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of the Proceedings at the Second Annual Meeting

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ASSOCIATION REPORT OF THE PROCEEDINGS AT THE SECOND ANNUAL
MEETING ***

DISCLAIMER

The articles published in the Annual Reports of the Northern Nut Growers Association are the findings and thoughts solely of the authors and are not to be construed as an endorsement by the Northern Nut Growers Association, its board of directors, or its members. No endorsement is intended for products mentioned, nor is criticism meant for products not mentioned. The laws and recommendations for pesticide application may have changed since the articles were written. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The discussion of specific nut tree cultivars and of specific techniques to grow nut trees that might have been successful in one area and at a particular time is not a guarantee that similar results will occur elsewhere.

**NORTHERN
NUT GROWERS ASSOCIATION
REPORT
OF THE PROCEEDINGS AT THE
SECOND ANNUAL MEETING
ITHACA, NEW YORK
DECEMBER 14 AND 15,
1911
PRESS OF THE ITHACA JOURNAL
ITHACA, NEW YORK
1912**

<p>Transcriber's note: The errors listed below have been corrected.</p>

Errata

Page 3, under "Officers" transpose addresses of President and Vice-President.

Page 23, line 5, for "Pennsylvania" read "Louisiana."

Page 103, line 2, for "Siebold" read "Nebo."



**MR. HENRY HALES OF RIDGEWOOD, NEW
JERSEY**
*And the Original Hales' Paper Shell Hickory
Tree*

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Secretary and Treasurer	W. C. Deming	Westchester, New York City

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W. N. Roper
And the Officers

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T. P. Littlepage
C. A. Reed
W. C. Deming

On Hybrids

R. T. Morris
Henry Hicks
C. P. Close

On Membership

W. C. Deming
E. R. Lake
J. G. Rush
W. N. Roper

On Nomenclature

John Craig

R. T. Morris
W. C. Deming

On Press and Publication

W. N. Roper
T. P. Littlepage
W. C. Deming

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Hicks, Henry, Westbury Station, L.I.
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Potter, Hon. W. O., Marion, Ill.

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Rose, Wm. J., 413 Market St., Harrisburg, Pa.

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Tuckerman, Bayard, 118 E. 37th St., New York City.

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Walter, Dr. Harry, The Chalfonte, Atlantic City, N. J.

Wentink, Frank, 75 Grove St., Passaic, N. J.

Williams, Dr. Charles Mallory, 48 E. 49th St., New York City.

Williams, Harrison, Erie R. R. Co., 50 Church St., New York City.

+Wissmann, Mrs. P. deR., 707 Fifth Ave., New York City.

Womack, B. F., Ancon Canal Zone, Panama.

***Honorary member.**

+Life member.

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CONSTITUTION AND RULES OF THE NORTHERN NUT GROWERS ASSOCIATION.

Name. The society shall be known as the NORTHERN NUT GROWERS ASSOCIATION.

Object. The promotion of interest in nut-producing plants, their products and their culture.

Membership. Membership in the society shall be open to all persons who desire to further nut culture, without reference to place of residence or nationality, subject to the approval of the committee on membership.

Officers. There shall be a president, a vice-president, and a secretary-treasurer; an executive committee of five persons, of which the president, vice-president and secretary shall be members; and a state vice-president from each state represented in the membership of the association.

Election of Officers. A committee of five members shall be elected at the annual meeting for the purpose of nominating officers for the subsequent year.

Meetings. The place and time of the annual meeting shall be selected by the membership in session or, in the event of no selection being made at this time, the executive committee shall choose the place and time for the holding of the annual convention. Such other meetings as may seem desirable may be called by the president and executive committee.

Fees. The fees shall be of two kinds, annual and life. The former shall be two dollars, the latter twenty dollars.

Discipline. The committee on membership may make recommendations to the association as to the discipline or expulsion of any member.

Committees. The association shall appoint standing committees of three members each to consider and report on the following topics at each annual meeting: first, on promising seedlings; second, on nomenclature; third, on hybrids; fourth, on membership; fifth, on press and publication.

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The Northern Nut Growers Association

SECOND ANNUAL MEETING

THURSDAY, DECEMBER 14, 1911, 10 A. M.

ROOM 191, NEW YORK STATE COLLEGE OF AGRICULTURE, ITHACA, NEW YORK.

President Morris: The meeting is called to order and I will first ask Professor Craig to make a few remarks on behalf of the College Director and the President of the University.

Professor Craig: It is my privilege and pleasure to welcome the representatives of the Northern Nut Growers' Association in this, their second annual meeting, to the New York State College of Agriculture. I regret exceedingly that Director Bailey, who has been avoiding out of state engagements this winter quite generally, made one about two months ago for this day, about a thousand miles away, which makes it absolutely impossible for him to be with us. He regretted this very much, and asked me particularly to impress upon you the idea that he was most anxious that this Association should meet here, and that all the facilities of the College of Agriculture should be placed at your disposal, for the purpose of making your meeting as profitable and as pleasant as possible.

President Schurman, whose time at this period of the year is much monopolized and who is by previous engagements occupied very completely this morning, has asked me to say to you that he hoped to be able to come over and join us informally some time during the afternoon. I wish then to impress the thought that, although the official representatives of the University and College are not with us, they have not forgotten this meeting. As a member of the Executive Committee, in charge of the sessions, I have made up a tentative program for this morning for the purpose of starting the meeting off; and as the President will undoubtedly tell you later on, this program is subject to revision and change according to the convenience of the members. It is proposed to occupy this morning with regular program subjects, and it has been suggested that this afternoon we take a couple of hours' leisure which we may use in examining the exhibits or in viewing the University, if you care to consider that an exhibit worth while. It will be our pleasure to furnish guides for those who desire to make an excursion around and through the University buildings.

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Let me say in conclusion that I hope you will make use of the opportunities and facilities that are at your full disposal. The Department of Horticulture is located on the second floor. I would like you to make that office your headquarters, and make use of our clerical force, and such facilities as are available, to the fullest measure possible, so that your visit will be pleasant, as I am sure it will be profitable.

President Morris: The next order of business will be the report from the Secretary-Treasurer, and the report of the last meeting.

Doctor Deming: A meeting for organization of Northern Nut Growers was held, on the invitation of Dr. N. L. Britton, at the Botanical Museum in Bronx Park, New York City, on Nov. 17th, 1910.

Dr. Britton called the meeting to order, stated its purpose and presented specimens.

Those present were:

- Dr. N. L. Britton, Director N. Y. Botanic Gardens.
- Dr. Robert T. Morris, 616 Madison Ave., New York City.
- Prof. John Craig, of Cornell University.
- Mr. T. P. Littlepage, Union Trust Building, Washington, D. C.
- Mr. A. B. Malcomson, Orange, N. J.
- Mr. Henry Hales, Ridgewood, N. J.
- Mrs. Joseph L. Lovett, Emilie, Bucks County, Pa.
- Mrs. Yardly (with Mrs. Lovett).
- Dr. Geo. Knapp, (at the request of Simpson Bros., Vincennes, Ind.) 21
Claremont Ave., New York City.
- Mr. C. A. Schwartz, 92 Stagg St., Brooklyn, N. Y.
- Mr. Nash, of the Botanical Museum.
- Dr. W. C. Deming, Westchester, New York City.

On the retirement of Dr. Britton Dr. Deming acted as temporary chairman and read a number of letters from persons interested in nut culture encouraging the formation of an association.

The chairman appointed Prof. Craig, Dr. Morris and Mr. Littlepage a committee to draw up a tentative constitution or set of working rules until permanent organization could be effected. The committee made the following report which was adopted with the understanding that the executive committee should consider the question of constitution and by-laws and report at the next regular meeting.

Name. The society shall be known as the NORTHERN NUT GROWERS ASSOCIATION.

Object. The promotion of interest in nut-producing plants, their products and their culture.

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Membership. Membership in the society shall be open to all persons who desire to further nut culture, without reference to place of residence or nationality.

Officers. There shall be a president, a vice-president, a secretary-treasurer and an executive committee of five persons, of which latter the president and secretary shall be members.

Meetings. The association shall hold an annual meeting on or about Nov. 15 and such other special meetings as may seem desirable, these to be called by the president and executive committee.

Fees. The fees shall be of two kinds, annual and life. The former shall be \$2.00, the latter \$20.00.

In addition to the large number of letters showing a wide spread interest in nut growing, communications of especial interest were received from Prof. W. N. Hutt, State Horticulturist of North Carolina, Mr. W. N. Roper, former editor of the American Fruit and Nut Journal, and from Mr. Henry Hicks of Westbury, Long Island.

The election of officers resulted as follows:

President—Dr. Robert T. Morris, New York City.

Vice-President—Mr. T. P. Littlepage, Washington, D. C.

Secretary-Treasurer—Dr. W. C. Deming, Westchester, New York City.

Executive Committee: Prof. John Craig, Cornell University; Henry Hales, Ridgewood, N. J.; Prof. C. P. Close, College Park, Md.

Exhibits of nuts, nut literature, trees, grafting methods, a budding tool, etc., were received and shown from nineteen different contributors. A detailed account of these has been published and is on file.

The following resolution, introduced by Mr. T. P. Littlepage, was unanimously adopted:

Resolved, that the Northern Nut Growers' Association express its appreciation of the attitude of the National Nut Growers' Association in encouraging the organization of associations which have for their purpose the development of the nut industry, and we hereby pledge our support to, and our cooperation with, said National Nut Growers' Association. And be it further

Resolved, that we hereby acknowledge our great obligation to the many pioneer nut growers of the South who have done so much to put nut culture on a scientific basis, and that we express to them our deep gratitude for the fund of valuable information and data which they have worked out and made available.

The meeting then adjourned.

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The Secretary-Treasurer has received for membership fees \$108.00, and expended for postage, printing and stationery, telephone and telegrams, \$59.27. Remaining in treasury, \$48.73.

The following leaflets were issued during the year:

A reprint of Dr. Morris's article "Nut Culture for Physicians."

A list of societies, books and other publications devoted to nut culture.

A list of some of the chief nurserymen carrying nut trees in stock.

The President also published in the Garden Magazine for May an article on nut culture, in which he referred to our organization, as a result of which some 45 letters

of inquiry were received by the secretary, covering the country from Canada to Texas and from British Columbia to Panama.

The leaflets, and notices of the annual meeting, have been sent to about 321 addresses, including the members, agricultural journals, nurserymen and nut dealers, government and state officials, state horticulturists, correspondents and persons who it was thought might be interested.

The following letter was sent to 21 leading nurserymen:

"The President of our association, Dr. Robert T. Morris of New York, asks me to suggest to you that it might be well for your firm, or some member of it, to join the association, to be present at the meetings and to take up the matter of raising such nursery stock as is in constant and growing demand by the members. We need to be in touch with those who are growing things commercially and if they are present at the meetings they will know what we want. The national association is largely made up of professional nurserymen."

Nov. 15, 1911.

Two nurserymen have accepted the invitation. Evidently the others do not yet think the northern nut grower one whose acquaintance is worth cultivating. We hope to convince them to the contrary.

The following letter has been sent to the state horticulturists of the northern states and the provinces of Canada.

"The Northern Nut Growers' Association desires your interest, your aid and advice, your membership and, if possible, your attendance at the meetings.

It would also be of help to the association in its work if you would give it information of those persons in your state who are interested in nut culture."

Nov. 15, 1911.

Cordial replies have been received from M. B. Cummings, Secretary of the Vermont Horticultural Society; from Le Roy Cady, Chief of the Division of Horticulture, Minnesota Agricultural Experiment Station; and from J. H. Poster, Professor of Forestry, New Hampshire Agricultural College.

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Fifty postal card reminders of this meeting were sent to members and others a week ago.

The secretary has also made investigation by correspondence on the hickory bark beetle and the identity of *Juglans mandshurica*.

The response from all communications to the various officials of the Department of Agriculture at Washington has been prompt, cordial, interesting and helpful. This should certainly be very encouraging, if encouragement is needed, coming from men likely to be far-seeing as to the needs for, and the possibilities of, nut culture. Prof. Frederick V. Coville is conducting experiments in rooting hickory cuttings sent by the secretary. Prof. Walter Swingle offers his cooperation in experiments in propagation.

The general correspondence received by the secretary shows an interest and an enthusiasm that reveals the growing appreciation of the importance of the purposes for which this association stands.

(The following figures are brought up to date of going to press.)

Eighteen of our 60 members are from New York, 8 from Connecticut, 6 from Pennsylvania, 4 from New Jersey and Illinois, 3 from the District of Columbia, 2 each from Indiana, Virginia and Minnesota, and one each from Massachusetts, Ohio, Georgia, Louisiana, Florida, Colorado, Kentucky, Michigan, Oklahoma, Panama and Canada. Thus seventeen states, the District of Columbia, Panama and Canada are represented in our membership.

Eight of our members are women, one of them a life member, nine are professional nurserymen, eight are physicians, six are connected with educational institutions, three are lawyers, five agriculturists, two at least are capitalists, and all expect to be, two are in literature and there are one each of the following: clergyman, painter, insurance, secretary, railroads, senator.

The national association has 273 members of whom 52 are from the northern states. We ought to have all of these.

The secretary is keeping a record of the scattered articles, communications to agricultural journals and other literature relating to nut growing. He would consider it a favor if the members would send him information of anything of this kind that may come to their knowledge.

Professor Craig: I second that motion. I would like to add just a word, to the effect that it seems to me that the Secretary has started out in a very promising manner. He has not merely performed the routine duties of the secretary, but he has studied the case, and has presented in an analytical and striking form a good many facts not apparent on the surface, had he only given us the stereotyped matter in the conventional way; and it seems to me that this augurs well for the future of the Secretary's office. I trust he can keep up the gait. (Carried.)

Professor Craig: May I say that it seems to me there are one or two matters arising out of the Secretary's report which are worthy of special action? One is the question of the invasion of the Scolytus beetle; the other is the nomenclature of *Juglans mandshurica*. It occurs to me that it might be well to appoint committees on these subjects to report during the sessions of the society. I might say on the Scolytus matter, that I have conferred with Professor Comstock, who has been kind enough to say he would place the matter in the hands of one of his assistants, who will present to the society the latest we have on that subject; and in the event of a committee being appointed, I would suggest that that person, Professor Herrick, be made the chairman of that committee.

President Morris: I will appoint Professor Herrick and Professor Craig on the scolytus committee, and on the nomenclature committee I will appoint Doctor Deming and Mr. Barron.

In this connection, I will have to say, however, that I neglected to bring my correspondence relating to the nomenclature of *Juglans mandshurica*. I can say a word that the committee may wish to use. For a long while, I have been trying to trace the origin of the name *Juglans mandshurica*. It is applied to two different nuts. The one described in the United States government bulletin is the nut originally described by Maxim as *Juglans mandshurica* more than thirty years ago. That nomenclature has priority for two reasons: first, because of the date, and in the second place, because of the recognized standing of Maxim as a botanist. The Yokohama Nursery Company has been sending out a very different nut which they call *Juglans mandshurica*, evidently of the race of *Juglans regia*. The *Juglans mandshurica* of the government bulletin is like the butternut, the *Juglans mandshurica* of the nursery companies is evidently a race of *Juglans regia*. I have conferred with Doctor Britton, Sargent, and other authorities, and we have never been able to trace the name given to this walnut of the *Juglans regia* type, *Juglans mandshurica*, until by accident I happened to get word from the Yokohama Nursery Company to the effect that they had made up that name in the office a few years ago, not knowing that a previous *Juglans mandshurica* existed and had been named by Maxim. So that traces the rodent to its hole. The name *Juglans mandshurica* by Maxim is the proper name for the worthless butternut-like nut from China. De Candolle named the valuable walnut that has been sent out by the Yokohama Nursery Company *Juglans regia sinensis*. So both of these nuts have been previously named, and by authority.

Professor Craig: It is a question, then, of priority.

President Morris: Yes, a question of priority; but really the Yokohama Company had no right to make up that name. It was simply made up in the office as a matter of trade convenience, and they attached to this *Juglans regia* nut a name that had been applied to an entirely different nut, not knowing that this name had been previously applied. So there is a *Juglans mandshurica* and a *Juglans regia sinensis*, respectively.

Mr. Littlepage: Is the walnut, *Juglans mandshurica*, which you have been discussing, similar to the ordinary butternut of the Middle West, the Indiana white walnut?

President Morris: You can find nuts much alike on first inspection, but the mandshurica nut has six ridges in addition to the suture ridges. The leaf of *Juglans mandshurica* is sometimes a yard in length, with twenty-seven to thirty-one leaflets, sometimes—an enormous tropical leaf. The nut is usually too small to be valuable.

Mr. Littlepage: I have seen the butternut of the Middle West nearly similar, but it grows on the ordinary tree with white bark, and has small leaves.

President Morris: The general outline of the nut is about the same in both, but the air chambers are very much larger in the *mandshurica* than they are in the butternut and there is a marked difference in the flavor. You can distinguish them readily enough.

Mr. Littlepage: The butternut grows wild throughout the Middle West, usually along small water courses and alluvial lands. There are perhaps one hundred and fifty on a creek corner on one of my farms.

President Morris: They are very plenty here at Ithaca. In fact, you will find them in Maine and Nova Scotia.

Mr. Littlepage: I saw them in Michigan.

President Morris: I will state, that from two until four the members will view the collections, and make the tour of the Campus buildings. During that time the report on competition, or at least examination of specimens in competition, should be made, and I would like to appoint Professor Reed and Mr. Littlepage on that committee, and I will serve as *ex-officio* member of the committee. The other committees I can make up a little later. The next order of business will be the President's address. Mr. Littlepage, will you take the chair?

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THE HICKORIES.

ROBERT T. MORRIS, M. D.

So far as we know, the hickories, belonging to the Juglandaceae, are indigenous to the North American continent only. Representatives of the group occur naturally from southern Canada to the central latitude of Mexico, in a curved band upon the map, which would be bounded upon the east by the Atlantic Ocean and the Gulf of Mexico, and on the west roughly by the Missouri River, until that river bends east from the eastern boundary of Kansas. From the angle of that bend the hickory runs approximately southwest into Mexico.

The exact number of species has not been determined as yet, because of the open question of specific or varietal differences in some members of the family. Sargent's classification at present includes eleven species: *Hicoria pecan*, *H. Texana*, *H. minima*, *H. myristicaeformis*, *H. aquatica*, *H. ovata*, *H. Carolinae-septentrionalis*, *H. laciniosa*, *H. alba*, *H. glabra*, and *H. villosa*. To this list may be added *H. Mexicana* (Palmer), which so far seems to have been found only in the high mountains of Alvarez, near San Louis Potosi in Mexico; and *H. Buckleyi* from Texas, which was described once by Durand, and since that time overlooked by writers, excepting by Mrs. M. J. Young in 1873, who included the species in her "Lessons in Botany." Professor Sargent tells me that the Buckley hickory will be included in the next edition of Sargent's "Manual of the Trees of North America." This brings the number of species up to thirteen. In addition we have well marked varieties: *H. glabra odorata*, *H. glabra pallida*, and *H. glabra microcarpa*, making sixteen well defined hickories that have been described.

Nuts of all of these hickories are in the collection of "Edible Nuts of the World" at Cornell University, with the exception of nuts of the varieties *H. glabra odorata* and *H. glabra pallida*.

In addition to the sixteen described varieties and species of hickories in America, we have an endless variety of hybrid forms, because cross-pollenization seems to take place readily between hickories of synchronous flowering time.

Five of the hickories: *H. pecan*, *H. Texana*, *H. minima*, *H. myristicaeformis*, and *H. aquatica* belong to the open-bud group, while the rest belong to the scale-bud group. The winter buds of the open-bud group resemble the winter buds of the walnuts in a general way, and in artificial hybridization experiments I seem to note a close relationship between the open-bud hickories and the walnuts.

There is no more promising work for the horticulturist than crossing hickories with walnuts, and crossing hickories with each other. Five hundred years from now we shall probably find extensive orchards of such hybrids occupying thousands of acres of land which is now practically worthless. The hickories are to furnish a substantial part of the food supply of the world in the years to come. At the present time wild hickories held most highly in esteem are: *H. pecan*, *H. ovata*, *H. Carolinae-septentrionalis*, and *H. laciniosa*. Several other kinds have edible kernels, sometimes of excellent character, but not readily obtained except by boys and squirrels, whose time is not valuable. In this group we have *H. alba*, *H. glabra*, *H. villosa*, *H. glabra pallida*, *H. glabra odorata*, *H. glabra microcarpa*, *H. Mexicana*, *H. Buckleyi*, and *H. myristicaeformis*. In another group of hickories with temptingly thin shells and plump kernels, we have a bitter or astringent pellicle of the kernel. This group contains *H. Texana*, *H. minima*, and *H. aquatica*. Sometimes in the bitter group we find individual trees with edible nuts, and it is not unlikely that some of them represent hybrids in which the bitter and astringent qualities have been recessive.

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Among the desirable species of wild hickories there is much variation in character, and selection of trees for propagation is in its infancy. One reason for this has been the difficulty of transplanting hickories. Another reason is the fact that hickories do not come true to parent type from seed. A third reason is the length of time required for seedling hickories to come into bearing.

Concerning the first reason, the enormous taproot of young hickories requires so

much pabulum for maintenance that when the trees are transplanted, with destruction of root-hairs along with the feeding roots, transplanted stocks may remain a year or two years in the ground before they are ready to send out buds from the top. On this account, the Stringfellow method has in my locality proven of value. This consists in extreme cutting back of root and top, leaving little more than a short club for transplantation. The short club does not require much pabulum for maintenance, and new feeding roots with their root-hairs get the club under way quickly, because there is little useless load for them to carry. The Stringfellow method further includes the idea that stock should be planted in very hard ground, and seems to be practicable with the hickories. The root-hairs which take up nourishment from the soil find it difficult to carry on osmosis in loose soil. The close contact obtained by forcing a way through compact soil facilitates feeding. On this account, autumn is perhaps a better time for transplantation of hickories, in the northern latitudes, at least. Callus forms over the ends of cut roots at all times when the ground is not frozen, and the more complete the callus formation the more readily are feeding roots sent out.

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One of the main obstacles to propagation of hickories has depended upon the fact that nuts did not come true to parent type from seed. This is overcome by budding or grafting, and we can now multiply the progeny from any one desirable plant indefinitely. In the South grafting is nearly as successful as budding, but in the North budding seems to be the better method for propagation. The chief difficulty in grafting or budding the hickories is due to slow formation of callus and of granulation processes which carry on repair of wounds.

The propagation of trees from a desirable individual plant can be accomplished also by transplanting roots. A hickory root dug from the ground, divested of small rootlets, cut into segments a foot or more in length, and set perpendicularly in sand with half an inch protruding, will throw out shoots from adventitious buds. In my experimental work with hickory roots, in covered jars, surrounded by wet moss, but with the entire root reached by light, adventitious buds have started along the entire length of the root, and we may find this an economical way for root propagation, dividing up sprouting roots into small segments. The chief objection to this method of propagation as compared with budding is the length of time required for seedling trees to come into bearing, propagation from roots probably requiring the same length of time as propagation from seed, whereas by budding or grafting the bearing period begins very much earlier. Forty-six years ago Mr. J. W. Kerr of Denton, Maryland, planted three pecks of large shagbark hickory nuts, but of the progeny only about twenty were satisfactory, most of the trees bearing inferior nuts. These trees required from thirteen to eighteen years to come into bearing, and young trees that Mr. Kerr purchased from nurseries and planted were twenty-five years old before they began to bear. Others who have planted shagbark hickories and pecans state that nearly twenty years are required for the trees to come into bearing on an average. When budded or grafted the pecan sometimes comes into bearing in two years, and frequently in four years. We may anticipate that other hickories will act analogously.

The hickories prefer rich, well drained soil for best development of nuts, and an abundance of moisture, provided the land is well drained. Many of the hickories, however, are so adaptable to various soils that they often thrive in lands that are sandy, and dry, and almost barren. In the latter case, they have to maintain an enormous root system for feeding purposes, and this is detrimental to good bearing qualities. The mocker-nut, pignut, and hairy hickory, perhaps adapt themselves best to sandy soils. This feature may make them valuable species for planting when one has no other soil, because the stocks can be used for grafting better kinds.

While the hickories prefer neutral or alkaline soil, most of them will grow fairly well even in acid glacial tills. Their preference, however, for neutral or alkaline soils would suggest the use of a good deal of lime in acid soils, when hickories are to be grown in orchard form.

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All of the trees in the hickory group are intolerant of shade and of competition with other trees. The more sunlight they can have the better. Most of us are familiar with the hickory tree standing alone in the cultivated field, which bears a heavy annual crop, when the neighbors at the edge of the forest bear sparingly. Hickories in forest growth put their energies into the formation of wood chiefly, and in the struggle for food and light devote very little energy to fruiting.

The best method for cultivation of hickories has been worked out only with the pecan up to the present time. With this species, it has been determined that clean cultivation with plenty of fertilization gives best results, as with apples. It is probable that Stringfellow's sod culture method will come next in order, and will perhaps be most generally used by nut orchardists, because it is less expensive and requires less labor. The sod culture method includes the idea of cutting all grass and weeds beneath the trees, in order to take away competition, allowing these vegetable substances to decompose beneath the trees and furnish food. There is no objection to adding artificial fertilizer, or a still greater amount of vegetable matter.

The enemies of the hickories are not many in the forest, where the balance of nature is maintained, but when man disturbs the balance of nature by planting hickories in large numbers in orchard form certain enemies increase, and must be met by our resources. Fungous and bacterial enemies are beginning to menace some varieties of the pecan in the South, and both in the North and in the South certain insect enemies are becoming important in relation to all valuable hickories.

The bark boring beetle (*Scolytus*) has been reported as destructive to hickories in some sections, the trees dying as a result of depredations of the larvae of this beetle.

I find a large borer at work on some of my hickories, but have not as yet determined its species. It may be the painted hickory borer (*Cylene*), or the locust borer. It makes a hole as large as a small lead pencil, directly into the trunk or limbs, and excavates long tunnels into the heart wood. The painted hickory borer is supposed to occur chiefly on dead and dying hickories, but the borer of which I speak is found in the vigorous young hickories in the vicinity of my locusts, which are riddled with locust borers.

In some localities involucre borers make tunnels between the nut and the involucre, interfering with the development of the kernel.

The hickory twig girdler (*Oncideres*) is abundant in some localities, but not as yet very destructive.

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Hickory nut weevils destroy many nuts in some localities, and their colonies increase about individual trees markedly. In such cases, it is important to collect the entire crop each year from a given tree, taking pains to destroy all nuts which contain weevil larvae. These may be selected in a general way by dumping the freshly gathered nuts into a tub of water. Nuts containing weevil larvae will float for the most part, and in order to make sure of the destruction of larvae in the remaining nuts they may be placed in a closed receptacle, and carbon bisulphide poured over them.

One of the bud worms is sometimes very destructive to individual hickory trees which have developed colonies, the larvae destroying the axillary buds, and burrowing into the base of the petioles of leaves.

A new enemy which I found this year for the first time is the *Conotrachelus juglandis*. This beetle ordinarily lays its eggs in the involucre of the butternut. With the introduction of exotic walnuts, the beetle has changed its habits, and lays its eggs in the herbaceous shoots of walnuts and hickories. The larvae tunnel into the center of a shoot, and destroy it, or seriously interfere with its nutrition.

Among the enemies of the hickory we must not forget the common field mouse, and the pine mouse, which burrow beneath the surface of the ground, and in winter feed freely upon the bark of the roots of the hickories. They have destroyed many thousands of young hickories of various kinds in my nursery, and in digging up roots of old hickories for experimental root grafting I find that mice have been living freely for years upon the bark of some roots.

RANDOM NOTES

Aside from the facts which have been grouped together in this paper, certain notes may be of interest, as introducing questions for speculation.

Are we likely to find more species among the hickories than the ones already described? If so well described a species as the *H. Buckleyi* has almost escaped observation, and if *H. Mexicana* is confined, as it seems to be, to a very limited area, and if most of the hickories grow in regions where few botanists are at work, it seems to me probable that several species remain as yet undiscovered. These are likely to be species which lack means of defence, and which are restricted to certain small areas. If we make a parallel with other observations of recent discoveries, one thinks, for instance, in Ichthyology of the Marston's trout, the Sunapee sabling, Ausable greyling, and the Kern River trout, confined almost to a certain stream or lake, and remaining undiscovered for years by naturalists, although familiar to thousands of local fishermen.

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Sometimes there is a very apparent reason for the check to distribution of a species. The men whom I employed to go into the mountains of Alvarez for the Mexican hickory tell me that the trees are so loaded down with mistletoe that they rarely bear a crop, and there are few nuts with well developed kernels to be found.

Distribution of a powerful species of hickory, like the pecan, seems to be limited in the North by incomplete development of the pistillate flowers. These are borne on the ends of the herbaceous shoots of the year, and the pecan has such a long growing season that in the North the pistillate buds, which are last developed, are exposed to winter killing. Southern limitation of hickories which have a very short growing period, like the shagbark, may be due to the fact that after a period of

summer rest, new growth begins in the autumn rains, and this new growth may not lignify for winter rest.

By artificial selection we can extend the range of all hickories far beyond their indigenous range, which is limited by natural checks. Extension of range, adaptation to various soils, and changes in the character of the nut are likely to occur from grafting hickories upon different stocks of the family. Thus we can graft a shagbark, which does not thrive in poor sandy soil, upon the mocker-nut, which does grow in such soils. Some varieties of the species may grow freely far out of their natural range if they are simply transplanted. For instance, the Stuart pecan, which comes from the very shores of the Gulf of Mexico, is one of the hardiest pecans at the latitude of New York. I don't know about its northern fruiting as yet.

If the Satsuma orange grafted upon trifoliate orange stock gives a heavy, well flavored fruit, while the same variety grafted upon sweet orange stock gives a spongy fruit of little value, we may assume that similar changes in character of fruit will follow nut grafting. Perhaps the astringent feature of the pecan nut will be found to disappear when the pecan has been grafted upon certain other hickories. Sometimes undesirable results are obtained from such grafting; for instance, the pecan grafted upon water hickory stock has been found to grow freely for four or five years, and then to die back unaccountably.

Stocks of rapidly growing hickories, like the pecan and the bitternut, may serve to shorten the bearing time of slowly growing species, like the shagbark, when scions of the latter are grafted upon such stocks. At the present time I have shagbark grafted upon stocks of the pecan, shagbark, bitternut, mocker-nut, and pignut, but these are all young, and I cannot at the present time discern much difference in effect of stock upon scion.

In cross pollenization of hickories, I have not as yet discovered the best way to prevent the development of aphides and of other insects under the protection of the paper bags (which cover the pistillate flowers) sometimes to the point of destruction of flowers before nuts are started. It is probable that sprinkling the leaves with Persian insect powder, and leaving a little insect powder in the bag, will settle the question.

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I have not as yet learned how to prevent squirrels from getting at hybridized nuts while they are still upon the tree. Squirrels cut through mosquito netting which is tied about nuts to prevent them from falling to the ground, and if wire gauze is used, they cut off the branch, allowing gauze and all to fall to the ground, and then manage to get the nut out of the gauze. The red squirrel particularly is a pest in this regard, and will even cut off the tape which is tied about the branches for marking purposes, for no apparent reason aside from pure mischievousness.

Nuts which are to be planted must be kept away not only from the squirrels, but from rats and mice. One of my farmhouses got the reputation of being haunted because of mysterious noises made by rats in rattling hybrid nuts worth a dollar apiece about between the partitions. The best way that I have found for keeping nuts for sprouting purposes is to have a number of large wire cages made. These are set in the ground, nuts are stratified in sand within these cages, and allowed to remain exposed to the elements during the winter.

It is probable that some of the hickories will be grown in forest form in future because of the increased value of the wood of the species. For growing hickories in forest form, it is probable that they should be set not more than six or eight feet apart at the outset. At ten years of age the first thinning will give a valuable lot of hoop poles. The second thinning will give turning stock. The third thinning will give wood for a large variety of purposes. I know of no tree which promises to return a revenue more quickly when planted in forest form than hickories like the shagbark and the shellbark, mocker-nut and pignut. These trees will not be expected to bear nuts, because in the struggle for food and light their energies will be directed toward making trunks.

Hickories are undoubtedly to be used for decorative purposes in parks and streets by future generations. The stately pecan, the sturdy shagbark, can be made to replace, South and North, the millions of useless poplars, willows, and other bunches of leaves, which please the eye but render no valuable annual or final returns. The chief reason why this has not been done is because people have not thought about it.

President Morris: This paper is not to be considered with the respect that is ordinarily due to a presidential address, but is open for discussion, and I would like to have any of my theories disproven.

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Professor Craig: Doctor Morris has covered a very extensive field in his presidential address, and has raised so many interesting questions that I imagine the difficulty

with you is to know just where to begin. Personally, and because I am not as thoroughly aware of the field of Doctor Morris' hybridization work as I ought to be, I should like to ask him what combinations of the hickories he has effected thus far. The field of hybridizing nuts is an exceedingly interesting one, and Doctor Morris has been the foremost worker in it. I am sure it would be interesting to you, as it is to myself, to know briefly what ground he has covered in the extensive range of his experiments.

President Morris: In answering that question, I am speaking from memory and may not speak correctly. I have made crosses back and forth between shagbark, bitternut, mocker-nut, pignut, and pecan. In the crosses I made, using pecans, pollen was received from the South and put upon the others. The number of crosses that are fertile I cannot state as yet, because I have not had experience enough in protecting these nuts, and many of the hybrid nuts were lost. Squirrels and mice destroyed the labor of three of my men and myself during one season. I have secured fertile hybrids between the pecan and the bitternut and between the pecan and the shagbark. If I remember correctly, those are the only fertile hybrids I have between hickories at the present time. In regard to crossing hickories and walnuts, I have crossed back and forth several of the walnuts, our black walnut, our butternut, the Siebold walnut, with the pecan, and with the bitternut, and have fertile hybrids. These are open bud hickories, and the open bud hickories seem to cross pollenize freely with the walnuts back and forth, while the scale bud hickories do not accept pollen readily from the walnuts. I would rather perhaps not make a report to this effect for publication at the present time, for two reasons. In the first place, I am speaking from memory; in the second place, rats, mice, squirrels, small boys, visitors, and high winds have made such inroads upon my specimens, and upon my work, that it is not quite time to report. I am merely speaking offhand in a general way, stating that the hickories, open bud and scale bud, both seem to cross rather freely back and forth. Open bud hickories and the walnuts seem to cross rather freely back and forth, while the walnuts and the scale bud hickories apparently do not cross so readily back and forth.

Professor Craig: In growing your hickories from root cuttings, have you had any trouble from excessive sprouting?

President Morris: Anywhere from one to eight sprouts will start from adventitious buds at the circle near the ground, and then I break all these off but one, letting that one grow.

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Mr. Wilcox (Pennsylvania): How do you prepare your stocks for budding and grafting, in pots?

President Morris: I have tried practically every method that has ever been described, and the only successful method that I have now has been topworking vigorous sprouts of one year's growth. That is, I would cut off the tops of the trees now. Next spring those tops send out very vigorous sprouts. I bud those early in August or the latter part of July, or else in the following spring, sometimes, we graft them; and in grafting, it is quite important to cut longitudinally at one side of the stock, and go clear to the cambium layer. That gives the flexible slice on one side, and adapts itself to the tying.

Mr. Wilcox: Have you prepared any stocks in pots at all?

President Morris: Yes. I personally have to leave these to others. I tell my men to do it, but it is rather new work for them, and I give them so much to do that things are apt to be neglected; and just a moment of neglect at the wrong time will wipe out a whole year's work. I have not cared very much at the present time for root grafting in pots. I have lost a great proportion of the grafts, and it does not at the present time seem desirable; but I believe if that is done in hot houses with the ground warmed from the bottom, it is very apt to succeed. Give them plenty of time for granulating. They granulate very, very slowly.

Mr. Wilcox: What kind of pots do you use?

President Morris: Some Professor Sargent showed me, long, made for the purpose.

Mr. Collins (Pennsylvania): You spoke of the hairy hickory. What hickory is that?

President Morris: *Hicoria villosa*, that you find from Carolina southward.

Mr. Littlepage: You spoke of the Stuart as being the most hardy pecan in the latitude of New York. I presume you meant of the southern pecans?

President Morris: It seems to be one of the hardiest anyway. Even Virginia forms don't stand it through the winter as well as the Stuart. Mine are not fruiting as yet.

Mr. Littlepage: What varieties have you there?

President Morris: Appomattox and Mantura are northern ones I have.

Mr. Littlepage: Have you none of the Indiana varieties?

President Morris: Yes, I have the Indiana varieties on northern stocks, but those have only gone through one winter. They went through all right. I would say that the Stuart is quite as hardy as those.

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Mr. Littlepage: I have observed the Stuart in Indiana. A friend of mine has a small orchard of several varieties of pecans. I notice some places where the Stuart has lived six or seven years, and then some particularly hard freeze has frozen it back. I have a letter from Mr. Jones in Louisiana, in which he says they had a recent freeze, and every variety of pecan he had there had suffered, except the Stuart. I don't recall whether he mentioned the Moneymaker in a previous letter or not, but he did mention the Russell and some other varieties.

President Morris: We have a number of pecan trees about New York that have been grown on private estates. Pecans have been planted in Connecticut and Massachusetts. You run across seedling trees here and there, and a good many of them are perfectly hardy. They are very apt to be infertile. The staminate flowers are apt to be destroyed because they mature so late, and they may not carry any nuts. Pollination is imperfect as a rule, and nuts may not fill.

Mr. Reed (Washington, D. C.): But trees of Stuart are in bearing?

President Morris: I don't know about bearing. Three years they have stood a temperature of twenty below zero, so that is a pretty good test.

Mr. Reed: You haven't seen any nuts yet?

President Morris: No, I haven't seen any nuts; but they mature their wood, and if they mature their wood, they are likely to mature staminate and pistillate flowers.

Mr. Littlepage: While it is true they may mature staminate and pistillate blossoms, the question arises whether or not the growing season is going to be long enough at the end to mature the nuts. I notice in going through wild groves in Indiana, once in a while you have a tree which never matures any nuts, though it has bountiful crops. The frost gets them.

Professor Craig: There is evidently a lack of summer heat to ripen fruit. Before we get quite away from this subject, I would like to ask Mr. Roper if he has noticed any striking differences in the hardiness of Stuart and other northern forms of the pecan in his particular locality. Does Stuart maintain its reputation for hardiness in his locality? We are interested in that question from the northern standpoint.

Mr. Roper (Virginia): I think it does, but that is discussed in a paper which I shall read some time here in the meeting. Both the Stuart and Moneymaker have done better with us than any other of the southern varieties when they are budded on hardy stocks. The grafted trees do not do well with us.

President Morris: Professor Lake, will you speak on any of these points?

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Professor Lake: I am learning much and prefer to continue a learner. I shouldn't know anything about this crossing, except in the case of the *Juglans regia* and the oaks of California. That is one case that was not mentioned. We have a remarkable hybrid between the native oaks and the Persian walnut. It is remarkable in many ways. It has foliage that is perhaps half way between the oak and the walnut, and the nut on the surface looks like a small walnut, and on the inside it is between a walnut and an acorn. I had an opportunity to sample the flesh, but it is not edible yet. They are interested in the work very much, especially at Chico and the Southern California Station.

President Morris: It is said to be a cross between the live oak and the walnut. It seems absolutely impossible, but I have seen the nuts, and a photograph of the tree.

Mr. Reed: We haven't devoted a great deal of attention to the hybridization of nuts in our Department work. There is one thing that occurred to me, as I sat here, merely of passing interest. A gentleman in Mississippi sent a specimen of foliage, together with berries, from what he said was a hybrid between the pecan and the China berry; and he had the evidence, because the parent pecan tree stood right there, and the China berry was the other parent tree! He wanted world wide attention called to that. They were taken to the botanist, and he recognized them as one of the ordinary soap berries. There was a similar case this fall. A gentleman in Texas exhibited some nuts at the State Fair at Dallas that he said were a hybrid between the mocker-nut, the common hickory there in Texas, and the pecan. He said that the parent trees stood near one another and that the pecan blossomed some years about the same time that the hickory did, and in those years the hickory nut was long, and in other years it was short. Somebody sent one of the nuts to Mr. Taylor, Assistant Chief of the Bureau of Plant Industry. He sent the nut on to me, and I looked it up. I struck Texas on one of those cold wave days, and drove five miles out and back in a Texas livery rig, and found an ordinary hickory that bore nuts just a little different from others. That is one way the Department is called upon to ferret these things out.

Mr. Littlepage: I would like to ask Mr. Reed what information he has as to the success of pecans bearing when grafted or budded on other varieties of hickory? I say that because I know from traveling around through the country that there is a widespread impression that it is possible to have very extensive pecan orchards throughout the North by topworking the wild hickory. I have had some little experience along that line, but I don't know what the facts are; and Mr. Reed has made an extensive trip recently for the Department of Agriculture, collecting data in reference to the pecan.

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Mr. Reed: The present situation, so far as we have been able to gather the information, is just this. The pecan has been grafted on a good many species of hickory, all the way from Virginia south to Florida, and west to Texas; but rarely ever can we find an instance in which they have produced satisfactorily after they have come to a bearing stage. We find that they unite readily ordinarily, and grow rapidly; but the pecan eventually proves to be a more rapid grower than the hickory, and when it catches up and is the same diameter, then the pecan growth is slower, and while they bear a little the first few years, later on they are not productive. I don't wish to say that is final, but it has been the experience so far. You will find most enthusiastic advocates of pecan on hickory where it hasn't been tried for any length of time. The men who try it find it unites readily and makes this quick growth, and think the question is solved. But aside from a few instances in Texas, I don't find very encouraging reports. It may be due largely to the fact that the right varieties of pecan haven't been used. We know that in the early history of pecan culture the Rome and Centennial and some others that are light bearers were used; and then the pecan on hickory has been looked at as so much saved, and they haven't been given much attention. It is still very much a matter of doubt, but is not in a very favorable light at present.

Professor Craig: I would like to ask Mr. Reed if he has looked over Mr. Ramsey's work recently at Austin, Texas.

Mr. Reed: I was at Mr. Ramsey's last year, and I don't recall that that matter came up at all.

Professor Craig: Didn't you see his plantation of top worked hickories?

Mr. Reed: I didn't know he had topworked hickories. He has topworked pecans. Professor Kyle of the Station in Texas has recently issued a bulletin on that very thing, and he cites a number of cases in which he concludes that there will be a favorable outcome; but for some reason, in the instances which he cites, the trees haven't borne very much. They attribute it this season in one instance to the fact that they had a storm at pollinating time, and last year some other accident happened that prevented them from maturing after a quantity of nuts had set.

Mr. Littlepage: I mention this at this time because I want to get Mr. Reed's testimony in the record, because I think that every prospective nut grower must go through this stage. A year ago I undertook on my farm in Indiana to bud the pecan into other varieties of hickory—I have a great many wild hickories growing all over my farm,—shagbark, shellbark, and different varieties of those even. So I went to work and budded perhaps one hundred of those trees, and for a while it seemed that there was going to be a great degree of success. I budded them all upon the limbs where the bark was thinner, and tied the bud in with waxed cloth very tightly; and by absorption the majority of the buds lived a week or ten days. After that, there was perhaps a third of them alive. For the next two weeks, we could find an occasional bud that remained green, and then the number became so very small that I gave up the idea that any would live. But this spring I found a few of these had started to grow, but I had tied them so very tightly that in some instances where there had been a growth of an inch or two, the bud part had been cut in two. Then I undertook it on a much smaller scale. I cut back eight or ten small hickory trees three to four inches in diameter, let them throw up water sprouts, and budded into these. The bud wood I used stuck very tight, and I examined the buds in November, and there were quite a number alive of the Greenriver and Huntington varieties of pecan. Whether they will grow finally remains to be seen.

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(A discussion then occurred as to holding the afternoon session and it was decided to continue the business during the afternoon, instead of visiting the Campus.)

President Morris: I would like to comment on one point made by Mr. Littlepage. He has given us perhaps the reason why pecans die back when grafted upon other stocks. Mr. Reed, that is an extremely important point. He has shown that the pecan grows so much more rapidly than other hickories that when it has arrived at a proportion to be supported by the root of the other hickory, it then ceases bearing because all the energy is required for maintaining this new pecan top that tries to grow faster than the hickory, if that is my understanding of this point.

May we not graft freely back and forth hickories of kinds which have about the same rate of growth, and may we not graft other kinds of hickories upon pecan stock, for

we don't care how much nourishment is given to a fine young shagbark?

Mr. Littlepage: That is a fine point.

President Morris: I am very glad Mr. Reed brought up that point. It is going to save thousands of dollars if it is a fact recognized in time, because many would go to putting pecans upon other hickories. We may learn that certain kinds of hickories can be grafted to advantage upon other stock, however.

Mr. Reed: There is another point right there I would like to have your views on, and that is, the smaller the hickory is at the time the pecan is grafted on it, the greater will be the influence of the pecan on the hickory.

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President Morris: It can drag the stock along perhaps. It has been proved, I think, that a graft has a certain influence upon the stock, and in some cases can drag it along willy nilly to a certain extent. The root and the top get to balance each other fairly well if the root is very small at the time the graft is put on. Most of the trees that have been topworked to pecan have been various kinds of large hickories. Perhaps if you were to take a shagbark hickory one to two years of age and graft it, the pecan top would dominate or control that root, no matter whether it wanted to grow or not.

Mr. Reed: The claim is sometimes made that if the pecan is grafted on other hickory young enough, it will transform the hickory completely. It will make a sufficient root system to feed the pecan as well as the pecan root would. But I have never seen that demonstrated.

President Morris: That is speculative. It is a very valuable point, one of the sort of points that would naturally be brought out at a meeting of this kind.

Mr. Reed: Have you seen that with other fruits, Professor Craig?

Professor Craig: Yes. Each variety of apple produces its own kind of roots without reference to the seedling stock. That is to say the scion overrules the root in budding or grafting upon one or two year old seedlings.

President Morris: A parallel that comes to mind now is the grafting of Burbank's Royal walnut upon ordinary walnut stock. When that was done, his Royal walnut was said to drag the other walnut along.

Professor Craig: I think it is a very valuable suggestion. I am not sure I will go as far as the President has gone; but I think it is exceedingly suggestive, and worthy of careful consideration.

Mr. Rush (Pennsylvania): I find the same experience in some instances, that the graft outgrows the stocks. That is a peculiar instance of the work of improper unions. Eventually the stock pushes up and forms a perfect union in growth, with the Persian walnut. This is particularly applicable to pecan and hickory. I suppose Mr. Reed will bear me out in that, with regard to English walnut and black walnut.

Mr. Reed: Oh, yes.

President Morris: You occasionally see a variety of apple grafted on another in which the graft part gives the tree a sort of slipshod appearance. How about the bearing in that kind of a tree?

Professor Craig: They usually bear heavily where the food supply is restricted.

Mr. Reed: That would make our pecans bear more heavily on hickory stock than on their own.

Professor Craig: As a matter of theory, they ought to. The bearing ought to be increased, because it is a system of girdling, or brings about the same effect,—in other words it restricts the return flow of the elaborated food. The food is checked at the point of union. Another parallel is in the case of *Prunus domestica*, the European plum, when worked on *Prunus Americana*, the American plum. In that case, the top always outgrows the stock, and in ten years it presents a very curious appearance. It presents the appearance of a very top-heavy head on a very spindling stem. The bearing is usually encouraged, but the fruit is usually small. The amount of fruit measured by numbers is increased, but the amount of fruit measured by the size of individual specimens is decreased.

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Mr. Collins: Isn't the size of the fruit increased in the case of apples?

Professor Craig: By topworking, usually, it is, but that doesn't contemplate such an extreme case as that. It means when the union is reasonably uniform, when there is a reasonable affinity between stock and scion. But in extreme cases we get the opposite result. Reproduction is encouraged, but size of fruit is checked.

President Morris: I would like to hear from Mr. Rush or Mr. Pomeroy in connection with the hickory.

Mr. Pomeroy: I haven't ever tried any experiments with the hickory.

President Morris: We will discuss further some of the points that have been suggested in this paper, because it seems to me we are along a good line of cleavage, and this line of cleavage may dispose of some questions that we haven't discussed. One question brought up was if the bitter, astringent qualities are likely to be recessive among hybrids in the trees which have bitter nuts.

Mr. Littlepage: I made a trip through Missouri and Arkansas a year ago, and while there, took occasion to go into the forests, and investigate to some extent the Arkansas and Missouri hickory and pecan. Among other things, I found two hybrids, one of the pecan and one of the pignut, one of which was bitter and inedible, the other a fairly good nut. I have both of them with me here today. One of them was very astringent and bitter, the other had taken more the quality of the pecan as to meat, and was a fairly good substitute. I don't know what the reason for it is, that one is fit to eat, and the other isn't, when they are both hybrids between the pignut and the pecan.

Doctor Deming: How did you know they were hybrids, by the appearance?

Mr. Littlepage: Yes, the appearance is unmistakable. The pignut characteristics are very prominent, also the pecan characteristics.

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President Morris: Have the members anything to say about the Stringfellow method of transplanting hickories?

Doctor Deming: I have had very little experience in transplanting hickories, but I set out two Hales hickories I got from Meehan, and they are both living, although they have made little growth in some three years. Can you tell us what stocks the Hales hickory is grafted upon?

Mr. Brown (Pennsylvania): Upon the bitternut. All there are have been upon the bitternut from the start.

Doctor Deming: Mr. Littlepage, what do you think of the future of topworking our seedling hickories in the North with improved varieties of hickory or pecan,—the commercial future?

Mr. Littlepage: It is largely speculative. I suppose it is the province of every nut enthusiast to have an opinion about these things. In fact, I find it is encouraging to talk to the fellow who has an opinion. My notion is that there is a great future for topworking the various varieties of the hickory in the North to the desirable forms of the hickory, that is, of the hickory other than the *Hicoria pecan*. On my farm I expect next year to devote some time to topworking the various hickories I have to the desirable varieties of the shagbark. I think that can be done throughout the whole country. The shagbark seems to be indigenous to such extensive latitudes, that it seems to me there are great possibilities along that line. I observe that around here we find many of those trees. I have some very beautiful shagbarks that came from Canada. My opinion is that it will be successful. I think the reason the pecan has not proved very satisfactory upon the other species of hickory is that most of those hickories have a close grained wood, and that the distribution of available food depends largely upon the amount of sap. The *Hicoria pecan* is a much coarser grained wood. The flow of the sap upward is facilitated much more than the flow of the sap upward through the hickory stock of other varieties. I believe that is the reason the theoretical rule would probably not work in this case, simply because the distribution of sap cannot take place fast enough through the tight, close grained stock of other varieties of hickory. Otherwise, I don't see why the rule would not obtain, as with fruits. The experiences Mr. Reed gives, I think, are generally recognized by those who have experimented with them to any extent. I noticed in visiting Mr. Roper's nursery he had one very beautiful specimen of the pecan grafted on a hickory. That was the Stuart, was it not?

Mr. Roper: The Moneymaker. It had made a growth of four or five feet in two years.

Mr. Littlepage: Do you know the variety of hickory that it was topworked to?

Mr. Roper: Just our common hickory, I suppose the pignut.

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Mr. Littlepage: It made beautiful growth from the wood standpoint.

Mr. Roper: Mr. Reed's point was that it would do that till it got by the period of good nutrition from the root. Professor Craig says the elaboration of food from the pecan top more than overcomes the deficiency.

Professor Lake: I would like to question Mr. Littlepage's physiological ground for the lack of proper fusion of liquids between the pecan and the other hickories. I believe it is not authenticated that the water supplies from the earth would not distil as fast in the close grained hickories as in the more open grained pecan. At least, the very close grained, firm woods of the tropics transmit a tremendous amount of water, much in excess of many of our fine grained woods of the North. And it seems to me I

wouldn't like to have this Association go on record as vouching for this explanation exactly. It seems to me there are better explanations. Lack of fusion is not due to the amount of water that is carried up, but rather to the fact that the root system of the hickory does not develop fast enough to collect water to transmit.

Mr. Littlepage: I am very glad to hear Professor Lake's statements. My suggestions were given only as a possible theory that occurred to me, and I don't vouch for their accuracy. There must be some explanation to controvert the general rule which Professor Craig has given us.

Professor Craig: May I add one word? When a stock and scion unite, the union is really a mechanical one. It is a union of cells, and in that respect it is simply mechanical, not a physiological union. The different life types or character of the scion and top do not fuse, but we have a mechanical union of cells, and that mechanical union is as clearly shown forth as possible when we make a section through the point of union. If your type of cell in the stock differs very materially from the type of structure in the scion, the union is unsatisfactory. If the types of tissue are much alike, the union is good and you do not have either overgrowth of stock or undergrowth of scion very much, but you have what is called a good union. It is to some extent a question of mechanics, in my judgment, influenced by the cell structure of stock and scion. If you have a good, smooth union, the two grow equally. Where you have overgrowth of scion, you usually have a starved root, because the food which is to be returned elaborated is checked at the point of union, the root is starved, and you have a short lived tree, because your root system, which ought to receive its share of the distributed food, is underfed, finally weakens, and the whole structure fails.

Professor Lake: You may have mechanical union, but you can't have the after fusion in which you are going to have proper function of stock and scion.

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Professor Craig: Each cell functions after its own kind. It is a question of passage or transmission of food through that carrier, after the union is effected. If the character of the two types differs very much, the transmission of food is checked and is difficult.

President Morris: There is another mechanical point I'd like to ask about. When the two types of cells differ, will the difference in degree of capillarity regulate the amount of pabulum distributed, or does it depend upon negative and positive pressure?

Professor Craig: That is a very difficult question, because it isn't settled at the present time what credit we should give to capillarity and what to root pressure in sap circulation.

Mr. Reed: There is another question I would like to ask Professor Craig. Supposing you have a mechanical union perfected, what is the difference in the food that different species of the same genus transmit? Has that been worked out?

Professor Craig: I don't think so. Of course, there is a difference in the food. That is proven, because there is a difference in the quality of the food. The tree machine, the tree factory speaking individually, evidently makes different products, and that is shown by the different quality of nuts. That is all we know about it.

Professor Lake: That part below the scion still continues to be normal hickory, and that part above, pecan, so really it is not a matter of distribution of water supply by gravity or other pressure, but rather a distribution of the proper amount of elaborated food; and that is transmitted through the cell itself, not the cell walls. Because this top makes a food that is different from the normal requirements, or because the latent character of those cells below does not respond to the food supply as actively as the part above, is the whole question, it seems to me. If the cells below functioned as the cells above, there would be no question about the stock and scion being the same.

Mr. Littlepage: Of course there must be sufficient flow of sap to distribute food. The hickory root might not send the flow of sap as fast as the pecan top would like.

Mr. Reed: Is Mr. Lake's point always true, that the stock below the point of union remains a normal hickory?

Professor Craig: I don't believe there are more than one or two exceptions noted to that, and those exceptions are recorded under graft hybrids.

Mr. Reed: A seedling pecan tree owned by Mr. B. M. Young of Morgan City, Louisiana, was top worked with scions from the McAllister hican some seven or eight feet above ground, and later on the bark of the pecan trunk below the point of union became scaly like that of the hican above.

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Professor Lake: That would suggest something worth while, if that part below would produce fruit like the part above, but I would want to question a little the modification in bark characteristics being a direct result of cross grafting.

Mr. Reed: Of course, it was no check—only one instance.

Professor Craig: There are one or two others that are authentic. I have known a case of plum. Here we have the plum stock, we will say it is *Prunus Americana*, grafted with *Prunus triflora*, the Japanese, then later on, *Prunus domestica* is put on top. I have seen a sprout from triflora bearing Japanese plums, while the top of the tree bore *Prunus domestica*, although there was only a small section of stem in there between our two distinct species. They were perfectly normal.

President Morris: Each elaborates its own kind of food in its own kind of cell. I would like to hear from Mr. Brown and Mr. Wilcox on this matter of grafting—the influence of stock on scion.

Mr. Wilcox: We had a good show of stocks, but instead of allowing them to become established in the pots, we grafted them as they started into growth after rooting. Had they been established, we would have expected better results.

Professor Craig: What method do you employ?

Mr. Wilcox: Side grafting.

Professor Craig: Do you mean whip grafting?

Mr. Wilcox: Side whip grafting.

Doctor Deming: I would like to ask Doctor Morris what he thinks of the practical future of grafting our hickory seedlings with improved varieties of hickory or pecan, and the method most likely to succeed,—whether grafting or budding, and at what season. It is important to learn whether we can so graft or bud our hickory sprouts that within a few years we can hope to get something from them.

President Morris: We can only make a parallel with the pecan. If we know that it requires fifteen or twenty years for coming into bearing as a seedling tree, and if we know that it bears frequently in two, three, or four years after being grafted we can anticipate analogous action with other species of hickories. I haven't been able to get testimony from men who have grafted hickories. One man told me he thought shagbark grafted upon other shagbark, topworked, came into bearing in seven or eight years. Another man told me that his came into bearing in a much shorter time than it would otherwise, while with one particular variety, the Hale, I think that twelve years has been required for the tree to come into bearing.

Doctor Deming: I have a communication from Mr. Hales in which he speaks of a tree grafted in 1880, but doesn't say when it began to bear.

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Mr. Littlepage: He told me it has taken some of them twenty years.

Doctor Deming: But the pecan on hickory has been known to bear the second season, that is, topworked. Can we expect such results in topworking our own hickories?

Mr. Littlepage: I think so.

Doctor Deming: Are we going to have success in topworking, and by what method?

President Morris: I believe in the South they can graft, but in the North we have got to do it by budding. My best results have been late July or early August. I believe herbaceous budding promises a good deal.

Mr. Rush: Were those buds then of the year previous?.

President Morris: Those were buds from the year of the scion, and herbaceous stock of the year.

Doctor Deming: Mr. Littlepage has had some success in budding hickory very early, haven't you?

Mr. Littlepage: I was just stating that I started in last year to bud. I think it would be possible to make a pecan orchard bear early by budding into these hickories, ten, fifteen, or twenty years old. This next year I am going to try hickory on hickory. I am going to try three processes. I am going to try bark grafting, and whip grafting in the body of the tree which has been cut off. Then, I have quite a number of hickories each four or five inches in diameter that I have sawed off and allowed to put up clusters of water sprouts, and I am going to whip graft some and put paper sacks over them, and see which is the best.

President Morris: I have found budding the best.

Mr. Reed: Doctor Morris referred to the analogy of the pecan grafted on pecan as coming into bearing in two years. Do you account for that in the fact of its being a graft, or the fact that the wood you selected came from a tree that had the characteristic of early bearing?

President Morris: No doubt that characteristic was transmitted, and further, no doubt the grafted stock was used from bearing wood. Those points are all of interest.

Mr. Reed: Does the mere operation of grafting or budding influence earliness of bearing?

President Morris: Yes, if I understand the question rightly. A tree that might not bear for fifteen years as a seedling may bear in three years grafted.

Mr. Rush: I have Persian walnuts that bore two fine nuts the second year. I have young trees, one about thirty inches, and I am sure it will be full of nuts next year, unless some providential misfortune should intervene.

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Mr. Reed: At what age did the original trees begin to bear?

Mr. Rush: Those were buds shipped to me from California.

Mr. Littlepage: I am firmly convinced that there is something in the process of budding or grafting that stimulates the growth. For example, I have scions that were not over four to eight inches long grafted on one year seedling pecans which, at the end of this season's growth, were as much as thirty inches high. All along in the same row where seedling pecans were not grafted, there is none over eighteen inches high.

Mr. Reed: To have made exact comparison, you would have had to take buds from your seedling nursery trees, and graft on other trees. You are comparing these buds from one tree with seedlings of another.

Professor Lake: I would like to ask if you didn't bud or graft the best stocks in the row too?

Mr. Littlepage: We took the whole row, as we came to it, but that particular tree might have been on some particularly favorable stock. It is a matter of a good deal of interest to see why a seedling which wasn't budded at all didn't grow as high as a scion which was budded in summer, stratified all winter, then put into the ground in an unnatural position.

Professor Craig: It is the same principle, I think, which we discover in pruning. If we prune heavily during the dormant season, the effect is increased vegetative growth. If we wish to stimulate the growth of an old tree somewhat debilitated, we go to work and cut off a large portion of the top. We don't disturb the root. The effect is that with the same amount of pushing power from the root, we have a decreased area over which that energy is spread, and it results in apparently increased growth. I am not quite sure if we were to measure it up in a scientific way, we would actually find it was increased growth. There are fewer branches, but they have made greater length. In the case of grafting our pecans, we cut off our tops, set a two-bud scion in the root, and usually but one starts and receives all the vigor from the established root, instead of the vigor being distributed over several buds on the original seedling top. We have as a result of that concentration of vitality increased growth. I think that theoretical explanation will stand fairly well, because it seems to be directly in line with the effect of winter pruning.

Mr. Reed: I would like to ask Professor Craig to what extent he would select seed for nursery purposes? What influence would the characters of the parent tree from which the seed came have on the grafted tree?

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Professor Craig: I don't believe that we can expect the characters of our stock to affect the scion to any extent. I think what the nurserymen should have in mind and keep in mind is a good, vigorous stock, and as many stocks as possible,—as he can get out of a pound of nuts. Otherwise, I don't think it cuts much figure. In that connection there is a principle which I have discovered by experience, namely, that if you are growing stocks it is wise to get your nuts as near your own locality as possible. My experience last year in planting five hundred pounds of northern grown nuts in a southern locality, and five hundred pounds of southern grown nuts in the same locality, gathered in that locality, is that I got fifty per cent more trees from my southern grown nuts than northern, and trees that were fully thirty per cent better.

Mr. Littlepage: Where were your northern grown nuts stratified?

Professor Craig: They were not stratified. They were planted as soon as they were received, and they were received within two weeks from the time they were taken from the trees.

Mr. Littlepage: I am inclined to believe that if your northern grown nuts had been stratified in the North, and undergone the customary freezing and thawing, then had been taken up in the spring, you wouldn't have seen that difference.

Professor Craig: I think that point is well taken.

President Morris: There is no doubt about that. In that same connection—I would choose nuts for seed purposes of a mean type, for the reason that nature is all the while establishing a mean. The big pecan is a freak. If you plant big or small nuts, you don't get big or small nuts in return. You get both big and little seeking a mean.

Mr. Roper: The large nut will give a better tree. We have tested that out.

President Morris: Does that work out logically in that way, is it a comparative matter all the time?

Mr. Roper: We haven't worked that out in the bearing, but in the nuts in the row, the small nuts did not produce as large trees as the large nuts. We never tested the mean nuts. We did select some of the very smallest we had, and planted one of the northern and one of the southern type. They came up, but the trees amounted to nothing.

President Morris: The idea I meant to convey was that both very small and very large nuts are freaks, and neither likely to give as good a tree as mean types. What would you anticipate, Professor Craig?

Professor Craig: I think that would resolve itself on a practical basis from the practical standpoint. I think the mean or average sized nut would give you the best results. There is no doubt, as Mr. Roper said, the very small nut would give you weak seedlings. On the other hand, you couldn't afford to use the very largest, so that a mean between large and small would be the natural thing to choose. But we should do nothing to discourage the planting of the finest specimens, with the possibility of getting something unusually good. That is certainly the work for every amateur.

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Professor Lake: Does that statement, that you think it doesn't make much difference about the parent of the nuts for stock, apply to walnuts?

Professor Craig: I haven't had any experience in walnuts.

Mr. Littlepage: I would like to ask Mr. Roper if he knows of any examples where selection of fine varieties of seed has not resulted in getting a more productive variety of the plant which he was producing?

Mr. Roper: Only one, and that wasn't in a tree.

President Morris: In regard to coming true to type, I think records have been made of many thousands of pecans, and I don't know of any instance where the progeny resembled the parent closely.

Mr. Pomeroy: Maybe someone could explain one of my failures a few years ago in planting some Persian walnuts. I went to another tree in western New York, and got a peck or more. They were planted the same day, in the same ground, and all came up. Those I got from another tree resembled a hill of beans, and stayed that way for three years. Why wouldn't those grow? In soil three feet from those, there were trees growing. Those nuts never did make trees. The nuts were of good size.

Colonel Van Duzee: As a practical nurseryman, I wouldn't think of planting nuts from a tree that I didn't know individually. We have had very much better success with nursery stock where we have chosen as seed medium sized nuts from vigorous trees with which we were acquainted. In the case of Mr. Pomeroy, I don't think there is any question but that the history of his tree would account for the failure. In other words, his nursery stock was undoubtedly from the results of years of slow growth on the part of the original tree, or unfavorable conditions of some kind. I don't quite agree with Professor Craig on the question of the influence of stock, because I believe it is really a very important point.

President Morris: We are not here to agree upon anything.

Colonel Van Duzee: I can't speak from the scientific standpoint, but I am quite sure that in the nursery business I shouldn't care to overlook that influence.

President Morris: When men agree, it means we are on stale old ground which has been thrashed over.

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THURSDAY AFTERNOON, DECEMBER 14, 1911.

President Morris: The meeting is called to order. The first paper this afternoon will be that by Mr. J. Franklin Collins of the United States Department of Agriculture, on the chestnut bark disease.

THE CHESTNUT BARK DISEASE.

J. FRANKLIN COLLINS, Washington, D. C.

I presume some of you know as much about certain features of this chestnut disease

as I do myself; for I have only worked over certain sides of the whole question. I also presume that you are all acquainted with the fact that this disease, which is known as chestnut blight or the chestnut bark disease, is without doubt the most serious disease of any forest tree which we have had in this country at any time, that is, so far as its inroads at present appear to suggest.

I want to call your attention to certain general historical facts in connection with the disease, facts which are familiar to some of you, but unfamiliar possibly to others. The Forester of the Bronx Zoological Park, Dr. Merkel, discovered in the fall of 1904, or had his attention particularly called in 1904 to the fact, that a good many chestnut trees were dying in his vicinity, a number sufficient to have attracted especial attention. He looked at the matter carefully, and decided that there was a definite disease on these trees. He handed specimens over to Doctor Murrill of the New York Botanical Garden; who worked out the disease, and decided that it was a new fungus which was causing the trouble. He named it *Diaporthe parasitica*, the name under which it is generally known today, although there is some question as to whether that is the one which should be applied to it. This, you remember, was in 1904—in the fall.

The first publication which appeared on the disease was in 1906, as I recall it. The publication which then appeared was Doctor Murrill's upon his investigations. The disease has spread very rapidly since then, so that today we know the disease in a general area indicated by the red color on this map. The green area indicates in a general way the natural distribution of the common chestnut. Since 1904 investigations upon the geographical range of the disease have been carried on so far as to show that the disease is now known over approximately the area indicated in red on that map. The northern limits of the disease are perhaps in New York State. Further east, it is known as far north as northern Massachusetts, mainly in the western part, and it is also known in Boston. There have been two or three cases of the disease found in the Arnold Arboretum. On the west, we have two cases in West Virginia, and the most southern station which I know of is in Bedford County, Virginia. But those are isolated stations beyond the area which is indicated here. I shall have a little more to say in regard to the distribution.

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Before speaking of that, I want to call your attention to a few points in regard to fungi in general, points of common knowledge to all who have studied fungi or mycology. A fungus is a kind of plant which does not, on account of the absence of the green coloring matter, manufacture its own food. It is a plant which has, in other words, no green foliage, and as it has no green foliage, it must obtain its organic or elaborated food from some other source. The fungi have very aptly been termed the tramps of the vegetable kingdom, that is, they live on food prepared by somebody else. They can take certain organic substances and change them apparently into other organic matter which can be used by the plant. In the case of this chestnut fungus, we have a fairly typical fungus in certain respects. We have a vegetative stage of the fungus which is nothing more or less than a lot of threadlike structures penetrating the bark of the chestnut, the inner bark or the middle bark, and there drawing the organic matter from the bark of the chestnut and appropriating it to its own use. Fungi, like practically all other plants, have two stages of existence, one the vegetative or growing stage, the other the reproductive stage. Sooner or later the fungus will produce the fruiting bodies, after it has obtained a sufficient amount of food to justify the formation of these more highly organized structures. In the case of the fruiting body of the chestnut fungus, we have very small, pinhead-like structures, which come out to the surface of the bark, the vegetative portion developing through the interior of the bark. On smooth bark we find that these fruiting pustules are apt to appear all over the surface. With bark that is sufficiently old to have ridges and crevices, we find these fruiting bodies only in the crevices.

These fruiting pustules which you will see on this bark are the structures which produce the reproductive bodies, these latter being known as the spores. There are two types of spores which are produced by this fungus. One is the type which is commonly spoken of as the summer spore, the other the type which is spoken of as the winter spore. The winter spore is known from the point of view of the mycologist as the perfect stage of the fungus, that is, it is the more characteristic of this particular fungus. If we should make a cross section of the bark, we should find that the vegetative stage is running through the middle bark, and commonly the inner bark, sometimes in one place only, sometimes in the other only, sometimes in both. This vegetative stage later sends up in various ways a mass of tissue which results in the formation of pustules. These appear on the surface, sometimes more or less regularly rounded, sometimes rather irregular. In the case of the summer spore stage, we have inside the pustules a mass of tissue which is formed into spores. The interior of the spore mass, or at least portions of it, is somewhat mucilaginous, so that when moisture is applied a swelling of the interior mass is produced at a certain stage and something has to break. As a result, we have a mucilaginous mass pressed out through the break in the shape of a twisted thread, much the same as if you take a collapsible tube of paste and pinch it.

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Now, one of those summer spore threads may contain anywhere from one to five million spores. I have tried to estimate the number in a thread of this sort which was about an eighth of an inch long, and by taking a certain portion of that thread, mounting it in a drop of water, and then counting over a certain measured area under the microscope, I have estimated, by multiplying, that there were 2,400,000 spores in that one thread. So you can imagine how many of these spores may be produced by a single diseased area which has produced perhaps four or five hundred of those pustules, each pustule containing anywhere from one to twenty threads. Each one of those spores may develop a new diseased area, provided it is transported to a fresh break in the bark of a chestnut tree. Fortunately, only a very small fraction of one per cent ever reaches the proper place for growth.

This last is what I alluded to as the summer spore stage. There is a winter spore stage, or technically, the ascospore stage, which comes, as a rule, later in the development of the fungus. In this same pustule, later in the season, certain sacs are formed. These have long necks which extend to the top of the pustule. These sacs are sufficiently large to be seen with the naked eye. They are dark colored. Inside these, we have a lot of smaller transparent sacs or cases in each of which we get eight spores, sometimes in one row, sometimes in two rows. Each spore can propagate the fungus.

We have, then, two types of spores, either one of which can reproduce the fungus under suitable conditions. There is still another way by which the disease may be kept going. The vegetative stage can survive the winter and continue growing the following year.

I will say right here that I am planning to give you merely an outline of this disease, and have time afterwards for questions which I think in a meeting of this sort are one of the most productive sources of information.

In regard to the rapidity of spread of this disease, I will merely call your attention to two cases as illustrations, or to certain facts, rather. One is that the disease, so far as our attention has been directed to it, has developed over the area indicated on the map since the fall of 1904. Another case is one which has occurred in Rhode Island, where I have had a chance to watch its development a little more closely than in other places, that is, more constantly. In the fall of 1908, after I had made over thirty excursions around Rhode Island, I was unable to find a single trace of this disease, and no one else was able to find a single case of the disease in Rhode Island. In May, 1909, I happened to be about five miles west of the city of Providence, and I found two or three cases, all in one rather restricted spot. Later, it was discovered a little farther south, and soon, a little to the north, so that at the end of the season of 1909 we knew of about ten cases in Rhode Island. At the end of 1910, a season in which very few trips were made with the special object of surveying for the disease, we had more than doubled the number of infections found. That led to putting someone into the field in 1910 to make a survey of Rhode Island. A man was also put into the state of Massachusetts for the same purpose. Mr. Rankin, in cooperation with the United States Department of Agriculture, made a survey of New York State, which has resulted in this map. A man was put into Pennsylvania and one into Maryland for the same purpose. As a result of the survey in Rhode Island, where at the end of 1910 we knew of less than fifty cases at the outside, we now know of very nearly 4000 cases. It has been much the same story in Massachusetts. At the beginning of this year, there were four towns in which the disease was known; now there are seventy-one. At present in Connecticut, the disease is known in one hundred thirty-two towns of the one hundred sixty-eight in the state, and the southwestern part of Connecticut is very badly infected, just as badly as the adjoining portions of New York.^[A]

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So much for illustrations of the rapidity with which the disease develops. I am not going to say at this time anything special about the origin of the disease, simply because we haven't yet decided what was the probable origin. I will merely say there are some different theories in regard to the origin. One is that it was imported from the Orient, another, that it is a saprophyte, a fungus which has lived normally upon dead organic matter, but which has taken on the parasitic form, which develops on living organisms.

In connection with any disease of this sort, one naturally inquires, how are we going to recognize this disease? This past summer Pennsylvania has put into the field thirty or more men who have been trained to recognize this disease, with the idea of locating the infections in Pennsylvania. As perhaps all of you know, the legislature of Pennsylvania has passed a law relating to this particular disease, and has appropriated \$275,000 to see if the disease can be controlled. Their idea is that they have perhaps fifty million dollars' worth of chestnuts, and if \$275,000 can show whether or not this disease can be controlled, it is economy to try it.

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So far as Pennsylvania is concerned, it means possibly the saving of the chestnuts in the middle and western parts of the state; but it also means that if they can check it there, it is likely to save the great area of chestnut growth along the southern Appalachians. I don't want to make any prophecy as to how that experiment is likely

to come out, but, however it comes out, it will be a very great object lesson as to what can be done on a large scale with a disease of this sort.

One of the first things which had to be considered in Pennsylvania was to train a number of men to recognize the disease, so as to go over the country and locate the diseased spots. The method of recognizing the disease I will briefly outline. Of course, over a large country, many hundreds of square miles, it is a long, and laborious operation to look over every tree. It is perhaps impossible without a very much larger force than \$275,000 could put into the field. But there are certain clues to the location of the disease which can be seen a long distance, a quarter of a mile, at any rate. The means of recognition is by what I commonly call danger signals. This fungus, when growing through the bark, starts from the common point of infection and grows in all directions, up the stem, down the stem, and around the stem. Wherever this vegetative stage, technically known as mycelium, penetrates, the bark is killed; and of course, you all know what that means. When this has succeeded in reaching around a twig, branch, or trunk, everything beyond that girdled area dies, not immediately, perhaps, but sooner or later it dies; and it dies in such a way that the leaves change color during the summer. The first obvious change which can be noted is a slight wilting of the leaf; then the leaf assumes a pale green color, and from the pale green it takes on a yellow stage; from this a reddish yellow stage, and then a brown, till the leaf is the ordinary dark dull brown of the dead leaves. This coloration which takes place is conspicuous. There is your guide, your danger signal. If the disease has worked very long, half a season, in one locality, you are almost sure of getting some of these danger signals. Where one is present, you can go and look up the cause of that danger signal. It may be a broken twig, but the point is to find out if it is this disease which has caused the danger signal. We start by looking at the danger signal, then at the base of the dead area. If we find here some of the reddish pustules which have been shown on this bark we are quite sure that the disease is present. Then by cutting into the bark a little, instead of the normal buff or yellowish tint of the fresh clean bark, we get, when the disease is present, a rather mottled effect, varying from a brownish to lighter or even darker. There is a peculiar fan-like effect to this mycelium which penetrates the bark, so that by shaving off the surface of the bark, you get this mottled appearance, which gives you another means of identifying the disease. So we look for the danger signals, and then look for the meaning of the danger signals. If we find those two things, the pustules and the mottled mycelium, we can very safely say that this disease is present.

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There are a few fungi which closely resemble this chestnut disease in general appearance, but they are not very common, and are not confused with the disease, as a rule, when you get the lens on them.

In regard to the experiments for the control of the disease. I want to say a few words. As far back as 1907, the United States Department of Agriculture began experiments on certain experimental plots, particularly in Long Island near the region where the earliest cases of this disease were known, to see if it could be controlled on individual trees after they had become infected. Later, experiments were undertaken along the same line in Lancaster County, Pennsylvania. Spraying was tried, although there was no idea that it would be of any use, because the vegetative stage of this fungus is running through the interior of the bark, where no spray could reach it. Thus spraying was found to be of no use whatever. Then the operation of cutting out the disease was tried. Where the diseased spot appeared, it was cut out with a gouge. Then the exposed area was covered in various ways with antiseptics.

This gave, for a year or two, very promising results, but about the third year the disease appeared to get over on to the margin, where it had been cut. This led to the later discovery that the disease had been running in the wood, as we had previously suspected. So the cutting out of the bark alone is not sufficient. This year cutting has been done so as to include a portion of the sap wood.

There is just one other topic which I want to allude to. That is in regard to the immunity question. It has been found that this disease attacks the common native chestnut, the chinquapin, the various cultivated European chestnuts, but very rarely the Japanese. In regard to this point. I hope that Doctor Morris will tell us something about his experiments on the breeding of chestnuts with the idea of producing a new and immune variety.

You will understand that I have just made an outline of this disease, and I hope that, if there are any questions to be asked, you will make them easy, so that I can answer them.

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President Morris: This very interesting paper is now open for discussion, and I hope that we can get some points which will allow us to know how to control the disease. With the wind-borne spores that are carried miles and miles by a single sharp gust of wind, this disease is a difficult matter to control. We must, I believe, find some natural enemies, if we can. I don't know where to look for these. I will have to ask the mycologists what we may anticipate along the line of natural enemies. I would like to ask if it is common for a weak species to become a devastating species. Have we

many parallels in the field of mycology? The point relating to raising immune kinds is one for discussion. Are we to raise immune chestnuts? The history of most plants, I think, has been this, that where they have met their enemies in their natural environment, the fittest survive; and it seems to me that this is a case in which we perhaps have survival of the fittest in North Asia; for the North Asian chestnuts certainly resist the disease better than any others, but the chestnuts of southern Asia are quite vulnerable to it. In my own orchards, I have twenty-six kinds of chestnuts, and have followed them along, for the purpose of determining which ones would resist the blight best. I cut out last year 5000 old American chestnut trees on my property. There is not a tree in all that part of Connecticut, the vicinity of Stamford, that is not blighted, and very few that are not dead. Now, in the midst of this disaster, what was the behavior of my experimental chestnuts of various kinds? It was this. I had about one thousand Koreans that lived up to five years of age, growing in the midst of blighted chestnuts, and none of these blighted. It occurred to me that it might be well to graft these on the stumps of American chestnut, because these Koreans resisted the blight; but when I grafted them on the sprouts of American stumps, at least fifty per cent of the Koreans blighted, showing that the pabulum wanted by the *Diaporthe* seemed to be furnished by the American chestnut. I had some chestnuts from North Japan that resisted the blight, and yet these grafted on the sprouts from American chestnuts blighted. I had some Chinese chestnuts, and none of those have blighted as yet; and in grafting them, two or three have not been blighted. I have perhaps twenty-four chinquapins, both the western form and the eastern, and only one branch of one tree has blighted. Of the southern Japanese chestnuts, very many are blighted. They are not as resistant as the northern. I have a good many chestnuts of European descent, and among these some resist the blight pretty well; and some of the American progeny, like the Hannum and Ridgely, seem to resist well enough, so that now I am grafting these upon many different sprouts. This should be worked out, and I wish to know what men have tried experiments along this line. I would like to ask Professor Reddick to discuss this question.

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Professor Reddick: I have very little that I can add at the present time. The points the talk has raised here are of the greatest importance, and there is certainly room for a great many people to work, though here in this state we have only one man who is devoting his attention particularly to this disease. I find in connection with the work that Professor Collins is doing, and in connection with the Pennsylvania work, that there are some people engaged on these very vital and important problems. They are not giving any particular attention to field work, but are working on these special problems. I think you all appreciate that progress of investigations on this kind of subjects is rather slow, and in the meantime the man who has his trees and his nurseries blighting is surely up against it.

I have only one thing in mind, a thing which I suggested to Mr. Rankin when he first started on this work, and it is a thing which Doctor Peck, our state botanist, suggested at the chestnut bark conference that was held in Albany not long since. Doctor Peck says that he has lived a good while, and he has seen epidemics come and go. Certain plants, certain varieties were threatened with extermination, yet at the present time they are still with us. I suggested to Mr. Rankin that, while it looked as if chestnut blight was going to be with us indefinitely, the chances were it would all be gone before he had a chance to find out all the things he thought he was going to. Our friend Doctor Clinton of Connecticut would have us think it is only a matter of a few years to have conditions come around so that the chestnut blight will not be a thing of serious importance. In other words, Doctor Clinton stoutly maintains that, while this fungus is doing so much now, it is largely due to the condition to which our trees have come, owing to a succession of very unfavorable summers and winters; and as soon as the conditions get around to normal, the disease will be no more. Some of us are not inclined to agree with him entirely.

Professor Craig: Perhaps you can tell us what Mr. Rankin has been doing this year.

Professor Reddick: At the beginning of the past summer, from the surveys and observations that had been made almost entirely by the United States Department of Agriculture authorities, it was known that the chestnut disease had extended up the Hudson River perhaps as far as Poughkeepsie. It was our idea that he would probably find the border line of healthy and diseased trees somewhere in the vicinity of Poughkeepsie, so Mr. Rankin located it opposite Poughkeepsie at Highlands. During the course of the summer, the assistance of the State Survey Commission and the State Department of Agriculture was enlisted, and there were six or eight men who spent part of July and all of August surveying the portion which now appears on this map in red. The results of this survey show that the entire Hudson River Valley, with the exception of a small part in the vicinity of Albany, is now infected. In fact, it is the general opinion that there is no use whatever to attempt in any way to save the trees in this locality. Very fortunately there is a strip of territory which is almost solid spruce forest, and in which there are almost absolutely no chestnut trees. We have already, then, abandoned the Hudson River Valley, but with this great natural barrier, you see that it is going to be relatively easy, so far as the State of New York is concerned, to put some sort of an artificial barrier across the little neck there. This

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all depends on what can be done in Pennsylvania. This cross-hatching of red along the Delaware River represents an area in which the infection is only partial, and the few dots of red shown about Binghamton represent localities in which the blight has now been exterminated. The diseased trees have been taken out, stumps killed, and bark burned. We are in hopes the disease will not reappear there. I don't believe things have been definitely settled at Albany in the Department of Agriculture, where the control work naturally lies, but Commissioner Pearson is very anxious that something be done to try to control or prevent the further spread of the disease in our state. Plans are being made so that a large number of men will be located in this territory next summer, making very careful inspection, removing the occasional diseased trees, killing stumps, and burning bark; and a forester will be connected with the work, for the purpose of advising with regard to the use of the diseased timber. I might call attention to the fact that our state agricultural law, as it now reads, empowers our Commissioner of Agriculture to quarantine against this or any other dangerous fungous disease,—a very broad step from what it was before that time, when the only fungous disease he had any power to act against was the black knot of plums.

Mr. Reed: From the chart, it appears that the disease is more common in the vicinity of streams and bodies of water.

Professor Reddick: That is an observation that has often been recorded.

Mr. Reed: How is it elsewhere than in New York?

Professor Collins? The question has been asked more often than otherwise, why do we find the disease on the tops of hills away from the water? I think there isn't a sufficient amount of evidence or observation on that point to say whether it is more common near or away from bodies of water.

I will call your attention to one experiment that can be performed by anybody with the microscope. Take a piece of one of those spore horns or threads, put it in a drop of water on a microscope slide. Inside of two minutes, it will disappear entirely. It is dissipated in the water, and the spores are so small you cannot see them with the naked eye. If you let the water dry on the slide, then put that slide under the microscope and try to blow those spores off, you can do it just about as easily as you can blow the shellac off a door. You can brush that film under the microscope, and you can't see that a single spore has been disturbed. The explanation, I think, lies in the fact that these spores are of a mucilaginous nature, and when they dry, they stick to whatever they come in contact with. That does not mean that these spores cannot be blown, because they may lie on fragments of leaves and be blown about by the wind. Again, some of the spores may be detached in a mechanical way and thus blown by the wind. But I am quite convinced that the spores are not blown broadcast, simply because they are of a sticky nature.

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Now, those spore threads are forced out under certain conditions, moisture conditions, as a rule. It has been shown after repeated observation that these spore threads are pushed out a day or two after a rain. Of course, in the springtime, the atmosphere is much more moist than later in the season. Consequently, we find more of these spore threads in the spring than at any other time. You will recall that the last week of August this year was a week of almost continuous rain. Two days after that ceased, I saw as many of these spore threads as I had seen at any one time all summer. So that, although conditions are best in the spring for greater abundance of these spores, they may occur at any time. If a bird alights on these spore masses, there is no reason that I see why they should not be carried. We know the rain water running down the trunk dissolves these spore masses, and they are carried down, there to reinfect the tree when insects crawl around.

President Morris: My brother has some Japanese chestnuts twenty-five or thirty years of age. By cutting off one branch at a time as fast as they blighted, he has saved those trees.

Professor Collins: You spoke, Doctor Morris, of grafting Japanese on to American stock. I have seen repeated cases where the Japanese has been grafted on to American stock. The whole Japanese tree has been killed, and we find the disease has killed the tree by girdling the American stock below the graft.

President Morris: Yes, I find this over and over again. In one case where I had a very choice variety of Burley's chestnut, the *Diaporthe* attacked the American stock underneath this, and had practically girdled it when I saw it. There remained a fraction of an inch of good bark. I cut off all except that, and put tar over it, and grafting wax over that, and this year the graft has grown a foot or more. So by giving a great deal of attention to some one little injury, we can overcome the effect of it.

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Mr. Jensen: In your grafting, what was the relationship of the rapidity of the growth of top after grafting, compared with the old stock?

President Morris: When these grafts are put on the stock, on rapidly growing shoots from a large root, they grow enormously, and sometimes we have had nearly one

hundred feet of growth in one year. That, however, would be a chestnut like the Scott or the Ridgely. We frequently get thirty, forty, or fifty feet growth in one year.

Mr. Jensen: Does the plant grow more rapidly when it is grafted than on its own stock?

President Morris: I have not grafted Japanese on Japanese stock, but the Japanese and Korean grafted on American stock does grow more rapidly than it does on its own roots.

Professor Craig: Mr. Hall has another interesting instance of chestnut blight.

Mr. Hall: On the ground where the blight appeared, there were four chestnuts set by a nurseryman, two Japanese and two European chestnuts. Of the European chestnuts, one has succumbed to the blight, and the other has been continually attacked for the past four or five years, twice in a period of four years, and it is still alive and recently appears to be in a more healthy condition than for the past four or five years. During that time it has never borne any chestnuts. The companion tree of the same kind was girdled in two or three years.

President Morris: There is comparative resistance. Some of my trees went down instantly, and went all to pieces, while others stood up for four or five years. Chestnuts of the Paragon type I hoped were going to be fairly immune, but they are going pretty fast. I have advised people who have asked about Paragon chestnuts to buy them, but be prepared to have to cut out blighted branches as they appeared. It is a question whether I can advise even buying them much longer, because I have lost nearly all my Paragons, but they have not gone as fast as the Americans.

Doctor Deming: Ought we not before we leave this subject either to appoint a committee, or to pass resolutions urging action on the part of the state similar to the action taken by Pennsylvania in attempts to limit this disease? I would make such a motion, that the Northern Nut Growers' Association urge legislative action similar to that already taken by the State of Pennsylvania to limit the spread of the chestnut bark disease.

Mr. Littlepage: I second the motion. (Carried.)

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Professor Craig: Should not the Secretary be empowered to send a copy of those resolutions to the Commissioner of Agriculture? I think the motion includes that.

Mr. Reed: It seems to me that this disease is of as much importance to other states as it is to New York and Pennsylvania, and that this sentiment, as this action can only be a sentiment of the Association, should be sent to the Commissioner of Agriculture in other states, as well as in New York. This is not the New York Nut Growers' Association. I would make that as a motion, that the sentiment of this Association in favor of state action similar to that of Pennsylvania be pressed upon the Commissioner of Agriculture in each state where that disease is prevalent.

President Morris: Shall we make Mr. Reed's motion take the place of Doctor Deming's?

Doctor Deming: I would accept that as an amended motion. (Carried.)

Professor Craig: Inasmuch as we have gone that far, should we not take another step, and that is, fearing lest the United States Secretary of Agriculture should feel slighted, should we not as the Northern Nut Growers' Association draw his attention to the fact that here is a serious disease sweeping over the whole northern part of the country, representing a very considerable portion of his domain, and ask his aid and cooperation with the various states which are attempting to do such good work?

President Morris: Will that have to go as another motion or as an amendment to Doctor Deming's?

Professor Craig: I move that a resolution of a similar type be passed, and forwarded to the Secretary of Agriculture of the United States. (Carried.)

Mr. Wilcox: May I ask some of the gentlemen who have experience along this line if we may look for any cure or help for it in the future, and if so, along what lines will it be possible, along the lines of isolation, of natural enemies, or some other preventive or cure?

President Morris: Yes, I would like to ask if anyone has a definite proposition beyond the one that has been proposed, restricting it by cutting out the advance agents of the blight. I believe that has been the only proposition so far. We certainly can't kill off the birds that will carry off blight on their feet. We don't know if a fungous enemy is likely to follow it up, or if it is a weak species, brought into activity by certain conditions, which will be brought back to its normal mode of life again. I don't know that anything definite could be stated till we know more about it.

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Professor Craig: Perhaps Mr. Collins or Professor Reddick might offer something in the way of suggestions on that.

Mr. Collins: I don't think that I have anything to propose beyond the points suggested by the President. I think there are a good many points which should be kept watch of, and I don't know any one that looks any more promising than the other, except perhaps this of cutting out the disease. But this is an expensive method.

Mr. Reed: Have you ever found any individual trees in infested districts that were immune?

Mr. Collins: Only the Japanese, but I think Doctor Morris has found the Korean even more immune. I shouldn't use the word "immune," perhaps, but "highly resistant" to the disease. I have watched quite a number of trees, in the midst of disease, which seemed to be resisting the disease. I explained it in some cases by the fact that the bark was very free from injury—maybe that was the reason why they did not take the disease so easily as they might otherwise.

President Morris: The next paper will be that of Mr. C. A. Reed of the United States Department of Agriculture on "The Present Status of Nut Growing in the Northern States."

NUT GROWING IN THE NORTHERN STATES.

C. A. REED, Washington. D. C.

With the exception of the chestnut, no species of native nut-bearing tree has become of prominent commercial importance as a cultivated product in that portion of the United States lying east of the Mississippi and north of the Ohio and Potomac Rivers. The growing of foreign nuts has attracted greater attention than has the development of the native species. Almost with the beginning of our national history, the culture of Persian walnuts attracted considerable attention throughout the East, especially in the States of the Middle and North Atlantic Coast. The European and Japan chestnuts, the European hazels and the Japan walnuts have since come into considerable prominence in the same area.

Within the district so outlined, which comprises practically the entire northeastern quarter of the United States, there are few sections of large extent to which some species of native or foreign origin has not already demonstrated its adaptability to the soil and climatic conditions, or to some other locality of approximately similar conditions.

In order of importance, the species of native nut-bearing trees known to be suited to some portion of the area under discussion, the following list is probably not incorrect: The American chestnut (*Castanea dentata*); the shagbark (*Hicoria ovata*); the American black walnut (*Juglans nigra*); the butternut (*Juglans cinerea*); the pecan (*Hicoria pecan*); the shellbark (*Hicoria laciniosa*); and the hazels (*Corylus americana*; *Corylus rostrata*). The American beechnut (*Fagus atropunicea*, Sudworth) naturally belongs to this list, but as it is probably not under cultivation as a nut tree at any place in the United States, it will not be discussed at this time.

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The principal foreign species which have been tried in the Northeastern States are: The European and Japanese chestnuts (*Castanea sativa* and *C. japonica*); the Persian (English) walnut (*Juglans regia*); the Japanese walnuts (*J. Sieboldiana*; *J. cordiformis* and *J. mandshurica*); the European hazels (*Corylus avellana* and *C. tubulosa*).

THE AMERICAN CHESTNUT (*Castanea dentata*, Marsh).

Representatives of the American species of chestnut are found native to a large area. The species seems to avoid extremes of temperature, cold, alkaline or acid soils, and an excess of moisture. It is apparently at its best in the sandy and coarse gravelly soils of the uplands from lower New England to the southern extremity of the Piedmont Plateau in the East and from the extreme southern part of eastern Michigan to northern Mississippi on the West.

Although the quality of the American chestnut is unapproached by most of the foreign species, comparatively little attention has been paid to its development, while considerable effort has been directed toward the introduction and cultivation of the large European and Asiatic species. Comparatively few varieties of the American species have been originated, and of these none have been widely disseminated. The one variety, which, because of its size, productiveness, and quality, has been extensively propagated and widely planted, is the Paragon. This variety originated at Germantown, Pa., and was introduced about 1888. It is believed to have originated from a seed grown from a nut obtained from a European seedling, then in one of the gardens of Philadelphia. This variety has been propagated very extensively both in the nursery and by grafting on native stumps and sprouts of cleared-over forest lands. In the nursery it is now chiefly grafted to seedlings grown from Paragon nuts.

This variety is both precocious and prolific. In a 25 acre orchard of young nursery grown trees planted near Boonville, Indiana, during the spring of 1910, nearly every tree set a number of burs during the same season. From two or three to from fifteen to seventeen burs had to be removed from each tree in order to prevent over-taxation.

Mr. Charles A. Green of Rochester, New York, Mr. E. H. Riehl of Alton, Illinois, and Mr. G. W. Endicott of Villa Ridge, Illinois, are the introducers of a number of improved varieties of the American sweet chestnut, illustrations and descriptions of which may be had upon application to these gentlemen.

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The extreme severity of the chestnut blight throughout the section where it has made its appearance, the rapidity with which it has spread since its discovery, and the present practical impossibility of keeping it under control have put the future of the chestnut industry of this country much in doubt. As has already been made clear during the present meeting, this disease has resulted in the entire destruction of thousands of forest and park chestnut trees in the sections where it has appeared, and as evidence of the further apprehension with which the chestnut blight is taken into account by the authorities familiar with it, it may be well to state that at the last meeting of the Pennsylvania State Legislature, the sum of \$275,000 was appropriated for use in studying and combatting this disease. Above every other question bearing upon the subject of chestnut culture, that of this disease is by far of the greatest importance to the prospective planter.

THE SHAGBARK HICKORY (*Hicoria ovata*).

This species is native to the greater portion of the area under discussion. It is not common north of southern Maine and is much less abundant than the chestnut in the lower New England and North Atlantic States. It is best adapted to regions of deep fertile soils well supplied with moisture, yet without standing water. It is very difficult to propagate by asexual methods and ordinarily requires from twelve to twenty years to bring it into commercial bearing. For these reasons exceedingly few varieties have been called to public attention. The location of several individual trees of superior merit to that of the average are now known and arrangements are being made for their early propagation.

The most practical means of obtaining young trees for nut purposes at the present time is to plant nuts from selected trees. This method will, of course, lead to the wide variation common with seedling trees, but until experienced propagators meet with better success in their efforts at grafting or budding this species than in the past, there is little use for the amateur to undertake it.

THE AMERICAN BLACK WALNUT (*Juglans nigra*).

The American black walnut is common to much the same general area as the shagbark hickory. It is much less exacting in its soil and moisture requirements than that species and is much more frequent within the same area. Its representatives, either native or planted, are found in almost every kind of soil and at nearly every degree of elevation from the well drained lowlands to the mountain sides. As with the shagbark, few varieties of the black walnut have been introduced. The same interest is now being shown by leaders in nut culture in their efforts to locate and insure for propagation superior varieties of black walnuts as with the shagbarks.

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THE BUTTERNUT (*Juglans cinerea*).

The butternut or white walnut, as it is sometimes called, is one of the most neglected of our native nut bearing trees. In the forest it abounds under much the same conditions as does the black walnut, to which it is closely related. Its native range within the entire United States extends further to the East and North and is not found so far to the South or West as is the black walnut. Like the shagbark, it is generally less abundant within the area of its native range than is either the chestnut or the black walnut within their respective native areas.

So far it is known to the writer, not a single variety of the butternut has been introduced.

THE PECAN (*Hicoria pecan*).

The pecan is native to a very small portion of the area under discussion. North of the 38th parallel it is found native along the river bottoms bordering on the Mississippi River and its tributaries to Davenport, Iowa, Terre Haute, Indiana, and nearly to Cincinnati.

Scattered individual trees are by no means rare in Illinois, Indiana, Ohio, Pennsylvania, Delaware and New Jersey, as far north as the 41st parallel, and they

are occasionally found in the lower parts of Michigan, New York and Connecticut. In rare instances, they have been reported near the Atlantic coast in Massachusetts.

It is doubtful if any of these northern trees which are well outside of the area included by the native range of the pecan have yet borne nuts of good size and quality to an important extent. The efforts to carry the pecan beyond the limits of its accepted range have thus far been mainly by the planting of seedling nuts. During the past 3 or 4 years, intelligent efforts have been made by several persons in the State of Indiana to locate wild or seedling trees of sufficient merit to justify their propagation as named varieties for northern planting. Already they have called to attention and are propagating as rapidly as possible the Indiana, the Busseron, the Major, the Greenriver, the Warrick, and the Hinton. Some of these varieties compare favorably in the matter of size with the average pecans of the South, and while none of those yet discovered are of extremely thin shell, in points of plumpness, richness, bright color of kernel and pleasant flavor one or two of these northern varieties are not excelled by any of the southern sorts. Scions and buds from these trees have been used in the propagation of nursery trees, and already a few trees have been disseminated. Several nurseries are now propagating these varieties but all combined their output will necessarily be very limited for some years to come.

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Somewhat in advance of the steps taken in Indiana two varieties, the Mantura and the Appomattox, have been introduced from southeastern Virginia by Mr. W. N. Roper of Petersburg.

The Mantura pecan is distinctly of the southern type,—large, thin shelled and a ready cracker. It has been disseminated throughout the North to some extent when grafted upon the stocks of southern seedlings. None of the trees are yet in bearing. It is now being propagated by grafting to stocks of northern seedlings and it is highly probable more hardy trees will be the result.

The Appomattox pecan has not yet been propagated to great extent. Since the variety was called to public attention, a horse stable has been erected immediately under the tree; and consequently, being greatly over-supplied with nitrogen, it has been unable to normally develop its crops. Good specimens, therefore, have not been obtainable for description during the past several years.

In the mind of the introducer, however, it is a valuable variety, and well worthy of further observation.

THE SHELLBARK HICKORY (*Hicoria laciniosa*).

The shellbark hickory is much less common and far less well known than is the shagbark. In its native range it appears in certain counties of central New York, eastern Pennsylvania and in parts of Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Nebraska and Oklahoma. According to Nut Culture in the United States,^[B] this species attains its "greatest development along the streams of southern Kansas and Missouri, Arkansas and Oklahoma."

The nuts of this species are considerably larger than those of the shagbark and of much thicker shell, and commonly do not have as plump kernels. Exceedingly few have been propagated.

THE AMERICAN HAZELS (*Corylus Americana*; *Corylus rostrata*).

Shrubs of these two species are often seen growing together throughout the greater portion of the area under discussion. The former (*C. americana*) is of somewhat the better quality. Neither has been propagated asexually or cultivated to any extent, but it is doubtful if any native species of the nut tree offers a more inviting field for improvement than do these two species of hazels. The same methods of searching out the individuals of superior merit to that of the general average for propagation by grafting and budding by which other nut trees are being improved should be followed with the hazels.

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THE CHINKAPIN (*Castanea pumila*).

Except as a wild product, this nut has perhaps the least commercial importance of any species mentioned in this paper. A few cultivated varieties are in existence but the nuts are commonly looked upon by experienced growers as novelties rather than as products worthy of special attention. The species is merely that of a dwarf chestnut growing as a shrub instead of as a tree. It is less hardy than the chestnut, being evidently best adapted to the climatic conditions of the southern portion of the chestnut area and even farther south.

FOREIGN NUTS.

THE EUROPEAN AND ASIATIC CHESTNUTS (*Castanea sativa*; *Castanea japonica*).

It is probable that within the area under discussion greater attention has been paid to the introduction of European and Asiatic chestnuts than to any other foreign species. The former is a moderately strong grower usually, with a low, rather broad top. The latter makes a small tree chiefly of value for ornamental purposes. Both are grown principally from second generation seedlings, which seem better adapted to American conditions than do imported trees.

As in the case of the American sweet chestnuts the existence of these species in the United States is threatened by the swiftly spreading chestnut blight.

THE PERSIAN WALNUT (*Juglans regia*).

The Persian walnut was among the first nut species to be introduced. The area east of the Rocky Mountains within which it seemed most successful previous to 1896 was described in Nut Culture at that time as being "A limited area along the Atlantic Slope from New York southward through New Jersey, southeastern Pennsylvania, central Virginia, North Carolina and Georgia." Continuing, the same publication said, "The tree endures the winter in favored localities near the coast as far north as Connecticut, Rhode Island and Massachusetts, but has never been planted there except in a small way."

What was then said is still very largely correct. However, contrary to the construction which might be implied from the wording, there are few commercial orchards of Persian walnuts anywhere east of the Rockies; one, that of Mrs. J. L. Lovett of Emilie, Bucks County, Pa., of from fifty to seventy-five trees, approximately twenty years of age, is bearing fully as well as could be expected under its present environment. The trees appear to be entirely unaffected by the severity of climatic conditions, but being seedlings altogether, and uncultivated, the crop production is irregular. Reports from northwestern New York and Pennsylvania indicate that this species may be safely grown in those sections when within the zones which are tempered by the influence of the Great Lakes.

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Ordinarily the trees scattered over the Eastern States do not seem able to permanently withstand the severe winters, as in most cases they are not infrequently severely frozen back. In eastern Pennsylvania, Maryland, Delaware, New Jersey and New York City, the writer recently inspected numbers of fine trees apparently from 50 to 75 years of age which showed no indications of winter injury. The owners seemed to be entirely ignorant of the reputation of the species with respect to its inability to withstand severe weather.

The nuts from many of these trees were of such large size and good quality that a number are to be extensively propagated in the near future.

THE JAPAN WALNUTS (*Juglans sieboldiana*; *Juglans cordiformis*; *Juglans mandshurica*).

These nuts are of comparatively recent introduction into the United States, having been brought from Asia since 1860. All are generally hardy; the first two are rapid growers, very productive and serve to an excellent purpose as ornamentals; the last is well known. The nuts of the former two are smaller than those of our native black walnut, of about equally thick shell, usually of no better quality, and as yet are not in great demand on our markets. A few trees, however, should certainly be given a place about the home grounds.

THE EUROPEAN HAZELS (*Corylus avellana*; *Corylus tubulosa*).

Numerous efforts have been made to introduce these species into the Eastern states, but owing to the severity of a blight everywhere prevalent with the American species in this section, such efforts have usually met with failure. There have been very few instances in which either species has been cultivated in the Eastern states for any great period of time without being destroyed by blight.

The future of hazel nut production in this section evidently depends upon the development of our native species or by hybridizing with some of the foreign species.

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In concluding this article, it may not be amiss to throw out the following suggestions as to the steps by which all may help in the development of the nut industry:

- (1) Ordinarily, stick to the native species.
- (2) Plant nuts or seedling trees only when budded or grafted varieties cannot be had, but do not fail to plant nut trees of some kind.
- (3) Whenever a tree or shrub is located which because of the superior quality, size,

thinness of shell and quantity of nuts appears to be worthy of propagation, specimens should be sent to the officers of this Association; to the State Experiment Stations or to the U. S. Department of Agriculture at Washington, D. C., for examination. (Franks for the mailing of such nuts to the U. S. Department of Agriculture without postage will be sent upon application.)

(4) Nut trees must be accorded the same degree of cultivation and horticultural attention given to other fruit-bearing trees, if commercial production of nuts is to be expected.

President Morris: This interesting paper is now open for discussion. I will start it by saying that the criticism of the Japanese walnut is correct, so far as it goes; but we have there a fine opportunity for good new work, and if the nurseries would take up this question in the right way, they could open up an enormous trade for stock. Let us take the *Juglans mandshurica*, and the *sieboldiana*, which have been distributed more than any others over this country because of the beauty of the trees. They grow rapidly, and are tremendously hardy, although not so much so as the best of the Japanese walnuts, the *cordiformis*. It was found on the Pacific Coast that the *cordiformis* went largely to wood. In the East, it bears well, is perfectly hardy and the nut is delicious. Individual trees bear thin shelled nuts, and individual trees bear large nuts. In fact, I have seen the nut quite as large as the nut of the average American butternut, and thin shelled, at that. The thing for the large nurseries is not to sell Japanese nuts under that name, but to sell the *cordiformis*, and sell only that, and only grafted trees. In that way we would get rid of the less desirable varieties, just as with the hickories a thousand and one shagbarks that we find are not remarkable, and yet we will find here and there one that is worth grafting and propagating. It is the same way with the Japanese walnuts, but particularly this *cordiformis* which is hardy and growing native in a climate which corresponds to Nova Scotia. If the nurseries will put out this nut, grafted, they will have a very valuable nut to give us. I notice that the speaker distinguished a "little shagbark." Now, I wonder if that is not a question worthy of discussion right here. The names shagbark, shellbark, and scaly bark, are applied indifferently to *Hicoria ovata*, *Hicoria cinerea*, and *Hicoria septentrionalis*. We can distinguish them much better if we take different names for the little and the big shagbark,—if we call the little one shagbark and the big one shellbark, it makes a distinction; and the reason why that distinction seems legitimate is that the bark comes off like great sheets from the big shellbark, and the little shagbark has the scales of the bark coming off in smaller scales, shelling off. At the same time, it is more scaly than the other. If we call the shaggy one, *Hicoria ovata*, shagbark, and call the big western one shellbark, it seems to me a distinction that we may as well make in our discussions, and fix the names in such a way as to afford convenience.

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Mr. Reed: My reference was to *Hicoria ovata*.

President Morris: Yes, that is for the little one, and if we call the *laciniosa* shellbark, that will make a distinction. Shall we call the little one shagbark, and the big shagbark shellbark, or must we always depend upon the scientific names in classifying?

Mr. Collins: May I call attention to another complication? To botanists who are not particularly nut growers, there is another tree which is known as the little shellbark,—that is the *microcarpa*, with a nut about one-half to three-quarters of an inch long.

Professor Lake: Have we a committee on nomenclature?

President Morris: We haven't appointed that committee yet.

Professor Lake: I was going to move that the matter go to them, with the suggestion that they take official action.

President Morris: Supposing we extend the function of the committee on the nomenclature of *mandshurica* to include this question of the naming of the shagbarks.

Doctor Deming: Then had we not better include the President, *ex-officio*, on that committee?

President Morris: We may as well begin, because there is no need of having this eternal confusion.

Doctor Deming: I have never been able to understand why more attention hasn't been given to the hazels. Here we apparently have a nut which is easy to transplant, which is perfectly hardy, which comes into bearing early, which bears a valuable nut—so valuable that when I went into a confectionery store in New York, I saw trays of nut meats lying side by side, and pecan meats were priced at \$1.00 a pound and filbert meats were \$1.25. I understand the only obstacle to the growth of the filbert, which might well fill the early waiting years of the nut grower, is the hazel blight. I tried to get information on the hazel blight from Doctor Waite of the United States Department of Agriculture, and also from Mr. Kerr of Denton, Maryland, who, I

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know, has grown hazels for a long time, and done it very successfully; but I have not succeeded in getting any accurate information on the blight, and as I understand it, no accurate experiments have been carried out in the treatment of the blight, or in its prevention. It seems as if the blight, being an external fungous disease, ought to be one amenable to treatment by sprays. I am not aware of any experiments which have been made with that object.

President Morris: Henry Hicks of Westboro has given as much attention as anybody to this matter. He made a great effort to introduce the European hazels for years. They all went down with the blight. Specimens of the blight you can get without difficulty.

Doctor Deming: Did he practice spraying experiments carefully?

President Morris: He told me he had tried all. What have the Meehans done?

Mr. Wilcox: They have never had any trouble with the blight.

President Morris: How long do they keep them in the nurseries?

Mr. Wilcox: We keep them to six or eight feet.

President Morris: Do you have the common hazel abundant?

Mr. Wilcox: Yes, along the water courses.

President Morris: This blight is more apt to attack the exotics, and over where Mr. Kerr lives there are no native hazels. He happens to be on an island. He started Europeans where we have no American hazels, so that accounts for his immunity.

Mr. Reed: His trees are practically all dead now. He has given up.

President Morris: That has been the history everywhere. That is the last instance I have been able to find of successful raising of hazels. One line, it seems to me, offers promise—that is the making of hybrids. I am making hybrids between the American hazel and various European and Asiatic.

Mr. Rush: I have had some experience with the hazel. I have exchanged with Mr. Roody of Washington. He has sent the Barcelona and Du Chilly, and they are growing very hardy without the least indication of blight. There are two kinds of American hazels. I have them growing as large in the bush as twenty to twenty-five feet. And then we have a small bush. The small type is worthy of propagation. The Barcelona and Du Chilly are thickly set with catkins this fall, and by all indications there will be a very nice crop next summer.

President Morris: The rule is they begin to blight about the fifth year. About the eighth they are gone.

Doctor Deming: Isn't that a most promising field for experiment, in producing blight-free varieties, and also in spraying?

President Morris: As I understand it, this fungus lives in the cambium layer of the bark, very much as *Diaporthe parasitica* does, and at such a depth that spraying is not much advantage. The fungus does not attack the native hazel, except when it has been injured.

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Professor Craig: We haven't heard from Mr. Barron.

Mr. Barron: I don't know that I have anything to say. I came here to gather some information. I am chiefly interested in the possibility of the use of nut trees for landscape effect.

President Morris: This belongs right with this paper, because the uses of nut trees are not limited to the nuts for fruit purposes. Their decorative value is one Mr. Barron brings in very properly, and it seems to me we may replace thousands of practically useless trees in the parks with wonderfully beautiful nut trees. What had you in mind particularly? Had you thought it out?

Mr. Pomeroy: The nurserymen must have done something to induce people to set out horse-chestnuts. There can't be anything more unsightly. It is always shedding something in the way of filth. There are two or three varieties of Japanese walnuts that are beautiful, at the time of year when they are in blossom, with that long, red blossom. It seems as if the nurserymen might do something to induce people to set out these.

President Morris: What could be finer than your English walnuts?

Mr. Barron: Mr. Hicks has given up hazel, but right close by Mr. Havemeyer is starting right in again. He has had them there for two years.

Doctor Deming: One of my correspondents wrote, asking me what varieties of nut trees were most rapid growing and best for shade or screens. I think that is a very good subject for investigation.

President Morris: We can discuss it right here.

Doctor Deming: I said the most rapid growing trees were the Japanese walnuts, and perhaps the best for screens were the Japanese chestnuts. I should hardly know what to say are the best for shade, because all of the nut trees are so good.

Mr. Reed: It would depend very largely on the locality. Of course, there are some of us here who are disciples of the pecan, and where you can grow the pecan successfully, it is doubtful if there is a prettier shade tree and one that makes less litter, or that grows faster. Some of the hickories—the mocker-nut especially, *Hicoria alba*, makes a very beautiful growth, and has a dense foliage of rich, dark green. For other purposes, there is no prettier tree than the chestnut, aside from the blight. It grows to greater size than most of the hickories and more rapidly. The Japanese chestnuts I am not familiar with. The butternut is not usually a compact enough grower to be a beautiful tree, but the black walnuts and certain of our hickories, the rapid growing hickories, are very fine, and this Rush chinquapin, I expect, would be very fitting for hedge planting. It is a very compact grower, and grows up about fifteen or twenty feet, making a very pretty tree. But every one of these trees we are mentioning has its particular place in the landscape. You can't use any one of them in all places.

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President Morris: The objection to black walnut and butternut is the early loss of leaves in autumn. I have heard others speak about it as an objection. Among the rapid growing ones, there is no doubt the Japanese walnuts are tremendously rapid growers, during the first few years. For screen purposes, the chestnuts and chinquapin certainly would do remarkably well. We have forgotten the beech altogether, simply because we haven't been classifying it as a nut tree. But the nurserymen can put out beech trees grafted from trees that bear fine, valuable nuts, and give us the beech as a tree of double value.

Mr. Reed: Dr. Deming raised the question as to why the hazel nut was not given more attention. It occurs to me that we have an analogy in the pecan situation. The pecan is native up and down the Mississippi River and out in Texas, and in that district you will find that a great deal less attention has been paid to development of varieties of the pecan as an orchard tree than farther east. All through Mississippi, Alabama, Georgia, and Florida, we find new varieties by the scores. It seems to be a case of distance lending enchantment.

Professor Lake: Going back, I wanted to ask you, Doctor Morris, if in your work of reproducing the hazel, you had used the Pacific Coast hazel for stock.

President Morris: Yes, the Pacific Coast hazel is really the same species as ours, only it grows thirty or forty feet out there, and I have seen it nearly thirty feet high up in the Hudson Bay country. In some of the rich valleys in the far North, both on the Pacific and Atlantic Coasts, the hazel becomes almost a tree. I have used it for grafting stock, but I haven't used it for crossing as yet. I have a lot of hazels ready for pollenizing next spring.

Professor Lake: It seems to me it would be a most excellent thing if this Association could do something in the way of stimulating the improvement of varieties of the native hazel. I can't help thinking that bush is entitled to much more attention than we have given it in the past.

President Morris: Some work has been done along that line. I devoted the entire nut-collecting part of one year to studying the hazel. I went over many thousands of hazels. One day, when I asked a neighbor if I might go over his grounds, he said, "Yes, but what better hazel do you want than that one that grows above your north bars?" He said, "We have known of that for one hundred years about here." He couldn't find it. Finally it was found, covered by a ton of grape vine. It has wonderful hazels on it. I have transplanted it. It is a large, thin-shelled, fine hazel, but a shy bearer. I have three very fine American hazels I am going to use in crossing. This big, thin-shelled one is a wonderful hazel, except that it is a shy bearer, and it is difficult to transplant. I have transplanted four American hazels, and it took me about two or three years to get them under way. It is a nuisance with us. It grows in our pastures so rapidly the cows have to get out of the way—crowds everything out. I have no doubt a great deal more work will be done with the hazel. Now my bushes are all ready for pollenizing. I have crossed a lot of them this year.

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Professor Craig: I think Mr. Barron's point in reference to the ornamental or esthetic value of the nut trees is very well taken, indeed. It is a fact that nurserymen have paid more attention in the past to those forms which are particularly striking in some way, rather than to the forms which are actually and intrinsically beautiful. Anything which has variegated leaves or purple leaves is sure to catch the eye. As a matter of fact, I believe there are few trees which are more picturesque than the hickories here in New York. The summer season is not the season in which they carry their most beautiful forms. The winter is the time when we see that picturesque framework standing out against the sky, distinctive in every respect.

Mr. Collins: Isn't this subject one in which the Association might interest itself?

President Morris: I have found that nurserymen to whom I have talked for the most part were men of naturally esthetic taste, but dropped their esthetic taste in order to adjust themselves to economic principles. If a customer says, "Please give me a thousand Carolina poplars," the nurseryman knows these will be beautiful for about fifteen years, then ragged and dead and unsightly; but the customer wants them, and the nurseryman has to furnish Carolina poplars.

Mr. Barron: The nurseryman, as a rule, doesn't take much trouble towards educating the people up to the better stuff.

President Morris: I believe that if the nurserymen make a concerted movement—or not necessarily a concerted movement—if any one firm or two or three firms will make a business of introducing beautiful, useful trees of the nut-bearing group, they will open up a new group. People just haven't thought about it. They give an order for trees in a sort of perfunctory way, because they must have them.

If there is no further discussion, we will go on to the Indiana pecan, by Mr. T. P. Littlepage, and this will be the last paper of the afternoon.

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THE INDIANA PECAN.

T. P. LITTLEPAGE, Washington, D. C.

The subject of the northern pecan is one that I have been interested in for more than thirty years. Away down in Spencer County, Indiana, on the banks of the Ohio River, stand many large native pecan trees, and some of my earliest recollections and most pleasant experiences are connected with gathering the nuts from under these large trees; and, without realizing it, I acquired much of the information in those early days that has of late enabled me to carefully discriminate between the desirable and undesirable varieties of pecans, viewed from the standpoint of one who propagates them for orchard purposes. My interest in the various points connected with pecan growing was at that time a very direct interest, and the only motive I had for determining various facts was the fundamental motive which largely dominates the world today, and that is the question of securing the thing we desire for our immediate use.

The large, magnificent pecan trees growing on the banks of the beautiful Ohio year after year became a matter of the deepest interest to me. I have seen the Ohio surging swiftly through their branches in the winter, have seen them withstand the storms and vicissitudes of snow and ice and raging floods; and as the spring came on I have beheld them, with more or less surprise and pleasure, laden with blossoms. As summer advanced, I watched the growing clusters of delicious nuts; and as the nuts began to ripen in the fall, I soon learned to pick out the best bearing trees. It was not a matter of science or unselfish research that enabled me to determine the fact that some trees rarely ever missed a crop, while others were very uncertain; that some nuts were large, thin-shelled, and of fine flavor, while others were small and hard to crack, and otherwise undesirable; that some of the trees ripened their nuts early, long before frost, while others seemed to hang on and resent the coming of autumn with all their might. At the age of nine, I could take many different varieties of Indiana seedling pecans, separate them, and locate the trees from whence they came, and give the essential points of their bearing record. I could also tell whether the respective owners watched them very carefully, kept a dog, or lived at a safe distance away, all of which points were just as essential so far as I was concerned as the size of the nut and its quality. The pecan captured me early in life, and I have been a willing victim ever since. My interest in this nut of late years is based on more scientific principles, but I doubt if the facts arrived at are any more reliable than the facts which came from the simple desire to appease a boyish appetite with the best nut that nature has ever produced.

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When I was about fourteen years old I came into personal possession of twelve acres of land which had descended to me from my father's estate. The land was almost valueless for general cropping purposes, but I had already, at that age, determined something of the value of a pecan orchard, and I proceeded to gather nuts from the best trees in that section, and the following spring planted the whole twelve acres in pecans. I knew, however, that even though the ground was not very productive it would have to be cultivated that summer, so I planted the pecans around stumps where the young trees would be protected. My information as to the value of pecans was accurate and unerring; however, there were several things I had not taken into consideration. First, that a pecan that is kept in the dry all winter is very slow to germinate in the spring, and in fact the percentage of them that does germinate is very small. Second, that the field mice have an abiding hunger for pecans. Third, that

the pecan does not come true to seed, and that an orchard of seedlings is of very questionable value. The first two facts, which I failed to take into consideration—that is, the poor germinating qualities of a dry pecan, and the appetite of the field mice, relieved me from the embarrassment of the third, for it is needless to say that this attempt made twenty-five years ago was a complete failure, and for the time being discouraged my ambitions in this direction. But after many years they revived sufficiently to stimulate me to action again in the line of pecan culture.

I mention the above facts merely to show my credibility as a witness on this subject. Being a lawyer by profession, I have learned long since that the value of one's opinion, and especially the value of testimony is directly in proportion to one's knowledge of and interest in the subject matter at issue. Therefore, trusting that I have sufficiently established my credibility, at least to my own satisfaction, I shall proceed to make some observations relative to nut culture in the North.

First, let me say that I most heartily endorse the line of work undertaken by our Association—that is, the work of collecting and diffusing information in reference to nut culture that will be valuable to the prospective grower. Our southern brethren have very largely passed this stage in nut work in the South. They still have many problems before them, but the fundamental problems of the determination and propagation of the most desirable varieties of pecans have been already worked out and they are producing in their nurseries hundreds of thousands of fine budded and grafted pecan trees. There is such a lack of information on this subject in the North that it is indeed opportune that our Association should at the beginning of the interest in nut culture in that section take up these various question and give the public the benefit of our experience and information in reference to them. There are yet many people who think that you cannot transplant a pecan tree, and that if you cut the tap root it will not produce, while the fact is that the pecan tree can be transplanted with almost as much success as can fruit trees. Two years ago I transplanted a number of cherry trees. At the same time I transplanted some pecan trees, and I had a higher percentage of loss among the cherries than among the pecans. There are some who believe that it is even a benefit to cut the tap root. I have never belonged to the school which endorses cutting the roots of any tree to accelerate its growth, except, of course, where it is necessary to take up a tree and reset it, in which case it is necessary to cut some of the roots. It is unquestionably true that if the roots are cut too severely the tree receives too great a shock, but the pecan tree seems to recover as quickly as any other variety of tree. However, there are hundreds of farmers today who would not undertake to raise pecans, for the reason that they think they cannot be transplanted. Also, in every community where the pecan is native, can be seen many seedling trees ranging anywhere from ten-to twenty-five years old that have never borne a nut. These trees are pointed out by the general public as horrible examples of the uselessness of attempted pecan culture. Near my home at Boonville, Ind., is a row of seedling pecan trees planted in a garden. The trees are now old enough to bear a half bushel of pecans every year, but so far as I know they have never borne a nut. The general public throughout the North and Middle West have not yet learned that the average seedling pecan is an uncertain quantity, grows slowly, bears irregularly, if at all, and probably inferior nuts. However, once in a while, nature, through her wonderful workings, has produced a tree that bears large crops of fine nuts regularly, and when the seedling pecan is grafted or budded from this kind of tree the trees so propagated take on the qualities of the parent and begin bearing very early. I have frequently taken pictures of small pecan trees not over three feet high, each bearing a cluster of large, fine nuts. This, of course, is unusual, but shows the tendency of the grafted or budded tree. I mention the above two points not for the purpose at this point of entering into a discussion of the propagation of the pecan, but to show the necessity for general enlightenment on the possibilities, and to dispel some of the bug-a-boos that exist in the minds of many persons. Those of you here who have engaged in the various phases of nut culture may think these points primitive and unnecessary, and they are, perhaps, unnecessary to the expert, but it is my pleasure every summer to spend considerable time in the rural sections of the country, and it is surprising how very little is known, even by our most enlightened farmers, on the subject of nut culture. I have made many trips throughout the South, and I find the farmers in that section have read the various proceedings of the National Nut Growers' Association until a knowledge of nut culture throughout the South is becoming very general. It is, therefore, the duty and the province of the Northern Nut Growers' Association to diffuse as much information as possible among the farmers of the North and Middle West on this subject.

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This is important for many reasons. At a recent meeting of the National Nut Growers' Association held at Mobile, Ala., in discussing the subject of the Extension of the Pecan Area, I used the following language:

"In my opinion nothing is more important to the permanency of the pecan industry than the development of the pecan area in different parts of the country, and having orchards cultivated under as many different conditions as are consistent with the known probable successful area. This is important, for the reason that this more than

anything else will insure a supply of pecans each year, and this will develop a public dependency upon this most valuable nut. Nothing can be more detrimental to any industry than a spasmodic and irregular supply of the product upon which that industry depends."

I quote this language for the reason that the culture of the pecan in the North is just now in its infancy, and it is peculiarly the function of our organization to get before the public the essential facts upon which its success depends. We are under great obligation for the work that has been done in the South and the information that is made available through the National Nut Growers' Association. Much of this is valuable in the North, but there are a great many of the essential points that have yet to be worked out, as the climatic conditions make it impossible to follow exactly in all cases the line of work that has been done in the South.

The fake promoter and the crooked nurseryman will no doubt come in for their inning in the North, as they have in the South, and the public will be imposed upon by inferior and "doctored" trees, and all sorts of get-rich-quick orchard schemes will no doubt make their advent throughout the North; but it is very probably that our Association, through its proper committee, having in mind the experiences of the South, can keep closely in touch with the general work that is going on and have on hand sufficient information to protect those who will take the trouble to make inquiry. Nothing in the horticultural line is more satisfactory, more beautiful or more valuable than a fine young grove of grafted or budded pecan trees of good varieties; but like all other good things, it will attract the counterfeiter.

Coming now more specifically to the subject which has been assigned to me by the committee—that is, "The Indiana Pecan and My Experience in Nut Culture," I want to explain what is meant by the "Indiana pecan." It is true, of course, that some of the very finest of the northern pecans have originated in Indiana, yet I prefer to speak of pecans in that whole section of the country as belonging to the "Indiana group." Taking Evansville, Ind., as the center, there grow, within a radius of fifty miles, in Indiana, Illinois and Kentucky, many thousands of wild pecan trees; and after an investigation extending through a number of years, there have been selected from these various wild groves a few trees from which it has been deemed desirable to propagate. In this connection I want to mention the valuable work that has been done along this line by Mason J. Niblack, of Vincennes, Ind.; Prof. C. G. Woodbury, of Lafayette, Ind.; R. L. McCoy, of Lake, Ind.; and J. F. Wilkinson, of Rockport, Ind. These men, with the assistance of others throughout the State, have for several years been making investigations of these pecans with a view of determining the most desirable varieties from which to propagate. It has been my privilege to have the benefit of the information gathered by these gentlemen, which, added to my own experience, has given me a fairly comprehensive view of the desirable nuts in that section, and, as the geographical center of the present known desirable varieties seems to be about Evansville, Ind., I will, for matter of convenience, designate them as belonging to the "Indiana Group."

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We have been able to determine with some certainty the desirability of six or seven varieties of pecans for propagating purposes. We have a number of others under observation. In investigating a pecan for propagating purposes, it is necessary to examine it from two standpoints, first, the tree qualities, and second, the qualities of the nut itself.

The tree must be of a thrifty nature, a rapid grower, not especially subject to any particular diseases, must bear regularly, and the crops must be of a good average as to quantity. When observing a great number of pecan trees, it soon becomes apparent that some varieties grow much faster than others. This is first noticed in the nursery rows, and it is highly desirable to select not only those varieties which grow fast, but even the best growing trees of any particular variety. Most of the trees from which propagating is done are generally full grown, and it is sometimes difficult to tell from observing them in the woods what their growing qualities are, yet it is occasionally apparent from observing a tree that it is thrifty and strong, while another tree may look entirely different. The growing quality, however, does not usually become apparent until after they are propagated and put under proper conditions of cultivation.

The bearing record of a tree can be determined only by observing the tree for a number of years and measuring its crops. There are many trees that are almost infallible producers, but some years the crop is lighter than others, although it is not probable that an orchard, even from one of these unusual bearers, can be obtained which will not occasionally miss a crop.

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The influence of the stock upon the scion is something that has not yet been fully worked out, and for that reason it is impossible to say why the grafted or budded tree does not always take on the bearing qualities of the parent, although it is pretty safe to say that as a rule its qualities are very closely approximated, and by careful selection it is possible to get grafted and budded trees that begin bearing very early and bear with a great degree of regularity.

In visiting a tree while the nuts are green, one can get some idea as to its bearing quality by the number and size of the clusters hanging on the limbs. A tree that is a poor bearer, or bears only a fair crop, usually bears its nuts in clusters of one to three, while a good bearer produces clusters of from three to six. I have seen as many as eight nuts in a cluster in the South, and have seen some clusters of seven on some of our Indiana trees, but as a rule good bearing trees of the Indiana group have clusters of about four to five nuts each.

After the tree qualities have been determined, it is then necessary to consider the nut itself. The nut must be of fair size, of good flavor, thin to medium thickness of shell, well filled, and of good cracking quality—that is, the conformation of the shell and kernel must be such that a large percentage of the kernels can be taken out as whole halves, and the convolutions of the kernels must be wide enough that the partitions do not adhere to them. When all of these qualities, both of the tree and nut, can be combined, we then have a desirable tree from which to propagate, and it is very surprising how few come up to the standard. In one wild grove in Kentucky, on the banks of the Ohio River just across from Indiana, near the mouth of the Green River, there are nearly 300 acres of wild pecan trees. In this grove are perhaps more than a thousand trees, and so far as I have been able to determine up to date, there are but three trees out of the whole grove that come near my notion of the standard.

Sometimes, however, a tree or a nut may grade up so high on some one point as to make it a desirable variety from which to propagate, even though it does not grade high on other desirable points. For example, one of the most desirable southern pecans, perhaps, considering only the nut itself, is the "Schley," yet the tree is reputed to be of very medium bearing quality. The nut is so very fine, however, that no southern grove of pecans is complete without a fair percentage of "Schley" trees. On the other hand, the "Stuart," another southern variety, has not ranked nearly so high as the "Schley," considering only the nut; and yet there are probably twice as many "Stuarts" being put out in the South today as any other variety, for the simple reason that it is a good-sized nut and the tree has a very fine bearing record. All these things have to be taken into consideration by those of us who are undertaking to propagate northern varieties.

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There is unquestionably a large area of country extending approximately from the latitude of Atlanta, Ga., to that of Terre Haute, Ind., in which there is a great field for experimenting with the northern varieties of pecans. It is a great mistake to undertake to bring the southern varieties too far north. A majority of the finest of the southern varieties originated on the Gulf Coast, and it is true that they can be brought a considerable distance north of there, but I have always doubted their successful growth with any degree of certainty of crops north of Atlanta, Ga.; for I think it is pretty well conceded that if one undertakes to crowd the northern limits with the southern varieties of pecans, they become uncertain in their bearing habits and the pecans are much smaller and not as well filled. On the other hand, it is my opinion that the northern pecan can be taken south of its origin with complete safety. The longer growing season will probably add to the certainty of the crops and the size of the nuts. It is also very important for the grower of these northern varieties of pecans to recognize the fact that they cannot be taken too far north of the location of the parent tree. The limits, however, both of the northern and southern varieties are not arbitrary, as they depend very much upon proximity to the ocean and other moderating influences. For example, it is very probable that pecans can be cultivated much farther north close to either the Atlantic or Pacific Coast than they can in the Middle West. All of these things remain yet to be determined, but it is important to distinguish between the setting of orchards for commercial purposes and the setting of trees for purely experimental purposes.

There is unquestionably a great section of the country comprising approximately, as I have said, the territory lying between the latitude of Atlanta, Ga., and Terre Haute, Ind., in which pecans can be commercially produced successfully. In the near future I expect to see pecan orchards of these northern varieties producing fine nuts and bearing as regularly in the northern sections as they do in the South. The prospective orchardist, however, must look well to the varieties which he selects and the latitude of the parent tree from whence they come and the geographical conditions that influence the weather.

I have referred to Evansville, Ind., as being about the center of the Indiana Group. The average fall frost period at Evansville is about the 20th of October. The average period of the last spring frost is about April the 9th. This will serve somewhat as a guide to the prospective commercial orchardist. However, most of the trees of the Indiana Group do not pollenate until about the 10th of May, and the great majority of them ripen their nuts by the 15th of October, and several of the good trees ripen their nuts by the 1st of October, though they usually are not gathered till later.

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The northernmost tree, so far as I know, that has been deemed worthy of observation is the "Hodge," which is native in Illinois, about eighty-five miles north of Evansville, Ind., and a few miles southwest of Terre Haute, Ind. It is one of the largest of the northern varieties, and is a fair nut, but does not grade high in filling qualities, and

the bearing record of the parent tree has not yet been determined. The tree is crooked and very unprepossessing looking, and stands in the woods where it has a very poor chance. When I visited it this year, it had a very light crop of nuts, but I did not condemn it, for the reason that any tree growing under the same conditions could not be expected to bear very well. I expect to observe the tree for several years in the future, and determine further as to its bearing record. It is possible that trees propagated from this variety, under favorable conditions, may prove to be good bearers.

The next northernmost trees of the desirable varieties are the "Indiana" and "Busseron," standing about 100 yards apart, west of Oaktown, Knox County, Indiana, about sixty-five miles north of Evansville. Mr. Mason J. Niblack, of Vincennes, Ind., has had these trees under observation for a number of years, and it is due to his interest that they were brought to the attention of the public. The "Busseron" is an old tree that is reputed to have a very fine bearing record. A few years ago, the owner of this tree cut all the top out of it, and this crippled the tree very badly and set it back for quite a while. When I visited it last August, it had put up new growth, and the few remaining old limbs that had been left on it were hanging full of clusters containing four and five nuts each. "The Indiana," standing a short distance away, is a comparatively young tree, and is thought to be a seedling of the "Busseron," as the two nuts resemble one another very much. The "Indiana" has been cut very severely for grafting wood the last few years, and it is therefore difficult to give very authentic information as to its bearing record. It appears, however, to be a very promising tree, and when I visited it in August it had a fair crop of nuts. The clusters were not large—mostly two and three each. The tree looked very thrifty, and from the best information that I have been able to gather in reference to it, I consider it a desirable variety from which to propagate. My choice of the two trees is the "Busseron," although the "Indiana" has made an excellent showing, considering the severe prunings for grafting wood.

Coming down near the center of the Indiana Group, we have the "Warrick," growing in Warrick County, Indiana, which took the prize at the pecan show at Mt. Vernon, Ind., in 1909, and is a fair nut of more than average size. It is reputed to have a good bearing record, but I have not yet had opportunity to completely verify this.

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In Posey County, Ind., near Evansville, are hundreds of wild pecan trees, many of which produce good nuts. One of them, from which I propagated last year under the name of the "Hoosier," is a very prolific tree. The nut itself is of medium size, beautiful color and thin shell, but the kernel qualities are not nearly so desirable as many of the other of our Indiana pecans, and it does not take a very high rank in the estimation of some of our observers. I visited the tree in August, 1910, and at that time it had one of the most bountiful crops of nuts that I had ever seen growing on a tree. It was hanging full of clusters containing five and six nuts each. I visited it again an October and found that the nuts had ripened very early. This nut took the prize at the Mt. Vernon pecan show in 1910.

Crossing the river from Indiana, we have in the Major woods at the mouth of Green River, nine miles from Evansville, three desirable pecans—the "Greenriver," the "Major," and the "Hinton." The "Major" and the "Hinton" have been propagated by Mr. William N. Roper, at Petersburg, Va., for some time. They are round, well filled nuts, and are considered by confectioners as the most desirable type of pecan for many of the confectionery purposes. The "Major" is the best cracking pecan that I have ever seen, either North or South, and is a regular bearer, but not as high in flavor as some other varieties. The "Hinton" is an oval-shaped nut, having a corrugated shell, of fine cracking and kernel qualities, but I have not yet satisfactorily determined its bearing record.

The "Greenriver" is a little larger than either of the above nuts, and is one of the very finest medium-sized pecans that I have found. The tree is reported not to have missed a crop in eleven years, although the crop this year was very light, probably owing to the fact that it was cut pretty severely last year for grafting wood. All three of these varieties coming from the Major woods at the mouth of Green River give excellent promise, with perhaps the "Greenriver" in the lead for general qualities.

Down on the banks of the Wabash in Posey County, Indiana, and across on the Illinois side, are several very fine, large, beautiful varieties of pecans, which Mr. R. L. McCoy, of Lake, Ind., and myself are observing. Several of these pecans are as large as many of the standard southern varieties, and when I visited the trees this year in August, they were bearing good crops of nuts. We have not yet named these varieties, but expect to do so after we have observed them the coming year. There are one or two varieties in this neighborhood that may take rank over all the northern pecans that have been discovered. It is no longer a question of finding nuts in the North of good size, for we have already located some that rank well with many of the standard southern varieties in size, and one of the surprising and favorable points of the northern pecan is their fine filling qualities and high flavor. When placed on the scales their weight is most surprising to those who have not tested them.

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The problem before the prospective pecan grower in the North is to secure good trees of these most desirable varieties. Seedling trees are not worth setting out. Until last year the successful propagation of pecans in the North was doubted by many, but the experiments conducted by myself and Mr. R. L. McCoy, at Lake, Ind., who worked in conjunction with me, have demonstrated that they can be successfully propagated. A number of points, however, must be carefully observed in this work.

First, in reference to grafting: The grafting should be done on northern two-year-old stocks. One-year-old stocks can be used, but two-year-olds are thought to be better. The stocks must be grown from northern seedlings. There is no place in the North for the southern stock, and right here let me suggest that the individual who buys northern trees grafted on southern stocks or southern trees grafted on northern stocks is throwing his money away. I set fifty trees last fall of the "Indiana" grafted on southern stocks, and the first freeze that came promptly killed them all. They put up a few new sprouts last summer, but finally the roots rotted, and this fall I dug them up. I have a neighbor who put out an orchard of southern grown trees. Some of them seemed to grow all right for six or seven years, and then froze down to the ground, and so far as I have been able to find out, experiments with southern trees in the North have been practically a waste of time and money. So it is necessary to bear in mind that these northern varieties must be grafted or budded on trees grown from northern seed.

The proper time for grafting in the Evansville latitude is the last week in March and the first week in April. The scions must be cut from thrifty growing trees and must be used immediately after they are cut. Experience has shown that scions kept in cold storage or stratified in sand for any length of time lose a very large part of their vitality, and success with them is very limited in that section. Last year I cut most of my scions in November and December, stratified them in sand until spring, and my percentage of success with them was very small, while on the other hand Mr. McCoy used scions directly off the tree and had a satisfactory stand. I am of the opinion that it will be proven later that the best method of grafting in the North is to graft above the ground and tie paper bags over the scions for two or three weeks until they start into growth. Our experiments so far have been confined to root-grafting, and while it has proven fairly successful under proper conditions, yet I believe that grafting above the ground will prove more successful. We have not done much budding in our section, but what we have done gives fair promise of success, and it may be that this will prove to be the best method of propagating nut trees in the North. In grafting we use both one and two-year-old wood, but one-year-old wood, if it is thrifty, is more desirable, although it is better to use thrifty two-year-old wood than to use weak scions of one year's growth. Either one or two-year-old growth can be used successfully.

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My experiments and adventures in the work of propagating pecan trees were made for the purpose of securing enough of the desirable varieties of these trees to put out an orchard for myself. I found, upon inquiry, that it was impossible to buy hardy northern trees, and furthermore that but few of the desirable varieties had been propagated. In fact, I knew that some of the best ones had never been brought to the attention of the nurserymen, and being more anxious to risk my own judgment on this than that of anyone else, I started in to produce my own trees. Up to date I have accumulated a vast amount of experience and have a few trees to show for my work, but I would not take many times the cost and trouble of my work, for the information I have acquired. I have also sent to some of my friends bud-wood from our best trees for the purpose of getting these varieties propagated for the benefit of those who desire to grow them. My suggestion is that unless one is looking for the experience and enjoys a great deal of hard work and some expense, he had better buy his trees from some reliable person who has successfully propagated them.

If the farmers in the latitude of the good varieties of pecans were to put out ten to twenty acres on some corner of their farm and cultivate the trees properly, they would soon be surprised to find that this small piece of ground would be worth more money than all the rest of their farm, and they would leave not only a valuable estate to their children, but also a monument by which they would be remembered for more than a hundred years after they had passed from the toils of this earth. Ten acres of pecan trees can be cultivated at less expense annually than ten acres of corn, and if the grove consists of the right varieties and has been properly cultivated, it will be worth not less than \$500 per acre in ten years. In fact, I do not know of a single grove of pecan trees in the United States—and I have seen many—of the right varieties that has been properly cultivated that can be bought for \$500 per acre at ten years of age, yet the principal reason that this very thing has not been done by the farmers throughout the pecan belt is because they have not had sufficient information on the subject and have had no means of acquiring it.

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I do not want to close this long paper without saying something about walnuts and hickory nuts in Indiana. While it is true that the pecan is unquestionably the most attractive and valuable nut that grows in the world, yet there is much profit and satisfaction in the culture of walnuts and hickories. In southern Indiana we have

some very fine varieties of the shagbark, and I am making some experiments in propagating it. One of the advantages of this nut is that it will grow far into the north. In fact, I have had some specimens of very beautiful shagbarks sent me by Dr. D. S. Sager, from Ontario, Canada. The shagbark is a slower growing tree than the pecan, but when properly cultivated shows a very satisfactory growth.

I am also experimenting with the propagation of the Persian (English) walnut, and so far have had very satisfactory results. I am trying some of the California varieties—the "Franquette" and "Parisienne" especially—and last spring I grafted a number of them on the wild seedling black walnut and they grew as much as four feet in height during the summer. There are several very fine varieties of the Persian walnut that are hardy throughout our latitude, and when grafted on the native black walnut stocks, make very satisfactory growth. I have had several Persian walnut trees under observation in Washington, close to where I live, and have found that some of these trees bear good crops of very fine walnuts. I cannot make this paper long enough to go into the details of this subject as it has been discussed here by others who know more about it than I. I merely desire to mention the fact that so far as our experiments have gone in Indiana up to date with the Persian walnut, everything seems to indicate that it can be very successfully propagated and grown there, provided the right varieties are selected; but with this, as with all other nut trees, the prospective orchardist must make very careful selection of the varieties which he plants.

In closing, I want to add just a few words more as to the value and beauty of nut trees. It is very hard to overstate either if the trees are properly cared for. A friend of mine recently asked me how early a pecan tree would bear, and how big it would grow within a certain time. I told him that it depended altogether upon who owned the tree. Nothing adds so much to the value of a home or to a farm as beautiful trees, and nothing indicates more the intelligence and taste of the person who owns a home or farm than the character of the trees surrounding it. In taking a trip through the country, it is very painful to notice how little attention has been given to trees, and I take it that this is due to the lack of information on this subject. A house can be built in a very short time. It can be furnished beautifully if one has taste and money. The science of mechanics can do much toward making an attractive place in which to dwell, but after all, the home that is remembered and admired, both by its occupants and by others, is the home surrounded by beautiful trees that bring forth their leaves and blossoms and fruit to please the eye and the taste and temper the heat of summer. These cannot be bought with mere money nor made in a day, but when placed there with care and intelligence come forth with surprising rapidity and beauty and not only add manifold value to the home and farm, but bespeak for some one a standard of intelligence and nobility that is better than great riches; for he who plants and cares for a tree is of the true, the beautiful and the good.

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President Morris: The paper is now open for discussion.

Professor Lake: I'd like to ask Mr. Littlepage a question. What is the condition of the wood of those large growths of walnuts?

Mr. Littlepage: When I observed it in November, it was ripening off very nicely. The average frost period for that latitude is about the twentieth of October, and we had had quite a number of very hard frosts,—in fact, there had been some ice. It had not been injured.

Professor Lake: That is remarkable.

Mr. Littlepage: I have pictures here of those, taken the twentieth of June. There was perhaps three feet of growth at that time. They quit growing about the middle of August down there, and to that I attribute very largely the fact that the wood ripened up.

Professor Craig: What is your minimum temperature?

Mr. Littlepage: I have seen the thermometer ten degrees below zero. I have seen the Ohio River frozen over so thick that for a month at Rockport the wagons could go across the river on ice. In fact, a threshing machine was hauled over. I don't know how low the thermometer got. I imagine it went lower than ten degrees.

President Morris: I have seen it lower still on Persian walnuts and pecans. It is the early starting of sap in spring that hurts mine most.

Mr. Littlepage: The pecans differ from native hickory. The native hickories in that section opened their buds and began to show strong flow of sap long before the pecans gave any indication whatever. Some of the pecans there seem to be very slow about starting sap. Very few pollinate before the tenth of May.

President Morris: My trees had to stand twenty-eight degrees one night only, but

they have had to stand twenty sometimes, and frequently several degrees below.

Mr. Pomeroy: I want to ask if he thinks he will have any difficulty in transplanting those black walnuts seven or eight years old?

Mr. Littlepage: That suggests a very painful subject. I have had that very thing in mind. They stand six or seven feet apart. I have got to settle that very question some of these times.

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Mr. Pomeroy: I might suggest that you begin the fall before, and take a whole lot of time in digging around the trees, then leave them till nearly spring, then finish the transplanting before the ground has a chance to thaw entirely.

President Morris: I believe that is a good point, if you will do your cutting early, and let the callus form well during the winter. Let us hear more about that particular point.

Mr. Reed: In view of the fact that this Association is trying to rectify as many mistakes as it can, and the fact that it is looked upon as an establisher of precedents, I make the motion that all of our references to the nut just under discussion be to it as the Persian walnut, and not as the English walnut.

Mr. Pomeroy: I second that motion. (Carried.)

President Morris: Let us hear from Mr. Roper.

Mr. Roper: I don't think I know much about the Indiana pecan trees, except what we have been doing in Virginia with them. I have discussed some of the results in the paper on pecan trees for planting in the North.

President Morris: Committee appointments are as follows: Committee on Competition, Messrs. Reed, Littlepage, and myself, *ex-officio*. Committee on General Exhibits, Messrs. Barron and Roper. Committee on Resolutions, Messrs. Reed, Littlepage, and Schempp. Committee on Membership, Messrs. Deming, Lake, and Rush. Nominating Committee, Professor Craig and Col. Van Duzee.

Professor Lake: Does that complete all the committees?

President Morris: That is all on the list here.

Professor Lake: I would like to suggest one, because I think it will materially help the matter of bringing the nut subject before the people in an effective manner,—a committee on score card. That is at the basis of competitions, and when the nut grower gets acquainted with the score card, and knows that is going to be the basis of judging the competitions, he knows there is going to be something doing.

President Morris: That is a rather important point. I would like to have the matter discussed.

Professor Craig: I think the idea is an excellent one. There is no way in which we can analyze the qualities of fruit better than by having a systematic method of discussing its different characters. The score card does that,—separates each one and makes them stand for what they are worth. In order to unify methods of judging used by the different societies, a score card which this society might develop and recommend would be a very valuable thing as a guide for nut growers here in the Northeast. The National Nut Growers' Association has a score card for pecans, and a score card has been recommended by the Department of Agriculture. I am not sure that score cards have been provided for the Persian walnut and for the hickories, and our northern types. I think Mr. Lake's suggestion is entirely in order and well worthy of consideration.

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President Morris: It appeals to me at once. I think we would put Mr. Lake and Professor Craig on a score card committee.

Professor Craig: I think a score card can be presented, subject to revision, which will answer the present demand.

FRIDAY MORNING, DECEMBER 15, 1911.

President Morris: The meeting is called to order. The Secretary will read the proposed amendments to the constitution. I believe there is no provision in the by-laws for making such amendment. I don't know what the customary rule is in the matter. I presume we could submit it to a vote.

Doctor Deming: Under the heading "Committees," the following is proposed: "The

Association shall appoint standing committees of three members each to consider and report on the following topics at each annual meeting: first, on promising seedlings; second, on nomenclature; third, on hybrids; fourth, on membership; fifth, on press and publication."

Professor Craig: I move the adoption of this amendment to our constitution. (Seconded. Carried.)

Doctor Deming: Under the head of "Meetings," the amendment is as follows: "The Association shall hold an annual meeting, to be held at the time and place to be selected by the Executive Committee."

Professor Lake: Some way or another, I feel that I oppose that attitude. I believe a delegate will often go to a convention with the idea of presenting views upon holding it at some specific place. It seems to me we ought to give the annual meeting an opportunity to designate the place of meeting. Some people say they will pack a convention. If they are sufficiently enthusiastic to pack a convention they are entitled to have the meeting. I have heard an expression from one or two members that they would like to see it at a certain place. It is true they can present their views to the Executive Committee, but if the Executive Committee is not present at this place, it is necessary for them to make another trip, or appeal to them by correspondence. I would like to have that put in such a way that the annual meeting might select the place of meeting.

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President Morris: It is a matter for consideration. Is there any further discussion on this point?

Doctor Deming: It seems to me that the question of the selection of the meeting place is a matter for very deliberate consideration, and it isn't always that a question of this kind will get deliberate consideration in a meeting which acts very often without considering all sides of the question. It seems to me that, while it would be advisable to have the place of the next meeting discussed by the Association as a whole, the decision as to the place of meeting might very safely be left to the Executive Committee.

Mr. Littlepage: I think, as a general rule, it is pretty wise to give some latitude in these matters, for the reason that conditions may develop from time to time which make it desirable to have some flexibility as to the place of meeting. I think, especially with the able Executive Committee we now have, it could safely be left to the Executive Committee.

Professor Craig: Since Professor Lake has spoken, I have a good deal of sympathy with his attitude, and I am rather inclined to think it would be wise to modify that clause in such a way as to give the meeting the privilege, in case there was an overwhelming element in favor of a certain place, of selecting the next place for the convention; and I would suggest a modification of that clause to this effect, that the place of meeting shall be selected at the annual meeting, or by the Executive Committee subsequently thereto. That would give the membership an opportunity of having a word in it, and would open the door so that it could be considered at the annual meeting; but in the event of this not taking place then, it would fall to the Executive Committee to select the meeting place. I move that as an amendment to the proposed clause.

Professor Lake: I support Professor Craig's motion.

Professor Craig: If my seconder will approve, I will offer that as a substitute instead of an amendment.

Professor Lake: I accept it. (Carried.)

Doctor Deming: Under the head of "Officers," the following amendment is proposed: "There shall be a president, a vice-president, a secretary-treasurer, and an executive committee of five persons, of which latter the president, vice-president, and secretary shall be members, and a vice-president from each state represented in the membership of the Association."

Professor Lake: I move that the clause be accepted.

Mr. Rush: I second the motion. (Carried.)

Doctor Deming: Under the heading of "Election of Officers," this addition is proposed: "The President shall appoint a nominating committee of three persons at the annual meeting, whose duty it shall be to report to the meeting a list of officers for the ensuing year."

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Professor Lake: I don't want to be an objector. I simply want to file a protest against this method of election in an organization, on general principles. I am opposed to anything that looks like continuing an administration. This doesn't give an opportunity for election from the floor. It might be so amended, that an annual meeting may elect from the floor. I am thoroughly in sympathy with popular

government. I have seen a good deal of this, and I would like to get away from the sentiment of anything of that kind by allowing nominations from the floor.

Doctor Deming: How would it be if the nominating committee, instead of being appointed by the President, were appointed in some elective way by the meeting as a whole?

Professor Lake: I accept Doctor Deming's suggestion. That is a most excellent way of eliminating both sides of the controversy. I would like to put that definitely into form, that we have a committee of five,—that is sufficient for the present,—that a committee of five be elected at the annual meeting for the purpose of nominating officers for the subsequent year. I put that as a motion.

Mr. Rush: I second that motion. (Carried.)

President Morris: The committee for the nomination of new officers will consist of Professor Craig and Colonel Van Duzee. This other committee of five, as I understand it, is not to be appointed now.

Doctor Deming: The only thing that I have now is the proposition that we honor Mr. Henry Hales by electing him an honorary member of the Association. I would like to move that Mr. Henry Hales of Ridgewood, New Jersey, be elected an honorary member of this Association.

Mr. Littlepage: I second that motion. (Carried.)

President Morris: On the competition, the committee consisted of Mr. Reed, Mr. Littlepage, and myself. Mr. Littlepage has specimens in for competition, and I will appoint Mr. Roper in his place. The next order of business will be the paper on experiences in propagation, by Professor Close.

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THE BENCH ROOT-GRAFTING OF PERSIAN WALNUTS AND PECANS.

By C. P. CLOSE, U. S. DEPT. OF AGRICULTURE, WASHINGTON, D. C.

The results of my bench root-grafting of Persian walnuts and pecans at the Maryland Agricultural Experiment Station in 1911 were not as satisfactory as might be wished, partly owing, at least, to the unusually long and hot drought which was disastrous in many respects in this section of the country.

PURPOSE AND METHOD OF THE EXPERIMENT.

The purpose of this experimental work was to devise some method of procedure in the bench grafting of nut trees which would be reliable and practical, especially if done during January, February, and March. The whip or tongue method with variation in thinness of tongue to make closely fitting unions, was employed. For the Persian walnut cions, black walnut, butternut and Persian walnut roots were used, and for the pecan cions, hardy Indiana and ordinary southern pecan seedlings, whole root and piece root, were used. Part of the grafts were planted outdoors in nursery rows as soon as made and part were placed in soil or decayed sawdust in a cool greenhouse. This was for the purpose of determining whether or not it would prove advantageous to go to the extra expense and trouble of placing the grafts under greenhouse conditions until April or May. Ground beds were used and thus bottom heat was not applied.

PERSIAN WALNUTS.

There were 287 grafts of San Jose, Concord and Franquette Persian walnuts, made from February 15 to April 4, which were planted in nursery rows very soon after being made. Only 40 of these were alive in October, the best results being obtained with San Jose on black walnut stocks. Sixty-four walnut grafts were placed in decayed sawdust in the greenhouse in February and March and of these 22 were alive early in May when they were taken out.

PECANS.

The pecan grafts, set in nursery rows as soon as made, numbered 474 and consisted of the following varieties: Mantura, Appomattox, Frotscher, Moneymaker, Van Deman, Stuart, and Pabst. Only one of these, a Pabst on a piece root, lived during the season.

The grafts which were placed in the greenhouse gave pretty good results as shown

EARTH BED.

Jan. 14.	10 Moneymaker on Indiana stocks, not waxed.	8 alive in May.
	10 Moneymaker on Indiana stocks, waxed	4 alive in May.
Feb. 14.	10 Mantura on Indiana stocks, not waxed.	8 alive in May.
	15 Moneymaker on Indiana stocks, not waxed.	11 alive in May.
Mar. 8.	33 Stuart on Indiana stocks, not waxed.	20 alive in May.
	30 Stuart on Indiana piece roots, not waxed.	15 alive in May.
	—	—
Totals	108	66

DECAYED SAWDUST.

Feb. 14.	25 Mantura on Indiana stocks, not waxed.	6 alive in May.
Mar. 8.	12 Stuart on Indiana stocks, not waxed.	12 alive in May.
	23 Stuart on Indiana stocks, not waxed.	21 alive in May.
	—	—
Totals	60	39

These figures show that 61 per cent of those in the earth bed and 65 per cent of those in the decayed sawdust, were alive when they were taken up early in May. Some had made a growth of from two to eight inches and were fine little trees. Most of these transplanted grafts were set in nursery rows and nearly all succumbed to the extreme drought of the season.

CONCLUSIONS.

The season was so extremely dry that the practice of planting root grafts as soon as made did not prove successful. However, work done in other years indicated that in normal seasons this may be done with considerable success. Placing the grafts in a greenhouse either in earth or decayed sawdust gave encouraging results, but when transplanted in the nursery the grafts could not withstand the unusually dry and hot weather. The black walnut proved to be the best stock for the Persian walnut and two buds to the cion are required. Grafting wax should not be used if the union of cion and stock is to be covered with earth; this point was clearly proven in previous years.

[The foregoing paper, read by title, was the subject of a verbal report by Prof. Lake, who said further:]

Prof. Close performed considerable work in topgrafting and budding on three and four year old stocks. The top grafts were a failure. The buds survived, and were in good, strong condition October fifteenth. That was on Persian walnut and pecan, about half and half.

Mr. Pomeroy: Did he bud on black walnut stock?

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Professor Lake: Yes. It was a little higher than a man, and had been cut back to about three feet. The crown grafting was fairly successful, but would have been much more successful, had they used something to cover the grafts.

Mr. Pomeroy: How long should the paper sack be left?

Professor Lake: It would vary with the season and activity of the stock, ten days to two weeks.

President Morris: I wish you would try further experiments in rooting scions in warm sand in the hot-house. I believe that in some stage you can probably root those cuttings in moist sand in the hot-house, heated beneath; and if you can do that, it is going to settle the question very largely of hickory and walnut propagation. What do you think about that, Professor Craig?

Professor Craig: I am not very optimistic about the possibility of that. I find it very,

very difficult to get roots to develop from *Hicoria*. You can get the callus almost every time, but it is very difficult to secure the development of roots afterwards.

President Morris: How about getting callus by three months, we will say, in storage?

Professor Craig: We would have the same trouble. They would develop adventitious buds very poorly. Doctor Morris has sent us from time to time some samples, and we have been making experiments. I have used different methods and different propagators. We have one propagator, who has been most successful usually in striking difficult things, and he has absolutely failed in this one. I may say that our facilities for propagation are not ideal at the present time, but we shall have in a short time a good propagating house with properly regulated benches, as to bottom heat and overhead ventilation and all that; and we shall, of course, keep up the experiments.

President Morris: In my experiments, I grafted hickory scions on hickory roots, and the whole thing, root and scion, lived until the root sent out adventitious buds, yet in that case we did not get union between the top and the stock. How do you explain that, Professor Craig?

Professor Craig: I don't explain it.

President Morris: Are we likely to have success along that line by some modification of the plan?

Professor Craig: I couldn't say. You can keep the cuttings alive for three or four months.

President Morris: They were in damp rooms, exposed to light, right in the window.

Doctor Deming: Professor Coville has made some experiments in rooting hickory cuttings for me. Professor Coville is the one who has made such a success of blueberry culture. I sent him some cuttings, and he reports as follows:

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"Two experiments were tried with the hickory cuttings received from Dr. W. C. Deming on January 5, 1911. In one experiment some of the cuttings were placed in a glass cutting bed in live sphagnum covered with sand, the upper ends of the cuttings projecting from the sand. The atmosphere above the cutting bed was kept in a state of saturation by a covering of glass. The bed was kept shaded and was subjected to an ordinary living room temperature varying from about 55° to 70°, or occasionally a few degrees higher.

On January 11 the cambium ring at the lower end of the cuttings had begun to callus. On February 17 the upper bud on one of the cuttings began to push. Later some of the other cuttings began to swell preparatory to the development of new growth. All the cuttings, however, finally died. It appeared from their behavior that the temperatures to which they were subjected were too high for their best development.

In the other experiment the cuttings were placed in sand without sphagnum in a greenhouse at a temperature ordinarily of 50° to 65°, rising occasionally, however, on still, sunny days to 70°. After a few weeks, these cuttings were well callused and the buds began to swell slowly, exposing first their green bracts, and later on some of the cuttings the green compound leaves, pushing out from among the bracts. These cuttings also, however, finally turned black and died, but not until after the first of April.

The experiments showed that hickory cuttings, when taken at a suitable time of year and exposed to conditions suited to other hard wooded plants known to be difficult to root, retained their vitality and passed satisfactorily through the stages preliminary to rooting. While no actual roots were secured, the experiments suggest that the rooting of hickory cuttings is not beyond the possibility of attainment.

As the basis of an experiment this winter, I suggest that you select half a dozen twigs that you are willing to sacrifice on some good variety of hickory, and remove a ring of bark at a distance of 4 to 8 inches from the top. The ring of bark removed should be about half an inch in length and its upper end should come about a quarter of an inch below a bud. At the present season the bark will not peel from the wood. It will, therefore, be necessary to scrape it off, so as to leave nothing but the wood on the girdled area. The bark should be cleanly cut at each end of this area. I hope that we shall still have sufficient warm weather to induce the formation of a callus on the cambium at the upper end of this ring.

Later in the winter, some time in January, you can cut off these twigs and send them to me, packed as those were last year. The cutting is preferably made just below the ring. I would prefer that all the wood from the ring to the tip of the twig be of the past summer's growth. We can try, however, twigs containing two seasons' growth, if the others are not easily available."

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President Morris: That is a suggestion, you see, of apparent value, because it has succeeded with blueberries,—this method of cutting off a ring of bark before the

leaves are shed, allowing a ring to callous, then later cutting off this prepared twig and subjecting it to methods for striking roots. It is an extremely interesting suggestion. Just as soon as I heard of this procedure, I went out and prepared about fifty hickory and walnut twigs myself, but that was this autumn, and I haven't cut them yet for the experiments in rooting. Has anyone had experience along this line?

Mr. Collins: I saw an experiment in rooting, and I am prompted to ask if anything has been done along this particular line. The method employed was this. The twig was partially cut from the branch, perhaps cut three-quarters of the way through with a slanting cut. It was then bent a little, and a little sphagnum put in the cut, then a ball of sphagnum was wrapped about the whole cut area, and it was tied with twine, and that was kept wet for several months, I think, until, finally, new roots pushed through and appeared on the outside of this ball of sphagnum.

President Morris: I read of that. It was published in a government report.

Professor Collins: It was on the rubber plant.

President Morris: I tried it at that time on the hickory. The difficulty was in getting my men sufficiently interested to keep the sphagnum wet all the time. It promised something. The rubber plants, perhaps, would lend themselves more readily to such a procedure than the hickories, because most of the rubber plants are air plants, anyway. All of the *Ficus* family depend so little upon the ground for their nourishment.

Professor Collins: I have seen that worked very successfully.

Professor Lake: You don't know how successful the callousing has been?

President Morris: They calloused all right.

Professor Lake: How long did it require?

President Morris: I don't remember. It was a good while, longer than I anticipated. I don't think there was a callus on the hickory in less than thirty days. The butternut and black walnut hardly showed any callus at all after keeping the sphagnum wet as long as my men would do it.

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Professor Lake: At what time was the ringing done?

President Morris: The leaves had fallen this year. Professor Coville suggested that it be done before the leaves had fallen. But the hickory will callous after the leaves have fallen. It seems to me hickories are at work all winter long. They have a free flow of sap in January, and any warm day in January they will be like a maple tree, almost, if they are cut. I have grafted them at that time.

Mr. Brown: Can anyone give me any information on grafting chestnuts?

Mr. Rush: I have been very successful with the grafting of the chestnut. It is just as simple as grafting other fruit, except the Persian walnut. Tongue grafting and cleft grafting is very successful. There is no particular secret in connection with grafting chestnuts.

President Morris: Personally, I found it difficult for two or three years, but now I can graft the chestnut about as readily as I can graft the apple. There is no difference in methods. It seems to me from my present experience that one may graft or bud chestnut by almost any of the accepted methods pretty freely. What has been your experience, Mr. Littlepage?

Mr. Littlepage: I haven't been experimenting with the propagation of the chestnut yet. I am getting ready. I have three or four thousand seedlings, a few of which will be ready to graft next year. I have twenty acres of the Paragon chestnuts growing.

President Morris: In chestnut grafting, we will find that one kind does not graft or bud readily upon another kind, perhaps. For instance, there is some antagonism between the American sweet chestnut and Asiatic chestnuts. There is some antagonism between Asiatic and Europeans; there is little between Europeans and American sweet. These antagonisms are something that one has to learn from experience at the present time, because I doubt if we have had enough experience to know just where we stand on this question.

Professor Collins: Doesn't there seem to be antagonism between eastern Asiatic other than Japanese and Japanese?

President Morris: Yes; the Koreans of both kinds, the north Japanese of both kinds, and the Manchurian chestnut are the five that I have experimented with in grafting, and none of those grow so well on American stock as they should.

Professor Collins: I mean to say between the Korean and the Japanese.

President Morris: There is less antagonism. You can graft the Korean upon the Japanese and the Japanese upon the Korean very readily. They have very much the

Professor Collins: Is there any antagonism between eastern Asian and Japanese?

President Morris: I don't know that my experience has been extensive enough to say. My men have put on perhaps two or three hundred grafts back and forth between these kinds, the customary accidents have happened, and we have about given up trying to do much grafting of Japanese on American, but still plan to graft Japanese back and forth upon each other, and we are now planning to graft European and American back and forth upon each other.

Mr. Brown: What about the position of the graft?

President Morris: I don't know, Mr. Brown, if there is very much difference. I haven't found very much. I have grafted all the way from the root to the top.

Mr. Rush: It is better on top. Sometimes the grafting has an effect upon the stock just at the union. If it is budded low, it blights. The bark gets loose. All those that are grafted high are doing remarkably well.

President Morris: The next on the list is Doctor Deming's paper on "Nut Promotions."

Doctor Deming: I will read first a communication from Mr. Henry Hales of Ridgewood, New Jersey.

HALES' PAPER SHELL HICKORY.

My shagbark (paper shell) hickory tree was on my farm when I bought it in 1868. It had been noticed by the neighbors as bearing a fine nut and was watched by them for the nuts, but they did not appreciate the value of them. The late Andrew S. Fuller had not seen them, but asked me to bring him a few. When he saw them he was surprised and at once pronounced them the finest hickories he had ever seen, and named them "Hales' Paper Shell." The hickory is one of the most valuable of North American nuts. It is of a variable nature. I have over twenty old trees on my place, and no two bear nuts of the same shape or size, and although some neighbors planted some nuts from the old tree and produced fruit from them they were only ordinary sized, so that it is necessary to propagate them to retain their value. About 1880 Parsons & Son, of Flushing, N. Y., grafted some in pots under glass, from which trees these nuts sent are the product. The fruit is fully as fine as the original tree. Prof. C. B. Sargent of the Arnold Arboretum has taken great interest in the nut. I have two trees grafted on wild saplings by Jackson Dawson near bearing size.

Those are the only trees successfully grafted, out of thousands done in the North outside, from which I am afraid grafting outside in the North is a failure on hickory stocks. There may be a better chance on pecan stock, which I have not thoroughly tested under favorable circumstances. I have been sending northern pecan nuts and had them planted, and sent scions for working on them in the South; had some failures from natural causes. Simpson Bros. of Monticello, Florida, have had fair success there. My share of two year old trees are on the way here. Of the value of these nuts too much cannot be said. Mr. Fuller ranked them superior to the Madeira nut. It has remarkable keeping qualities.

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It has taken from eighteen to twenty-five years for my grafted trees to come into bearing.

I earnestly hope that with the knowledge gained so far, the means of propagation on a large scale will soon be discovered and successfully carried on. What a gain it would be to the wealth of our food production and luxury. The American hickory would then stand highest on the list of our native nuts.

President Morris: Are there any comments upon this paper of Mr. Hales? So much is being said about the Hales hickory, it seems to me that possibly we ought to put on record some thoughts in the matter. Mr. Hales is entitled to more credit than any other man for bringing forward the development of the shagbark hickory, and his enthusiasm was based upon this remarkable nut on his grounds. It is a very large nut, and, like all large nuts, is much coarser in character than small nuts, and, like all large nuts, lacks delicacy of flavor that we find in small nuts. It is thinner shelled than most of the shagbarks that we would see in many days spent in the woods, but when we have for comparison some smaller nuts, we find shells very much thinner than the shell of the Hales. The Hales, like many other large hickories, keeps much better than the small hickories of finer texture and more delicate quality, and it may be very good at three years of age, while some of the most delicious of the smaller, more tender and delicate nuts are spoiling at the end of six months. I don't know that

Mr. Hales would take exception to my way of stating this, but it seems to me that he ought to feel that we give him all honor, that we think it a remarkable nut, that it is a nut, because of its size and features, worthy of the enthusiasm he gave it. There is apt to be some misunderstanding as to the exact position this holds in relation to other shagbark hickories.

Mr. Littlepage: What is its bearing record as to quantity?

President Morris: The tree has been cut so much for scions that it has never had a fair chance. It is a prolific tree. It is well worthy of propagation.

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Mr. Littlepage: It is, perhaps,—judging from looking at it—a very fine shagbark for commercial purposes. Isn't it true that within the next ten years there will, in all probability, be a complete reversion in the mind of the nut culturist as to the kind and quality of the nut he will propagate. I will supplement that by saying that heretofore, both in the pecan and other nut fields, the whole tendency has been toward something big. Now, the wise fellows in the South today are beginning to get away from that. I have made many trips down there, and I find there is a very changing sentiment. I want to say that in my observation the future price of the various nuts of the country is going to be determined by the price of nut meat; that the meats are going to be put on the market, and while there will always be plenty of nuts marketed in the shell, the price of the nut meat will be the dominant factor. I was walking down G Street in Washington the other day with an ex-United States Senator, and ex-member of Congress, and an ex-Governor, and they passed a nut store, and saw in the window some nuts, also a big box of nut meats. Everyone went in, and all passed up the nuts and bought the nut meat. That expresses, to my notion, the tendency that is coming; and that thing is going, then, to determine very largely the question of quality.

President Morris: I think we certainly are going to have a complete change in ideas about raising nuts. We are going to raise big ones of the kinds where everybody will buy one pound and nobody will buy two pounds. We are going to raise nuts that will appeal to the people who purchase things in the open market, and who never in their lives get hold of anything that is good. We are going also to raise nuts that will appeal to connoisseurs, and that will be bought by people who know one work of art from another. In other words, we are going to make the progress in nut culture that has been made in other fields of horticulture. At the present time, if one could raise a pear as big as a watermelon and tasting like the rind, that would be the pear that would sell in the market. But the connoisseur buys the Seckel in place of it. When there is a pear like the Kieffer that will fill the top of the tree so there is no room for leaves and branches, the market men are going to raise that pear. But when we go into the market, we go around a block to escape the place where they sell the Kieffer pear, and we buy the Bartlett. We have precisely the same problems in nut culture.

Mr. Pomeroy: I have been thinking some on this line. I have spent a good many half hours in the last four or five years with an old German in Buffalo. He has a stand on one of the big markets. I find that he has a whole lot to say in regard to what the people buy. He has found this out, and he has been there a good many years. He says, "I have been getting black walnuts from the same farmer boy for six or seven years. They are fine; try one." He has learned something about the different trees throughout that section, and about some nuts that are being shipped in, and he can tell the varieties. He has customers that do come back after the second package of nuts. He is trying to keep those customers one year after another. He is creating the demand. When I was a youngster, if I could have received the prices for black walnuts and butternuts that youngsters get now, I would have thought I was a capitalist. Butternuts are retailing at two dollars and two dollars and a half, and black walnuts the same.

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President Morris: We have got to get away from the idea that we are going to find the best hickory nut or the best walnut or the best nut of any kind in the largest nut. Nature spreads out just so much material in the way of flavor and good quality of a nut, and if it is in a large nut, those good qualities are spread out thin; if it is in a small nut, they are concentrated.

Professor Lake: I wish I were as optimistic as Mr. Littlepage in this matter. That is because he has been studying all nuts for twenty-five or thirty years, and I have only been dabbling around in Persian walnuts for about twenty years. I have been dabbling with apples twenty-five or more years, and the real connoisseurs of the apple have been telling us during that time that the Ben Davis would be wiped out inside of ten years. I heard that twenty years ago. I believe that there are more Ben Davis apples being consumed by the public today than any other one apple. Notwithstanding that, every man who knows good apples goes out and decries it. It is because that apple can be grown anywhere by anybody at any time, and will be eaten by the people. The kind of nut that is going to make the money the next twenty-five or thirty years is the nut that is prolific, of fair quality, that can be grown by any man, and that has a fairly good appearance. I believe that the process of educating the public on the matter of quality is going to be tremendously slow. It is not always

the case, however, that the smaller the size, the better the quality. A medium size would be better. The Yellow Newtown is quite a large apple, and it is superior in quality to the Winesap.

President Morris: I was stating a general rule.

Professor Lake: I fear we aren't going to be able to educate the people. How many people who eat nuts know anything about their quality? Dr. Morris has got the ideal of the best nut in walnuts, for instance, the French Mayette. That is the connoisseur's choice. I know of many people who will tell you very frankly they prefer the American grown Franquette, which is much more starchy in make-up and much less nutty.

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Mr. Littlepage: I think there is a great deal in what Professor Lake says. I am not sure he has got the cause of the facts he states. One reason why the Ben Davis is being planted is, as he stated, that it will grow almost anywhere; but the reason the public accept the Ben Davis is because they can't get enough of another at a reasonable price. There isn't any doubt that if there were plenty others at a reasonable price the Ben Davis wouldn't be used at all. We hear so much today about this high cost of living. Of course, there are artificial conditions that have contributed to this to a greater or less extent; but the principal element is that we have come up against the problem of feeding the great American public, that has grown faster than the facilities have grown. The time for low priced food products is gone forever. Yet there is a good deal in this commercial phase of it.

President Morris: The Hales hickory is going to be like the Ben Davis apple, one of the very most popular in the market.

Doctor Deming: I will say regarding the retail price of nuts that in New York City shelled filberts are priced at \$1.25 a pound, shelled almonds \$1.00, ordinary run of hickories and chestnuts in the shells twenty cents, black walnuts in the shell twelve cents.

President Morris: Hickories will give somewhat over fifty pounds to the bushel; black walnuts about forty. If we make a rough estimate of fifty pounds to the bushel for shagbarks, and forty for Persian walnuts, we will probably have a good fair average.

NUT PROMOTIONS.

BY W. C. DEMING, NEW YORK.

Promoters attack their quarry with a two-edged sword; one edge is what they say, the other what they leave unsaid; and both edges are often keen. What they say generally has a foundation of truth with a superstructure of gilded staff. You must knock over the staff and examine the foundations to see if they are laid up in good cement mortar or only mud. Sometimes they are honestly laid but your true promoter can no more help putting on his Coney Island palace of dreams than a yellow journal reporter can help making a good story of the most everyday assignment. I suppose he takes a professional pride in his decorations, even when the real facts themselves are good enough. Or even, in his enthusiasm, half believes, and fully hopes, that what he says is true. So you never can say that because of the evident gilding there is nothing worth while beneath.

What the promoter does not say it is absolutely necessary for the safe investor to find out. Deductions from experience in general, and from knowledge of the business in particular, will help and, when these favor further investigation, there are two essentials for a wise decision. First, a study of the records of the promoters, and second, a personal examination of the property. If these can be thoroughly made, and the results are satisfactory after a suitable period of mental incubation, if the prospects will stand the candle test for fertility, you may put some money on the chance of a good hatch; remembering, too, that many a good hatch afterward comes to grief with the pip.

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Some promotions are conceived in iniquity, some in drunkenness and folly and some are abortive from incapacity. Your legitimate and well-born, well-brought-up promotion, fathered by ability and mothered by honesty, it is your problem to recognize, if that is what you are looking for, and to avoid the low-born trickster or incapable. No one can tell you how to do this any more than he can tell you an easy way to graft hickories.

The northern nut grower is not yet bothered with northern nut promotions. At most he is called on to discount the statements of sellers of trees, and that a little, not too expensive, experience will teach him. The West is apparently too busy selling fruit and fruit lands to lay out nuts to trap eastern nibblers. But the allurements of pecan growing in the South are spread before us with our bread and butter and morning coffee. The orange and pomelo properties have been banished from the stage, or

made to play second fiddle, and now we see in the limelight the pecan plantation, with a vista of provision for old age and insurance for our children. And there shall be no work nor care nor trouble about it at all. Only something down and about ten dollars a month for ninety-six months. And the intercropping is to more than pay for that. It is indeed an enticing presentation.

Although we have as yet no northern nut promotions we may expect the time when the sandy barrens of the shore and the boulder pastures of the rock ribbed hills will be cut up into five acre plots and promoted as the natural home of the chestnut and the hickory, holding potential fortunes for their developers. I hope it will be so for it will postulate a foundation in fact. But the chestnut blight and the unresponsiveness of the hickory to propagation as yet hold up these future camp followers of the northern nut growing pioneers. So that for the present there is only the sword of the southern pecan promoter to parry.

It would be a work of supererogation and effrontery for me to attempt to treat this subject in particular since it has been so clearly and ably done by Col. C. A. Van Duzee of St. Paul, Minn., and Viking, Fla., from the standpoint of long experience and full knowledge. His paper should be read by all interested persons. I am permitted to make the following quotations from it:

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"The pecan as an orchard tree has recently been discovered and its history has not been written. The record at present is largely based on scattered individual trees growing under abnormal conditions which, as a rule, are favorable....

"Calculations and deductions based upon these results have been made which are fascinating, but they are utterly unreliable when applied to orchards of other trees in different localities growing under totally different conditions?...

"No one knows what a pecan orchard grown under such conditions is going to do."

Col. Van Duzee, however, expresses firm belief in the success of pecan growing under proper personal supervision.

It all comes down to the question, "Can you or I hire our business done for us, never go near it ourselves and expect others to make a success of it for us?"

And yet, when all is said, I confess that I have been tempted by my faith in the present and future of pecan growing in the South. I might have invested were it not for my firm belief that, in nut growing, the North is but a few years behind the South, and that I wish to devote my resources and my energies to having a hand in a development which, I share with you the belief, is to be of inestimable benefit to the human race. We can picture the day when our dooryards, our roadsides, our fields and hills shall be shaded by grand nut trees, showering sustenance and wealth on our descendants, and all people, and bearing the names of their originators; when the housewife of the future shall send her wireless call to the grocer for a kilo of Hales' Papershells, the Rush, the Jones, the Pomeroy Persian walnuts, the Black Ben Deming butternut, the Craig Corean chestnut, the Morris Hybrid hickory, the Close black-walnut or the Littlepage pecan.

President Morris: It is a very timely paper. The number of promoters we find in connection with any subject furnishes an index of the fundamental value of the original proposition. The number of dishonest people, the number of fakirs that are now promoting development schemes in connection with the pecan indicates that down at the bottom somewhere, there is a real gold mine. We will go on to Mr. Roper's paper.

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SOME FACTS CONCERNING PECAN TREES FOR PLANTING IN THE NORTH.

W. N. ROPER, PETERSBURG, VA.

Pecan trees for successful culture in the North must be of hardy, early-maturing varieties, budded on stocks from northern pecans and grown in nursery under suitable climatic conditions. These are requisites indicated by practical, experimental work and observations extending over several years.

The successful production of large southern pecans in far northern climates can hardly be looked for except under the most favorable conditions of soil, location and season. There seems no good reason for planting southern pecans in the far North,

except in an experimental way; for there are northern varieties now being propagated that are the equal of most of the standard southern sorts in quality and very little below them in size. They will prove to be as large or larger in the North than the southern varieties grown in the same locality, and much more apt to bear regularly.

The method used in propagating the hardy types is important. Budding and root-grafting each has its advocates among pecan growers in the South, and this would indicate that there is no great difference between the trees propagated by these two methods when they are planted in that section. But based on results with several hundred specimens, root-grafted pecan trees are not desirable for planting in northern climates.

During the past six years there have been grown in nursery, in the eastern part of Virginia, near Petersburg, about 2,000 root-grafted trees of eight southern varieties of pecans and one Virginia variety, including Stuart, Van Deman, Moneymaker, and Mantura. All these trees are worthless. None of them, though they have been cared for, has ever been considered by the grower fit to dig and transplant. Most of these trees suffer winter injury each year, many of them being killed back to the graft union. Those that do not die below the ground grow out the following summer, only to be killed back again the next winter or spring. Those damaged only a part of the way down the trunks, even when not badly injured, do not recover promptly. Several hundred budded trees grown during the same period in adjoining rows have been entirely free from any winter injury. The grafts and buds were inserted on stocks from northern and southern nuts.

A thousand budded and root-grafted trees received from six southern nurserymen were planted in orchards in the same locality. A very large percentage of the root-grafted trees died; only a small percentage of the budded trees died. Many of the root-grafted trees that survived are making poor growth; most of the budded trees are strong and vigorous. The only trees of the Virginia varieties ever reported winter-killed were root-grafts.

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No root-grafts of the northern types on northern stocks have been made in Virginia, but root-grafts of Indiana varieties on southern stocks transplanted there winter-kill badly. Several Indiana trees root-grafted on southern stocks and in their second year's growth in the nursery winter-killed in Florida last season. Not a single budded Indiana tree in Virginia suffered any winter injury whatever, although the buds were grown on southern as well as on northern stocks. All the root-grafted Indiana trees transplanted at Petersburg during the past two years have died from winter injury.

Northern types root-grafted on northern stocks not having been tested, no definite information can be given, of course; but with all southern varieties winter-killing in the North, when root-grafted on either northern or southern stocks, and the Virginia variety winter-killing when root-grafted on southern or northern stocks, and the Indiana varieties winter-killing both in the North and in the South when root-grafted on southern stocks, it seems reasonable to presume that the northern varieties root-grafted on northern stocks will also winter-kill. The stocks of the root-grafted trees are seldom injured. They send up sprouts except in cases where the graft union is so far beneath the surface of the soil that after the grafted part is killed the stock is too deep to grow out.

Not a single tree out of a total of 40,000 seedlings in Virginia grown from northern nuts planted during a period of six years has ever been found affected by winter injury; practically all the trees out of 50,000 or more grown in the same locality from southern nuts, planted during the same years had their tops affected by winter injury the first, and most of them the second season of their growth; but no injury after the second season has been noted.

With the view of making southern varieties better adapted to planting in northern area, experiments have been made in propagating them on stocks from northern nuts. This stock has thus far proved unsatisfactory for southern varieties either budded or root grafted. The trees from northern nuts go dormant earlier in the fall and remain dormant later in the spring than trees from southern nuts. Northern trees in the nursery rows in early spring, in a perfectly dormant condition, are in striking contrast with the southern trees and their fresh, green foliage. Though the growing period in the North is nearly a fourth shorter for the northern than for the southern varieties, the native trees in the North make equal growth with the southern trees there during the same season. Northern varieties budded on northern stocks grown at Petersburg the past summer made nearly as much growth during one season as root-grafted trees of the same varieties on southern stocks grown in Florida two seasons. The trees at Petersburg were from dormant buds set the previous fall. They were just starting into growth in May when the trees in Florida had made a growth of six to twelve inches.

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The northern seedlings in the North make better growth in a season than the northern seedlings in the South, as far as has been observed. When the growing period begins in the northern climate, the native trees respond at once to the quick

growing season and outgrow the trees that have been accustomed to a slower growing climate. When their growing period is over, they begin promptly their preparation for the winter. The long, slow growing climate of the South does not seem to give the quick growing tree of the North an opportunity for its greatest growth at the important period. There appears to be too much difference between the growing habits of the southern and the northern pecans for either to be suitable stock upon which to grow the other.

Two choice trees of Moneymaker and one of Stuart, all well grown and giving every promise of success, were selected out of a large number of these varieties budded on northern stocks, and were transplanted in orchard two years ago for experiment. The Moneymaker trees have made little growth and the Stuart tree practically none. All have an unhealthy appearance and are left standing only for further experiments.

The section of Virginia in which these experiments have been made affords very severe climatic tests. The temperature in winter sometimes goes below zero, the temperature in spring is variable, changing suddenly from warm to freezing. Pecan trees seem able to endure almost any degree of cold when they are in a thoroughly dormant condition. The winter-killing from which they often suffer in the South, as well as in the North, is due to the effect of sudden freezing temperatures following warm periods in winter or spring.

Only well grown, vigorous pecan trees should be planted in the North. It is a waste of time and money to plant indifferent pecan trees in any locality, and especially in a locality where they have to contend with severe climatic conditions. The size of the tree is less important than its root system and vigor. The purchasers of trees grown on thin, sandy soil, with the root systems consisting almost entirely of straight tap roots, destitute of laterals, need not expect success. Most of these trees will die early, and many of those that live will linger on for several seasons without making much growth, tiring out the patience of the planter.

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The work of transplanting should be very carefully done and the trees given proper care and culture.

It has been found that it costs more to grow pecan nursery trees in the North than in the South, but it is believed that planters in the North will find that these trees have a value which will far offset their additional cost.

Some of the methods of propagation and care are slightly different in the North from those that usually obtain in the South. But it is not practicable to go into the details connected with this work. The facts that have been mentioned are those that are believed to be of most importance for consideration by persons planting pecan trees in the North. Those who have gone thus far with the work upon which the conclusions are based are continuing as earnestly as they began.

The outlook for the success of the pecan industry in northern territory is exceedingly promising where hardy, early-maturing varieties are properly grown in nursery on hardy stocks under climatic conditions that will best fit them for the locality in which they are to be planted.

President Morris: We can give some time to the discussion of Mr. Roper's paper. I want to ask if some of the hardy kinds which will stand the winters well may not carry their ripening season so late that they do not properly mature! Isn't this a line of observation we have got to follow out in adapting pecans to northern fields? Who has had experience?

Mr. Littlepage: That is a very important point, and it is one of the things that everyone is going to discover who is engaged in northern pecan planting on the extreme limits within the next few years. There isn't much danger of the pecan getting frost-bitten in the spring as some imagine, because the pecan tree seems to be a pretty good weather prophet. They don't get ready, as a rule, till most of the danger is past. A great majority of the Persian walnuts and pecans don't begin to pollenate till the tenth of May, and it is very rare that a tree doesn't ripen its nuts there. But once in a while we discover a tree that sets a bountiful crop annually and never matures a nut, because it gets frost bitten. It simply doesn't have the length of growing season.

Mr. Rush: I remember a pecan tree I received, and have had growing for the last six years in Pennsylvania. It was never affected with the cold, and made luxurious growth. But I haven't been so fortunate as to get it to bear, although it throws out catkins in the spring.

President Morris: The pecan tree is known to be hardy as far north as Boston. There are quite a good many near New York City, some of them fine, trees, but not bearing much, and for the most part small nuts.

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Mr. Rush: Mr. Jones of Jeanerette, Louisiana, has been at my place, and he says that the growth of the pecan is just as luxuriant there as in Louisiana.

President Morris: The point we want to bring out is this, and I think we ought to emphasize it at this meeting—that pecans suitable for northern planting must include the idea of an early ripening season, earlier than the ripening season of southern pecans.

Mr. Rush: Sometimes there is a provision in nature for that. The tree will adapt itself to the climate, and give a smaller nut.

President Morris: What has been your experience, Mr. Roper?

Mr. Roper: We have only fruited Stuart at Petersburg. All the nuts have been well filled, but much smaller than the Stuart farther south.

Mr. Pomeroy: Mr. Littlepage made the remark yesterday that nature will attend to this largely for us. He spoke of the wood beginning to ripen the middle of August. With us in Niagara County, we expect that with all trees the wood will begin ripening about the first of August, preparing for the winter. Persian walnut doesn't come into blossom till about the last of May or the first of June.

President Morris: It is not mainly a matter of ripening wood, but of ripening nuts, in pecan growing in the North. A good many nuts will remain green, even though the tree will grow well; and we must have nurserymen draw our attention to this difference, when they are sending trees out to us for northern planting. That is a thing that may not be determined right now, but nurserymen must be able to report upon comparative ripening times of various kinds of pecans to be sent north.

We will have the report of the Committee on Nominations.

[The report was accepted and the nominees elected.]

President Morris: We have with us Professor Herrick, who will present his paper on the subject of the scolytus beetle. Professor Herrick has prepared his paper at our request since we came here.

THE SCOLYTUS BEETLE.

PROF. A. W. HERRICK, ITHACA, N. Y.

With a residence of a little over a decade in the South, I became more or less intimately connected with a good many of the nut growers of the section, especially the pecan growers. I found them there an intelligent body of men.

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The President has asked me to talk just a little on the hickory bark borer. While in Mississippi, I first came into contact with the hickory bark borer by its work on the hickories on the lawn in front of my house and on the Campus. It began killing the trees. I had ten or a dozen trees on the lawn that were from six to eight inches through, and they had made a fine growth but they began suddenly to die. First, I noticed the leaves falling in the summer time, then later in the winter the branches began to die at the top. On investigation, I found that it was this little hickory bark borer. We carried out, as a result of that investigation, a few experiments, and extended them over the Campus, following the recommendations of Doctor Hopkins of the Department of Agriculture, Washington. The results were pretty gratifying. I was able to save those trees on the lawn, and during three or four years succeeding the time we got these experiments into practice, no more had died, and they had kept on making a good growth; and I believe the ravages of the beetle had been checked.

The little beetle belongs to a family called the *Scolytidae*—very small beetles that burrow through the bark of trees, and between the bark and the wood, partly in the bark and partly in the wood. These beetles are interesting in their life history. The female bores through the bark, and then she builds a channel partly in the wood and partly in the bark. She goes along and digs out little niches all along, and in each one of these, deposits a tiny white egg. That soon hatches into the small grub, and the grub begins to burrow out to get his food, and you will find these little burrows running out from the main burrow of the mother beetle. When these grubs reach their growth, each one of them comes out and bores a little shot-hole-like round hole through the bark, so that a tree that is pestered with it will finally have the bark full of these little round holes. You have probably seen a similar thing in peach, plum, and cherry trees.

The hickory bark borer is found all over the eastern United States, from Canada to the Gulf, and as far west as Nebraska. It attacks hickory trees and walnut trees, and as far as I can find, the authorities say probably the pecan. I never found it on the pecan in the South. If it does ever come to attack it in any numbers, it will be a serious pest from the nut grower's point of view.

In this state, it was first noticed by its work on hickory trees in the vicinity of New York City, and it is killing a good many of them. To show its dangerousness—on the estate of Mr. Wadsworth at Geneseo in 1900 and 1901 over an area of two hundred acres, it destroyed ninety to ninety-five per cent of the hickories. It really becomes a most injurious pest. These little fellows running under the bark cut off the cambium layer and girdle it, and kill the tree as effectually as if we were to take an axe and girdle it. A few can girdle it very quickly.

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An infested tree in the summer shows some characteristic effects. The leaves begin to dry and wither, and finally drop. The adult beetles, when they come out in June and July, attack the petioles, leaves, and terminal buds for food, then go down to the larger branches and trunks, and burrow to lay their eggs. The younger top branches begin to die. If you look, you will very often find a little white sawdust in cracks in the bark. That is an indication that they are present. If you take off the bark, you will find such an appearance as I have shown you. Later, you will find these holes all over, showing the work of the beetle.

I will give the life history of the insect very briefly. The insects live over the winter under the bark, as grubs, and in the spring they change to the pupa form, and come out along in June and July. Some may be as late as August. Those beetles go to the branches and leaves, and soon begin laying their eggs. There is only one brood a season, in this locality at least. In a longer season, farther south, there might be more than one, although my experience in Mississippi was that there was only one brood.

A word regarding methods of control. You can readily see that there is no way of getting at the beetle with insecticides after they have gotten under the bark. Doctor Pelt mentions the value of spraying the trees in summer to kill adults when they are feeding on the petioles and probably the terminal buds and younger twigs. It is rather doubtful whether it would pay to spray hickory trees at that time, although the expense of spraying large trees is not so great as you might think. We have had experiences here, because it fell to my lot to spray all the elm trees on the Campus last year. I kept very careful account of this. We sprayed between five and six hundred trees. About one hundred are scattered over the hillsides west of the buildings, some a mile from the water supply. We did the work for about eighty-eight cents apiece, each tree having a thorough spray. The largest trees on each side of the street we gave two sprayings for a little less than forty cents apiece.

The real method of getting at this hickory bark borer is for everybody to cooperate and cut those trees out, or at least the affected parts of the tree, before the first of May. I know of no other effective method of getting them. Cut them out and burn them. Some say, peel off the bark and destroy that; but if you do that, you have got to cut off the smallest branches and burn those, and I am afraid you would not get all of the grubs. But it is better, if you can, to actually dispose of the whole tree in some way.

There were three trees on the lawn infested and dying. I cut those out in February, and that evidently stopped the ravages of the beetle. That was carried on over the whole Campus, and it must have stopped the injuries, because during the three or four years I was there after that, we had no dead hickories from that cause.

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That is evidently the only method of getting at them. It has been wondered if we might not go to the Commissioner of Agriculture, and ask him to take this matter in hand and force people to cooperate, because it has become a rather serious problem. It is evident from a perusal of the law that he has power to do that, and perhaps if this Nut Growers' Association wishes to pass resolutions to bring before Commissioner Pearson, they might induce him to take some steps to control this hickory bark borer.

President Morris: If we have evidence that the hickory bark borer can destroy ninety per cent of the hickory trees on an estate so well cared for as the Wadsworth estate, it indicates a menace to the whole hickory forests of the North. In view of this fact, in view of the possibility of ninety per cent of our hickory trees being destroyed by this beetle, it seems to me that we should ask our Commissioner of Agriculture to take charge of the matter, as he has taken charge of the chestnut bark disease, requiring the cooperation of the people in disposing of a question which is so vital among the economic problems of our state. Is there any discussion on this paper?

Doctor Deming: I would like to read an extract from a letter addressed to me by H. W. Merkel, Forester of the Bronx Zoological Park:

"Under Chapter 798 of the laws of the state of New York, passed on July 26th, 1911, the Commissioner of Agriculture is authorized and charged with preventing the spread of just such pests as the Hickory bark-borer, and if this matter be called to his attention promptly and in the right way by such responsible and interested parties as the Northern Nut Growers' Association, there is, undoubtedly, still time to check the further spread of the pest. We have from now until June (the time when a new generation of beetles will emerge) to take whatever action is necessary, and I urge

upon you to persuade the Nut Growers' Association to take the necessary steps. I would be glad to have a conference with you on this matter, and will be glad to help you in any way you wish."

I would suggest the appointment of a committee to draw up a strong set of resolutions to be sent to the Commissioner of Agriculture of the State of New York and perhaps of other states, and to the Department of Agriculture. (Referred to Executive Committee for report.)

President Morris: We will have next in order the paper by Professor Lake on the Persian walnut in California.

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THE PERSIAN WALNUT IN CALIFORNIA.

ABSTRACT OF A LECTURE BY PROFESSOR E. R. LAKE, WASHINGTON, D. C.

The Persian walnut industry of the United States is confined, practically, to four counties in Southern California, Santa Barbara, Ventura, Los Angeles and Orange. The territory covered is, in a general way, fifty by one hundred and fifty miles in extent, though, of course, only a very small part of this area is planted, and that really the best land in the territory. This industry which yields practically two and one-half millions of dollars annually to the growers is about thirty-five years old, and at present involves the consideration of one variety, the Santa Barbara Softshell. While it is true that there are about seventy-five named varieties now grown in the country, the Santa Barbara constitutes the commercial crop and will for some time to come, though effort is being made to find a more desirable variety.

During the past ten years a troublesome pest in the form of a fungous disease which attacks the young twigs and young nuts has awakened an interest in other varieties and at present much work is being done with a view to finding one or more varieties that shall be fully resistant to this foe. At present the University of California, which is the directive factor in this investigation, is recommending the trial of half a dozen of the more promising varieties or forms that have been developed through selection, or chance, in the local orchards. As a result of the effect of this trouble, the crop output has increased very slightly during the past decade, though the area of planted trees has increased very much, hence it is very apparent that some other varieties must be found; for it has been quite conclusively proven that none of the means so effectively used against the fungous troubles that affect other orchard crops are of any avail in this case. When it is noted that there has been practically no advance in the improvement of varieties since the origin of the Franquette and Mayette about one hundred and fifty years ago, except the accidental appearance of the Santa Barbara which was produced presumably from a nut from Chili (!) in 1868 on the grounds of Joseph Sexton, Goleta, California, it is evident that our nuciculturists have been indifferent, especially as to the possibilities of extending the area of production.

Speaking more particularly of California walnut growing, it may be said: The best of soils are selected for this crop; the trees are being planted from forty to fifty feet apart; the best and most common advice is to plant budded or grafted trees, and so far as this advice has been followed the Placentia, an improved Santa Barbara, has been used, though in the newer districts where efforts are being made, with apparent success, to develop this industry, several other varieties are being used, such as the Wiltz, Franquette, Mayette, Eureka, Chase, Prolific, Meylan, Concord, Treyve and Parisienne. Thus far this work is experimental, and only time will determine the success and value of it.

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The crop, as with all orchard crops on the Pacific Coast, is cultivated intensively, clean tillage being given, followed by cover crops and in some cases fertilizers accompanied with intercrops.

The trees require very little pruning, and though formerly the heads were started high, they are now formed low and the primary branches trained to ascend obliquely, thus facilitating tillage operations, and, in this respect, even improving upon the high head with spreading or even drooping main branches. While the more progressive planters favor trees one year from the bud, which have been put upon two year old stock, some still prefer two year old tops. Stocks are preferably California black, northern form. This is a large and vigorous tree, while the southern form is often or perhaps better, usually, a large shrub or small tree.

The remarkable behavior of the Vrooman orchard at Santa Rosa, in which there are sixty acres of grafted Franquettes, has been the chief means of stimulating the very extensive plantings that have been made during the past five or six years in the Pacific Northwest. This is the largest orchard of grafted nuts of a single type variety in the United States and is a most excellent example of what follows grafting. The nuts are exceedingly uniform, and large size. They are marketed in the natural color

and are especially attractive, particularly when of a reddish-golden tinge.

The trees begin to bear at five or six years, though many instances are recorded where two year olds have borne a few nuts. Usually only a few pounds per year are produced prior to twelve years, after that the yield increases rapidly until at sixteen years the trees will average approximately fifty pounds or more per tree under favorable soil, tillage, and climatic conditions, providing the trees are of selected varieties of good bearing qualities.

One tree, known as the Payne tree, top worked on to a native black, has a record of yielding as much as seven hundred and twelve pounds in one season, though it is not fair to use these figures in estimating the yield per acre of seventeen trees.

While the walnut has received little attention in the Eastern United States, there are sufficient data at hand now to warrant the statement that several meritorious varieties may be successfully grown in favorable localities. These nuts, though not rated as high as the best imported nuts or the choice California product, would successfully compete with the foreign nuts which are now rated as replacement nuts by the dealers in California's best grade. It is not safe to endorse the view that any waste or abandoned land may be converted into successful walnut orchards, though such lands may in due time produce trees that will bear nuts. A first-class walnut orchard can only be produced upon first-class land, deep, fertile soil, a low water table, an open subsoil, with choice varieties, grafted upon the most suitable stock and then given first-class tree-care.

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Professor Lake: I think a man now is making a tremendous mistake who thinks for a moment of advising the planting of seedling walnuts. We are bound to meet the problem of grafted fruit right away. The success in grafting in Washington this year has been such as to make us feel certain that we may safely advise budding yearling stocks and expecting a return of from seventy to ninety per cent of successful sets. Stocks giving best success in budding are California black. About two weeks after the budding is done, the tops are cut off two inches above, and allowed to bend over and protect the buds; and in the West, where they have intense sunlight, they have found it necessary to cover the buds with paper sacks. The budding which has given the largest success is hinge budding, a kind that I haven't seen discussed generally in the East. Instead of being a T at one end, it is a T at both ends. There is a horizontal cut across, another below, and a split between. The buds are taken preferably from the last year's wood. We attempt to take the wood away from the bud, with the exception of that little spongy part that runs up into the bud, and is the core.

Mr. Pomeroy: You speak of the hulling. Do they have to hull the Persian walnuts?

Professor Lake: In many instances, especially in dry seasons, or in those sections where water is not particularly abundant. Ordinarily, hulling is avoided by irrigating just preceding the time of falling. Frequently the growers of large acreages say that it is cheaper to run them all through the huller.

Mr. Littlepage: What would you prophesy about the average seedling Persian walnut tree as to success and quality of nut?

Professor Lake: I was led to think that all that was necessary to do was to plant the walnuts, because most of our authorities of twenty years ago said the walnut would come true to seed. I think out of several hundred trees planted throughout the state, and many we planted ourselves, not a seedling came true. I should think, normally, we should be very much dissatisfied in ten years from planting seedlings. As soon as anyone buds these with Franquette, Parisienne, Concord, Rush, Pomeroy, and others, I am satisfied he will not want to chance it with seedlings.

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Mr. Littlepage: This dissatisfaction that may result from setting seedling walnuts, such as Rush, Nebo, Pomeroy, and others, would be just as great, perhaps, as the dissatisfaction resulting in the West, would it not?

Professor Lake: I can't see any reason, but that if there are present any of the native trees, they are bound to cross-fertilize. In California we have the Royal hybrid produced at over a mile and a half distance from any known American blacks. The Royal is a cross between the American black and the California black.

Mr. Littlepage: I don't suppose it would be reasonable to expect that there is a Persian walnut in the northern or eastern United States far enough from some native black to render it safe.

Professor Lake: I should hardly think so. Even if it is, I question whether a nut of real merit will come true to seed.

President Morris: Is it true that even from single type orchards the nuts, while coming fairly true to seed, would give trees widely different in bearing propensities?

Professor Lake: That is very true in this Vrooman orchard that has been developed to the very best possible advantage. There are trees that haven't borne a nut to make them worth while, others have been remarkably vigorous. From these, a few people,

knowing of their real merits, are propagating select strains for their own use. They have fifteen or sixteen years' record. I question, if you take a hundred Franquettes from the Vrooman orchard miscellaneously, whether you would get more than ten per cent that would be really as good as the Vrooman.

President Morris: In California I went along the coast this summer from Los Angeles to Oregon and Washington, and looked over orchards. I find that in the West, as in the East, the tendency is for the Persian walnut to store up an undue amount of starch in the kernel. It is apt also to store up an undue proportion of tannin, and to be insipid. That means that in this country we must develop our own type of walnut, and it is quite the exception to find among any Persian walnuts growing on the Atlantic Coast or the Pacific Coast or in the middle of the country walnuts that are free from this tendency to astringency, to insipidity, and to toughness.

When I was on the Pacific Coast looking over specimens in one agricultural collection, a young woman who was showing the collection said, "And here is a lot of Franquettes, and Chabertes, and Mayettes, and Parisiennes that we imported; and do you know, we found our walnuts very much better than those?" I said to her, "Don't deceive yourself in this matter. This self-deception is a mistake. The thing to do is not to make that kind of a decision, but really to develop in our own country walnuts just as good as those, but not like them."

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This was exemplified in a group of walnut raisers. One would say, "Here is a fine walnut that I raised." The other would say, "Yes, that looks pretty good, but you have got to hire a good talker to sell it." Another would say, "Isn't this a fine thin shelled nut?" And the same thing would be said. Now, the whole conversation of that meeting was to the effect that "you have got to have a good talker to sell it." Those people send their good talkers all over the country, and they do sell the walnuts; and it is going to kill the walnut market, unless this is stopped. Those points are ones upon which I would like to have an expression of opinion from Mr. Lake.

Professor Lake: I may say that the western knowledge of the walnut is based very largely upon the character of the Santa Barbara Softshell, and the people in the West are fully satisfied that the Pacific Coast walnuts are the best in the world. I am thoroughly of their belief, too. I agree thoroughly with the doctrine that we have got to improve our own varieties, and that is being done in the best way that we know at present,—by cross-fertilizing and growing the seedlings. A number have been developed the past few years. It is very true that the general public's taste, however, is not up yet to the connoisseur's in this matter, and I am satisfied that the ordinary grade of walnut is going to meet the public demand for a long time yet. The Santa Barbara Softshell will sell to the American public for good profitable prices for some time, and in the meantime, the men who are really wideawake and have a knowledge of the situation are going to endeavor to improve the home strains. I can't see that we can hope for very much from France, for during the last two years the real Mayette of France has been imported, because we have trees bearing in Santa Clara Valley a Mayette as near like the Mayette of Europe as it is possible to make them. The French have not been particularly anxious for us to get their best strains.

President Morris: In this connection, let me say I have seen Mayette, Chaberte, Parisienne,—the best European walnuts—growing in this country, and in this country they do precisely like the best European grapes,—that is, they give us a different product. Imported grafted stock will take from our soil those elements which make an astringent, tough, insipid nut. We have got to recognize it. Don't let us fail to go on record as calling attention to that fact. That means if we import the very best European kinds and plant these, we are going to have the same records as with grapes.

Professor Lake: This matter of quality is of considerable moment to the growers out there. Last year I took occasion to write five of the leading dealers in New York, like Parke and Tilford. They said in their letters of reply, "We consider the quality as varying from season to season. Some seasons we get the California product better than the European product; other seasons it is just the other way." It leads me to think seasonal variation has a great deal to do with the walnut, possibly. In some cases even the large dealers are not yet agreed that the American product is not yet good enough for the American market.

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President Morris: Shall we say that nuts for the connoisseur should not be bleached?

Professor Lake: Modern bleaching consists in running the nuts through a current of salt. It is applied in such a way that it does not do any injury whatever to the flavor or the kernel, unless possibly salting the kernel in cracked nuts would be considered injurious. The bleaching is beautiful. They are not over bleached. They use six pounds of salt to a thousand gallons of water, and run a current of ninety-five volts. It is sprayed on to the nuts as they pass through a revolving cylinder, the spray coming on in a fine mist. As they pass over the cylinder, they are graded and ventilated, and put into sacks. That is after they have been dried. They are ready in about twenty-two hours to be sacked and delivered. The old method of processing in soda and lime and sulphur certainly did injure them.

Mr. Pomeroy: I am just a short distance from Niagara Falls and Buffalo. When any of you are in that section, I would like to have you come and see my trees. There are the seven year old trees my father started, and the orchard is of five or six acres. Some of the seedlings are in bearing now. I have a good many black walnuts in nursery rows, and I am going to begin grafting and budding. One thing I came for was to get information in regard to budding and grafting. In regard to the caring for the trees, it is a great pleasure to watch a tree grow and get it in shape.

Professor Craig: It seems to me that out of the very interesting discussion we have had on this question of the Persian walnut, and out of the discussion which has arisen from the papers of Mr. Littlepage and others on native nuts, we have obtained some very general principles which should be emphasized at this time. The one large principle that I want to call attention to is the principle which says that, in order to develop fruits—and we will include nuts in that general group—which shall be useful to the American public, we shall have to develop them under American soil and atmospheric conditions. In other words, the importation *per se* of European stock of whatever kind is altogether likely to meet with failure. This is the history of American fruit growing from the beginning. The very first beginning of fruit culture in this country was the importation of European fruits, and these uniformly failed. Success came when American colonists began to grow American seedlings. The fact that these have prevailed is shown by the percentage of American fruits the large orchardist produces at the present time. Today nearly ninety-nine per cent of our apples are of American origin. The condition of today means success; the condition of a hundred years ago meant failure.

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In this Persian walnut business, I think success is going to come to us through such work as Mr. Pomeroy and other interested amateurs are doing throughout the country, in selecting a good type of seedling here and there and growing seedlings from it. This homely old method of producing new types through seedling selection is, I think, going to do a great deal to ameliorate conditions the country over. I simply wanted to impress that idea, that if we nut growers are going to do something to help the nut interests of the country, we can do it by planting nuts and selecting nuts from the best types, again taking the best nuts from the best types and planting them; thus by keeping on selecting, we shall win success in the future.

IS THERE A FUTURE FOR *JUGLANS REGIA* AND *HICORIA PECAN* IN NEW YORK AND NEW ENGLAND?

JOHN CRAIG, ITHACA, N. Y.

[Read by title.]

It is common knowledge that there have been frequent instances of the successful fruitage of Persian walnuts throughout the entire Northeast. The evidence is forthcoming in attractive samples of nuts. Specimens have been received during the past two years from New England, Pennsylvania, New Jersey, and the lake region of New York, as well as the Hudson River section. So far as I am aware, however, *Hicoria pecan* has not fruited to any extent further north and east than southern Indiana.

Is it not remarkable that so little effort has been made to extend the natural range of this superb native nut northward?

The fruiting habits of *Juglans regia* may be regarded as fickle, depending in some cases upon pollination, in others upon climatic conditions at the blooming time. One of its defects is its decided proterandrous habit, which seriously affects pollination and fruit setting. In general, the Persian walnut is capable of cultivation in all safe peach growing sections. Yet in the Gulf States the complaint is made that it is too readily susceptible to stimulating influences of warm weather in the spring. Again, the roots in that section are affected by fungi and insects. Notwithstanding these charges, there should be a future in the North, as well as in the South, for this fine nut. It is hardly to be expected that success is to be attained in all sections of the country by using exclusively the material, by this I mean the strains and races, we have at the present time. For instance, in the South the root trouble is peculiar to that section, and it is probable that the root difficulties spoken of may be overcome by using native stocks in grafting and budding. The blooming habits, however, can only be modified by the relatively slow process of breeding.

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In the North, nature has already provided us with foundation material for the improvement of *Juglans regia*. We have many promising varieties that have appeared

more or less fortuitously here and there over the country. It is conceded that all of these do not possess the full range of desirable qualities, but they are sufficiently attractive certainly to challenge the best efforts of the plant breeder. We are encouraged too by such experiences as has come to us in the crossing of regia with allied species. A number of crosses of *regia* and *nigra* are recorded from the Pacific Coast. Burbank, Payne, and others have made notable progress in this line. It is a question, however, whether this line offers as certain reward as breeding in narrower lines, using the best individuals of *Juglans regia* which have come to us more or less by chance. The latter appears to me as the best field to operate.

Among the requirements in the Northeast, it may be said that we need hardiness of tree, coupled with a determinate habit of blooming, more than any other characteristics. Of course it goes without saying that we need thin shells, well filled with palatable meat. The work of Messrs. Pomeroy of Lockport, N. Y., J. G. Rush of West Willow, Pa., and other individuals in the Northeast is worthy of all encouragement. Wherever Persian walnuts are producing good nuts here in the Northeast, the best specimens of the best individual trees should be planted in the strong hope of improving the strain. There should be a first rate promise of success in this field, for many of our walnuts are fruiting as individual trees, standing alone and isolated, and therefore, are probably self-fertilized, a circumstance which may assist in shortening the process of improvement by breeding.

Hicoria Pecan. This is undoubtedly the best of all the native nuts, and the most worth while improving. The great popularity which this form of hickory enjoys in the South is undoubtedly due in considerable measure to the fact that it is adapted to a considerable range of territory. This adaptation is the natural acquirement of many years' evolution.

At this time of the year, one sees in fruiterers' shops in New York and other cities appetizing looking baskets, containing cracked shagbarks and pecans. These nuts are enjoying a large share of popularity at the hands of the consumers. As these two forms are exhibited together, the observer may note the essential good qualities of each, and he may make a mental picture of the possibilities of a union which would eliminate the undesirable features and combine the desirable. The lack of hardiness of the pecan would be strengthened by the hardy northern form, while the breeder would aim to retain the excellent flavors of each, the good qualities of meat, but enclosed by a covering of paper shell texture. We want the hardiness and adaptability of the shellbark, combined with the thin shell, the excellent cracking qualities, and the pleasant flavors of the pecan. Here is a truly attractive field. The fact that returns may be rather slow in maturing should not deter the plant breeder, for sometimes prizes come quickly. Of course the field is one which appeals more strongly to the institution of indefinite life tenure than to the individual whose years of activity are relatively brief.

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What nature has done in the way of extending the range of the pecan northward has been clearly set forth in the excellent paper presented by Mr. Littlepage. This indigenous movement from the natural zone of the pecan towards the North and East has undoubtedly been infinitely slow. The important fact has been established, however, that not only has nature extended the natural range in the directions indicated, but Mr. Littlepage has shown that here and there a variety of exceptional merit has appeared, fortuitously and without assistance or guidance from man. These superior varieties are being placed under observation by interested nut enthusiasts like Messrs. Littlepage, Niblack, and McCoy, and others, who are not only studying the nut in its native haunts, but are experimenting with methods of propagation so that we may confidently look forward to a stable supply of these natural selections in the years near at hand.

Here, then, we have the material for founding new races of northern nuts by combining them with our best hardy hickories. Who will gainsay the prophecy that not far distant is the day when we may expect new hybrid strains of great economical importance arising from the union of our northern hickories with the most northerly forms of the pecan? Shall we designate these hybrids as "shellcans," "shagcans," or "hickcans," after the nomenclatural methods of present day plant breeders? The splendid work of our President in the interbreeding of northern types of nuts gives us strong hope to expect results of this nature.

In the matter of propagation we have learned certain essential fundamentals. First and most important is the firmly established fact that southern, pecan stocks are unsafe and generally unreliable in the region of the northern hickory. We must grow our own stocks from northern nuts. We must propagate by using home grown material exclusively, and as to methods of propagation, it is probable that we can follow in general the practice of the southern nurseryman, but unquestionably modifications in procedure will arise out of the sum of our experience which will tend each year to bring a larger measure of success.

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This Association will perform an invaluable service in collecting these various experiences, winnowing the sound from the unsound, and disseminating safe

deductions and reliable principles to the rapidly increasing band of nut culturists throughout the region of its activities. Our second session has been an unqualified success. May this meeting be surpassed in respect to enthusiasm manifested, experience and knowledge disseminated, by each of the annual conferences to be held in the years to come.

President Morris: Discussion as to the next place of meeting is in order.

Mr. Rush: I would certainly be very glad to entertain the Northern Nut Growers' Association at Lancaster City, Pennsylvania, and will assure you in advance that I will give you the best hospitality that the country can afford. We have now associated with the walnut interests in Lancaster County Mr. Jones of Jeanerette, Louisiana, who has been through that section and is pleased with the work that is being done there. I think it may be policy for the Association to meet there. We can have our night session, and be absent several hours in the morning and look over some of the work. Mr. Jones contemplates topgrafting hickory trees at his new home, and we can have the opportunity of seeing with what success he meets.

The Association voted to accept Mr. Rush's invitation.

President Morris: We will hear the report of the Committee on Resolutions.

RESOLUTIONS PASSED BY THE NORTHERN NUT GROWERS ASSOCIATION,

December 15, 1911.

(Read by Reed.)

Be It Resolved:

That the Northern Nut Growers' Association assembled does hereby express its sincere thanks to the President and Faculty of Cornell University for placing at its disposal the facilities for holding its convention at this time.

That special thanks be extended to Dean L. H. Bailey of the College of Agriculture for the invitation to meet at this place and to Prof. John Craig for his many courtesies shown the Association and its individual members.

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That we hereby express our thanks to President Morris and Secretary Deming for their labor and untiring efforts to bring about a successful meeting.

That we also tender our thanks to President Morris for the liberal premiums offered for nut exhibits and to the many who have responded. That special attention be called to "The Morris Collection of the Edible Nuts of the World," maintained at this place by Dr. Robt. T. Morris, President of this Association. This collection is of the greatest possible educational value to those interested in the study of nuts and nut products.

That, in view of the distribution and rapid spread of the disease known as "Chestnut Blight," especially among the American species, we express our hearty approval of the efforts being made by the federal government, the several state departments and especially the action of the Pennsylvania State Legislature in appropriating the sum of \$275,000.00 to aid in studying and combatting this dread disease, and

That we urge the importance of continued efforts along these lines and similar action in all other states in which the chestnut species is of commercial importance, either for timber or nut purposes.

That the Secretary be instructed to send a copy of these resolutions to Hon. James Wilson, Secretary of Agriculture, at Washington, D. C., and to Commissioner of Agriculture or Director of Experiment Stations of such states as within which, according to his judgment, the chestnut species may be of sufficient importance to justify such action.

C. A. REED,
T. P. LITTLEPAGE,
GEO. C. SCHEMPP, JR.,
Committee.

(Read by Littlepage.)

That we thank Messrs. Collins, Reed, and Lake of the U. S. Department of Agriculture for attendance at this meeting and for their valuable information and assistance, and furthermore that we respect-fully invite them to attend the next

annual meeting, and in the meantime lend the Executive Committee their assistance in making plans for next season's work and in carrying out the purposes of our organization.

**T. P. LITTLEPAGE,
GEO. C. SCHEMP, JR.**

The Association voted to adopt these resolutions. President Morris: We will adjourn, and the Committee on Competition will meet this afternoon for examination of specimens and decisions in regard to the respective values of the different specimens exhibited.

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APPENDIX

MISCELLANEOUS NOTES.

Those in attendance at the meeting were as follows:

Dr. Robert T. Morris, New York City, President
Mr. T. P. Littlepage, Washington, D. C, Vice-President
Dr. W. C. Deming, Westchester, New York City, Secretary-Treasurer
Prof. John Craig, Ithaca, N. Y., Chairman of the Executive Committee
Mr. C. A. Reed of the U. S. Dept, of Agriculture, Special Agent Field Investigations in Pomology
Mr. J. G. Rush, West Willow, Pa.
Prof. J. Franklin Collins, Forest Pathologist, U. S. Dept, of Agriculture
Prof. E. R. Lake, Assistant Pomologist, U. S Dept, of Agriculture.
Col. C. A. Van Duzee, St. Paul, Minn., and Viking, Fla.
Mrs. W. C. Deming, Redding, Conn.
Mr. W. N. Roper, Petersburg, Va, Editor American Fruit & Nut Journal
Mr. Leonard Barron, Editor Country Life in America, Garden City, L. I.
Mr. A. C. Pomeroy, Lockport, N. Y.
Professors Crosby, de Garmo, Tuck, Herrick, Drew, of the University.
Mr. J. A. Holmes, Ithaca, N. Y.
Mr. Geo. S. Tarbell, Ithaca, N. Y.
Mr. G. C. Schempp, Jr., Albany, Ga.
Mr. H. Brown and Mr. S. V. Wilcox, representing Thos. Meehan & Sons, Germantown, Pa.
Mr. F. M. Rites, Slaterville Springs, N. Y.
Students of the University and others.

The thanks of the association are due Professor Craig for his contribution to the purposes of the convention of the services of his private stenographer which made possible a complete record of all the proceedings and discussions. The success of the meeting is largely due to the thorough preparation made by Professor Craig.

REPORT OF COMMITTEE ON EXHIBITS.

By Department of Horticulture, New York State College of Agriculture.

A collection of the walnuts of commerce, comprising 35 varieties, shown with a specimen of each in section.

A collection of 28 varieties of filberts.

A collection of 35 varieties of pecans.

The Morris collection of edible nuts of the world. This includes not only the nuts of the North, but the fullest collection of the nuts of the tropics that has ever been brought together.

By J. G. Rush, West Willow, Pennsylvania.

Two plates of black walnuts; one plate showing hybridity between Persian walnut and butternut; one plate Paragon chestnuts; one plate especially large American sweet chestnuts.

By A. C. Pomeroy, Lockport, New York.

Four plates of walnuts, showing variation of seedlings; grown on trees varying from six to eight years old.

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By W. N. Roper, Petersburg, Virginia.

One plate Mantura pecans.

By T. P. Littlepage, Washington, D. C.

An exhibit of eighteen varieties of seedling pecans, grown in the Wabash region of Indiana and Kentucky. These seedlings represent very promising varieties, some of them being exceedingly thin shelled, most of them well filled and symmetrical in form. Of these, five have been named, to wit: Greenriver, Warwick, Hodge, Hoosier, and Major. Mr. Littlepage exhibits a plate of *Juglans regia* and a fine sample of *Juglans nigra*.

PRIZE NUTS.

Announcement by the President.

In the interest of science and of American horticulture the Northern Nut Growers Association is making an effort to find nut trees of various kinds which produce superior nuts which can be used for propagation.

Prizes for special lots of nuts are offered.

Each lot of nuts sent for prize competition is to consist of twelve nuts from one tree, and the location of the tree is to be well marked, so that no mistake can be made later if cuttings are to be purchased from the owner or finder of the tree.

Nuts are to be sent by mail in a box or bag containing a card with the name and address of the sender plainly written. At the same time a letter is to be written separately, describing the tree in a general way, and giving the name of the town in which it grows.

Packages of nuts and descriptive letters are to be addressed to

PROFESSOR JOHN CRAIG,
Cornell University, Ithaca, N. Y.

and all specimens must be sent by November 15, 1911.

In former years it has happened that several people from the same town have sent nuts from the same tree. Under these circumstances, if the nuts take a prize, the prize must be given according to the date of the first specimens sent.

In addition to the prizes given, valuable varieties receive the name of the person sending them, and this goes on record permanently.

The sender of these nuts will often have opportunity to sell cuttings from the tree later at the common rate of five cents per foot.

Prizes are offered for the following nuts:

1st prize is to be two dollars,
2nd prize is to be one dollar,

and the amount of postage will be returned for all lots of nuts sent which do not receive prizes.

SHAGBARK OR SCALY BARK HICKORY (*Hicoria Ovata*).

Class A. Large thin shelled nuts.

Class B. Very small thin shelled nuts.

SHELLBARK HICKORY, KING NUT, BIG BUD HICKORY (*H. laciniosa*).

Size is particularly desired with this species, but thinness of shell counts high.

PECAN (*H. pecan*).

Pecans sent for competition must be native nuts from New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, Kentucky, Indiana and Ohio only, as these nuts are desired for northern horticulture.

OTHER HICKORIES.

Sometimes a tree of various other kinds of hickories will produce a very desirable nut; consequently first and second prizes are offered for any hickory nut not belonging to the above three kinds.

BLACK WALNUT (*Juglans nigra*).

Thin shelled black walnuts of good quality are desired.

BUTTERNUT, WHITE WALNUT (*Juglans cinerea*).

Size and thinness of shell are most important.

PERSIAN WALNUT, ENGLISH WALNUT (*Juglans regia*).

American grown varieties the only ones receiving prizes.

ASIATIC WALNUTS (*Juglans cordiformis*, *J. Sieboldi*, *J. Sibirica*).

American grown varieties the only ones receiving prizes.

BEECHNUT.

Size stands first for prize qualifications for Beechnuts.

AMERICAN HAZELS.

Thinness of shell and size are most important.

CHINQUAPIN (*Castanea pumila*).

Size is the most important qualification for this species.

CHESTNUTS.

On account of the rapid spread of the chestnut blight no other kinds of chestnut besides Chinquapins are desired at present.

FREAK NUTS.

Remarkable freaks of any species of edible nuts may win prizes. For instance, a black Walnut with meat growing in only one half of each shell.

R. T. MORRIS, New York City,
President Northern Nut Growers Association.

PRIZES AWARDED IN THE RESULTING COMPETITION.

1. *Hicoria ovata*

Plate II, first prize:

Plate I, second prize: Exhibited by Theron E. Platt, Newtown, Conn.

2. *Hicoria pecan*

Mantura, first prize: W. N. Roper, Petersburg, Va.

Major, second prize: T. P. Littlepage, Union Trust Building, Washington, D. C.

3. *Hicoria laciniosa*

First and second prizes: C. N. Stem, Sabillasville, Md.

4. *Persian walnut*

Nebo, first prize: J. G. Rush, West Willow, Pa.

Holden, second prize: E. B. Holden, Hilton, N. Y.

5. *Asiatic walnut*

Juglans Sieboldiana, first prize: J. G. Rush, West Willow, Pa.

6. *Chinquapin*

No. 2, first prize: J. G. Rush, West Willow, Pa.

No. 1, second prize: J. G. Rush, West Willow, Pa.

7. *Freak nuts*

Hickory No. 4, first prize: Lillie E. Johnson, Gowanda, N. Y.

8. *Butternuts*

First prize: Mrs. Albina Simonds, South Royalton, Vt.

9. *Beechnuts*

First prize: Malcolm Newell, West Wardsboro, Vt.
Second prize: William Davis, Rutland, Vt.

10. *Black walnuts*

First prize: J. J. Robinson, Lamont, Mich.
Second prize: Dorothy McGrew, R.F.D. 6, Box 77, Kent, O.

The prizes awarded in this competition were contributed personally by the President.

REPORT OF THE COMMITTEE ON THE NOMENCLATURE OF JUGLANS MANDSHURICA AND THE SHELLBARK HICKORIES.

The following are the questions sent by the secretary and the answers received:

As there seems to be a difference of opinion as to the identity of 'Juglans mandshurica' will you be so kind as to answer the following questions for the benefit of the Northern Nut Growers' Association at their annual meeting at Ithaca, New York, Dec. 14 and 15, 1911.

Q. 1 What type of nut do you consider the "Juglans mandshurica" to be?

J. H. Black, Hightstown, N. J.: Probably a Juglans Regia Manchuria.

T. E. Steele, Palmyra, N. J.: No resemblance to Persian walnut but very similar to butternut, a little longer and thicker than butternut and of little better quality.

Luther Burbank, Santa Rosa, Cal.: Nigra, or the connecting link between butternut, eastern black walnut and a trace of Sieboldi especially in foliage.

H. E. Van Deman, Washington, D. C.: It is almost identical with J. Sieboldiana.

J. M. Thorburn & Co., 33 Barclay St., N. Y. City.: Our idea of the type is that it resembles very closely in size, form and color of the shell the English walnut or Juglans regia, though the shell is thicker and the quality of the kernel has not the pleasant flavor of the Juglans regia.

Q 2 Does it resemble the Persian walnut or the butternut?

J. S. Black: Persian.

T. E. Steele: (See Q. 1).

Luther Burbank: (Does it resemble the Persian walnut—) *No.* (—or the butternut?) Very much in nut but less elongated and not pointed. *Very* thick shell.

H. E. Van Deman: Not similar to either of them.

J. M. Thorburn & Co.: (See Q. 1).

Q. 3 Is it a nut of commercial or other value?

J. S. Black: Yes.

T. E. Steele: I hardly think it a nut of commercial value as the shell is too thick. I should not consider it much better than the butternut.

Luther Burbank: Hardly unless improved. Meat sweet like butternut. Juglans Sieboldi var. Cordiformis is the very best of this type, thin shell, *very* sweet meats. Both these nuts vary *very* widely in form.

H. E. Van Deman: Only of value as a shade tree or as a stock from which to make crosses.

J. M. Thorburn and Co.: As far as we know it has no commercial value here. We sell it only for seed purposes.

Q. 4 How was it introduced into this country?

J. S. Black: By Yokohama Nursery Co. of New York City.

T. E. Steele: I do not know.

Luther Burbank: Some twenty years ago both by myself and the Arnold Herbarium of Newtown, Mass.

H. E. Van Deman: By nuts from Manchuria, I have always understood.

J. M. Thorburn & Co.: We cannot tell. We purchase direct from Japan.

Q. 5 What are the characteristics of the tree?

J. S. Black: Very similar but hardier than Persian.

T. E. Steele: Very similar in growth to that of the Japan walnut, not unlike the butternut. In fact many call them butternuts, but Mr. Van Deman was quite sure they were the Mandshurica when he picked one from the tree I have in mind.

Luther Burbank: Much like Sieboldi.

Van Deman: Very thrifty and luxuriant with large leaves and large growth. Bark light colored.

J. M. Thorburn & Co.: It is a broad-headed tree growing about 60 feet high.

Q. 6 Have you raised them yourself or can you say who has?

J. S. Black: We have raised trees but not the nuts.

T. E. Steele: I have never raised them and know of no one who has.

Luther Burbank: Young trees. My one tree is more spready than other walnuts, and so far though old does not bear.

Van Deman: No, I have not grown the trees. Think John or Wm. Parry of Parry, N. J., have them. I have J. Cordiformis.

J. M. Thorburn & Co: We have never raised them ourselves.

Q. 7 Can you send samples or say where they can be obtained?

J. S. Black: We can furnish trees. Get nuts from Yokohama Nursery Co., New York City.

T. E. Steele: I know of but one tree near here, and I am mailing you one nut that I gathered a year or two ago, too long ago to be of any value except to show the character of the nut. If I can procure another nut or two of this year's growth I will do so and mail to you.

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Luther Burbank: Have no samples but enclose usual form. From half shell. (Drawings of this, of the surface character of the nut, and of "size and form of a common sieboldi.")

H. E. Van Deman: Perhaps from the Parrys.

No replies were received from R. E. Smith, of the California Agricultural Experiment Station, Whittier; from Jackson Dawson, of the Arnold Arboretum; or from the Yokohama Nursery Co., 31 Barclay St., N. Y. City.

Summary of Dr. Morris's investigations as given by him on p. 12: The nut described in the U. S. bulletin as *Juglans mandshurica* is the one originally described and named by Maxim more than thirty years ago and is a nut of the butternut type. A few years ago the Yokohama Nursery Co., not knowing that this name had been previously applied, gave it to a nut of the *Juglans regia* type which they distributed. This nut had been previously named by De Candolle, *Juglans regia sinensis*.

NOMENCLATURE OF THE SHELLBARK HICKORIES.

The names "shellbark," "shagbark" and "scalybark" are at present used interchangeably by authors for different species of the hickory. It is advised that the Association take an arbitrary stand on the nomenclature and state our choice of the name "shagbark" for *Hicoria ovata*, "shellbark" for *Hicoria laciniosa* and "scalybark" for *Hicoria Carolinae-septentrionalis*.

This should become a matter of official record and eventually clear up the confusion.

THE HICKORY BARK BORER.

In Country Life in America for October 15, 1911, there appeared an article entitled "Warning!—The Hickory Bark Borer is With Us" by Hermann W. Merkel, Forester of the New York Zoological Gardens.

DYING HICKORY TREES.

Numerous magnificent hickories have been killed by the pernicious hickory bark borer in the vicinity of New York city. It has destroyed thousands of trees in the central part of the State, while recent investigations show that it is at work in the Hudson valley near Tivoli and probably is injurious in numerous other places. The severe droughts of the last two or three years have undoubtedly been favorable to the development of this pest, since the vitality of many trees has been lowered and they have thus been rendered more susceptible to attack by insect enemies.

The preliminary signs of injury, such as wilting leaves and dead twigs in mid-summer are exceedingly important because they indicate serious trouble before it has passed the remedial stage. Examination of injured trees at the present time may show particles of brown or white sawdust in the crevices of the bark, and in the case of some a few to many circular holes appearing as though they had been made by number 8 buckshot. This external evidence should be supplemented by cutting down to the sapwood. The exposure there of the longitudinal galleries 1 to 1½ inches long, about ⅛ of an inch in diameter and with numerous fine, transverse galleries arising therefrom and gradually spreading out somewhat fan-shaped, is conclusive evidence as to the identity of this pest. Only a little experience is necessary before one can recognize the work of this borer.

The insect passes the winter in oval cells as stout, whitish, brown-headed grubs about ¼ of an inch long, the beetles appearing from the last of June to the last of July. Badly injured trees are beyond hope and should be cut some time during the winter and the bark burned before the beetles can emerge; otherwise many will mature and attack other trees next spring. It is particularly important to locate the trees which have died wholly or in part the past summer, because they contain grubs likely to mature and then be the source of trouble another year. General cooperation in the cutting out of infested trees and burning of the bark as indicated above will do much to check this enemy of our hickories.

E. P. PELT.
State Entomologist.

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The following "Press Notice" was issued by the U. S. Department of Agriculture under date of Nov. 15, 1911:—

THE DYING HICKORY TREES,—CAUSE AND REMEDY.

Within the past ten years a large percentage of the hickory trees have died in various sections throughout the northern tier of States from Wisconsin to Vermont and southward through the Atlantic States to central Georgia and to a greater or less extent within the entire range of natural growth of the various species.

CAUSE.

While there are several and sometimes complicated causes of the death of the trees, investigations by experts of the Bureau of Entomology, U. S. Department of Agriculture, have revealed the fact that the hickory barkbeetle is by far the most destructive insect enemy and is therefore, in the majority of cases, the primary cause of the dying of the trees.

HOW TO RECOGNIZE THE WORK OF THE BEETLE.

The first evidence of the presence and work of the beetle is the premature dying or falling of a few of the leaves in July and August caused by the adult or parent beetles feeding on the bark at the base of the leaf stem, but this work alone does not kill the trees.

The next evidence of its destructive work is the dying of part of a tree or all of one or more trees. If the trees are dying from the attack of the beetle, an examination of the inner bark and surface of the wood on the main trunks will reveal curious centipede-like burrows in the bark and grooved on the surface of the wood. These are galleries and burrows of

the parent beetles and of their broods of young grubs or larvae. The girdling effect of these galleries is the real cause of the death of the trees.

HABITS OF THE BEETLES.

The broods of the beetle pass the winter in the bark of the trees that die during the preceding summer and fall. During the warm days of March and April these overwintered broods complete their development to the adult winged form, which during May and June emerge through small round holes in the bark and fly to the living trees. They then attack the twigs to feed on the base of the leaves and tender bark and concentrate in the bark of the trunks and large branches of some of the living healthy trees and bore through the bark to excavate their short vertical egg galleries. The eggs are deposited along the sides of these galleries and the larvae hatching from them excavate the radiating food burrows which serve to girdle the tree or branch.

The following recommendations for the successful control of this beetle are based on investigations, experiments and demonstrations conducted by the experts on forest insects of the Bureau of Entomology during the past 10 years.

RECOMMENDATIONS.

1. The best time to conduct the control work is between October 1st and May 1st, but must be completed before the 1st to middle of May in order to destroy the broods of the beetle before they begin to emerge.
2. The hickory trees within an area of several square miles that died during the summer and fall and those of which part or all of the tops or large branches died should be located and marked with white paint or otherwise.
3. Fell the marked dead trees and cut out all dead branches or the tops of the remaining marked trees which still have sufficient life to make a new growth of branches.
4. Dispose of all infested trunks and branches in such a manner as to kill the overwintering broods of the beetles in the bark; (a) by utilizing the wood for commercial products and burning the refuse; or (b) utilizing the wood of the trunks and branches for fuel; or (c) by placing the logs in water and burning the branches and tops; or (d) by removing the infected bark from the trunks or logs and burning it with the branches or as fuel.
5. So far as combating the beetle is concerned it is unnecessary and a waste of time to dispose of trees or branches which have been dead 12 months or more, because the broods of the destructive beetle are not to be found in such trees.
6. Spraying the tops or branches or the application of any substance as a preventive is not to be recommended. Nothing will save a tree after the main trunk is attacked by large numbers of this beetle or after the bark and foliage begin to die.
7. The injuries to the twigs by this beetle do not require treatment.
8. The bark and wood of dying and dead trees are almost invariably infested with many kinds of bark and wood-boring insects which can do no harm to living trees. Therefore all efforts should be concentrated on the disposal of the broods of the hickory barkbeetle, according to the above recommendations.

In order to insure the protection of the remaining living trees it is very important that at least a large majority of the dead infested and partially dead infested trees found within an entire community of several square miles be disposed of within a single season to kill the broods of this beetle. Therefore there should be concerted action by all owners of hickory trees.

On account of the value of the hickory for shade and nuts and for many commercial wood products it is important that the people of a community, county or state who are in any manner interested in the protection of this class of trees, should give encouragement and support to any concerted or cooperative effort on the part of the owners towards the proper control of the hickory bark beetle.

The following is an extract from a letter from Dr. Felt to Mr. Merkel:

"Replying to yours of the 11th inst. I would state that Chapter 798 of the Laws of 1911, a copy of which is enclosed herewith, is, in my estimation, sufficiently comprehensive to include such an insect as the hickory bark borer."

"It is certainly extremely unfortunate that trees past hope and infested by thousands of insects liable to destroy those in the vicinity, should be left standing through the winter and the pests allowed to mature and continue their nefarious work, especially as they could be checked at a comparatively slight expense and by the adoption of measures which ultimately must be carried out unless the trees are allowed to decay in the field. I am much interested in the matter."

The following are extracts from a letter from Dr. Felt to the Secretary, under date of Nov. 21, 1911:

"Your of the 19th is at hand and it gives me pleasure to enclose herewith a copy of a circular summarizing the hickory bark beetle situation in this State and suggesting the prompt adoption of remedial measures. This pest, as you are doubtless aware, is very injurious and has been responsible for the destruction of thousands of hickories, not only in the Hudson valley but also during recent years in the central part of the State. Only a few weeks ago we found a rather bad infestation in the vicinity of Tivoli. You are doubtless familiar with my article on this pest, published in *Insects Affecting Park and Woodland Trees*, N. Y. State Museum Memoir 8, Volume I, pages 275-79."

At the annual meeting of the Northern Nut Growers' Association, held December 14th and 15th, 1911, at the New York State College of Agriculture, Cornell University, Ithaca, New York, the following resolutions were adopted:

"Be it resolved that, in view of the distribution and rapid spread of the disease known as the "Chestnut Blight," especially among the American species, we express our hearty approval of the efforts being made by the federal government, the several state departments, and especially the action of the Pennsylvania state legislature in appropriating the sum of \$275,000 to aid in studying and combating this dread disease; and

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That we urge the importance of continued efforts along these lines, and similar action in all other states in which the chestnut species is of commercial importance, either for timber or nut purposes.

That the secretary be instructed to send a copy of these resolutions to the Hon. James Wilson, Secretary of Agriculture, at Washington, D. C. and to the Commissioner of Agriculture or the Director of Experiment Stations of the states within which, according to his judgment, the chestnut species may be of sufficient importance to justify such action.

Attention is called especially to Farmers' Bulletin No. 467, "The Control of the Chestnut Bark Disease," Issued Oct. 25th, 1911, by the U. S. Dept. of Agriculture.

And be it further resolved that, in view of the depredations in various parts of the country by the "Hickory Bark Beetle," to which attention has been called by a press notice of the U. S. Department of Agriculture, by a circular issued by Dr. E. P. Pelt, Entomologist of the State of New York, by an article entitled "Warning;—The Hickory Bark Borer is with Us," by Herman W. Merkel, Forester of the New York Zoological Park, published in *Country Life in America*, Oct. 15th, 1911, and by an address before the annual meeting of this association by Prof. Herrick of the New York State College of Agriculture; and

In view of the presence of this destructive insect throughout the eastern states, and as far south and west as Mississippi and Nebraska; and

In view of the presumption that its introduction into the pecan area of the United States would be a calamity; and

In view further of the fact that it has been demonstrated that prompt action in the destruction of infested trees will prevent further spread of this pest, and that it is of the utmost importance that such action should be taken before the emergence of a new brood of this beetle in the spring of the year;

The Secretary be instructed to present these resolutions to the Hon. James Wilson, Secretary of Agriculture, Washington, D. C., and to the Commissioners of Agriculture of New York and other states where the hickory bark beetle is a menace, urging immediate and energetic measures against the spread of this dangerous pest which in many localities threatens the hickory tree with serious destruction."

Jan. 31, 1912.

LETTER FROM THE SECRETARY TO HON. CALVIN J. HUSON.

The Honorable Calvin J. Huson,

Sir:—

I have the honor to transmit herewith the resolutions passed by the Northern Nut Growers' Association at its annual meeting held at the New York State College of Agriculture, Ithaca, New York, Dec. 14th and 15th, 1911.

In connection with these resolutions I wish to recall to your attention the fact that by the Laws of New York, Chap 798, entitled "AN ACT to amend the agricultural law, in relation to fungous growths and infectious and contagious diseases affecting trees," which became a law July 26th, 1911, the Commissioner of Agriculture is given full power to deal summarily with these and other pests.

The testimony of all those fully acquainted with the facts concerning the "chestnut bark disease," and the "hickory bark borer" is unanimously to the effect that they have done such an amount of damage, and threaten such continued destruction, as to demand that every effort be made to check their ravages, and that even large expense will be inconsiderable in comparison with the enormous loss that will be inflicted if these most destructive pests are not checked.

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Attention has been called in the resolutions to the action of the state of Pennsylvania in appropriating the sum of \$275,000 for taking action in the case of the chestnut bark disease. Since the passage of these resolutions it is reported that the Governor of the state of Pennsylvania has called a conference to be held at Harrisburg, February 21st and 22nd, for the purpose of considering further action to be taken in the case of this disease. It might be well that your office should be represented at this conference in order that the united action of the states may be brought about and that our state may not continue to lag behind in a matter so seriously affecting so many of its inhabitants.

Detailed information concerning both these diseases is contained in the literature to which reference is made in the resolutions.

May I ask if you will kindly inform me what action, if any, has been taken by the Commissioner of Agriculture, or other department of the state government, for the study or the control of either of the diseases referred to.

REPLY FROM THE COMMISSIONER OF AGRICULTURE.

Feb. 7, 1912.

I have your communication of the 1st inst., duly received and containing the resolutions passed by the Northern Nut Growers Association at its meeting in Ithaca on the 14th and 15th of December last.

Chapter 798 of the Laws of 1911 constitute Sections 304 and 305 of the Agricultural Law, under which this Department has been working for several years for the control of such insects as are distributable by nursery stock, and for the preventing of the establishment in the state of dangerously injurious insect pests and fungous diseases. If the Department were to attempt to control the hickory bark borer, it would require a character of work quite different from anything that we have undertaken for the reason that this insect would not likely be distributed in nursery stock. It is an insect that is not only a native of the country but is quite widely distributed over the state and is one that is given to irregular periodic outbreaks. Of late its depredations have shown seriously in the vicinity of New York along the Hudson Valley and at numerous places in the state. The pest is not amenable to such treatment as can be used against many other deleterious insects. I am informed that the only way now known to control the insect is to first locate it and then destroy all trees or parts of trees in which the grubs are found before the middle of June. It appears to me that to attempt the suppression of the hickory bark borer, it would require a very large force of men and, of course, considerable money.

Relative to the chestnut bark disease, we had a conference at this office in the month of October last and the question was discussed by botanists and foresters from adjoining states and the whole matter was thoroughly thrashed out by those who were present, including representatives of the United States Department of Agriculture, Washington. Invitations have been received from the Governor of Pennsylvania to a conference to be held at Harrisburg on February 20th and 21st and I have directed a representative of this Department to be present.

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Mr. C. H. Pettis, Superintendent of Forests of the State Conservation Commission, joined in our conference here and I learn that someone will be sent from that Commission to Harrisburg.

We have in the hickory bark borer and the chestnut bark disease, two very serious propositions, the importance of which I fully appreciate. It is not clear to me what

methods should or can be adopted which will be productive of the greatest good.

Any suggestions that your Association make will be highly appreciated. As soon as I learn of the result of the conclusions at the Harrisburg meeting, I shall be pleased to take the subject up again.

Very truly yours,

CALVIN J. HUSON,
Commissioner.

LETTER FROM THE SECRETARY TO COMMISSIONER OF AGRICULTURE.

March 16th, 1912.

Hon. Calvin J. Huson,
Commissioner of Agriculture,
Albany, New York.

Dear Sir:—

Your letter of February 7th in reply to mine of an earlier date in relation to the hickory bark beetle has been too long unanswered owing to a rush of professional and other work. I regret this delay as I would like to do all that I can to expedite the work which should be done as soon as possible to prevent further damage from this insect.

If I am not mistaken Chapter 798 of the laws of 1911 is a new law under which the Department has not previously worked and which states specifically that "no person shall knowingly or willfully keep any plants or vines affected or infected with—or other insect pest or fungous disease dangerously injurious to or destructive of the trees, shrubs or other plants; every such tree, shrub, plant or vine shall be a public nuisance, etc." It also states that if the Commissioner of Agriculture is notified of the presence of any such pests he shall take such action as the law provides, and the law provides for the destruction or treatment of diseased trees.

This law appears to be not confined in its application to nursery stock, and in this view I am supported by such men as Dr. E. P. Felt, State Entomologist, and Forester Merkel of the New York Zoological Park. It appears that the Commissioner of Agriculture not only has the right but it is his duty to take action under this law when his attention is called to a matter such as the one in question.

The methods of procedure under this law seem to be sufficiently clear. Wherever infected trees are known to exist the Commissioner is directed to order the owners thereof to destroy them. Failure to obey these orders constitutes a misdemeanor and the Commissioner may have his orders carried out by his own agents.

I am glad that you fully appreciate the serious nature of this pest which threatens great destruction of one of our most valuable timber and nut trees and I hope that no obstacle will be allowed to stand in the way of the enforcement of the full intent of the law.

This Association will aid such work in any way in its power.

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I would like to call to your attention a report in the Yearbook of the U. S. Department of Agriculture for 1903, page 317, of the successful treatment of an outbreak of this pest at Detroit, Michigan. Also to an address to be published in the transactions of this Association, a copy of which I will send you, by Prof. Herrick in which he recounts the successful treatment of another outbreak.

April 3, 1912.

W. C. Deming, M. D.,
Sec., Northern Nut Growers' Association,
Westchester, New York City.

Dear Sir:—

I am in receipt of your communication of the 16th of March, and have considered carefully the question of what can be done towards the control of the hickory bark beetle. As this is a species which at irregular intervals becomes abundant and capable of doing considerable local damage, yet I am inclined to think that so far as the Department of Agriculture can exercise any control, the hickory bark beetle should be classed among such pests as in a way have like habits of injury, such for instance as the apple tent caterpillar, forest tent caterpillar, green maple worm, fruit tree bark beetle, pine bark beetle, and other thoroughly established native and introduced species, all of which exert injuries at irregular intervals and then disappear. The hickory bark beetle suggests one of the problems which is difficult to handle, and it does not seem that much can be accomplished in a practical way by starting an agitation on the subject. The entomologist of the New York Agricultural

Experiment Station, Geneva, says that the insect is common around Geneva, and nearly every season an occasional tree succumbs to its work. He further says that he believes that hickory trees have some time in the past suffered from either a severe winter or drought, and that the shot-hole borer is attacking the weakened trees.

Owing to wide distribution, I do not see how I can direct a campaign against this particular insect at this time for the lack of funds. The appropriations at my disposal under Sections 304-305 of the Agricultural Law, are scarcely adequate for the large amount of work which has already been started, and which, owing to its nature, must be kept up and finished each season.

It is my opinion that general publicity would result in accomplishing much, if individual owners were informed how necessary it is to seek out and destroy the dead trees before the 1st of June, in order to prevent the insects attacking healthy trees adjoining. The habits of these insects are thoroughly known and their life histories have been worked out by our entomologists, and very definite information can be given for the control of the hickory bark borer.

Very truly yours,

CALVIN J. HUSON,
Commissioner.

**RESOLUTIONS PASSED AT THE CONFERENCE CALLED BY THE GOVERNOR
OF PENNSYLVANIA AT HARRISBURG FEB. 20 AND 21 FOR THE
CONSIDERATION OF THE MEASURES TO BE TAKEN TO CONTROL THE
CHESTNUT-TREE BARK DISEASE:**

WHEREAS this Conference recognizes the great importance of the chestnut tree as one of our most valuable timber assets, having an estimated value of not less than \$400,000,000, and

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WHEREAS a most virulent fungous disease has made its appearance in wide sections of the chestnut timber region, and already many millions of dollars of damage has been sustained, and the total extinction of the chestnut tree is threatened by the rapid spread of this disease, and

WHEREAS we recognize the importance of prompt action.

THEREFORE, BE IT RESOLVED:

That the thanks of this Conference are tendered to Governor Tener for calling it, and for the courtesies he has shown

That we appreciate the interest of the President of the United States as evidenced by his communication to Governor Tener, showing as it does, that the head of the National Government is not unmindful of the great danger presented by the Chestnut Blight problem.

That the Commission appointed by the Governor of Pennsylvania be commended for the earnestness and diligence they have shown in the conduct of their work.

That we urge the National Government, the States and the Dominion of Canada to follow the example of Pennsylvania, which is analogous to that of Massachusetts in starting the fight against the gypsy moth, and appropriate an amount sufficient to enable their proper authorities to cope with the disease where practicable.

That we favor the bill now before Congress appropriating \$80,000 for the use of the U. S. Department of Agriculture in Chestnut Bark Disease work, and urge all States to use every means possible to aid in having this bill become a law at the earliest moment.

That we believe trained and experienced men should be employed in field and laboratory to study the diseases in all its phases.

That we believe definite boundaries should be established where advisable in each State beyond which limits an endeavor should be made to stamp out the disease.

That we believe an efficient and strong quarantine should be maintained and that it should be the earnest effort of every state, the Federal Government and the Dominion of Canada to prevent the spread of the disease within and beyond their borders. In accord with this thought we strongly commend the efforts being made to pass the Simmons bill now before Congress.

That we believe strong efforts should be made in all States to stimulate the utilization of chestnut products, and in order to do so, we recommend that the Interstate Commerce Commission permit railroads and other transportation companies to name low freight rates so that chestnut products not liable to spread the disease may be properly distributed.

That we recommend the National Government, each State and the Dominion of Canada to publish practical, concise and well illustrated bulletins for educating owners of chestnut trees.

That we believe further meetings on the line of this Conference advisable and we hope the Pennsylvania Commission will arrange for similar meetings.

That we thank the State of Pennsylvania for its intention to publish immediately the proceedings of this Conference.

That copies of these resolutions be forwarded to the President of the United States, to the Governor of every State, to the Governor General of the Dominion of Canada, and the members of the Federal and State legislatures, with the request that they do all in their power to aid in checking the ravages of this dread disease.

FOOTNOTES

- [A] Since this statement was made the disease has been definitely reported in approximately 164 towns in Conn. [J. F. C]
- [B] Published by the U. S. Department of Agriculture in 1896.

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ASSOCIATION REPORT OF THE PROCEEDINGS AT THE SECOND ANNUAL
MEETING ***

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