We are fast seeing this hope realized in the region of which the Perrine Grant formed the nucleus, and the influence here set in motion is spreading rapidly over large portions of south Florida, where killing frosts seldom occur. Even a hundred years may be too short a time to properly evaluate the work of such a pioneer as Dr. Henry Perrine. Despite his seeming failure through tragic fate, yet his career may still serve as an inspiration to those of us today who are interested in developing new tropical crops and who are privileged to labor without the tremendous handicaps imposed upon his brave spirit. All honor to Henry Perrine, physician, botanist, plantsman, and pioneer introducer of useful plants chosen to serve his country's need.

EXPLANATION OF GROUND PLAN OF INDIAN KEY
A. Dr. Perrine's house with wharf in front.
B. Mr. Howe's house with negro quarters, kitchen, and shop.
C. Carpenter shop.
D. Blacksmith shop.
E. Store where six Indians were when Mrs. Perrine and children took the boat at F which they were loading with plunder.
G. Mr. Houseman's house.
H. Large warehouse.
I. State Senator English's house and kitchen.
J-K. Cottages of Glass and Beiglet who gave the alarm.
L. Fence where Indians lay hid when discovered by Beiglet.
M. Tropical hotel.
N. Nott's house.
O. Mrs. Smith and Mrs. Sturdy's house.

REFERENCES
Henry E. Perrine. The True Story of Some Eventful Years in Grandpa's Life. 1885. Buffalo, N. Y.
Jefferson Bell, in Miami (Fla.) Herald. Mar. 2, 1924.
C. F. Millspough. Biographical Sketch of Dr. Henry E. Perrine (unpub. mss.).

Mr. Hume: Dr. Perrine was a noteworthy figure in Florida Horticulture, and this discussion of his life by T. Ralph Robinson, covers one of the most interesting episodes in the history of Florida's development.

Our concluding speaker is Dr. P. W. Zimmerman, of Yonkers, N. Y. Dr. Zimmerman's work on Plant Propagation has attracted the attention of horticulturists in all sections of this country and other countries. His topic is "Growth Substances in Relation to Plant Propagation."

THE USE OF HORMONE-LIKE SUBSTANCES FOR PROPAGATING PLANTS

P. W. Zimmerman
Boyce Thompson Institute, Yonkers, New York

My hobby and subject today concerns the use of special chemical compounds to regulate the growth of plants. These chemicals are often designated by the names, hormones, auxins, growth substances, etc. They are unlike fertilizers in that they do not affect the plant as a whole, but may regulate particular organs as, for example, roots.

Animal hormones have been known for many years. Secretions from endocrine glands are known to control growth, development, maturation and practically everything we do. The changes occurring in the individual from young to middle age and then old are probably associated in some way with the changes occurring in the hormone balance in the system. In fact, deficiencies in certain hormones cause marked effects and medical doctors administer glandular extracts to correct
or bring about normal hormone balance. To mention some of the known hormones, adrenalin, secreted by the supra-renal gland, stimulates heart beat; pro-lactin, found in pregnant animals, stimulates growth of mammary glands and develops the mothering instinct. When these regulators are extracted, purified, and injected into young females they induce responses resembling those associated with pregnancy itself. It seems very clear, therefore, that animals produce and are regulated by a complex set of natural hormones.

Since plants are living things they also must produce and be regulated by hormones. This was predicted more than fifty years ago by Dr. Sachs. Twenty-seven years ago Boysen-Jensen actually demonstrated the presence of growth promoting substances. In recent years Went of Utrecht perfected a delicate method to test for the presence of natural hormones and Kögl actually isolated and identified three chemical compounds which have come to be known as auxins or natural hormones.

At the Boyce Thompson Institute in Yonkers, New York, Hitchcock, Wilcoxson and I have located some fifty chemical compounds which induce hormone-like responses in plants. That is when applied locally to a growing part of the plant these chemicals accelerate growth causing swelling and bending of the treated parts. Associated with this response is cell division and the initiation of new roots. From a practical standpoint, the most important effect is the induction of roots. To prove that these compounds have root forming power, one need only apply them to leaves, stems or flower stalks of intact plants and roots will arise from the treated parts. If the top of a tomato plant is removed and the cut surface treated with one of these substances roots will grow on the upper end of the stem making a kind of upside down plant. I mention these effects only to convince you that certain chemical compounds actually have root inducing power. My main interest on this program concerns propagation of plants with the aid of hormone-like chemicals.

Let us assume that under natural conditions cuttings make their own root hormones and that, as these accumulate at the base of the cutting new roots are induced to form. If this assumption be true then plants differ in their capacity to make this hormone, for there are species, the cuttings of which root with ease, some with difficulty and others not at all. Under such conditions the ideal thing would be to determine what these chemicals are, make them in the laboratory and apply them artificially to the cuttings. That is just about (but not quite) what has happened. As stated earlier, we now know fifty chemical compounds which have root-inducing powers. These have varying degrees of merit, but nevertheless they are all hormone-like substances. The names are long and need not be listed here. To give some idea of the names here are two of the important ones—alpha naphthaleneacetic acid and beta indolebutyric acid. To save the trouble of remembering such names we have agreed to use the term “Hormodin” to designate all root-inducing substances. Particular substances will be called Hormodin A, B, C, etc.

With the aid of these substances we have been able to hasten the rooting of cuttings which are now propagated in that way and to induce roots on species which will not root otherwise. An adequate root system can be quickly formed and the resulting plants readily established. Some of the difficulties encountered in the past with plants from cuttings concerned a meager root system. This phase of the problem can now be eliminated.

The question is usually asked, will this new method take the place of budding and grafting? The answer is that where it is desirable to have plants on their own roots the new method may take the place of grafting. However, it is a well known fact that stocks often have a desirable effect on the growth of scions or that seedling stock are more resistant to disease than the commercial varieties. Where such problems are involved grafting and budding will always be important. Before any established practice is discontinued it is always desirable to extend experimental tests to field trials where the new can be readily compared with the old. This problem, however, need not concern us at this time. There are many varieties which are known to do well on their own roots.

The chemical methods as worked out at the Boyce Thompson Institute permit those who now have a method for propagating plants to continue
as usual except for a 24-hour period at the beginning when the chemical treatment is given. The complete procedure, for example, calls for the following steps to propagate holly:

1. Take three to five inches of the terminal growth of any shoot and trim off all but about three leaves.
2. Place the basal end in one to two inches of a water solution of Hormodin A for 18 to 24 hours.
3. Remove from the solution and plant in the rooting medium (preferably for holly a mixture of peat moss and sand). Plant deep enough so that the lowest leaf will be near the medium.
4. Press the medium until it is fairly tight around the cuttings and then water well. Heavy watering at first is desirable to bring the sand particles in close contact with the stem. Thereafter water frequently enough to prevent drying. Inspect often.
5. Shade equivalent to that which would be made by cheese cloth is advisable, though the location of a rooting medium will vary this requirement. If a frame is used sash and slats will serve the purpose. If a propagating greenhouse is used, a coat of lime on the roof may help.
6. If temperature can be controlled, use approximately 60° to 65° at night and 70° to 80° during the day. Holly is not especially sensitive to temperature change.
7. Remove the cuttings in two to three months and plant in pots or nursery rows. It is well to shade or otherwise protect the newly transplanted cuttings for two to three weeks until the plants are reestablished.

While this is a more or less complete set of directions for handling holly, it will not serve for all types of plants. Other species may have different requirements. If you try the new chemical method be sure to follow directions. Many people may think that the amount of chemical specified is too small and to be generous use twice the amount called for. If they do, the cuttings may be killed. I suggest also that to convince yourself at first, keep a few cuttings which have not been given the chemical treatment and plant the two sets at the same time side by side, in the rooting medium. If there is no difference in six weeks the chemical is not effective. However, if you follow the directions you will be sure to find a great difference between checks and treated cuttings.

Among cuttings which are most sensitive to the Hormodin are species like roses and dogwood. Apples and pears are the most resistant forms, though leafy cuttings of these can be rooted. In general, leafy cuttings of all species respond to the chemical treatment better than leafless hardwood types. However, it has been encouraging to find that most species respond to the chemical treatment whether hard or soft wood cuttings are used.

The age of the tissue in most cases effects the response of the cuttings to Hormodin. Our aim is to determine the requirements for most species. That in part concerns my mission in Florida at this time. When such information has been gathered we can put down in black and white, the name of the species; the best time to gather cuttings; the concentration of chemical to use, and how long to treat before planting. Failures should be few and these chemicals in the hands of up-to-date nurserymen should greatly facilitate plant propagation.

Growth substances which I have discussed have not been found in green plants. They may not exist as natural hormones. They do, however, induce responses which we would expect of natural hormones.

There must be many different kinds of growth regulators. We know most about those that induce roots. We assume, however, that there must be also flower inducing and shoot inducing substances. If these are ever located we should be able to make flowers arise from leaves or other treated parts.

Thank you.

Hormodin is manufactured and distributed by Merck and Co., Inc., Rahway, N. J.
Thursday A. M., April 15th

Mr. Lyons: I have an announcement to make. Anyone having back copies of the Horticultural Society Proceedings, especially 1894, 1895, 1897, 1901 and 1902, 1903 and 1904, which might be obtained to complete a library are requested to get in touch with the Secretary of the Chamber of Commerce. If you have any of those proceedings or know of anyone that does, please assist us. We would like to complete the files of the Society.

(End of Krome Memorial Institute Program)