

wave lengths of light. In addition to the visible there are the invisible rays, some of which are shorter than the violet and others longer than the red. The short rays are known to be especially active in the stimulation of chemical reactions and life processes.

Studies are now in progress in an attempt to make use of the stimulating property of light to find out how nitrogen is fixed, in order to improve the present commercial methods of nitrogen fixation and fertilizer development. Some of these methods depend upon the use of iron mixtures called catalysts which speed up chemical reactions to a point sometimes hundreds of times greater than would be the case without them. The effect of some of the shorter light rays on these catalysts and in turn on nitrogen fixation is being investigated.

Another form of very short and invisible radiation now being applied is X rays, commonly used by physicians and dentists to locate defects or foreign materials. Examinations and photographs can be made of catalyst materials, soils, fertilizer materials, nitrogen compounds, and many agricultural products, such as cotton and leather. In many cases the X-ray method is the only one whereby the structure of the material or other desired information can be obtained. Thus the various radiations serve as an additional tool for helping to solve some of the farmer's problems.

C. H. KUNSMAN.

LILY Breeding Is Fertile Field for Plant Improvement

Considering the admiration man has for the lily, it is rather remarkable that the genus still persists in a state of nature to a larger extent than almost any other. The hybrids are few, and the recognized horticultural varieties of any origin are confined to a small number of species. It is maintained by some that this results from incompatibility, from parthenogenetic tendencies, or other causes, and that we must ever depend mostly on native species in the lily instead of on man-made improvements such as exist in other genera of admired and domesticated plants.

Few authentic hybrids have been made, and still fewer have persisted beyond the human generation that produced them. But are we justified in the view that such will always be the case? The writer sees no reason for assuming that the lilies are any more resistant to improvements than any other group of plants. While it is true that there is little improvement to show for the large amount of effort that has been expended in lily culture, recent tendencies point to improved forms with greater beauty, greater vigor, and greater adaptability to cultural requirements.

The lily throughout its history, except in one or two spots, has not been handled with the commercial acumen that has characterized the development of other bulbous genera. Seldom has the newly developed variety been propagated to commercial quantity before being placed on the market. The beautiful Backhouse hybrids, for example, are sold in pea sizes, and no one is working up a large stock to insure perpetuation. The same thing obtains with some of the rare species. No stocks have been accumulated, and the few bulbs existing are likely to disappear.

But conditions are changing. There are among the lilies, as in most genera, species which have good parental qualities. There are those which have excellent seed habits and those which are receptive

to a wide range of pollens. Some of the results of these discoveries are the Backhouse hybrids of delicate pastel shades. More recent is the group of more brilliantly colored west-coast hybrids, which are being produced in quantity at Bellingham, Wash.; while the recently commercialized *Lilium longiflorum erabu* from Japan is another result.

Receptive to Wide Range of Pollens

Recent experiences indicate that *Lilium superbum* is receptive to a wide range of pollens. *L. regale* has the same characteristic, although the resulting seedlings are predominantly Regal. But what the second generation may bring forth no one has progressed far enough to predict. This lily takes the pollen of *L. leucanthum chloraster*, *L. sargentiae*, *L. browni colchesteri*, etc. Such crosses should yield results of great interest.

Lilium columbianum reacts to pollens of a wide range of Martagon lilies of both hemispheres. The European group of *L. martagon* is known to be amenable; so are the West coast species, as abundantly proved at Bellingham, Wash. The splitting up in the latter comes in the first generation, and the second generation is a riot of brilliantly colored lilies, no two of which are alike. *L. pardalinum*, *L. parryi*, and the *L. humboldtii* group produce very remarkable hybrids which are desirable garden lilies. (Fig. 146.)

Doctor Stout has shown that even our old *Lilium tigrinum*, which seldom seeds in this country, can be made to seed with foreign pollen. Results have been obtained with pollen of both *L. pseudotigrinum* and *L. superbum*, the latter in reciprocation.

Persistency is indispensable when one undertakes to hybridize lilies. The fact that a cross has been tried without success augurs little.

Walter Van Fleet tried for 10 years to cross *L. tenuifolium* and *L. concolor* by reciprocally pollinating them. The seed from the last reciprocal cross he made was entrusted to the writer the fall before he died. Fully 1,000 plants were grown. Only one was an undoubted hybrid. There was no appreciable variation in the others, and there has been no breaking up in the second generation of the general progeny. The hybrid has produced no seed thus far.

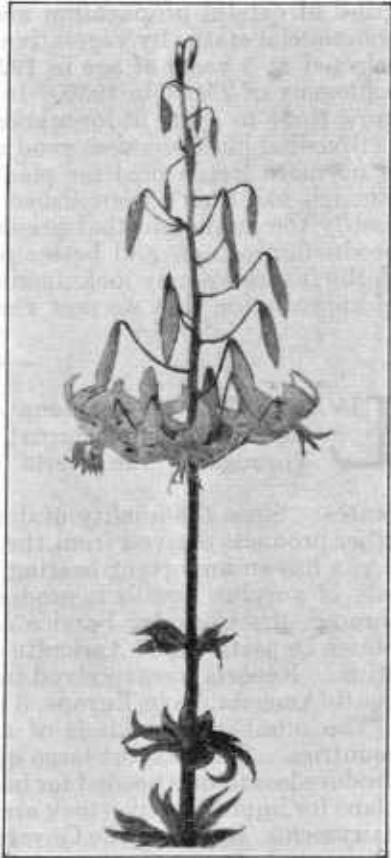


FIGURE 146.—A yellow first-generation hybrid lily produced by crossing two west American species. The shape of the flower is that of *Lilium humboldtii magnificentum*, but the position on the stem and color simulate *L. parryi*

Large Progenies Necessary

To improve lilies by hybridization it is necessary to deal in large progenies. When a cross has been effected and the seedlings grown to maturity, it is imperative that the basis for the establishment of the new variety be a single seedling. Vegetative propagation of this seedling will constitute the variety, which should be propagated into a large stock to insure its perpetuity before dissemination.

All this takes time. Basing judgment on experience with our West coast Martagons, it takes four or five years before the first seedling can safely be picked out. After that the matter becomes a long grind of careful propagation and culture to work up the stock to a commercial status by vegetative means. It looks now as if a seedling selected at 5 years of age in 1924 will yield enough material to start a progeny of 25,000 in 1930. It will take at least two years longer to grow these to a size fit for marketing. This is considered quick work.

Breeding lilies promises good results. In the writer's opinion there is no more fertile field for plant improvement to-day than the lily. Enough has been accomplished by breeders in the last few years to justify the prediction that present activity will lead inevitably to the production of new and better plants. It seems safe to predict that in the future we may look upon the wild lily with much the same sort of appreciation that we now view the native species of tulips.

DAVID GRIFFITHS.

LIVESTOCK Betterment Registers Advancement Throughout the World

A survey of livestock improvement in 33 important stock-raising countries has resulted in information of interest to stock owners in the United

States. Since the quality of domestic livestock extends to meat and other products derived from the animals, the betterment of herds and flocks has an important bearing on competition among nations in the sale of surplus livestock products. The information was obtained through the Consular Service and the foreign offices of the United States Department of Agriculture, with the State Department cooperating. Reports were received from Canada and Mexico, 5 countries in South America, 18 in Europe, 3 in Africa, 2 in Asia, and 2 in Oceania.

The numbers and kinds of animals vary greatly in the different countries. Some export large quantities of livestock products; others produce less than is needed for home consumption. In many countries plans for improving livestock are largely in the hands of stockmen and dairymen. In others the Government has endeavored to bring about livestock betterment through legislation, distribution of improved breeding stock, subsidies, prizes, and other inducements.

Purebred Sires a Dominant Influence

Although the conditions of production are extremely varied, the use of carefully selected purebred sires is the dominating influence underlying all plans for improvement. This applies to all classes of livestock and to both governmental and private activities. The reports show universal agreement that the use of purebred males is an economical and effective means of improving all kinds of farm animals.