of avian typhoid contracted under natural conditions are reported, the details being given in numerous tables. "The external symptoms in the naturally infected field cases as received in various stages of the disease did not vary to any marked extent [from] external symptoms already recorded by other workers. It was possible to recover *S*[*almonella*] *gallinarum* from the blood stream with relative frequency during the fastigial or high fever stage of the disease. . . . Cases under study yielded *S. gallinarum* in droppings during the stages of fastigium, decline, and convalescence, indicating the possibility of the perpetuation of *S. gallinarum* infection of the premises by birds in these stages of the disease. In these studies *S. gallinarum* was present in relatively large numbers in the fluids of the eyes, posterior nares, and pharynx during the fastigial stage. . . .

"Evidence of possible egg transmission of fowl typhoid is shown by the recovery of the causative organism from three eggs laid by three carrier cases. Tube agglutination tests conducted on the blood of survivor cases started from 4 to 30 weeks after receipt and conducted for a period of from 34 to 41 weeks were positive in each case in a dilution of 1 : 25 or greater. In most instances the titer of the last test was less than in the first. Antigens of *S. pullorum* and *S. gallinarum* were used, and higher titer was obtained with the *S. gallinarum* antigen. The continued presence of agglutinins for the duration of the periods noted above was probably due to the focalization of *S. gallinarum* and not to reinfection. A whole blood or tube agglutination test with *S. pullorum* or with *S. gallinarum* antigen applied to survivors of a fowl typhoid outbreak within 2 or 3 months after the disease has subsided should probably remove a large percentage if not all birds which are in the carrier stage. Autopsy findings in fatal cases (acute and sub-acute infections) were similar to those described by other workers. . . .

"In addition to the recovery of *S. gallinarum* from sources noted while under study, the causative organism was isolated from the livers of fatal cases and from blighted ova or from ovarian tissue or from both sites in all survivor cases. Three distinct morphological types of *S. gallinarum* were identified in the strains studied: *S* (smooth), *rS* (slightly rough) and *RRRR* (strong rough). Organisms recovered from the liver of fatal cases were of *S* type. Strains from the blighted ova and ovarian tissue of survivor cases and from infected eggs laid by these cases were *rS* or a mixture of *S* and *rS* types. A single strain recovered from the droppings of a survivor bird was of the *RRRR* type. The presence of *S* type organisms in fatal cases and *rS* and *RRRR* types in survivor cases suggests a relationship between virulence and morphology to the extent that the *S* type or organism is probably more virulent than either the *rS* or *RRRR* type. The probability of greater virulence in the *S* type than in *RRRR* type or *rS* type was further shown in pathogenicity tests in which four out of seven birds inoculated with *S* type organism succumbed to infection within 14 days following inoculation, whereas only one fatality occurred in the test birds inoculated with *rS*, *RRRR*, or a mixture of *rS* and *S* types. In the latter instance the inoculum consisted of a mixture of *rS* and *S* types. The results of biochemical tests applied to the organisms studied were characteristic of *S. gallinarum*."

Cysteine-gelatin as a Differential Medium for Salmonella pullorum and Salmonella gallinarum. W. R. Hinshaw and L. F. Rettger. Soc. Expt. Biol. and Med. Proc., Vol. 35, 1936, p. 44.

A brief report is made of work with cysteine gelatin as another medium for the differentiation of *S. pullorum* from *S. gallinarum*. All 58 of the *S. gallinarum* strains of fowl origin gave a definite positive reaction in cysteine gelatin in the form of a distinct yellowish-white turbidity when incubated at 37° C. for from 24 to 72 hours. The nature of this turbidity has not been definitely determined, but it is not due to profuse growth of the organisms. When stab cultures of the same strain were incubated at 20°, a zone of turbidity developed at the surface and along the line of puncture in from 48 to 72 hours. In shake cultures a similar zone was found around each individual colony. All of the 120 strains of *S. pullorum* of fowl origin produced no changes in the cysteine gelatin, either when incubated at 37° or at 20°. The reactions of the 11 strains of *S. typhi*, all of human origin, in cysteine gelatin more nearly resembles those of *S. pullorum* than *S. gallinarum*.

A Composite Drop-Reaction Sheet for the Spot Method of Conducting the Whole-Blood Test for Pullorum Disease. D. E. Stover. Journal of the American Veterinary Medical Association, Vol. 90, 1937, p. 661.

A description is given of a composite drop-reaction sheet divided with a view to eliminating an outstanding flaw in the spot method of conducting the whole blood test for pullorum disease. The sheet consists of a piece of drop-reaction filter paper and a piece of lens paper placed face to face and attached at the corners with paste.

Titre Fluctuation in Agglutination Tests for Pullorum Disease in Hens. B. H. Edgington. Poultry Science, Vol. 16, 1937, p. 15.

Following a brief reference to the literature, this contribution from the Ohio Experiment Station reports upon an investigation in which adult hens showing different titer limits in agglutination tests for pullorum disease were assembled in two groups. In one group the fowls were isolated in individual cages ; in the other they were held as a unit in a single pen. The results of the agglutination tests, which were run at monthly intervals over a period of 1 year, are reported in detail in tables. Titer fluctuations varying as to time of occurrence and degree were observed in each group. There appeared to be no significant difference in sustained trends of titer variations of the two groups that could be attributed to the manner in which the fowls were maintained.

Technique for the Eradication of Pullorum. C. A. Bottorff. Agricultural Experiment Station, Durham, New Hampshire. Bulletin No. 296, 1937.

A comparison of the efficiency and accuracy of the whole blood-stained antigen test for pullorum and the standard tube test was made in twelve flocks selected on their history of possible infection. There were 15,304 birds tested and only 63 reactors were found—one in one flock and 62 in another. The owner of the flock having the large number of reactors decided against additional testing. In this one case, the whole blood method picked out 42 reactors, and the standard tube test 62 reactors. The remaining ten flocks all passed negative.

As a result of this work it is recommended that the standard tube test continue to be used for the official test in New Hampshire.

Large Scale Testing of Fowl's Blood for the presence of S. Pullorum infection. H. P. Hamilton. The Veterinary Journal, Vol. 93, 1937, p. 175.

Contents : Antigen ; Accuracy Control ; Serum-antigecs dilution. It is the writer's firm opinion that the tube test for the presence of *S. pullorum* infection is gaining in popularity ; but such popularity will only be increased so long as the test is maintained at its present high state of efficiency.

Salmonella Infections in Chickens. H. Van Roekel and K. L. Bullis. Agricultural Experiment Station, Amherst, Mass. Journal of the American Veterinary Medical Association, Vol. 91, 1937, p. 48.

The control and eradication of Salmonelloses in chickens is recognized by diagnosticians and disease-control agencies as a tremendous but not an insurmountable task. The data presented in this paper show that pullorum disease, fowl typhoid, and possibly other Salmonella infections, can be eradicated from flocks.

An effective and successful programme can be carried out by the use of the macroscopic agglutination test along with sound eradication measures. Flocks should be 100 per cent. tested annually. When infection is discovered, a sound retesting programme should be followed if the value of the flock warrants the expenditure. Flocks revealing no reactors should be employed as foundation stock for replacing infected flocks. Eggs from flocks revealing no infection should not be incubated on the same premises where eggs from infected or untested birds are incubated. Likewise, pullorum-clean chicks should not be reared with chicks from untested or infected flocks.

Commercial hatcheries which handle thousands of eggs and chicks annually should strive to establish and maintain pullorum-clean flocks. Separate hatching facilities far remote from their main hatching operations should be provided and used only for eggs and chicks which are to replace their custom-breeding flocks. Such a procedure would, in a way, be similar to the practices followed in the New England States. This would permit dealing with fewer flocks for replacements, consequently reducing the factor of human error. Only those flocks whose owners are conscientiously disease-eradication-minded should be selected. Such a programme, supplemented with effective education, should expedite pullorum disease eradication. It is hoped that the widespread interest and participation in pullorum disease testing will lead to a sound eradication programme which is national in scope. Progress in eradication cannot be anticipated from a federal plan which permits the use of ineffective testing procedures and official grade terms that mislead the public. Poultrymen and hatcherymen should appreciate the fact that pullorum disease is a transmissible, infectious disease, whose dissemination can be prevented by practical means which will lead to ultimate eradication of the infection. Federal and State agencies should recognise that competent personnel and proper organization are necessary to execute and carry out a sound eradication programme.

Pullorum Disease in Ducklings. W. R. Hinshaw and H. A. Hoffman. Poultry Science, Vol. 16, 1937, p. 689.

An outbreak of pullorum disease in 4 week-old chicks and 1 week-old mallard ducklings in a flock in California is reported upon, circumstantial evidence being presented that the disease was transmitted to the ducklings from the chicks. " Complete studies of the strains of *S.* (*almonella*) *pullorum* isolated from the ducklings and chicks are included in the report. These strains differed from the laboratory strains with which they were compared in the production of a wrinkled growth on agar, the formation of a slight pellicle on meat extract broth, and in their failure, when first isolated, to produce acid and gas in arabinose medium. After 1 year the duckling strain began producing acid and gas in arabinose broth. Reciprocal agglutinin-absorption tests made with two tested laboratory strains as controls showed the strains to be antigenically identical to *S. pullorum.* Both the duckling and chick strains produced typical pullorum disease in chicks but failed to infect one lot of 2-day-old Muscovy and one lot of 11-day-old mallard-Peking crossbred ducklings.

PARATYPHOID

Toxins of Salmonella aertrycke. R. C. Herter and L. F. Rettger. Journal Immunol., Vol. 32, 1937, No. 5, p. 357.

The authors have found that the virulent strains of *S. aertrycke* isolated during recent paratyphoid epizootics in turkeys, as reported upon by Rettger and his associates, in which the mortality was as high as 65 per cent, did not produce a demonstrable specific toxin in vitro for the natural host. Filtrates of 12-day broth cultures of this organism were not toxic for chickens and turkeys but were highly toxic for mice and rabbits. "These substances are 'nonspecific' in nature, since similar results in mice and rabbits are produced by filtrates of *E* [*scherichia*] *coli*. The production of this so-called nonspecific toxin is apparently correlated with cell death. The substances extracted from young cells by alternate freezing, thawing, and subsequent grinding are highly toxic for young turkeys. Substances extracted from *S. pullorum* in a similar manner are highly toxic for chicks. These toxic substances are not specific, since extracts of *E. coli* prepared in the same manner gave similar results. These substances are not true toxins, since no specific neutralizing antibodies were produced against them. The substances isolated by chemical fractionation possess both toxic and immunizing properties for young chicks and must be regarded as true toxins."

The reaction of Chickens to certain members of the Colon-paratyphoid Group of Bacteria. C. Olson and G. R. Goetchins. Veterinary College, Ithaca, N.Y. The Cornell Veterinarian, Vol. 27, 1937, p. 354.

Twenty chickens, divided into four groups of 5 fowls each, were given 10 daily intravenous inoculations with Salmonella anatum variety aertrycke. One group of 10 chickens were fed a culture daily for 15 days. The results were as follows : A marked heterophilic granulocytosis was observed in those chickens receiving the bacteria intravenously. Those inoculated with Salmonella natum variety aertryke showed the highest counts, and all the fowls died 12 to 24 days after the beginning of the experiment. Most of the chickens receiving strains 7 and 33 intravenously survived and their blood counts returned to normal. Lameness due to arthritis associated with Salmonella anatum variety aertryke infection was observed in the fowls receiving that micro-organism. Feeding of strain 7 to a group of chickens induced no specific pathological changes.

No instances of transmissible fowl leukosis or fowl paralysis were observed among the experimental animals. Two cases of lymphocytoma of the ovary occurred, one of which was in a control chicken. We were unable, therefore, to substantiate the claim of Eminel that these diseases may be produced with such bacteria.

The occurrence of Salmonella, Senftenberg type, in a disease of Turkeys. P. R. Edwards. Journal of Bacteriology, Vol. 33, 1937, p. 193.

Two cultures isolated from young poults in a flock affected with a derangement of the hock joint which caused the foot to turn outward and in which the mortality did not exceed 10 per cent. were demonstrated by the Kentucky Experiment Station to be members of the Senftenberg type of *Salmonella*. This is said to constitute the first recognition of the Senftenberg type in animal disease.

Paratyphoid in Turkeys. V. A. Cherrington, E. M. Gildow and P. Moore. Poultry Science, Vol. 16, 1937, p. 226.

The authors report having found a *Salmonella aertrycke* type organism to be responsible for several outbreaks of paratyphoid in turkeys in widely separated localities in that State.

Paratyphoid infection of turkeys may be characterized as an endemic septicemic disease of poults. The poults died rapidly up to 10 days of age, with weakness and occasional diarrhœa as the common symptoms. No outstanding diagnostic symptoms or lesions were present. Older poults were more chronically affected and responded to good hygienic and management practices. One-third to one-half of the hens in the breeding flocks that produced affected poults reacted when tested by the agglutination test with antigen made from the *S. aertrycke* type organism. One flock of hens producing parathphoid-free poults did not show any reactors.

The *S. aertrycke* type organism was isolated from 3 out of 30 dead-in-the-shell poults cultured from one flock. The organism was not detected in 23 infertile eggs from the same flock. The causative organism was isolated from the ovaries of 2 out of 6 hens examined. These birds were from a flock in which 13 reacted out of 24 tested.

Attempts to eliminate the disease by fumigating the eggs in the incubator, by isolating the poults in sanitary quarters, and by the use of medication in the drinking water were not effective. Low vitality in the poults at hatching time and overheating them in the brooder house appeared to reduce their resistance to the infection and to raise the mortality rate. One lot of 38 poults brooded at the University in a battery brooder under good conditions showed a mortality of less than 50 per cent. up to 12 weeks of age. Poults from the same hatch, when brooded on the turkey farm, showed a mortality of approximately 90 per cent. Clean 10-week-old poults brought in from outside sources and ranged with poults from the affected flock died extensively from paratyphoid infection.

The data accumulated in this study seem to indicate that the initial infection was present in the ovaries of the breeding hens ; that it was transmitted to fertile eggs and directly to the poults that hatched from such eggs ; and that the infection spread rapidly in the incubator and brooder to poults that were not infected at hatching time.

A list is given of 9 references to the literature.

TUBERCULOSIS

Avian Tuberculosis. G. S. Harschfield, L. M. Roderick and M. C. Hann. Agricultural Experiment Station, Fargo, North Dakota. Journal of the American Veterinary Medical Association, Vol. 91, 1937, p. 323.

In view of the number of chicks examined in this study it is extremely doubtful if egg transmission of tuberculosis to the chick is a factor in the dissemination of the disease. Fowl tuberculosis is primarily an environmental problem. If appropriate sanitary measures, therefore, are practiced on the farm and in hatcheries, it seems doubtful if the requirement of the tuberculin test of breeding stock is justified as a control measure to minimise the danger of the transmission of the disease to the young chicks.

In 246 common crow tuberculosis was found in eight birds, the lesions usually were limited to a few nodules. They did not have the disseminated generalised character of these of domesticated fowls. While crows are omnipresent, it seems rather doubtful if they play any essential rôle in the dissemination of the disease. From other studies at this laboratory it seems again that the significant feature of the fowl tuberculosis problem is the reservoir of infection in the soil.

Avian tubercle bacilli were also found in sheep in 26 cases.

The Presence of Avian Tubercle Bacilli in the lymph-nodes of Cattle. J. McCarter, E. G. Hastings and B. A. Beach. University of Wisconsin, Madison. Journal of the American Veterinary Medical Association, Vol. 90, 1937, p. 619.

1. Of the tuberculous lymph-nodes of 28 tuberculin reacting cattle examined by cultural methods and by guinea pig inoculation for the presence of acid-fast micro-organisms, three were found to be infected with avion tubercle bacilli, 23 with mammalian tubercle bacilli, and negative results were obtained on the remaining two.

2. It is probable, therefore, that infection with avian tubercle bacilli is responsible for a part of the tuberculin reactions in lesion as well as in no-visible-lesion cattle in Wisconsin.

Herrold's egg-yolk agar medium has been found to be completely efficient for the culture of bovine tubercle bacilli from tuberculous guinea pig tissues, but is not quite so satisfactory as the inoculation of guinea pigs for the detection of bovine tubercle bacilli in the tuberculous tissues of cattle. The factors responsible for the superiority of Herrold's egg-yolk agar over the other media used have not been studied.

PEST

The Transmission of Fowl Pest to Ferrets. G. M. Findlay and R. D. McKenzie. British Journal of Experimental Pathology, Vol. 18, 1937, p. 146.

The ferret and the fitch are highly susceptible to the virus of fowl-pest. One strain of fowl-pest virus killed ferrets on intracerebral and intraperitoneal inoculation as well as in intranasal instillation ; a second failed to kill on intraperitoneal inoculation but killed after intracerebral inoculation ; another strain failed to kill but produced a febrile reaction on intracerebral inoculation. The pathogenicity of fowl-pest strains for ferrets paralleled their pathogenicity for mice. All four strains produced cross-immunity in ferrets. The clinical symptoms produced in ferrets by fowl pest virus were those of ascending myelitis. At autopsy there were also broncho-pneumonia and lesions of the liver, kidney and stomach. No relation could be found between the virus of fowl-pest and other viruses—canine distemper, influenza, Right Valley fever—which induce broncho-pneumonia in ferrets. The pig inoculated intranasally with foul-pest virus exhibits no reaction but develops immune bodies ; inoculated intracerebrally it develops a short febrile reaction.

Vaccination of Fowls against Chosen Disease (Newcastle Disease) and Fowl Plague. J. Nakamura, S. Cyama and S. Wagatsuma. Institute for Veterinary Research, Fusan, Chosen. Journal of the Japanese Society of Veterinary Science, Vol. 16, 1937, p. 55.

The route of the formalinized vaccine had a great influence upon the immunizing effect. The intravenous application brought always far better results than the subcutaneous or intramuscular application. A high percentage of the vaccinated fowls showed an absolute immunity to the subsequent virus inoculation.

Also with fowl plague, the intravenous injection of the vaccine was far more effective than the subcutaneous or intramuscular injection.

Variations in Fowl-Pest Virus. R. D. McKenzie and G. F. Findlay. British Journal of Experimental Pathology, Vol. 18, 1937, p. 138.

Intracerebral passage in passively immunized canaries has resulted in the production of a variant of the fowl-pest virus. A second variant was produced by passaging the strain obtained from the canary intracerebrally in mice. The latter, it was found, could easily be infected with the canary variant, although they were only slightly susceptible to the action of the original or starting strain. The second or mouse variant differed from the canary variant and from the original strain in being even more highly pathogenic for mice.

The varying degrees of pathogenicity in mice provided a ready means of distinguishing between these three strains. The two variants and the original strain are antigenically related.

CORYZA INFECTIOSA

Coryza Infectiosa Gallinarum. Prof. Dr. L. de Blieck. Proceedings of 12th International Veterinary Congress, Vol. III.

During the years 1931 and 1932 the author published various articles in which he described the *Bacillus hemoglobinophilus coryzae gallinarum* as the cause of roup. In the present report this bacillus is described in detail, and new statements concerning the infection, its therapy, and immunity are made.

Coryza infectiosa gallinarum is an independent infectious disease which runs its course exhibiting the symptoms of a chronic catarrh of the mucosa of the nasal

cavities and of the cella infraorbitalis. Instillation of nasal secretion from diseased animals into the nasal passages of healthy ones unfailingly transmits the disease. The incubation period varied between 2 and 8 days ; the course of the disease will run from 1 to 9 months. Contact infection results in mild cases.

The conception of Nelson, who differentiates three types of coryza, could not be confirmed. Cold and moist climatic conditions are influences which will favour natural outbreaks of coryza. The infection spreads by the use of common drinking and feeding vessels. The infectious agent occurs solely in the nose, the cella infraorbitalis, the throat cavity, and the larynx. Search was made in various ways to find a filtrable virus, but without success.

The author concludes that the coryza bacillus, discovered by him, is the sole cause of roup. Various other bacilli and *Pasteurella* species cannot be considered to be a causative agent. The coryza bacillus is to be placed in the influenza group, on the basis of detailed investigation concerning its growth behaviour. The cultural characteristics upon various nutrient media (necessity of the X and V factors) as well as complement fixation, justify this classification.

The coryza bacillus attains optimum growth upon 25 per cent horse-blood agar which has been heated to 70° C., but the growth is always very weak. In very acute cases, about 2 or 3 days after the onset of symptoms, the bacillus may be isolated in practically pure culture.

The bacillus is pathogenic solely for the chicken and turkey. Pigeons and ducks are not susceptible. Coryza could not be produced with several different hemoglobinophilic bacilli.

The disease produced by artificial inoculation (abbreviated : K.C.) corresponds in every respect to the spontaneous or natural coryza (abbreviated : N.C.), except that the course of the atrificial infection is always shorter. One month was the longest duration of the disease. In this particular case a primary or secondary culture of coryza bacilli was used, in which various other bacteria, staphylococci, streptococci, and pseudo-diphtheritic bacilli had also grown. In the opinion of the author, the shorter duration of the artificially produced diseases may have been caused by the great attenuation of the coryza bacillus in the culture.

Local treatment was attempted with silver nitrate, kerosene, chinosol, superol, formalin (also in form of vapours), and protargol. The following drugs were placed in the drinking water : Chinosol, superol, calcium chloride, and potassium iodide. Finally injections were made with trypan blue, hexamethylen-tetramine, and with vaccines prepared from nasal secretions and from coryza cultures. The results of all these experiments were negative. The experiments must be continued with drugs in a vaporized state. Disinfection of the drinking water was attempted regularly as a prophylactic measure, but likewise without tangible results.

As soon as the animals recover from a natural coryza, an immunity toward natural coryza will develop. This immunity will be the stronger, the longer the discharges last. Both natural and artificial coryza will confer immunity toward artificial coryza, but the artificial coryza will confer only partial immunity toward natural cloryza. The duration of the first infection influences the degree of immunity considerably.

The germ causing natural coryza possesses low resistance. Exposure to a 0.9 per cent sodium chloride solution at 37° C. for 19 hours leaves the exudate still virulent, but after 24 hours the germ will become nonvirulent gradually. Exposure to 22° C. for 24 hours leaves the infective matter still virulent. In one experiment it was found that exposure of the exudate to 22° C. for 48 hours resulted in infection of one hen in a group of three used (incubation period : 13 days). Exposure to 22° C. for 96 hours made the secretion avirulent. Exposure to potassium permanganate solution 1 : 1,000 at room temperature for 10 minutes does not kill the germ. Exposure to Edington's glycerin-carbolic acid mixture at 37° C. for 8½ to 10 hours renders the exudate noninfective. Exposure for 1½ to 2½ hours results in an incubation period of 4 days ; when exposed for 4½ hours, the incubation period will be 20 days.

Immunization attempts were made with exudate which was either sterilized or mitigated by various methods and then applied to the nasal mucosa.

The following immunization experiments were carried out :

1. With sterilized exudate, no reaction and no immunity resulted.
2. Attenuated exudate (1 : 10 and 1 : 50 in sodium chloride solution) resulted always in a positive infection with prolonged incubation. Additional attenuation made with the purpose of attaining a milder reaction did not result in a sufficient immunity, with this method, to natural coryza.
3. Repeated instillation of formalized exudate (formalin 1 : 500) and of formalized cultures into the nasal cavities of chickens resulted sometimes in a mild form of

coryza, having a long incubation, but running a short course. When the formalin was left to act upon the infective matter for a very long time, no infection resulted. In the former case, immunity is developed also against a contact infection, but only a partial immunity is established toward the instillation of exudate, the same as in the case of a previous artificial coryza. Repetition of these experiments is urgently needed, because they were carried out on a limited scale only.

The possibility exists that this method of immunization can be used in infected flocks as soon as the disease makes its appearance. However, precaution is to be taken against the establishment of a too severe infection.

PARALYSIS

Observations and Experiments with Neurolymphomatosis and the Leukotic Diseases. C. S. Gibbs. Massachusetts Station Bulletin, No. 337, 1936.

In reporting upon an investigation of the methods of transmission of neurolymphomatosis through the egg and of leucotic diseases by means of viruses, erythroleucosis, myeloleucosis, monoleucosis, and lympholeucosis are first dealt with. It appears that erythroleucosis and myeloleucosis are filtrable virus diseases, the filtrable agents being contained in the blood stream independent of the cellular elements. "Chickens under a year old are more susceptible than older birds. Predisposing factors appear to be mites [the chicken mite], warm weather, and overcrowding.

"An outbreak of monoleucosis is reported as distinct from erythroleucosis and myeloleucosis.

"Lympholeucosis is due to a histogenous cell identified by the vesicular arrangement of the chromatin of the nucleus. It is usually found infiltrating the tissues of the liver and spleen, and free in the portal blood of affected chickens. The living lympholeucotic cell is resistant to vital strains such as trypan blue, but the dead cell readily absorbs trypan blue. Lympholeucosis was transmitted from diseased to healthy chickens by inoculating portal blood containing large numbers of the living cells directly into the blood stream or the abdominal cavity.

"Neurolymphomatosis, or avian paralysis, is due to a histogenous cell indistinguishable from that occurring in lympholeucosis, except that it has a special predilection for the nervous system, and, under conditions not very well understood, it may invade other adjacent tissues. Chickens inoculated in the nervous system with living cells developed neurolymphomas distally to the point of inoculation in the nerves of the limbs.

"The evidence indicates that the neurolymphomatous cell was transmitted from the hen and possibly from the rooster to the chicken through the egg. The exact method by which the egg is affected was not determined, although neurolymphomatous cells were found infiltrating ovules in affected hens, and cells indistinguishable from them were found in the semen of affected roosters and the follicular fluid of diseased hens. The ovaries and testes of active transmitters were found at necropsy to be infiltrated with neurolymphomatous cells, and no hen or rooster was incriminated in this study as a transmitter that did not show such infiltration of the reproductive organs at some time.

"Symptoms appeared in affected chickens in from 2 weeks to 10 mo. The average period for the 66 birds in this study was 188.85 days, or about 6 mo.

"During the course of these observations and experiments, evidence was secured which indicates that hereditary factors involving resistant and susceptible birds were found in certain forms of neurolymphomatosis, particularly in the infiltration of the ovules of the ovary and the nerve of the eye.

"In conclusion it should be pointed out that the experiments reported in this bulletin were directed toward a study of those forms of neurolymphomatosis which affect the ovary and testes, and of the methods whereby the disease is transmitted through the egg. Transmission through the egg, however, may not be the only way or even the most important way in which the disease is spread."

A Study of Fowl Paralysis in its relation to Leukemia. E. L. Stubbs. Veterinary Extension Quarterly, School of

Veterinary Medicine, University of Pennsylvania, Philadelphia, Vol. 37, 1937, p. 67.

Normal chickens were injected with material from grey eyes, intracranially, intraocularly and intraneurally. All injections were negative.

Paralysis in Fowls and Scrapie in Sheep. A comparison. A. Brownlee. Journal of Comparative Pathology and Therapeutics, Vol. 49, 1936, p. 328.

A review of literature on paralysis in fowls and scrapie in sheep shows that the two diseases have many features in common.

Neuro-lymphomatosis. T. Dunlop Young. Veterinary Medicine. (Ref. Veterinary Journal, Vol. 93, 1937, p. 217.)

The following table indicates the number of fowls affected with neurolymphomatosis gallinarum, leucosis, iritis and lymphocytomas, from January 1st 1925 to February 1st, 1936 :—

Year	Neuro-lymphomatosis	Iritis	Leucosis	Lympho-cytoma
1936	112	87	72	37
1934-35	116	33	71	54
1932-33	20	27	50	33
1930-31	13	10	35	48
1928-29	33	0	7	23
1926-27	3	0	7	30
1925	0	0	0	0

The Etiology of Fowl Paralysis, Leukemia, and Allied Conditions in Animals, VII, VIII. M. W. Emmel. Florida Station Bulletin No. 306, 1936.

This further contribution is presented in two parts as follows :

VII. Hemocytoblastosis in Chickens as Induced by Salmonella aertrycke. (pp. 5-33).

It is pointed out that hemocytoblastosis as discussed in this contribution is a fundamental process in the development of many of the various pathologic manifestations resulting from infection by many species of the genus *Salmonella.* It also results from the injection of organ emulsions and filtrates of leukemic birds, commonly known as the transmission agent and referred to by some investigators as a filtrable virus.

" Experiments conducted to determine the effect of hemocytoblastosis on the growth curve show that in one instance 10 Barred Rock chickens, equally divided as to males and females, infected by the intravenous injection of a suspension of *S. aertrycke* when 3 weeks of age, averaged 696 g. in weight when the birds were 10 weeks of age, as compared to an average weight of 924 g. in the non-infected group. A repetition of this experiment with an equal number of Rhode Island Red chickens showed a difference of 190 g per bird in favour of the non-infected group when 10 weeks of age. Hemocytoblastosis has been diagnosed in 10 flocks of laying birds in which this process was the only pathologic manifestation occurring. Marked reduction in egg production was noted in all flocks. Scaly and more or less atrophied comb and wattles are the principal symptoms shown. A shorter incubation period results when birds are exposed to *S. aertrycke* during " active " hemocytoblastosis. Birds showing " recessive " hemocytoblastosis, or which have recovered from the process, show considerable immunity to subsequent infection by *S. aertrycke* as long as 6 months.

" According to the conception of hemocytoblastosis advanced in this study, birds recover from this process in instances in which other pathologic manifestations do not develop. Many birds never show external symptoms of hemocytoblastosis. The rate of recovery depends in a large measure upon the intensity of the process. Recovery often requires as long as 3 to 6 months. The course of hemocytoblastosis, once established, is dependent almost entirely upon the individual resistance of the bird."

VIII. Hemocytoblastosis in Naturally Occurring Cases of Fowl Paralysis and Lymphomatosis, as well as in other Birds from the same Flocks (pp. 35-41).

This contribution deals with hemocytoblastosis as concerned with naturally occurring cases of fowl paralysis and lymphomatosis, as well as in other birds from the same flocks in which these pathologic manifestations were observed.

" One hundred birds 6 to 52 weeks of age, from 44 sources, affected with fowl paralysis, 40 birds 14 to 98 weeks of age, from 18 sources, affected with lymphomatosis, 40 birds 6 to 33 weeks of age, from 24 different flocks, affected with " light," anemia, and unthriftiness, and 75 apparently normal birds 6 to 28 weeks of age from 14 flocks in which fowl paralysis was occurring showed by total and differential blood counts that hemocytoblastosis was present. In general the degree of hemocytoblastosis varied to some extent in the different groups studied. Hemocytoblastosis was more pronounced in the group affected with light, anemia, and unthriftiness and less pronounced in the group affected with lymphomatosis. Birds affected with fowl paralysis and apparently normal birds associated with outbreaks of fowl paralysis occupied a place between these two extremes, hemocytoblastosis being slightly more severe in the group affected with fowl paralysis."

It is considered likely, in naturally occurring outbreaks of this group of diseases, that most of the entire flock become infected to some degree, although not necessarily sufficient to develop into one of the pathologic manifestations.

The Etiology of Fowl Paralysis, Leukemia and Allied Conditions in Animals.

IX. Salmonella enteritidis as a causal micro-organism for this group of Diseases in the Chicken.

X. Salmonella schottmülleri as a causal micro-organism for this group of Diseases in the Chicken.

M. W. Emmel. Agricultural Experiment Station, Gainesville, Florida, Bulletin No. 313, Sept., 1937.

SUMMARY IX.

Salmonella enteritidis induced a septicemic disease when a suspension of 0.1 c.c. of this micro-organism was injected into the yolk sac of 20 day-old Barred Rock chicks.

Twenty 3-weeks old Barred Rock chicks exposed to *S. enteritidis* in the drinking water of one day developed hemocytoblastosis ; fowl paralysis and erythroleucosis each occurred in one bird after an incubation period 15 and 45 days, respectively.

The daily exposure for 30 days of 20 10-weeks old parasite-free White Leghorn chickens to *S. enteritidis* in the drinking water and 19 birds of similar age and breed for a period of 60 days resulted in the development of hemocytoblastosis, but none of the other pathologic manifestations.

The repeated intravenous injection of suspensions of *S. enteritidis* into 100 parasite-free birds 6 to 20 weeks of age resulted in the development of one of the pathologic manifestations in 57 birds ; hemocytoblastosis with recovery occurred in the remaining 43 birds.

Ninety-six of 175 birds of four breeds affected with artificial or natural *Eimeria*, *Ascaridia* or *Taenia* infestation developed one of the pathologic manifestations following oral exposure to *Salmonella enteritidis*. Fowl paralysis occurred in 46 birds, lymphomatosis in 27, myeloid leukemia in 13, erythroleucosis, " light " and anaemia, fowl paralysis and leukemia each occurred in two birds, fowl paralysis and lymphomatosis in three birds, while anaemia occurred in one. The incubation period for fowl paralysis was from 15 to 66 days, lymphomatosis from 25 to 82 days, myeloid leukemia from 78 to 137 days, erythroleucosis from 64 to 81 days, " light " and anaemia from 23 to 27 days, and anaemia 15 days.

S. enteritidis is a causal micro-organism for fowl paralysis, leukemia and allied conditions in chickens. Two strains of *S. enteritidis* of avian origin and two of human origin did not materially differ in their ability to induce the various pathologic manifestations. The ability of *S. enteritidis* to induce this group of diseases compared most favourably with the more pathogenic strains of *S. aertrycke*.

SUMMARY X.

The intra-yolk sac injection of 0.1 c.c. of a suspension of *Salmonella schottmülleri* into day-old Buff Orpington chicks induced a septicemic disease.

Twenty 1-week old Buff Orpington chicks exposed to *S. schottmülleri* in the drinking water for one day developed hemocytoblastosis; one chick developed anaemia in 10 days, four died of septicemia in 4 days.

The oral exposure of 20 3-weeks old Buff Orpington chicks to *S. schottmülleri* in the drinking water for two days resulted in the development of fowl paralysis in one bird in 22 days and anemia in another in 19 days; the remainder developed hemocytoblastosis and recovered.

The daily exposure of 20 11-weeks old parasite-free Rhode Island Red chickens to *S. schottmülleri* in the drinking water for 30 days and of 20 birds of similar age and breed for 90 days resulted in the development of hemocytoblastosis, but none of the other pathologic manifestations.

The repeated intravenous injection of suspensions of *S. schottmülleri* into 95 parasite-free birds 8 to 16 weeks of age resulted in the development of one of the pathologic manifestations in 37 birds; hemocytoblastosis alone with subsequent recovery occurred in the remaining 58 birds.

Eighty-four of 195 birds of three breeds affected with artificial or natural *Eimeria*, *Ascaridia* or *Taenia* infestation developed one of the pathologic manifestations following oral exposure to *S. schottmülleri*. Fowl paralysis occurred in 34 birds, lymphomatosis in 26, myeloid leukemia in 13, erythroleucosis in 3, anemia, "light" and anemia, fowl paralysis and leukemia, and fowl paralysis and lymphomatosis each occurred in 2 birds. The incubation period for fowl paralysis was 16 to 60 days, lymphomatosis from 29 to 67 days, myeloid leukemia from 82 to 137 days, erythroleucosis from 70 to 101 days, anemia from 19 to 20 days, and "light" and anemia from 17 to 22 days.

S. schottmülleri is a casual micro-organism for fowl paralysis, leukemia and allied conditions in the chicken. Four human strains of *S. schottmulleri* induced the various pathological manifestations but with less ability to do so than the two avian strains.

The ability of *S. schottmülleri* to induce this group of diseases was not as great as in the instances of *S. aertrycke* and *S. enteritidis* under similar conditions.

The Importance of Endotoxin of Salmonella aertrycke in the development of Fowl Paralysis. M. W. Emmel. Journal of the American Veterinary Medical Association, Vol. 90, 1937, p. 749.

In connection with the work with fowl paralysis noted above, the author reports having found that the intravenous injection of endotoxin of *S. aertrycke* often results in transient but typical symptoms of fowl paralysis. "Birds show a progressive age resistance to the neurotoxic action of endotoxin. Repeated intravenous injection of endotoxin in chickens results in mild hemocytoblastosis, but repeated intravenous, intracerebral, or intraperitoneal injections will not result in fowl paralysis. Endotoxin in varying amounts in vitro inhibits agglutination and reduces the titer of *S. aertrycke*-immune serum and inhibits phagocytosis. *S. aertrycke* alone induced fowl paralysis in 22 of 108 birds 6 to 12 weeks of age, while the same number of causal micro-organisms plus 1 cc of endotoxin induced fowl paralysis in 53 of 105 birds of the same age. By the injection of endotoxin into baby chicks it was possible to predict, with 86.7 per cent. accuracy, the development of fowl paralysis when the same birds became 8 to 12 weeks of age and exposed to repeated intravenous injections of *S aertrycke*."

Primary Irido-cyclitis in Fowls: a condition distinct from the eye lesions occurring in neuro-lymphomatosis. H. P. Bayon. Journal of Comparative Pathology and Therapeutics, Vol. 49, 1936, p. 310.

The occurrence of outbreaks of iridocyclitis, involving relatively large numbers of fowls, without the appearance of paralysis before, during, or after the development of the eye lesions, suggests that iridocyclitis is not always due to neurolymphomatosis, but may occur as a separate disease. "Such birds with primary iridocyclitis, when placed in single-pen cages where they have easy access to food and drink, notwithstanding their blindness, will go on laying throughout the season, while fowls with neurolymphomatosis either do not come into lay at all or cease laying the moment the disease is manifest. Though it is admitted that there is no clear-cut difference

between the anatomical lesions in the eyes of birds with primary iridocyclitis when compared with those detectable in the eye affection occurring in the course of fowl paralysis, yet the different occurrence and course of the two ailments may be allowed to suggest a distinction in pathology between the localized affection of the eye when occurring alone and the generalized lymphomatosis seen in fowl paralysis. From the standpoint of veterinary medicine it is advisable to treat cautiously the presence of 'pearly eyes' in breeding birds, since it is not always possible to distinguish in the living, on the spot, certain harmless varieties of "pale eyes" from early and yet dangerous pathological lesions."

LEUCOSIS

Transmissible Splenomegaly of Fowls or Reticulo-endothelial Leucosis ("Erythroleucosis"). H. P. Bayon. Royal Society of Medicine, London, Proc., Vol. 30, 1937.

Following a review of previous investigations abroad, presented with a list of 25 references to the literature, the author's observations on splenomegaly in fowls in Great Britain are reported.

"In fowls from different parts of England a deadly disease has been observed which is characterized by the appearance of a dark swollen liver and a much enlarged spleen; the blood was found to contain an increased number of immature monocytes. Histological examination of the internal organs showed that the condition was due to a diffuse proliferation of the reticuloendothelial system of the liver, spleen, and bone marrow; at times lungs and ovary were involved. Kidney might also be affected, but here enlargement seemed to be due to an invasion by monoblastlike cells. Nerves were not found infiltrated, the type of cell in this ailment differing from that involved in neurolymphomatosis gallinarum. The disease could be accurately named "reticuloendothelial leucosis," since anemia is not an outstanding or primary feature; at no time are large numbers of immature erythrocytes or even erythroblasts detectable in the blood, as in yellow anemia or erythromyelosis. The invasion of the blood by immature monocytes or monoblasts occurs in later stages and is preceded by hypertrophy of the hepatic and splenic reticuloendothelium.

These investigations not only confirm the independent origin of erythrocytes and lymphocytes in fowls, but also indicate that monocytes arise in the reticuloendothelium of the marrow, spleen, and liver, and differ in behaviour from histiocytes. The identity of the disease observed in England with that described as erythroleucosis on the continent has been ascertained by obtaining virus from Budapest and then comparing the lesions obtained by the inoculation of this virus with those observed in this country, either in the field or after inoculation with tissues of leucotic fowls from Dorset.

The term "leucosis" might be served for those conditions, occurring in birds and other animals, in which the morbid condition consists in the primary proliferation of lymphoidal cells (monoblasts or histiocytic cells) in the tissues, with their secondary invasion of the circulation as monocytes or blood histiocytes.

Fowl Leukosis. C. D. Lee, H. L. Wilcke, C. Murray and E. W. Henderson. Journal of the American Veterinary Medical Association, Vol. 91, 1937, p. 146.

This contribution includes the results of seven transmission experiments with fowl leucosis, which term is used to include in common the group of leukemic, aleukemic, and leukemiclike diseases of fowl. Young chicks have been found to be more susceptible than older ones, with the greatest incidence between the ages of 2 and 12 months, the majority of cases occurring between 4 and 10 months.

"The disease in all of its expressions may be transmitted to healthy chicks by injection of tissue suspensions of affected tissues or by injection of cell-free filtrates. It may be transmitted by direct pen contact or by rearing chicks on contaminated litter. Neurolymphomatosis gallinarum, associated with eye lesions, hemocytoblastosis, lymphoid, erythroid, and myeloid types of leucosis are different expressions of the same disease and were transmitted by a common etiological agent. Erythroleucosis and myeloid leucosis manifestations are largely dependent upon involvement of the bone marrow. The lesions may be localized in one area or may be generalized. The injection of a suspension made from one type apparently produces practically all the various types considered as expressions of this disease. Different suspensions

were used in all groups of the experiment, but practically the same results were obtained in each group. The incidence is often very high in spontaneous infected flocks. The lesions may be confined to one or more types of tissue in some cases and to some other type or types in other cases. Breed and sex differences apparently do not affect the incidence of the disease. There appears to be an inherent difference of susceptibility and resistance by different birds and birds of different strains. The disease spreads rather slowly in infected flocks, and only a few birds are clinically affected at one time. There seems to be some evidence to suggest that the disease may be transmitted through the egg to a limited extent. The evidence indicates that fowl leucosis is an infectious disease, and the transmissible agent is a filtrable virus. The clinical course is variable, extending over a period of weeks or months in some cases, while in others it is comparatively short. No complete recoveries occur, although temporary respites from the disease have been noted.

"This disease is one of the most important diseases confronting the poultry industry. The most important methods of control are proper sanitation and the use of breeding stock from resistant sources."

A list is given of 37 references to the literature.

OTHER INFECTIOUS DISEASES

The recent Turkey Disease. E. P. Johnson and G. W. Underhill. Southern Planter, Vol. 96, 1935, p. 28.

This contribution from the Virginia Experiment Station calls attention to a disease of turkeys in various parts of Virginia. In the first outbreak, observed in 1933, approximately 30 per cent of the young turkeys in the affected area died during July and August, and in the summer of 1934 the same section encountered a recurrence of the disease, with an approximate loss of 40 per cent of the turkey crop. By 1935 it had spread and appeared in various parts of the State where turkey raising is a major enterprise, the loss ranging from 10 to 50 per cent of all the turkeys in such areas.

Affected birds lose their appetite, appear droopy, and have a tendency to lie down. "When disturbed they may move with difficulty, and when excited in the later stages, they may fall over, gasp, go into a coma, and, finally, die. Visible symptoms usually last for only 2 or 3 days, at which stage the birds either die or recover. No outstanding gross lesions have been found with the exception of slight inflammation of the duodenum. The birds are usually somewhat emaciated and appear anemic. The flesh is usually flabby and the musculature of a brownish colour. Occasionally small haemorrhages and ulcers occur in the intestines." On microscopic examination of blood smears from affected birds a protozoan has been found, usually in large numbers. This is thought to be spread by an intermediate host, such as the simulid or blackfly, commonly known as the turkey gnat, implicated by Skidmore in Nebraska in 1930.

A Blood Disease of Turkeys. E. P. Johnson and G. W. Underhill. Southern Planter, Vol. 98, 1937, p. 34.

A practical account is given of the progress of work at the Virginia Experiment Station with the disease of turkeys noted above. In order to determine if certain flies of the genus *Simulium* are involved in the transmission of this leucocytozoon disease of the turkey, experimental houses were constructed and transmission experiments conducted which have shown the causative organism to be transmitted by a blackfly from infected to normal fowl.

Toxoplasma in North American Birds and attempted Transmission to Canaries and Chickens. C. M. Herman. American Journal of Hygiene, Vol. 25, 1937, p. 303.

In a study here reported, Toxoplasma, a genus of parasites which has been found in the white blood cells and lymphoxytes of mammals and birds, has been detected in many species of passerine birds, having been found in Syracuse, N.Y., and Beltsville, Md., and on Cape Cod, Mass. It is suggested that only one species occurs in birds, for which T. *paddae Herman*, possibly synonymous with *T. gondi*, is believed to be the correct name. Attempted transmission from sparrows to canaries and to chickens resulted negatively.

A list of 27 references to the literature is given.

Some Notes on the Efficiency of Home-made Sodium Hypochloride as a Disinfectant. H. P. Hamilton. Veterinary Journal, Vol. 93, 1937, p. 153.

Reporting upon the efficiency of home-made sodium hypochloride as a disinfectant, it is pointed out that an available chlorine content of 0.6 per cent will kill the highly resistant Salmonella pullorum after an exposure of 5 minutes, at a dilution of 1 part of disinfectant to 10 parts of water.

Tables are given which show the germicidal properties of dilutions of the disinfectant in broth cultures of S. pullorum of from 1 : 2 to 1 : 20, the concentration of disinfectant necessary to inhibit growth of this organism in optimum conditions of temperature and media, the concentration necessary to inhibit S. pullorum and other bacterial growth in drinking water, and a comparison of nonstabilized and stabilized fluid.

An Erysipelas Outbreak in Turkeys. D. E. Madsen. Journal of the American Veterinary Medical Association, Vol. 91, 1937, p. 206.

Report on the outbreak of erysipelas due to *Erysipelothrix rhusiopathiae* in a flock of 1,300, 5½ month-old turkeys, which resulted in the death of 325 (25 per cent).

Infectious Bronchitis. F. R. Beaudette. Iowa Poultry Impr. Association Yearbook, Vol. 5, 1937.

A practical summary on infectious bronchitis, a new respiratory disease previously noted, contributed from the New Jersey Experiment Stations.

Infectious Laryngotracheitis. F. R. Beaudette. Poultry Science, Vol. 16, 1937, p. 103.

A practical review of the status of knowledge of infectious laryngotracheitis, contributed from the New Jersey Experiment Stations.

Filterable Virus Diseases of Fowls. C. A. Brandly. Veterinary Medicine, Vol. 32, 1937, p. 180. (Ref. Experiment Station Record, Vol. 77, 1937, p. 904.)

A summary of information, particularly on the pathogenic effect and differentail diagnosis of leukemia and fowl pox, with control measures.

PARASITES

WORMS

Internal Parasites of Poultry. R. Graham, J. P. Torrey, J. D. Mizelle and V. M. Michael. Illinois Station Circular, 469, 1937.

A compilation of information on internal parasites of poultry, including flatworms and roundworms and their control and prevention. An outline of primary and intermediate hosts, including illustrations of the adults of the intermediate hosts, together with a list of 28 references to the literature examined, follows.

Control of the large Roundworm of Fowls. (Ascaridia) (galli.) Experiments with nicotine sulphate (40% *nicotine*). F. Roberts, Yuronpilly. Eggs, April 7th, 1937.

Conclusions : A mash containing .5 ml. of nicotine sulphate per pound of dry mash is capable of giving high efficiency against A. Galli if fed continuously over a period of 7-8 dys.

In the case of young birds the food consumption and gains in weight of the treated birds compared very favourably with the controls. It would appear that worms were more readily and more rapidly removed from older birds by this nicotine sulphate mash.

It is significant that the only worms surviving the treatment were small ; all the mature worms were removed.

It was also found that the treatment was about 50 per cent. efficient in removing the Cæcum Worm, Heterakis Gallinæ.

Further Records of the Gizzard Worm Amidostomum anseris in the State of Washington : Report of cases in wild waterfowl. A. C. Jerstad. Journal of the American Veterinary Medical Association, Vol. 90, 1937, p. 785.

A brief report is made of cases of parasitism in certain species of wild waterfowl in Washington State that have come to attention since the earlier report of its occurrence in geese in work conducted by the U. S. D. A. Bureau of Animal Industry in co-operation with the Western Washington Experiment Station.

On some Lesions associated with Helminths in Birds of economic importance. P. A. Clapham. Journal of Helminthology, Vol. 15, 1937, p. 49.

A report of studies conducted at the Institute of Agricultural Parasitology at St. Albans, England.

Relative Abundance of Crop Worms in Turkeys : Macroscopic differentiation of species. E. E. Wehr. Veterinary Medicine, Vol. 32, 1937, p. 230.

In an examination made of a large number of turkey esophagi collected at one of the poultry markets in Washington, *D.C. Capillaria contorta, C. annulata,* and *Gongylonema sp.* (probably *G. ingluvicola*), named in the order of their relative abundance, were found to be the parasites of the esophageal mucosa of turkeys in that vicinity.

An Outbreak of Parasitic Necrosis in Turkeys caused by Plagiochis laricola (Skrjabin). A. Foggie. Journal of Helminthology, Vol. 15, 1937, p. 35.

A brief account is given, together with a description of a small fluke (*P. laricola*) which was found to have caused the death of 11 in a flock of 23 turkey poults at the time of visitation of a farm in Northern Ireland.

Note on the Occurrence of Hatertia gallinarum in the Korhaan. Dr. H. H. Mönnig, Onderstepoort. Journal of the South African Veterinary Medical Association, Vol. 8, 1937, p. 195.

It is of interest to record that the nematode parasite, *Hatertia gallinarum* (Theiler, 1919), known hitherto only in the domestic fowl, has now been found in the " vaal korhaan," *Heterotetrax vigorsi.*

This worm and its life-cycle was described in 1919 by Theiler, who found that the termite, *Macrohodothermes mossambicus transvaalensis* was the intermediate host. The worm was first discovered in fowls around Pretoria, later at Kroonstad, then in other parts of the Union and as far north as Elizabethville, Belgian Congo.

The distribution of this parasite, restricted as it is to (southern) Africa, made one suspect that it is one of those which our domestic animals have acquired from wild animals in this country.

The Nematode Ornithostrongylus quadriradiatus, a Parasite of the domesticated Pigeon. E. Cuvillier. United States Department of Agriculture, Technical Bulletin, No. 569, 1937.

A study is reported of the taxonomy, life history, host-parasite relations, and pathogenicity of the small roundworm *O. quadriradiatus*, which is associated with a serious disease and of which since 1930 there have been numerous outbreaks among pigeons in various parts of the world.

The taxonomic studies indicated " that *O. crami* Pérez Vigueras 1934, described from Cuba, is synonymous with *O. quadriradiatus*. Similar study of specimens from Panama revealed that they are less closely related to *O. quadriradiatus* than to *O. fariai* and that they probably belong to the latter species. They differ from *O. quadriradiatus* most markedly in length of the worms, size of the dorsal ray of the bursa, and spicule length. According to morphological observations, the spicule length of *O. quadriradiatus* does not vary markedly in specimens from different parts of the country nor in male worms of different ages.

" The life history was shown to be of the direct and simple type. Eggs in the 32- or 64-cell stage, when passed in the feces of the host, may hatch within 19 hr. under favourable conditions ; a rhabditiform larvae emerges. The first-stage larva molts within about 8 hr., becoming the second-stage larva. The second molt occurs usually on the third day, the larva then becoming filariform, ensheathed, and infective for the host. This third-stage larva may be distinguished by its dorsal and two subventral tail papillae. The fourt-stage and the adult stage are passed within the intestine of the host ; eggs may appear in its feces 5 to 6 days after infection."

The eggs were found to be nonresistant to drying and to a very low temperature ; neither were the first- and second-stage larvae resistant to heat or drying. The third-stage larvae were killed by strong sunlight within a few hours. " Drying for 24 hr. killed a large percentage of infective larvae. Exposure to extreme cold for a short period, however, did not kill them. Placing them in water an inch deep killed the infective larvae, possibly because of decreased oxygen supply. Survival of larvae on soil, either shaded outdoors or in boxes in the laboratory, was considerably shorter in duration than that in water cultures in the laboratory. Infective larvae were observed to migrate laterally about 2 in. and vertically as much as 3 in. Attempts to infect chickens, turkeys, and a duck were unsuccessful except for the development of 11 fourth-stage larvae in 1 chicken.

" Control of this parasite should be based mainly on destruction of the preparasitic stages. This can be done effectively by drying and exposure to sunlight. It is advisable to separate immediately any infested birds."

A list is given of 40 references to the literature cited.

COCCIDIOSIS

Cod Liver Oil for Coccidiosis. Feathered World, November 26th, 1937.

The feeding of adequate levels of cod liver oil is of considerable value in overcoming some of the detrimental effects of a severe infestation of cecal coccidia, according to Messrs. R. R. Murphy, J. E. Hunter and H. C. Knandel, of the Pennsylvania State College.

When laying pullets in excellent condition became infested, at 26 weeks, with cecal coccidiosis, body weight and egg production decreased. A more severe drop in egg production occurred in the groups fed with lower levels of oil. Recovery of normal body weight and satisfactory egg production was more rapid in the groups on the higher oil diets.

As the amount of cod liver oil in the ration was increased the rate of mortality following the infestation of coccidia decreased.

There appeared to be a direct relationship between the amounts of cod liver oil concentrate fed and the performance of pullets following an attack of coccidiosis.

The substance or substances contained in cod liver oil responsible for the rapid recovery of laying pullets from coccidiosis was not determined. To determine this and other points concerning the problem further work will be necessary.

Control of Coccidiosis. C. L. Martin, T. B. Charles, R. C. Durgin and S. R. Shimer. Agricultural Experiment Station, Durham, New Hampshire. Bulletin No. 296, 1937.

Studies were made of various parts of the chicken's digestive tract to determine the normal pH and the influence of feeding different alkalis and acids. No variations of significance in the study of coccidiosis, however, were found.

The influence of feeding and litter treatment on chronic coccidiosis was also investigated. A pen started with hard grain feeding along with the mash was compared with a pen that was not fed hard grain for the first four weeks ; and both pens were compared with others in which the litter was treated and the birds fed according to recommended practice. No coccidiosis developed, but mortality and culling were lower in the litter-treated pens. The pens were kept dry at all times, and the results tend to confirm other observations that there is much less trouble with the disease in dry pens. Half of the birds were placed in batteries, and egg records of these were much lower than for the birds kept in pens.

Another group of birds was divided into six pens of 20 birds each. In five pens three birds were treated periodically with oocysts of chronic coccidia, receiving otherwise different rations and treatments. Again all pens were kept dry, however, and the disease did not develop. Records of egg production from October to April show considerable variation, as follows :

Control Group, no oocysts		2045 eggs
Oocyst Groups :	Litter treated with sulphur weekly	1879 eggs
	2% sodium bicarbonate in feed	1742 eggs
	5% sulphur in feed	1529 eggs
	10% milk sugar in feed	1233 eggs
	Regular feed	1214 eggs

Studies on Oöcyst Production in Avian Coccidiosis. I. *A Dilution Count Technique.* II. *Chronic Isosporan Infections in the Sparrow.* D. C. Boughton. American Journal of Hygiene, Vol. 15, 1937, pp. 187, 203.

A technic for counting oöcysts of avian coccidia by which dilution counts as suspensions of dried feces are made, is described. Single counts readily differentiate the various levels of oöcyst production encountered in natural and experimental infections. Dried samples can be stored conveniently and do not deteriorate.

The counting technic is capable of demonstrating parasite populations (Hospomicroscopically in avian malarvas).

The oöcyst production of the coccidia (*Jsospora*) of the English sparrow (*Passer domesticus*) under various caging conditions, and as a result of experimental inoculation, was studied by means of oöcyst counts. Infection is normally prolonged and chronic, and is maintained for long periods in hosts which are not permitted access to infective material. An infection may readily be superimposed upon an existing chronic infection by inoculation of the host with infective material. A second experimentally induced infection can readily be established in a host which has previously experienced a similarly induced infection The incubation period of a superimposed infection is approximately ten days. The time of day at which diurnal peak of oöcyst occurs is independent of the time of previous ingestion of infective oöcysts.

Studies on Oöcyst Production in Avian Coccidiosis. III. D. C. Boughton. Journal of Parasitology, Vol. 23, 1937, p. 291.

Data on the findings in five pigeons, trapped in Boston in November, 1933, confiined as a group in the same cage, and on the findings when placed in separate cages, are reported in tables in this further contribution.

Tyzzeria perniciosa gen. et sp. nov., a Coccidium from the Small Intestine of the Pekin Duck, Anas domesticus L.

E. A. Allen, Zoological Division, Bureau of Animal Industry, Washington, D.C. Archiv für Protistenkunde, Vol. 87, 1936, p. 262.

Tyzzeria perniciosa is described as a new genus and a new species of coccidia from ducks, with a key to the genera of the sub-family Cryptosporidiinæ ; also an account is given of its life-cycle.

Since this coccidium is very minute, it could easily be overlooked. It is highly pathogenic and, therefore, it is likely to be economically important.

BLACKHEAD

A Study of Immunity produced by Infection with attenuated Culture Strains of Histomonas Meleagridis. E. G. Tyzzer. Journal of Comparative Pathology and Therapeutics, Vol. 49, 1937, p. 285.

Various culture strains of Histomonas meleagridis show no uniformity in regard to the rate of decrease in pathogenicity. Thus while pathogenicity was lost in one and a half years in one strain, another strain was still mildly pathogenic after three years.

Strains which have become non-pathogenic retain for a time well-marked immunising properties when established in the cæca, but may gradually lose these properties and later on furnish no more than slight or partial protection against inoculation with fully pathogenic strains.

Histological study of successive stages of the pathological process resulting from the invasion of the cæcal wall by Histomonas has revealed qualitative as well as quantitative differences in the reaction of the chicken to different culture strains.

On comparing the reaction of partially immunised and those of non-immunised chickens to pathogenic Histomenos, the lesions are found to be microscopically similar, differing only in extent.

In birds completely immunised, as judged by gross appearances when killed at appropriate periods after the test inoculation, no invasion of the tissues has been demonstrated microscopically.

Notwithstanding the lack of distinctive histological differences in the character of the reactions of the partially protected chickens as compared with those of controls, the modification of the infection in the former is clearly shown in the shortening of the course of infection, in the occurrence of delayed infections, and in the marked limitation of the area of the cæcal wall invaded.

A Note on the Occurrence of Enterohepatitis or Blackhead in Chickens. F. H. S. Roberts. Animal Health Station, Yeerongpilly, Queensland. The Australian Veterinary Journal, Vol. 13, 1937, p. 158.

Description, with photo of cases, of blackhead in chickens. Form 2 and Form 3 of Tyzzer of Histomonas meleagridis were readily recognised and in the sections examined by the writer were present in large numbers.

Infectious Enterohepatitis. A. J. Darant, University, Columbia, Missouri. Journal of the American Veterinary Medical Association, Vol. 90, 1937, p. 596.

Description of cause, symptoms, pathology, mortality, control measures. It is highly important that young turkeys be kept away from older birds, and that both be kept entirely isolated from chickens or where chickens have been within the last two years.

POISONS

The Toxicity of Crotalaria retusa L. Seeds for the domestic Fowl. M. W. EMMEL. Journal of the American Veterinary Medical Association, Vol. 91, 1937, p. 205.

In an experiment at the Florida Experiment Station force feeding Leghorn hens with single doses of 100 *C. retusa* seeds caused death within 14 days and single doses of 200 seeds caused death within 10 days. Chronic cases of poisoning were induced by force feeding 10 seeds every other day, death occurring in from 18 to 40 days. In five birds fed a grain mixture containing seeds of *C. retusa* scattered on the ground once a day, death occurred in from 15 to 32 days.

The Pathology of Crotalaria spectabilis Roth Seed Poisoning in the domestic Fowl. M. W. Emmel, Agricultural Experiment Station, Gainesville, Florida. Journal of the American Veterinary Medical Association, Vol. 90, 1937, p. 627.

Innumerable petechiae in the serous membranes and visceral fat as well as a dark liver, marbled in colour, are the outstanding lesions in the acute type of Crotalaria spectabilis Roth poisoning in the domestic fowl. In the chronic type of poisoning necritic enteritis, ascites and anaemia are observed ; the liver often appears as in the acute type of poisoning.

Passive congestion, edema cloudy swelling and occasionally foci of necrosis in the parenchymatous tissues, smooth muscle and serous membranes dominate the histopathology.

SUNDRY DISEASES

Report of the Veterinary Service of the Palestine Department of Agriculture and Forests for the year ended 31st March, 1936.

The general condition and health of poultry kept under the modern system of poultry-raising has been good. Fowl-pox is widespread in the country. The flocks are vaccinated with pigeon-pox virus obtainable from the Government Veterinary Laboratory. It is only occasionally that cases resembling fowl paralysis are met with in Palestine. Two such cases were observed among imported breeding fowls. Several cases of leucaemia were observed on post-mortem examination. A virus disease of an hitherto unknown disease of fowls occurred in Haifa and Tulkaru Sub-Districts. The disease caused a mortality from 80% to 90%. Particulars of this disease are published in this report by the veterinary pathologist.

Several outbreaks were reported of Cell Enclusia Disease. Fowl cholera is endemic in Palestine, also Spirochaetosis. The Hebrew University is studying Spirochaetosis in fowls. Infectious coryza is commonly met with among pullets during the summer months. Tuberculosis is not found among flocks of modern poultry farms. Coccidiosis is the most prevalent infectious disease of chicks. Air-taminosis was prevalent during the summer months, particularly in laying pullets.

Last year about 80 million eggs and 2 million live fowls were imported. The report gives a description of the poultry station by the senior poultry officer. Various experiments are conducted at Government Poultry Stations, f.i. poultry housing, feeding, time of incubation, methods of rearing.

Control of Poultry Diseases. Journal of the Ministry of Agriculture, London, Feb., 1937.

Contents :—Fowl Pox ; Tuberculosis ; Cholera ; Contagious Bronchitis ; Legislative action—New Orders : I. The Fowl Pest Order of 1936. II. Poultry and hatching eggs (importation) Order of 1936. III. Poultry Markets and Receptacles (Disinfection) Order of 1936.

These three orders are the first statutory regulations to be imposed in Great Britain dealing with poultry diseases.

Poultry Diseases Demonstrations. K. D. Downham. Veterinary Record, Vol. 48, 1936, p. 1178.

Description of tuberculose, tuberculin test, coccidiosis, bacillary white diarrhoea, neurolymphomatosis and enterohepatitis.

Poultry Autopsies. C. L. Martin and C. A. Bottorff. Agricultural Experiment Station, Durham, New Hampshire, Bulletin No. 296, 1937.

During the fiscal year 2,143 poultry autopsies were performed in the poultry pathology laboratory. There were 831 adult chickens, 1,245 chicks, 66 turkeys and one duck autopsied for the poultrymen in the state.

The principal diseases in adults were ruptured egg yolk 29.8%, coccidiosis 16.4%, indigestion 15.6%, uremia 8.54%, pneumonia 8.42%, tumours 5.9%, round worms 5.8%.

The principal chick diseases were pneumonia 24.3%, coccidiosis 18.0%, ulcerated gizzard 17.0%, pullorum 13.0%, indigestion 9.3%, epidemic tremors 5.7%.

Mortality in the Laying Flock. A. E. Tomhave. Annual Report Agricultural Experiment Station, Newark, Delaware, Bulletin No. 207, 1937.

This study is being continued to determine if mortality in the adult flock can be reduced by following certain procedures in the selection of the breeding birds. The procedure of selection being followed appears to be producing promising results, but the data are not sufficiently complete to warrant discussion.

Special Poultry Number of the Veterinary Journal. Vol. 93, 1937, No. 1. Ed. London : Baillière, Tindall & Cox.

Contents :—Biography : Sir Edward Brown. Editorial : The Control of Poultry Diseases Veterinarians and Poultry Diseases, by Sir Edward Brown ; The Poultry Industry in 1935, by Sir Edward Brown ; Poultry Diseases, by K. D. Downham ; Observation on an outbreak of Fowl Paralysis, by J. W. Johnston and J. E. Wilson ; Poultry Mortality, by G. Mayall ; Some Notes on Lymphomatoses Gallinarum, by H. P. Hamilton ; Bloodtesting as a means of controlling Bacillary White Diarrhoea in the Irish Free State, by H. N. Spears ; a Preliminary Report on the Helminthic Parasites of Poultry, Wild Birds and Small Mammals in the South Wales area, by T. Walker ; Control of Poultry Diseases ; Abstract from the memorandum describing action of the Ministry under the Diseases of Animals Act, 1935 ; Symptoms of Fowl Pest ; Poultry and Hatching Eggs (Importation) Order of 1936 ; Poultry Markets and Receptacles (Disinfection) Order of 1936 ; Legislative Action, New Orders ; the Fowl Pest Order of 1935.

Illinois State Report, 1935.

Report on : Control of pullorum disease, control of laryngo tracheitis of chickens through vaccination, hereditary resistance to pullorum disease and the value of pigeon pox vaccine for control of fowl pox.

Indiana State Report, 1936.

Report on : Transmission of paralysis in chickens by inoculation, agglutination tests for pullorum disease.

Tennessee State Report, 1936.

Brief reference is made to the progress of poultry yard sanitation investigations by Allen and Jacob.

Work in Poultry Pathology by the New Jersey Stations. F. R. Beaudette. New Jersey Stations Report, 1936.

Reference is made to the diagnosis of poultry diseases during the year, including the occurrence of a thorny-headed worm, probably *Plagiorhynchus formosus*, in a white-throated sparrow, thought to be a new host, and *Haemoproteus columbae* in pigeons from South Carolina ; investigations of infectious laryngotracheitis ; a study of fowl paralysis ; and paratyphoid infection in pigeons.

Work with Diseases of Fowl by the Massachusetts Station. Massachusetts Station Bulletin No. 339, 1937.

In this report of the year brief reference is made by H. Van Roekel, K. L. Bullis, O. S. Flint, and M. K. Clarke to the progress of pullorum disease eradication, antigenicity studies of *Salmonella pullorum* strains, its viability, the whole blood agglutination test, maltose-fermenting *S. pullorum* strains, pullorum disease in turkeys (encountered in two flocks during the year), disease studies of ruffed grouse and paratyphoid infection in young pheasants, diagnosis of ulcerative enteritis of turkeys and of an organism resembling *Erysipelothrix rhusiopathiae*, flock mortality studies, and epidemic tremor in chicks.

Work with Avian Diseases by the Rhode Island Station. Rhode Island Station Report, 1936.

A brief report is made of the work of the year with infectious rhinitis (coryza), in which during the course of studies of *Hemophilus gallinarum* a secondary micro-organism, *Shigella nasalis*, was isolated from infected chicks ; infectious bronchitis ; leucosis ; and cerebral disorder of chicks.

The Problem of Infection as presented by Bacterial Invasion of the Chorioallantoic Membrane of Chick Embryos. E. W. Goodpasture and K. Anderson. American Journal of Pathology, Vol. 13, 1937, p. 149.

The authors have found the inoculation of the chorioallantoic membrane of chick embryos with pure cultures of pathogenic bacteria to be a practical method for studying many problems of infection, especially the early stages of invasion. " Many pathogenic bacteria find in either mesodermal cells (fixed or mobile) or epithelial cells, or both, favourable and possibly necessary media for invasion of the living host. In these instances phagocytosis, instead of representing resistance to infection, actually favours it. Among those pathogenic bacteria that are able to utilize a living intracellular environment for growth are *Str[eptococcus] viridans*, *A[erobacter] aerogenes*, *E[berthella[typhi*, *Br[ucella[abortus*, and *Myco[bacterium[tuberculosis avium*. *Staph-[ylococcus] aureus* and *Str[eptococcus] hemolyticus* may be in part destroyed by the phagocytes of the embryo, and they appear to be incapable of growing in an intracellular medium in this host."

Birds Dying at Laying Tests. South African Poultry Magazine, Nov., 1937.

It will be remembered that at the last Conference of the South African Poultry Association held at Maritzburg in March a resolution was passed requesting that at Government and other egg-laying competitions, replacements of birds dying during the first fortnight of the competition shall be permitted to compete for position and prizes, and shall be banded with competition rings, and, if eligible, shall be banded for the Breeders' Register. A reply has now been received from the Government to the effect that this cannot be allowed in respect of the Government test, as it is considered that the acceptance of the proposal would have a detrimental effect on the competition. It is contended that the manner in which the test has been conducted in the past accounts for the high level of efficiency that has been attained and that a change such as is suggested in the recommendation would be detrimental. It is pointed out that, compared with other countries, the Union is in a very favourable position both in regard to egg production and mortality, and that this is borne out by figures relating to the mortality of birds taking part in competitions as follows : South Africa, 6.7 per cent. ; Australia, 10 per cent. ; Canada, 17.9 per cent. ; England, 14.25 per cent. ; United States, up to 50 per cent.

Pedigreeing for Health. Editor: Eggs, Jan. 12th, 1938.

(1) It is essential that we should recognise that the *primary* cause of greater susceptibility to disease is due to errors in selection of breeding stock.

(2) Methods of selection have resulted in early sexual maturity, which has robbed the growing pullet of a high per centage of the nourishment needed for normal healthy development.

(3) These methods of selection have produced precocious male birds, which have lacked the constitution to carry them through a breeding season. Many pedigree breeders have made this complaint.

(4) We now recognise that there is a great difference in the mortality among the progeny of different males, indicating that some of them are of a poor constitution. What then are we to expect of the progeny of males which had not vitality enough to live through a breeding season ?

(5) External characteristics are useful as an indication of the health of the bird when purchased ; they are not an indication of his constitution.

(6) Selection for constitutional vigour is of primary importance and all other factors should be subordinated to it. What then may we anticipate from pullet bred cockerels ?

(7) That it does not follow that a hen possesses constitutional vigour because she has laid 300 eggs. Conversely it does not follow that she possesses it because she has laid only 200, or even 100 eggs.

(8) Constitutional vigour is exhibited by a high resistant power against disease, by the ability to lay a satisfactory number of well-shelled and hatchable eggs ; to produce healthy progeny with a low percentage mortality, and the liveability factor.

(9) It does not necessarily follow that the introduction of new blood will improve constitutional vigour ; the reverse is too often the case. We must not confuse hybrid vigour with constitutional vigour.

(10) There are fundamental laws of breeding, but there can be no arbitrary systems. Whether in-breeding, line-breeding, or outcrossing, success depends on the ability to select the right individual from the right group. The value of the " Super " bird is something it is not possible to over-estimate. There are a few of these birds in every flock, and should be purposefully utilised.

(11) Let us assume, from any given flock we have been able to select forty breeding hens with the necessary qualifications. This will give us five breeding pens. If we have to get the constitution of the male birds, we must go to trouble and expense for this purpose. We want vigour and health, and the son of a dam which laid 180–200 eggs will answer our purpose as well as one from a 280–300 dam. Remember we are building. We have thus the start of five families, and the interchange of blood from these families for several years. This is far more economic than scrapping the whole of your stock when an outbreak of disease occurs, and it is a better way ofchecking it than attempting to do so by continually introducing new blood.

Gout in Poultry. Die Gicht des Geflügels. H. Horstmann. Deutsche (landwirtschaftliche) Geflügel-Zeitung, Vol. 40, 1937, p. 197.

Birds severely affected eat poorly, lose weight and die of exhaustion. In preventing and curing the disease it is important to ensure that increases in the protein content of the ration be accompanied by proportionate increases in the green food content.

Sulphur in the Control of External Parasites of Chickens. Preliminary report. M. W. Emmel. Journal of the American Veterinary Medical Association, Vol. 91, 1937, p. 201.

In an experiment at the Florida Experiment Station in which commercia laying mash containing 5 per cent. commercial flowers of sulphur was fed to hens, their infestation by lice (*Menopon stramineum* and *M. gallinæ*) was considerably reduced at the end of 2 weeks, and by the close of the third week none could be found. A similar result was obtained when the experiment was repeated. Infestations by the sticktight flea of fowls receiving such treatment augmented by sulphurising the yards at the rate of 100 lb. of sulphur per 400 sq. ft. of area and placing a light coating of

sulphur on the floor of the houses beneath the litter were brought under complete control in 3 weeks. Infestations on fowl tick-infested flocks were reduced, and re-infestation did not occur. Direct contact with sulphur was found to kill the adult flea in from 5 to 10 min. at room temperature. The chicken mite was controlled in several poultry houses by dusting the floors, dropping boards, and nests with sulphur.

Parasitic Tumours in Wild Birds. L. C. Morley and J. E. Schillinger. Journal of the American Veterinary Medical Association, Vol. 92, 1937, p. 94.

An account is given of an extensive tumorous growth covering the breast of a redwinged blackbird, collected in New York State, which appears to have been due to the mite Harpyrynchus brevis (Ewing).

EGGS AND TABLE POULTRY

EGGS

Formation of Chalazae and Inner Thin White in the Hen's Egg. R. M. Conrad and R. E. Phillips. Kansas State College. U.S. Egg and Poultry Magazine, Jan., 1938.

In the magnum (the albumen-secreting portion of the oviduct), the white is deposited around the yolk as an apparently homogeneous gel. By the time the egg has reached the uterus, the layer of white adjacent to the yolk has liquefied, although the mucin content has not decreased. If the egg remains in the uterus until oviposition, the formation of the chalazae is accompanied by a decrease in the mucin content of the thin fraction. On the other hand, if the membranous egg is removed from the oviduct at the time it enters the uterus and is then surrounded by an artificial uterine fluid, a normal outer thin white develops, but no chalazae are formed and the mucin content of the inner thin does not decrease.

If an egg is treated in the same manner except that it is slowly rotated, normal chalazae develop and the mucin content of the inner thin white decreases as in a normally formed egg. This would indicate that the rotation of the egg in the uterus causes a segregation of the mucin of the inner thin white forming the chalazae and the chalaziferous layer.

Dried Egg-White. A. K. Balls and T. L. Swenson. Food Res., Vol. 1, 1936, p. 319. (Ref. Experiment Station Record, Vol. 77, 1937.)

In this contribution from the U.S.D.A. Bureau of Chemistry and Soils a new commercial method is proposed for the preparation of dried egg white by acceleration of the enzymic decomposition in the presence of trypsin. The results of whipping and baking tests in which the enzyme prepared egg white was compared with dried fermented egg white in sample angel food cakes were in favour of the enzyme-prepared product. The advantages of this new product are high sugar content, freedom from bacteria, and in general a closer resemblance to fresh egg white, together with the ease of preparation and saving of time.

Bacteria do not cause Ruptured Egg Yolk. L. W. Slanetz and C. L. Martin. Agricultural Experiment Station, Durham, New Hampshire. Bulletin No. 296, 1937.

Results of the bacteriological study indicate that bacteria are not the primary cause of ruptured egg yolk in New Hampshire flocks. Thirty strains of bacteria were isolated and classified into four different species on the basis of their morphological, cultural and biochemical characteristics. These organisms were similar to the types identified in previous studies. *Pasteurella avicida* could not be detected in any of the birds examined.

Pathogenicity studies gave essentially the same results as were previously reported. None of the species, when injected intraperitoneally into healthy laying birds, produced ruptured egg yolk.

Egg Quality Studies. A. J. Macdonald. Report of the 19th Annual Poultry Conference held at the Harper Adams Agricultural College, Newport, Shropshire, Aug., 1935.

Summary.

This review of the literature on the subject of judging the quality of eggs by their appearance when candled and the experiments which have been carried out at the Institute reveal quite clearly the limitations of the methods in present use for assessing the internal quality of eggs.

For examination of the shell for cracks, thickness and texture, the candling process is excellent, but for determining the quality of the shell contents the method of candling is far from satisfactory.

Foreign bodies, it is true, can be detected with comparative ease. We have seen, also, that the candling appearance of stored eggs differs from that of fresh eggs, both in the grading of the white, which is in a more liquefied state in stored eggs, and in the depth of the air cell. On the other hand, for eggs of a given age, the grading of the white by candling bears no relationship to the percentage of thin white.

The defect known as watery white is certainly difficult to define, for it does not seem to be related with the percentage of thin white, it is not influenced by feeding or by the rate of egg production, and seems to be a characteristic of individual birds. It is probable that many eggs classified as first grade possess as poor a quality of white as those classed as watery white, and that many classified as having watery whites have as good a quality for cooking purposes as first grade eggs.

The true watery white egg is one in which the white runs all over the pan when opened for cooking. It is not unlikely that a more fruitful method of investigating the problem lies in the relating of actual cooking quality with the candling appearance. If there is some clear connection between the two then we shall be nearer to solving the problem. With our present methods of candling it seems that the detection of watery whites is largely a matter to chance.

The grading of the yolk depends on the shadow of the yolk and on its motion, both of which are dependent to a great extent on the condition of the white. At the same time the condition of the white is judged very largely on the shadow and movement of the yolk, so that the two factors are difficult to distinguish and are liable to be confused.

It will be remembered that the actual colour of the yolk can be altered by feeding and in certain cases by the method of storage.

It may be well to recall, in conclusion, that the candling appearance of eggs which have been transported or stored is less affected when the eggs have been packed with the air-cell up than with the air-cell down.

Factors Influencing Production of Clean Eggs. E. M. Funk. Missouri State Bulletin No. 384, 1937.

The information presented is based on observations extending over 15 months and including the classification of over 66,000 eggs with respect to cleanliness. Most of the soiling of eggs occurred in the nest, since more than 99 per cent. of all eggs were clean before they came in contact with the nest. Certain breed differences and also differences between individuals within a breed with respect to percentage of clean eggs produced occurred, evidently associated with the temperament and habits of the individuals. A higher percentage of clean eggs was produced during the hot and dry seasons of the year. The percentage of dirty eggs was reduced approximately 50 per cent. by gathering eggs four times per day as compared to gathering only at the end of the day, and there was a higher percentage of dirty eggs present in trap nests in the morning than in the afternoon. When open nests were used, darkening the nests materially decreased the percentage of dirty eggs. A higher percentage of clean eggs was gathered from trap nests than from open nests and from birds confined to laying houses than from those on range. Shavings, oat hulls, sawdust, and excelsior were the most effective nesting materials for preventing dirty eggs. Covering the droppings platform with poultry netting and using strips of gravel in front of laying houses did not significantly affect the percentage of clean eggs.

The Pigment of Egg Shell Membranes. A. A. Klose and H. J. Almquist. Poultry Science, Vol. 16, 1937, p. 173.

The California Experiment Station has made a spectroscopic analysis of the pigment extracted from eggshell membrane. It is concluded that this pigment is identical with a natural porphyrin, probably protoporphyrin, which has been identified as the pigment occurring in all pigmented eggshells. The spectra of the membrane pigment and the porphyrin correspond in neutral ether, dilute acid, or dilute alkaline solutions.

Recent Developments in Studies in Egg Quality. W. L. Wilcke. Iowa State College. The U.S. Egg and Poultry Magazine, Jan., 1938.

Methods have been developed which measure certain factors of egg quality. Those criteria of quality which have been studied most extensively are yolk colour, yolk index, percentage of thick and thin white, thick white score and albumen index. In general, yolk colour may be affected by feeding, but other factors of quality seem to be affected chiefly by the individual bird, and are consequently problems of breeding. The one exception appears to be the work of North, in which he found that the feeding of rye would increase the percentage of thick white in the egg.

A Review of Recent Literature on the Storage of Eggs and Poultry. G. F. Stewart. Omaha Cold Storage Company. U.S. Egg and Poultry Magazine, Jan., 1938.

I. Storage of Eggs.

The seven ascertained factors determining successful storage of eggs are :—

1. Original fresh egg quality ; 2. Sterility of egg contents : 3. Prevention of micro-organism growth on shell ; 4. pH of egg contents ; 5. Prevention of absorption of flavours ; 6. Prevention of evaporation ; 7. Temperature.

Initial quality remains the dominant factor in storage of eggs. Humidity requirements for mould growth have been established. Flavour changes have been traced to chemical changes as well as absorption of foreign flavours.

II. Storage of Poultry.

Desiccation during storage is one of the major faults of the storage poultry. The relation of " store burn, pock marking and freezer burn " to dehydration in storage is well established. Control has been achieved by moisture-vapourproof wrappings, —20°F. or lower storage temperatures, glazing, and so forth, and humidification of storage rooms.

Quick freezing as applied to poultry has as yet to prove its exact worth.

Drawn poultry is being widely introduced and presents many unanswered problems for research.

Chemistry of Turkey Eggs. J. S. Hepburn and P. R. Miraglia. J. Franklin Inst. Vol. 223, 1937, p. 375. (Ref. Nutrition Abstracts, Vol. 7, 1937, p. 289).

Tables summarise the total solids, H_2O, crude fat and protein, ash, and glucose contents, and the calorie values of the whole egg, white and yolk of the domestic turkey and the constants of the yolk fat. The percentage of lipoid extracted varied with the solvent, being greatest with light petroleum and least with Et_2O.

A New Species of Micro-organism (Proteus melanovogenes) causing Black Rot in Eggs. A. A. Miles and E. T. Halnan. Journal of Hygiene, London, Vol. 37, 1937, p. 79.

In an investigation of the cause of a black rot occasionally observed in imported eggs, the specific causative organism was isolated and has been described. This organism proved markedly putrefactive, and the name *P. melanovogenes* has been provisionally assigned to it. It produced rot experimentally either when inoculated into fresh eggs or when brushed on the shell of such eggs. In a small number of trials hens inoculated with the organism laid eggs which failed to develop the specific rot. The organism has been found in a number of places, including English soils and manures, but its source, general distribution, and the conditions necessary for infection were not determined.

The Effect of Hereditary and Environmental Factors on the Interior Quality of the Egg. V. Heiman and L. A.

Wilhelm. Agricultural Experiment Station, Pullman, Washington. Bulletin No. 342, 1936.

The albumen index is a relatively constant characteristic of the individual hen from day to day. Eggs of known quality have been incubated, the chicks individually pedigreed, and, upon maturity, a high and low line have been selected and reproduced for a study of the mode of inheritance of albumen quality. The method of determining the albumen index has been modified as a result of work showing that when the egg weight is known and properly corrected, the albumen height may be used in place of the albumen index. This relation has been reduced to the form of a nomogram.

A device for measuring the degree of pigmentation in egg yolks was developed with a series of 24 colours.

A study of the effects of water intake on the hen in relation to the interior quality of her eggs is in progress. In this work 24 White Leghorn pullets are housed in individual laying cages and daily determinations of egg quality are made.

The effects of various carotinoid pigments found in natural feed-stuffs on the yolk colour of eggs also has been studied and will be published. Some thirty common ingredients of poultry feeds were used. It was observed that the pigmentation was introduced into the egg yolk very rapidly but when feeds containing the pigment are removed from the ration, the yolk pigmentation disappears slowly.

A study to measure the effects of seasonal variation and the physical condition of the hen on egg quality is in progress. The interior quality of all the eggs produced by sixty White Leghorn pullets will be measured daily before the candle and broken out. The house temperature, egg size, candling index, albumen index, and yolk colour will be observed daily.

The Effects of Storage Conditions on Egg Quality. V. Heiman and L. A. Wilhelm. Agricultural Experiment Station, Pullman, Washington. Bulletin No. 342, 1936.

In a study of the ability of eggs of varying quality to stand up under storage conditions, eggs of known interior quality will be held under storage conditions and, at various intervals, will be broken out and the interior quality determined.

The effect of temperature and humidity over various ranges of time on the interior quality of eggs is being determined. Eggs of known interior quality stored under varying temperature conditions, will be broken at intervals and the interior quality measured.

In studies on the development of improved candling methods for studying interior quality of eggs, an attempt will be made to correlate physical measurements of interior egg quality with the appearance of the egg under the candle.

TABLE POULTRY

Poultry Inspection. D. Young. The Veterinary Journal, Vol. 93, 1937, p. 48.

In the opinion of the author time has come, and is indeed long overdue, when all imported poultry should be certified as having been examined and found free from disease by Government veterinary inspection in similar manner to articles of food classed under the Public Health (Imported Foods) Regulations.

Standard Methods for the Preparation of Market Poultry. Marketing Service. Poultry Division. Department of Agriculture, Dominion of Canada. Publication No. 594, Nov., 1937.

Contents : Preparing for killing ; Killing and bleeding ; Blood cup and head weights ; Plucking ; Cleaning and flushing ; Pre-cooling ; Head wrapping ; Selecting birds for packing ; Packing-boxes ; Lining the boxes ; Stencilling and printing ; Frozen storage.

Mutton Fat for Table Birds. H. E. Gutteridge. Feathered World, Dec. 3rd, 1937.

The Sussex fatteners' preference for the feeding of mutton fat is strongly supported by experiments conducted on the Dominion Experimental Farms at Ottawa.

It was found that an addition of 5 per cent. of mutton fat to the fattening mash increased the gain in weight by 19 per cent., body fat by 17 per cent., and the efficiency of the use of feed by 30 per cent. The final grading of the carcases was improved by 17 per cent. Total food consumption was not materially affected.

Other results obtained at the same station showed that (*a*) the addition of 10 per cent. meat meal to the cereal ration gave increased gains (difference 18 per cent.); (*b*) a feeding period of 15 minutes was as efficient as one of 30 minutes; (*c*) the addition of 5 per cent. of ground oyster shell increased both feed consumption and gain by 10 per cent.; (*d*) the addition of 5 per cent. of molasses had no apparent effect.

Potatoes, raw or cooked, and mashed (equal weights) were definitely inferior to mash alone (differences 6.1 per cent. and 22.8 per cent.).

Maize gave equal gains to wheat, but on a considerably lower feed consumption (difference 17.1 per cent.).

Table Poultry Production. A. J. Macdonald and Jean W. T. Kay. A report from the National Institute of Poultry Husbandry, Newport, Shropshire. Bulletin No. 14, Aug., 1937.

The work shows that a ration containing 35 per cent. each of maize meal and wheatings gave significantly greater weights at eight weeks than other mixtures, using these meals in the proportions of 7 : 3, 3 : 2, and 2 : 3. The mixture used was 35 wheatings, 14 bran, 35 maize meal, 5 d.s. milk, 5 meat and bone meal, 5 ex. soya bean meal, 1 c.l.o., and 1 salt. At 14 weeks, however, the difference was less marked.

The ration containing wheatings and maize meal in the ratio of 2 : 7 gave the least satisfactory weight gains during fattening, the final weights being significantly lower.

Dressing Shrinkages of Bronze Turkeys. S. J. Marsden. Poultry Science, Vol. 16, 1937, p. 112.

Tests at the U.S. Range Livestock Experiment Station at Miles City, Mont., indicate that the weight losses of Bronze turkeys during overnight fasting averaged 3.34 per cent. of the live weight before fasting. The weight loss of young turkeys, of both sexes and of all weights and grades, during slaughtering, dry picking, and overnight air-chilling averaged 9.62 per cent. of the live weight after fasting. Little difference was noted between sexes, but large birds lost a smaller percentage than small birds, and fat birds less than thin ones. Weight loss due to full drawing averaged 14.65 per cent. of the dressed and chilled weight in fat young toms and 15.39 per cent. in fat young hens. Weight loss due to killing, dry picking, chilling, and full drawing averaged 23.18 and 23.47 per cent. for young toms and young hens, respectively.

Body Conformation of the Live Market Turkey. R. G. Jaap. Oklahoma A. & M. College. U.S. Egg and Poultry Magazine, Jan., 1938.

In Oklahoma the optimum time to market turkeys appears to be from 26 to 28 weeks of age. Regardless of the manner in which turkeys are fed and managed there are always rather large differences in body conformation. Since it is only the heritable differences which make possible any permanent improvement in body shape, it is important to evaluate the influence of heredity under different environmental conditions.

The records to be reported compose a survey of the amount of variability which may be expected in market birds. Approximately 1,400 turkeys reared on the experimental farm were weighed and certain linear measurements taken as the different age groups reached approximately 27 weeks of age. The different varieties studied are Bronze Black, Bourbon Red, Narragansett and White Holland. Since each body

measurement is treated in such manner as to become an indication of the entire conformation, the value of different measures shall be discussed. The influence of sex, age groups, variety and fleshing on each of the different measurements is given for this population.

A Statistical Study of Squab Production in the White King Breed. C. S. Platt. Journal of Agricultural Research [U.S.], Vol. 54, 1937, p. 235.

The New Jersey Experiment Stations have studied the relation between total weight of squabs produced annually and certain observed factors in 138 pairs of White King pigeons. The mean annual weight of squabs per pair of pigeons that survived a year was 225.9 ± 3.57 oz. Coefficients of correlation between total weight of squabs and other factors observed were total number of squabs 0.9512 ± 0.0055, percentage fertility of eggs 0.5874 ± 0.0476, percentage livability of squabs 0.5002 ± 0.0431, egg production per pair 0.2877 ± 0.0526, percentage hatchability of fertile eggs 0.1470 ± 0.0562, and average squab weight 0.0010 ± 0.0568.

Broiler Production. A. E. Tomhave. Annual Report, Agricultural Experiment Station, Newark, Delaware. Bulletin No. 207, 1937.

The growing ration recommended by the Station for growing White Leghorn chicks was compared with a commercial broiler ration for producing broilers. The Station ration produced increase in weight equal to the commercial ration and produced a pound of broiler on slightly less feed.

A study was made to determine the value of "fattener rations" during the last week of the fattening period. Two pens of broilers that had been fed a broiler ration up to one week before they were to be sold were each divided into two uniform lots. One lot was continued on the regular broiler ration and the other lot was fed a commercial fattener ration during the last week of the feeding period. In both experiments the broilers made less gain on the fattener ration and required more feed to produce a pound of gain than the broilers on the regular broiler ration. The poultry dealer purchasing the broilers could discern nothing in the fattener-ration finished broilers that would rate them superior to the broilers finished on the regular ration Pigmentation was not improved by the fattener ration in this experiment.

In a comparison of Barred Rock chicks and cross-bred chicks for broiler purposes, the cross-bred broilers were superior to Barred Rock broilers in rate of gain, uniformity of gain and efficiency of producing gains. The Barred Rock broilers, however, sold for 1 cent. more per pound than the cross-bred broilers, but in this experiment the slightly higher price received was not sufficient to overcome the more economical gains of the cross-bred broilers.

The results obtained in this experiment are of doubtful significance, as it would seem that there is as great a difference in the quality of chicks within a breed or among cross-bred chicks as will be found between Barred Rock chicks and cross-bred chicks.

Fishy Flavour and Odour in Turkeys. The effect of cod liver oil (not U.S.P.) and white fish meal. D. R. Marble, J. E. Hunter, H. C. Knandel and R. A. Dutcher. Pennsylvania State College. U.S. Egg and Poultry Magazine, Jan., 1938.

Twenty-six carcasses of turkeys fed cod liver oil, fishmeal, or both, for varying periods of time, were roasted in separate ovens, and the degree of fishy flavour in the breast meat, thigh meat and drippings was scored by eighteen observers. Odour was scored for the carcasses as a whole. Fishy flavour and odour were observed in the roasted carcasses of turkeys 28 weeks of age, fed either 1 per cent. of a poultry grade cod liver oil (not U.S.P.), 10 per cent. of vacuum dried white fish meal, or both, during the entire growth period. The combination of these two ingredients in the mash produced a more pronounced flavour and odour than when either was fed separately.

Three birds were removed from the pens receiving either cod liver oil, fish meal or the combination of both at 8, 4, and 2 weeks prior to slaughter and placed

in the pen receiving the basal ration containing neither cod liver oil nor white fish meal. The removal of both cod liver oil and white fish meal from the diet eight weeks prior to slaughtering time practically eliminated the occurrence of both fishy flavour and odour.

Breeding for Improved Meat Type in High Egg Laying Strains of Poultry. E. A. Lloyd and Donald R. Clandinin. The University of British Columbia. U.S. Egg and Poultry Magazine, Jan., 1938.

University of B. C. strains of Barred Plymouth Rocks, Rhode Island Reds, and White Leghorns have been bred and selected since 1919 for standard qualities as well as egg production, with special emphasis on the body conformation of males. To co-operate with Dominion policy of meat grading, all breeding birds and progeny have been graded since 1935 into A, B, and C grades, according to plumpness, general meatiness, quality or fineness in bone, skin, and feathering. In young males special attention has been given to early feathering, rapid growth and early maturity, as birds were weighed every two weeks after 12 weeks of age.

Differences in meat grades are apparent in breeds and families within same. In females and males respectively, the Reds rated 60 and 55.3 per cent.; the Rocks 55.6 and 71 per cent.; the Leghorns 51 and 66.6 per cent. in the top grade, A. Thus the Rock males and Red females are outstanding in meat type. Superior meat qualities appear to be inherited, and more characteristic of certain high producing families within the breeds. The deeper-bodied, shorter-breasted, slab-sided females, laid no more eggs than the plumper-breasted, rounder-bodied females. The deeper-bodies males and females were graded B or lower.

No correlation was found between age to sexual maturity and egg production; meat grade and egg production; body size and egg weight; body size and egg production.

Such bred-to-lay strains, with early feathering, rapid growing characteristics, appear to be suitable for table purposes. Further progeny testing and selection gives promise of further improvement of meat type in high egg laying strains.

Developing a Poultry Grading Programme in Iowa. A. D. Oderkirk, Iowa State College. U.S. Egg and Poultry Magazine, Jan., 1938.

The assembling of poultry upon a more economic basis, involving grading of market birds, is receiving a greater emphasis in the Middle West than it has in the past.

In the development of a grading programme in Iowa, which was attempted for the first time as a state-wide objective during 1936, the quality grades used were patterned after the Chicago live market grades for No. 1 and No. 2 birds. Uniformity of weight classifications was largely ignored by market agencies who emphasised the carcass quality factors involved in grading.

The college extension service, in assisting and advising market agencies regarding poultry grading, has considered the following steps as fundamental to the success of such a programme.

1. Considering the interests of three groups in planning a long time programme, namely, the producer, the market agencies, and the consumer.
2. Analyzing the market structure in the state and the attitude of both producers and market agencies toward grading. A survey of the attitude of market agencies, both co-operative and private industry, was taken in 1937 to secure detailed knowledge which could be used in formulating a long-time programme of poultry marketing.
3. Preparation of materials and method of presentation are the important phases in extension work after the fundamental information is made available. In the work thus far, actual demonstrations of live and dressed poultry grading together with explanations of price trends and market demands have been found to be of most value to both producers and market agencies.

Our experience indicates the need for careful planning before launching any programme or before assisting in steps which have been taken by any special groups to further their particular interest. As a surplus producing area, the producers' interests, the kind and volume of their product should be known at the outset. More factual information about consumer demands for poultry is needed. Between these extremes the marketing practices must be adapted until changes in basic knowledge and education can change one or all of these groups to more economic methods.

Consumption of Poultry in New York City. A. Sturges and G. W. Sprague. U.S. Department of Agriculture. U.S. Egg and Poultry Magazine, Jan., 1938.

Many of the marketing problems of the live poultry industry in New York City are due to declining volume of live poultry receipts over the past few years. They may be intensified by a further reduction in volume in the future, or partly remedied by its increase. Since the volume of receipts is largely governed by consumer demand, the factors affecting consumption are worth study in forming an estimate of the future.

Data were collected from over 8,000 families showing purchases weekly during March and April in 1935. Records were gathered in proportion to the number of families in 70 districts comprising all of New York City proper, except the Borough of Richmond. The data showed the amount of poultry purchased, the class, and the price for each family by nationality, size of family, and average weekly income.

This survey showed that four dominant forces influenced the decision on the part of consumers to purchase poultry and the amount to be purchased. The decision to purchase poultry was affected by nationality and income. The amount to be purchased was affected by size of family and price.

The Wax Method of Plucking Poultry. T. W. Heitz. New England Poultryman, April 15th, 1937.

Summary.

The advantages of this wax method of picking poultry are many. First, a more thorough and satisfactory job can be had than by most hand picking. By removing the pin feathers by wax means the skin is not damaged, as may happen when the feathers are removed by a pinning knife or by hand picking. Singeing is not necessary, as practically all of the hair of the fowl is removed with the wax. Most of the dirt from the skin is also removed by the wax and the poultry presents a much cleaner appearance and the skin is glossy and possesses a fine velvety finish or "bloom." There is a saving in labour cost over the old method. The amount of this saving varies considerably, depending upon labour conditions in the different sections of the country and upon efficiency in plant operation. Some operators claim a saving of as much as 50 per cent., whereas others believe it ranges from 25 to 33 1-3 per cent. in their plants.

Wax Heating Equipment for Poultry Dressing. W. T. Ackerman and G. M. Foulkrod. Agricultural Experiment Station, Durham, New Hampshire. Bulletin No. 296, 1937.

Inability to locate commercially made wax-heating equipment suitable for dressing poultry in small batches, caused the design and construction of a unit for test and demonstration.

To simplify the equipment, reduce the initial cost and, at the same time, present a design that poultrymen might duplicate themselves, materials that could be easily secured were employed.

An ordinary galvanized 12-quart pail was used as a receptacle for the wax. This was arranged to fit into the round, open top of a 5-gallon electric dairy hot water heater of 1,000 watts capacity at 110 volts. Several makes of this type are on the market. This method makes use of the double boiler principle, which is valuable to maintain a steady wax temperature, simplify the temperature controlling mechanism and reduce the fire hazard. (Extreme care should be exercised in heating wax over open flames.) A mercury bulb thermostat with the bulb placed in the wax was used as a controlling device.

The thermostat once set for the desired temperature of the wax will operate on about a 1 degree temperature variation, and the water bath, responding rapidly to the large heating element, keeps the wax within a degree of the desired temperature under normal use for a small number of birds.

Equipment of this type may be used for either scald picking or wax picking. A fan was found to hasten drying after scalding, and between dippings of the fowl in the wax.

GENERAL

LAYING TESTS

Laying Tests in Germany. Jahresbericht über die deutschen Legeprüfungen für Hühner 1935-36. Dr. K. Taut. Archiv für Geflügelkunde, Vol. 11, 1937, No. 5.

There were organised 5 laying tests and 4 flock production tests; they were held from October 16th, 1935, to September 30th, 1936—351 days.

For the laying tests were entered 1,400 pullets, in the flock production tests 443. There were only 5 breeds entered, including 77.7% White Leghorns, 10.1% Rhode Island Reds, 9.1% Brown Leghorns, 2.3% White Wyandottes.

All the food was delivered by one manufactory and was all the same for all birds.

	Average Production per hen Tests	Flocks	Mortality
White Leghorns ..	219.7	192.5	11.0%
Brown Leghorns ..	215.4		8.3%
Rhode Islands	199.8	189.9	6.4%
Wyandottes	206.5	167.7	2.7%
Rhine-breed	171.4		0.0%

The average mortality in the tests was only 10.1% and in the flock production tests only 9.5%.

Annual Report 1936-1937 *of Laying Trials in Germany. Jahresbericht über die deutschen Legeprüfungen für Hühner* 1936-1937. Dr. K. Taut. Editor: Reichsverband Deutscher Kleintierzüchter, Neue Ansbacherstrasse, Berlin.

Summary.

1. From 16th October to 30th September, 1937 (350 days), four laying trials were held in Germany and 5 flock tests.

2. There was an entry of altogether 1,918 hens in 248 pens, one pen comprising 7 birds. In Einach and Gieser one pen contained 20 birds.

3. The following breeds took part in the competition: White Leghorns 8.21%; Brown Leghorns 10.8%; Rhode Island Reds 4%; White Wyandottes 2.5%; Black Rhinelanders 1.1%; Barred Plymouth Rocks 0.4%.

4. The feeding was uniform for all tests, consisting of a laying mash containing 25–30% of protein, grains and an additional food of milk, cod liver oil, minerals and green foods.

5. Each hen had a housing area of 0.37–0.80 gm. and a free range of 10–30 gm. With the exception of Hamm, Elbisbach and Proskau all houses were illuminated.

6. At the laying competition (flock tests) the following records were obtained: White Leghorns 230.8 eggs, 58.2 g. (186.1 eggs, 57.0 g.); Brown Leghorns 217.1 eggs, 58.1 g. (179.3 eggs, 54.9 g.); Rhode Island Reds 210.0 eggs, 59.4 g. (182.6 eggs, 54.5 g.); Wyandottes 172.8 eggs, 59.8 g. (183.9 eggs, 54.2 g.); Rhinelanders 205.8 eggs, 55.1 g.; Plymouth Rocks 202.4 eggs, 61.6 g.

7. In April, 1937, the body weights of the hens averaged as follows:—White Leghorns 1,854 g.; Brown Leghorns 1,928 g.; Rhode Island Reds 2,543 g.; Wyandottes 2,422 g.; Rhinelanders 1,788 g.; Plymouth Rocks 2,424 g.

8. The mortality for all birds was 12.6%, *i.e.*, 12.5% for the White Leghorns; 11.5% for the Brown Leghorns; 15.6% for the Rhode Island Reds; 14.3% for the Wyandottes; 14.3% for the Rhinelanders; 0% for the Plymouth Rocks. The death was caused mainly by leucosis and by diseases of the reproductory and digestive organs.

9. The best pen of the laying competition, White Leghorn, obtained 259.0 eggs, 65.4 g. egg weight; 100.0 winter eggs.

10. The best pen of the flock test, White Leghorn, obtained 222.9 eggs, 56.3 g. egg weight; 50.1 winter eggs.

Third Egg-Laying Competition in Cedara. Die derde Eierlêwed strijdop Cedara. A. A. Reed. Landbouskool, Cedara. Boerderij in Suid-Afrika, Vol. 13, 1938, p. 35.

Resumè of 3 laying tests :—

	Number of Pullets	Average Production	Mortality Percentage
1934–35	400	206.1	10.2
1935–36	370	189.8	14.4
1936–37	80	194.8	10.0

Harper Adams Egg-Laying Trials 1936-37. Harper Adams Utility Poultry Journal, Vol. 22, 1937, No. 12.

The number of birds was 1,181, the average egg production 224.0; the average weight per egg over all eggs laid was 2.18 ozs. The average food cost per bird was 86 pence. The average egg receipts per bird 2.39 pence. The death rate was 21.3 per cent.

Duck section :—Number of birds 176; average egg production 224.0 eggs. Death rate 5.1 per cent.

15*th Egg-Laying Test at Stormont*, 1936-37. Monthly Report. Government of Northern Ireland, Sept., 1937.

The average total egg-production, based on the 864 birds originally penned and making no allowances for deaths, was 184.2 eggs per bird, while the average of scoring eggs, that is eggs of 2 oz. and over in weight laid during the 48 weeks of the test, was 161.5 per bird. Thus, 87.6 per cent. of all the eggs produced were of 2 oz. or more in weight. The flock average in the previous test was 176.5 eggs per bird. During the final period of four weeks, fifteen further birds died, making a total of 90 deaths during the 48 weeks the test was in progress. This represents a mortality of 10.4 per cent. which is 1.5 per cent. less than the rate for the previous test.

The following table gives particulars of average total production per bird, proportion of scoring eggs per bird, and rate of mortality in respect of the various sections of the test.

Section.	No. of birds originally penned.	Average Total egg Production.	Proportion of scoring eggs.	Percentage Mortality.
1. White Wyandottes ..	168	192.3	89.5	8.9
2. White Leghorns ..	78	176.3	87.3	19.2
3. Rhode Island Reds ..	186	188.8	91.5	5.9
4. Any other pure breed	96	182.7	82.5	5.2
5. (*a*) Stationholders', White Wyandottes	84	194.4	82.2	14.3
5. (*b*) Stationholders', White Leghorns ..	60	178.6	85.5	11.7
5. (*c*) Stationholders', Rhode Island Reds	120	183.4	90.3	7.5
6. Poultry Clubs and Young Farmers' Clubs ..	72	158.0	83.5	22.2

17*th Southern Rhodesia Egg-Laying Test.* H. G. Wheeldon. The South African Poultry Magazine, Oct., 1937.

There were 180 birds tested, 60 per cent. of the birds laying 200 eggs and over. The mortality figures taken in the last 11 years show a death rate of about 10 per cent. On the test under review mortality was about 8 per cent.

Scottish Egg-Laying Test, 1936-37. Department of Agriculture for Scotland, Edinburgh, November, 1937.

The test began on 8th October, 1936, and continued till 8th September, 1937. Entries in respect of 90 pens were received. Each pen consisted of 6 pullets. The average number of eggs laid per pullet was 179.30. 19.63 per cent. of the whole flock died.

Lancashire International Egg-Laying Test, 1936-37. The Lancashire Utility Poultry Society's Report, Vol. 11, 1937, No. 12.

PULLETS

Breeds	No. of Birds Entered	Deaths	Killed	Averages
Rhode Island Reds ..	608	122	2	165.40
White Leghorns	325	82	2	160.53
White Wyandottes ..	205	55	1	154.24
Black Leghorns	72	7	—	176.21
Light Sussex	68	5	—	176.68
Anconas	36	3	—	165.03
Buff Rocks..	36	6	—	161.78
Barnvelders	1	1	—	99.00
Unrecorded Eggs	—	—	—	—
Totals ..	1351	281	5	164.70

COMMERCIAL LAYING SECTION

Breeds	No. of Birds Entered	Deaths	Killed	Averages
Rhode Island Reds ..	48	6	—	184.58
White Leghorns x Rhode Island Reds	12	3	—	161.58
White Leghorns	12	2	—	185.83
Anconas	12	1	—	155.25
Black Leghorns x Rhode Island Reds	12	2	—	180.25
Totals ..	96	14	—	177.66

DUCKS

Breeds	No. of Birds Entered	Deaths	Killed	Averages
Aylesburys	49	1	—	160.41
Khaki Campbells	35	3	—	232.49
White Runners	28	—	—	183.43
White Campbells	21	2	—	155.52
Buff Orpingtons	7	—	—	198.86
Unrecorded Eggs ..	—	—	—	—
Totals ..	140	6	—	185.24

The average value of eggs produced per bird during the test was 18*s*. 4½*d*. The National Poultry Council standard average was 190.66 eggs for the pullets and 187.81 for the ducks. (All dead birds records excluded).

ANNUAL REPORTS

Over 60,000,000. Feathered World, July 23rd, 1937.

The number of fowls in England and Wales in 1936, on holdings of over 1 acre, was 57,743,623—1 per cent. less than in 1935 and 6 per cent. less than in 1934. Of this total, Wales, including Monmouth, returned 4,366,403.

1934 was, however, a peak year, the number of fowls recorded for England and Wales being 61,329, 893, and for the United Kingdom 78,512,855. The 1936 figures approximated very closely to those for 1932, and were well above those of previous years, for example, 1927, when they were only 39,491,374 poultry in England and Wales on holdings of over one acre.

If the number of fowls on small-holdings and gardens is taken into consideration, estimated at 6,000,000 at least, together with the considerable quantity of poultry-farmers who still do not receive census forms, the number of poultry in England and Wales in 1936 must have easily exceeded sixty million. It is probable, however, that the 1937 figures will show a further drop.

The figures for ducks have remained fairly constant at around two and a half million from 1927 to 1936. In 1927 they were 2,797,494, and in 1936 2,606,451. Similarly, geese show little variation over the same period, being 652,665 in 1927, and 634,402 in 1936. Turkeys, however, react very quickly to a sensitive market price. In 1936 707,413 turkeys were recorded. 1933 was the peak year of recent times with 810,899 turkeys, and 1931 the worst with 528,992 turkeys.

It is significant that the number of agricultural workers shows a steady decline.

Poultry Investigations in New Jersey. New Jersey Stas. Report, 1936.

The various investigations discussed include changing trends in egg production performance and mortality in egg-laying contests, the correlation between weight of eggs and weight of chicks at hatching, heavy hatching eggs as a means of flock improvement with regard to egg size, variations in eggshell colour in a given strain of Rhode Island Reds, cross-breeding for poultry meat production, and a comparison of individual cages *v.* pen, management of the breeding flock. Nutrition studies gave information reported on the vitamin 'A' requirements of the laying hen and on the rôle of trytophane in chick nutrition.

Nebraska State Report, 1936.

Experiments with poultry gave results on the nutrient requirement for growing chicks and poults ; the effects of additions of iron to a standard ration for growing turkeys ; the comparative efficiency of various proteins in poultry feeding ; the effect of fineness of grinding on the palatability of poultry feeding stuffs ; the use of pig-weed seed in a ration for chicks ; the comparative value of rye, cooked rye, and wheat in poultry rations ; the value of different qualities of alfalfa in a chick ration ; and from the Valentine Sub-station flock testing to determine the extent and influence of differences in turkey flocks.

Ohio State Bulletin No. 579, 1937.

Nutrition experiments reported include the efficiency of vitamin 'D' from cod liver oil and irradiated cholesterol for laying hens, and the stability of carotene and vitamin 'A' in a mixed ration, both by R. M. Bethke, P. R. Record, and O. H. M. Wilder ; vitamin 'G' (flavin) studies with chicks, by Bethke and Record ; the vitamin 'G' (complex) requirements of the chicken, by C. H. Hunt, Record, and Bethke ; the vitamin 'A' requirements of laying birds, by Record, Bethke, Wilder, and V. D. Chamberlain ; and methods of separating the various constituents that make up the vitamin 'B' group, by Hunt. Poultry tests include methods of feeding layers, soybean hay *v.* alfalfa for layers, and management tests with chicks and growing pullets, all by D. C. Kennard and Chamberlain.

Annual Report Illinois Agricultural Experiment Station, 1935.

Poultry investigations reported include the value of various soybean meals for chick feeding, and the value of mineral feeding on interior egg quality, both by H. J.

Sloan and L. E. Card ; and the vitamin 'E' requirement of chicks for normal development, and the protective action of yolk material against vitamin deficiency in chicks, by Sloan, Card, and F. B. Adamstone.

Annual Report Indiana Agricultural Experiment Station, 1936.

From poultry studies, results are noted on marketing eggs under U.S. grades and on a graded basis, soybean oil meal in broiler rations, the use of large amounts of corn in laying rations, the influence of condensed buttermilk on egg yield, optimum protein levels in rations for young ducks, poultry housing, and the inheritance of growth tendencies in chickens.

Growth and metabolism studies with rats are noted on the cystine deficiency of raw and heated soybeans.

Annual Report Washington Agricultural Experiment Station. Bulletin No. 342, 1936.

In poultry investigations, results were noted on the chemical nature of watery white in eggs, by J. L. St. John ; the protein requirements of chicks and of laying hens, all by J. S. Carver, V. Heiman, St. John, J. W. Cook, and H. W. Gerritz ; the vitamin 'G' requirement of poultry, the utilization of fish by-products for poultry, and the vitamin 'G' potency of dried milk products, all by Heiman and Carver ; and the effect of hereditary and environmental factors on the interior quality of the egg, and the effects of storage conditions on egg quality, both by L. A. Wilhelm and Heiman.

Annual Report, Director, Agricultural Experiment Station, Durham, New Hampshire. Bulletin No. 296, 1937.

Contents : Control of Coccidiosis ; Epidemic Tremors of Chickens ; Fowl Pox Vaccine Distribution ; Laryngotracheitis Vaccine Distribution ; Poultry Autopsies ; Protein Requirements of Chickens ; Pullorum Tests ; Record of Performance and Poultry Approval ; Technique for Eradication of Pullorum ; Vitamin 'A' Requirements for Growing Chicks.

Idaho State Bulletin No. 221, 1937.

Poultry tests gave information on the vitamin 'A' requirements of laying hens, the relative protein requirements of turkeys and chickens and the artificial incubation of pheasant eggs.

The carotene content of dehydrated alfalfa products is noted.

Livestock Investigations in Kentucky. Kentucky Station Report, 1936.

Poultry experiments reported include protein levels for pullets, Kentucky bluegrass as a source of protein for growing chicks, lespedeza by-products and distillery by-products for feeding chickens, turkey incubation studies, the use of laying mash for chicks, and the cholesterol content of fresh and storage egg yolks.

Investigations with Livestock in Massachusetts. Massachusetts Station Bulletin No. 339, 1937.

From poultry tests results were noted on broodiness in poultry, rate of feathering and breeding for plumage colour in Rhode Island Reds, and breeding for low mortality, all by F. A. Hays ; breeding for egg-production, by Hays and R. Sanborn ; and breeding for high and low resistance to fowl paralysis, by Hays, W. C. Sanctuary, and J. H. Vondell.

History of Ohio Agricultural Experiment Station's Poultry Work. D. C. Kennard. Agricultural Experiment Station, Wooster, Ohio. Special Bulletin No. 1, 1937.

This is a compilation of 92 poultry articles which have appeared in 64 issues of the Station's Bi-monthly Bulletin from 1921 to 1937. The subjects are arranged chronologically and constitute a fragmentary history of the Station's poultry work

and its interpretations and practical applications during this period. Two monograph bulletins were included because of their close correlation with similar but less comprehensive subject material which had appeared in the Bi-monthly Bulletin.

Inasmuch as most of the Station's published material on poultry subjects during the past 17 years has appeared in the Bi-monthly Bulletins instead of in monograph bulletins, the purpose of this compilation was to render the widely dispersed material conveniently available in one volume; whereas it was previously obscured and practically unavailable.

It was especially desired that this material be made available for students of poultry husbandry and writers on poultry subjects. Hence the few volumes of this compilation were placed where it was hoped they might best serve this purpose. We trust that in this way it may best serve the poultry industry at large.

MISCELLANEOUS

The Progress of Laying Batteries. D. C. Kennard and U. D. Chamberlin. The Bi-monthly Bulletin, Vol. 21, 1936, No. 178. Ohio Agricultural Experiment Station, Wooster.

Publication of some of the results of tests conducted by this station with layers in batteries *versus* similar layers confined to indoor floor pens.

The averages of two tests show that the egg production was practically the same but that there was a marked difference in favour of batteries on the score of livability of the layers. The feed consumption of layers in batteries and in floor pens was remarkably similar. A deficiency of vitamin ' D ' must be carefully guarded against. The poor egg production of the layers raised in batteries gives little encouragement to that procedure; whereas the pullets raised on fresh range yielded consistently better both in the batteries and in the floor pens. For best results it would be necessary to have a source of ready-to-lay pullets, 90 per cent. of which would live to lay 180 to 200 eggs a year.

Light in Relation to the Experimental Modification of the Breeding Season of Turkeys. H. M. Scott and L. F. Payne. Poultry Science, Vol. 16, 1937, p. 90.

In a study at the Kansas Experiment Station, three lots of Narragansett female turkeys hatched in May were placed on experiment December 1. Lot 1 housed in an open-front poultry house, received artificial lighting from 4.30 a.m. until daylight from December 1 to February 1 and in decreasing amounts until April 1, lot 2 was similarly housed without artificial lighting, and lot 3 remained in the open throughout the winter and breeding season.

The artificial lighting modified the reproductive cycle of the turkey, lot 1 starting to lay in January whereas the other lots produced no eggs until early March. There was little difference in the response of lots 2 and 3, indicating that proper housing exerted no influence on the sex cycle of the turkey. Subsequent trials showed that exposure to either white light or the longer wave lengths of red light stimulated early sexual activity, while the shorter wave lengths of blue light failed to exert such effect. The early ovarian activity is attributed to the increased light ration rather than to the lengthening of the feeding day. Four hours' artificial lighting during the normal period of daylight were without effect.

Light and the Sexual Cycle of Game Birds. L. B. Clark, S. L. Leonard and G. Bump. Science, Vol. 85, 1937, p. 339.

In studies at the New York State Game Farm and Union College, continuous lighting beginning February 10 brought grouse into laying about one month earlier than in case of the controls. By keeping grouse and pheasants in the dark from February 10 to June 20, egg laying was prevented. Continued light did not prevent retrogression of the gonads after the conclusion of the breeding season. Stimulation of immature and adult males was affected by hypophyseal extracts, leading to the conclusion that the light acts through the hypophysis.

Cost of Producing Eggs and Artificial Lights. R. O. Bausman. Agricultural Experiment Station, Newark, Delaware. Bulletin No. 205, 1936.

The cost of producing eggs from the flocks without lights is 2.77 cents per dozen and the cost for the flock with lights is 29.3 cents per dozen, a differential of 1.6 cents per dozen in favour of the flocks without lights. These data do not indicate that there are no instances where artificial lights may be used to advantage with Delaware poultry flocks ; however, with higher production costs with flocks where lights are used, with no differential in egg production per layer, and with no differential in the average price received per dozen eggs in favour of the flocks with lights over those without lights, the use of artificial lights for the average Delaware commercial poultry farm becomes an extremely questionable practice. These results, in general, are verified by an Oregon research study.

Economics of Turkey Production. A. J. Macdonald and M. S. Miller. Journal of the Ministry of Agriculture, London, 1937, p. 655.

Summary.

Details are given of the growth rate, mortality, food consumption and returns from American Mammoth Bronze and Black Norfolk turkeys hatched at the end of May and the beginning of July, 1936. All the birds were reared intensively.

In Hatch 1, at 28 weeks of age, the average weight of the American Mammoth Bronze males was 20 lb. 10 oz. and the females 12 lb. 14 oz. ; at the same age the Black Norfolk males were 18 lb. 10 oz. and the females 12 lb. 4 oz. In Hatch 2, at 23 weeks, the average of the American Mammoth Bronze males was 13 lb. 13 oz. and the females 10 lb. 12 oz. ; at the same age, the Black Norfolk males were 12 lb. 11 oz. and the females 9 lb. 6 oz. The rate of growth at different stages and the final weights show that the American Mammoth Bronze males and females are appreciably heavier than the corresponding Black Norfolks. The available data do not indicate that there is any difference in mortality in the two breeds, but the Black Norfolks appeared more delicate and were more difficult to rear during the brooding period. The total losses in rearing the American Mammoth Bronze poults was 13.6 per cent. ; the Black Norfolk mortality was 15.7 per cent. The mortality would have been considerably lower if there had not been an outbreak of Blackhead disease in Hatch 1. This disease was checked in Hatch 1, and prevented in Hatch 2 by strict attention to hygiene and precaution against the introduction of further outside infection.

The average food consumption per poult reared was higher in the American Mammoth Bronze group but there was less difference in the food utilization, *i.e.*, the amount of food consumed per lb. of live-weight gain. In Hatch 1 the average consumption of mash and grain per lb. of live turkey was 5.6 lb. for the American Mammoth Bronze and 5.7 lb. for the Black Norfolks. In Hatch 2, the average consumption of mash and grain per lb. of live turkey was 6,1 lb. for the American Mammoth Bronze and 5.4 lb. for the Black Norfolk turkeys. The average cost of all food consumed per lb. of turkey produced was $5\frac{1}{2}d.$ for both breeds in the early hatch and $5\frac{3}{4}d.$ for the American Mammoth Bronze and $5\frac{1}{4}d.$ for the Black Norfolks in the later hatch.

There was little difference in quality between the two breeds, but, on the average, the Black Norfolks were slightly better fleshed than the American Mammoth Bronze. The early-hatched birds, especially the American Mammoth Bronze, were inclined to be rather " leggy " and contained fewer really first-class birds ; this difference is shown by the better prices per lb. received for both breeds hatched in July.

The losses in plucking 12 birds of each breed indicated that the American Mammoth Bronze poults carried a higher percentage of feathers. The percentage shrinkage losses (including giblets) were very similar for both breeds, the losses being very similar to those obtained in dressing table poultry.

The returns from birds sold in London and the local markets indicated that prices vary very considerabluy in different markets. In the local market small birds (13 lb. and under) made better prices than larger birds, whereas in London there was very little difference in the prices received for birds of various weights. From a survey of the prices obtained in different markets, it would appear that there is a good market for a limited number of first quality heavy birds, but at the same time the demand for such birds is easily met by home supplies. The larger birds are in demand for catering, but snch birds are no longer in demand by the average house-wife. The

small or medium-sized birds are more suitable for the present-day small family, which cannot readily consume very large birds; further, modern ovens are too small for roasting large birds.

Both breeds gave a very satisfactory margin of profit over food costs. In both hatches, there was no appreciable difference between the two breeds in the profits over foods cost per bird reared. The early-hatched birds of both breeds proved more profitable than those hatched later; the American Mammoth Bronze poults hatched in May gave 2*s.* 4½*d.* more profit than those hatched in July, and the early-hatched Black Norfolks gave 2*s.* 2*d.* more than those hatched at a later date. The above figures show that turkey production can be a profitable undertaking. Maximum profits, however, can only be obtained by making a careful study of market requirements. There is still room for considerable expansion in the home production of turkeys, but it is doubtful if there is an economic market for a considerable expansion in the production of large birds.

Turkey Production: Suggestions for West Virginia. T. B. Clark and H. M. Hyre. West Virginia Station Circular No. 73, 1937.

Included in this practical circular are suggestions on selection, feeding, and management of the breeding flock, incubation, brooding the poults, management of growing turkeys, marketing, killing and dressing, and sanitation practices.

The Comparative Growth Rates of Turkeys, Ducks, Geese and Pheasants. T. T. Milby and E. W. Henderson. Poultry Science, Vol. 16, 1937, p. 155.

The comparative growth rates of White Pekin Ducks, Toulouse geese, Bronze and White Holland turkeys, and ring-necked pheasants have been studied at the Iowa Experiment Station, and the data obtained, along with data from another source, on the growth rate of White Plymouth Rock chickens have been plotted to show the comparative growth curves of the various species. The growth rates of turkeys, chickens, and pheasants were of practically the same magnitude during the first few weeks after hatching, and these species followed the same rates of growth during other periods of constant growth rate, the only marked differences being that each growth period was more prolonged for the turkeys than for the chickens or pheasants. The ducks and geese were very much alike in their rates of growth, but their rate during the first few weeks was practically double that for chickens, etc., while the decline in growth rate was more pronounced and occurred at an earlier age. These results suggested that rapid early growth and quick attainment of the greater proportion of mature weight may be a characteristic of migratory species of fowls.

The Effect of Poultry on the Chemical Composition of Herbage and Soil. A. W. Ling and W. R. Murr. Journal of the Ministry of Agriculture, Feb., 1937.

In this survey an endeavour has been made to discuss the more important problems concerning the management of grass land in relation to poultry husbandry. Where possible, suggestions have been made, but these must be regarded as tentative pending investigations on a wider basis.

Contents.—Folded poultry and down herbage; Poultry in pens; effect of poultry on the chemichal composition of the soil; Poultry and grass land management.

Yarding Systems and Crop Rations for Poultry Farms. H. B. Sprague. Agricultural Experiment Station, New Brunswick, New Jersey, Circular No. 357, 1935.

Contents.—Double yarding system. General soil management. Varieties and amount of seed. Crops for feed and litter. Rotations. Use of Manures. Culture and yields of corn. Culture and yields of wheat and rye. Culture and yields of alfalfa and clover.

Improved Poultry Housing and Equipment. D. C. Kennard and U. D. Chamberlin. Bi-monthly Bulletin, Ohio Agricultural Experiment Station, Vol. 22, 1937, p. 65.

Contents.—Insulation. Basement rooms or bank poultry houses. Metal roofing. Exposure. Window screens. Dropping pits. Feeders. Box tunnel nests.

New Jersey Laying Houses. E. R. Gross. Agricultural Experiment Station, New Brunswick, N.Y. Hints to Poultrymen, Vol. 23, 1936.

Contents.—Best size laying unit. Are light partitions between units necessary ? Lighting. Material for wall construction. Wood or concrete floor. Insulation. Ventilation. Is a multiple storey house economical ?

Alarm System on Poultry Fencing. G. M. Foulkrod. Agricultural Experiment Station, Durham, New Hampshire. Bulletin No. 296, 1937.

The burglar alarm systems, described in Extension Circular No. 171, presuppose that the poultry is housed. Many poultrymen, especially turkey growers, have found they were losing birds from well fenced ranges. Tests were made to determine the practicability of connecting the range fence into the conventional alarm circuit.

The turkey range at the University Poultry Plant was wired by stretching a single strand of No. 28 enamelled wire around the entire fence line. The wire was fastened by taking a single turn about all metal posts and stapling to the wooden ones, keeping it about two to three inches above the top of the woven wire. The ends of this loop were connected through a transformer to the closed circuit alarm panel already installed. The ends of this loop were connected in series to the conventional closed circuit alarm system already in place.

If the wire is broken by prowlers climbing the fence, the alarm operates in the same manner as if any door or window were opened in the buildings.

The gates were wired by fastening a single strand of insulated wire across the gate. The bare end of this wire is slipped into a spring clip on the post connected to wire along above the fence to complete the circuit, when the gate is closed.

If the range needs protection during the day when the building alarm is not needed, a switching device must be installed allowing the building circuit to be shorted and thus connecting the range loop directly to the panel.

If bare copper wire is used and the side of the transformers connected to the panel is grounded, the alarm will ring when the wire is pushed against the fence and grounded. This has been advocated by some State Agricultural Engineers, but the trouble of insulating from the posts and stretching the wire so it will not blow against the fence and ring the alarm needlessly, really makes the installation quite a problem.

The Content and Function of a Survey Course in Poultry Management. F. E. Mussehl, University of Nebraska. U.S. Egg and Poultry Magazine, Jan., 1938.

A survey course in poultry management can make valuable contributions to general education as well as lay the foundation for professional training. All of our students know something about poultry products, and with this background the teacher can develop what he believes to be a fundamental philosophy. Economists and sociologists, though differing in methods, are in general agreement that the well-being of mankind is promoted as we develop the programme of—

(*a*) Efficient production. (*b*) Efficient and fair distribution. (*c*) Better living.

If, then, the survey course can effectively develop these principles, it has a definite place in the field o general education which many educators believe is being greatly neglected at the present time.

The general content and objectives of such a survey course can, therefore, be expressed as follows :—

1. To acquaint the student with the present distribution of the poultry industry and present day production trends.
2. To provide interesting and useful information about bird biology.
3. To enable the student to interpret consumer demands for poultry products and types of marketing services so that adaptations can be made to changing conditions.
4. To acquaint the student with present day developments in incubation and brooding equipment and practices.
5. To acquaint the student with principles of poultry housing and sanitation.
6. To acquaint the student with the principles of poultry nutrition.
7. To explain the system of poultry breed and variety classification and relationships between form and productive functions.
8. To enable the student to make a reasonable cost analysis of the jobs of producing broilers, market eggs, hatching eggs, baby chicks, turkeys, and other poultry products.

Commercial Poultry Farming. T. B. Charles and H. O. Stuart. Danville, Ill. Interstate Ptg. Co., 1936.

It is the object of this book to place at the disposal of poultrymen at large information relative to established and dependable practices in poultry production. Successive chapters deal with incubation, hatchery practices, brooding practices, battery brooding and laying batteries, broiler production, capons and caponizing, principles of feeding, feeding chickens, feeding adult birds, rearing and range management, selection, breeding and sex distinction, trapnesting and pedigreeing, improvement, programmes, marketing, fattening, housing and appliances, management factors, poultry diseases and egg formation.

The Poultry-Keeper's Text Book. E. T. Brown. London and Melbourne : Ward Lock & Co., 2nd ed., pp. 320.

A revision of a book for the poultry keeper dealing with the origin and classification of breeds, the theory of breeding and poultry keeping, and methods by which they may best be put into practice.

14*th Annual Conference of Poultry Instructors.* Oct. 20th, 1937. Journal of the Ministry of Agriculture, Dec., 1937.

The following papers have been read :—The value of pedigree-breeding for egg-production ; the chief factors governing the financial returns from poultry keeping entreprises under present conditions ; Investigations in connexion with fowl paralysis ; Internal egg faults in relation to education and marketing.

The Production and Sale of Poultry and Eggs in three Rhode Island Areas. A. W. Manchester and H. C. Fowler. Agricultural Experiment Station, Kingston, R.I. Bulletin No. 262, 1937.

The belief that the general level of egg prices in Rhode Island is unduly depressed at certain seasons of the year by changes in the methods of marketing surpluses at retail, is not substantiated. This conclusion is based on a study of production and marketing methods made in three areas of the State where the methods are known to differ markedly. The study included commercial poultry farms, side line and family supply flocks.

Poultry Management. R. O. Bausman. Annual Report Agricultural Experiment Station, Newark, Delaware. Bulletin No. 207, 1937.

The poultry management study has been completed. It was published in August, 1936, as Station Bulletin 202, " A Statistical Study of Commercial Egg Production in Delaware."

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