Transactions of the Wisconsin State Horticultural Society, including addresses and papers presented, and proceedings at the summer and winter meetings of the year 1881-2. Vol. XII 1882 [covers 1881/18...

Wisconsin State Horticultural Society
Madison, Wisconsin: David Atwood, State Printer, 1882 [covers 1881/1882]

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TRANSACTIONS

OF THE

WISCONSIN STATE HORTICULTURAL SOCIETY,

INCLUDING

ADDRESSES AND PAPERS PRESENTED, AND PROCEEDINGS AT THE SUMMER AND WINTER MEETINGS OF THE YEAR 1881-2.

F. W. CASE, Secretary.

VOL. XII.

MADISON, WIS.:
DAVID ATWOOD, STATE PRINTER.
1882.

REPORT TO THE GOVERNOR.

To His Excellency, JEREMIAH M. RUSK,

Governor of the State of Wisconsin:

In compliance with the provisions of the legislative enactment by which the reorganization of the Wisconsin State Horticultural Society was effected, I have the honor to present you with the Twelfth volume of the Society's Reports, covering the proceedings and a full statement of the receipts and expenditures for the years 1881 and 1882.

Your obedient servant,

F. W. CASE,

Secretary Wisconsin State Horticultural Society.

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LIST OF OFFICERS, 1882.

PRESIDENT.

J. M. SMITH, - - - - - - - - - - Green Bay.

VICE PRESIDENT.

J. C. PLUMB, - - - - - - - - - - Milton.

RECORDING SECRETARY.

F. W. CASE, - - - - - - - - - - Madison.

CORRESPONDING SECRETARY.

B. S. HOXIE, - - - - - - - - - - Cookville.

TREASURER.

M. ANDERSON, - - - - - - - - - - Cross Plains.

SUPERINTENDENT.

B. F. ADAMS, - - - - - - - - - - Madison.

MEMBERS OF EXECUTIVE COMMITTEE.

Ex Officio.

J. M. Smith, President, Green Bay.
F. W. Case, Secretary, Madison.
M. Anderson, Treasurer, Cross Plains.

Dist.
1st. G. J. Kellogg, Janesville.
2d. B. F. Adams, Madison.
3d. A. L. Hatch, Ithaca.
4th. J. S. Stickney, Wauwatosa.

Dist
5th. George C. Hill, Rosendale.
6th. D. Huntley, Appleton.
7th. A. A. Arnold, Galesville.
8th. W. Reynolds, Green Bay.

COMMITTEE ON NOMENCLATURE.

J. C. Plumb, Milton.
D. T. Pilgrim, West Granville.
G. J. Kellogg, Janesville.

COMMITTEE OF OBSERVATION.

Dist.
1st. J. S. Stickney, Wauwatosa.
2d. G. J. Kellogg, Janesville.
3d. George C. Hill, Rosendale.
4th. A. L. Hatch, Ithaca.
5th. H. Floyd, Berlin.
6th. C. W. Potter, Mauston.

Dist.
7th. D. Huntley, Appleton.
8th. William Springer, Fremont.
9th. A. J. Philips, West Salem.
10th. G. W. Perry, Superior.
11th. A. R. McDonald, Sheboygan.
12th. J. M. Smith, Green Bay.

MEMBERS, 1882.

Adams, B. F	Madison	Wisconsin.
Alcott, Wm	Brodhead	Wisconsin.
Anderson, Hon. M	Pine Bluff	Wisconsin.
Anderson, A. A	Neenah	Wisconsin.
Arnold, A. A	Galesville	Wisconsin.
Barter, S	Markesan	Wisconsin.
Baumback, William	Wauwatosa	Wisconsin.
Case, F. W	Madison	Wisconsin.
Daniels, E. W	Auroraville	Wisconsin.
Dibble, G. W	Evansville	Wisconsin.
Dickerson, H. J	Appleton	Wisconsin.
Floyd, H	Berlin	Wisconsin.
Freeborn, S. J	Ithaca	Wisconsin.
Gill, Wm	Dayton	Wisconsin.
Goss, B. F	Pewaukee	Wisconsin.
Graves, S. W	Brooklyn	Wisconsin.
Greenman, C. H	Wauwatosa	Wisconsin.
Hacker, T. L	Madison	Wisconsin.
Haight, Nicholas	Syene	Wisconsin.
Hanchett, Mark	Footville	Wisconsin.
Hatch, A. L	Ithaca	Wisconsin.
Hill, Geo. C	Rosendale	Wisconsin.
Hirschinger, Chas	Baraboo	Wisconsin.
Holt, M. A	Madison	Wisconsin.
Hoxie, B. S	Cookville	Wisconsin.
Howie, John	Waunakee	Wisconsin.
Hunt, Samuel	Evansville	Wisconsin.
Jeffrey, Geo	Milwaukee, 630 Chestnut St	Wisconsin.
Jewett, Z. K	Sparta	Wisconsin.
Kellogg, Geo. J	Janesville	Wisconsin.
Lawrence, F. S	Janesville	Wisconsin.
Lowe, Victor	Palmyra	Wisconsin.
McDonald, D	Verona	Wisconsin.
Mills, Simeon	Madison	Wisconsin.
Morrison, W. H	Elkhorn	Wisconsin.
Olds, B. B	Clinton	Wisconsin.
Palmer, N. N	Brodhead	Wisconsin.
Partridge, E. G	Warren	Wisconsin.

Peffer, Geo. P	Pewaukee	Wisconsin.
Philips, A. J	West Salem	Wisconsin.
Pilgrim, D. T.	West Granville	Wisconsin.
Plumb, J. C	Milton	Wisconsin.
Potter, C. W.	Mauston	Wisconsin.
Reid, Wm.	North Prairie	Wisconsin.
Reynolds, Werden	Green Bay	Wisconsin.
Smith, Alfred	Madison	Wisconsin.
Smith, J. M	Green Bay	Wisconsin.
Spencer, R. C	Milwaukee	Wisconsin.
Stickney, J. S	Wauwatosa	Wisconsin.
Stone, I. N	Fort Atkinson	Wisconsin.
Thompson, H. M.	St. Francis	Wisconsin.
Tuttle, A. G	Baraboo	Wisconsin.
Vaughan, J. C.	Chicago	Illinois.
Warren, A. A.	Green Bay	Wisconsin.
West, J. R.	Evansville	Wisconsin.
Wilcox, E.	Trempealeau	Wisconsin.
Williams, Daniel	Summit	Wisconsin.
Wood, J. W	Baraboo	Wisconsin.

HONORARY MEMBERS.

LIFE.

Dr. Joseph Hobbins, ex-President; F. G. S, Corresponding Member Royal Horticultural Society, England, Madison, Wisconsin.

O. S. Willey, ex-Recording Secretary.

Peter M. Gideon, Excelsior, Minnesota.

ANNUAL.

Mrs. A. A. Arnold	Galesville	Wisconsin.
Mrs. D. Huntley	Appleton	Wisconsin.
Mrs. H. M. Lewis	Madison	Wisconsin.
Mrs. D. C. Ayers	Green Bay	Wisconsin.
Mrs. Prof. A. Kerr	Madison	Wisconsin.
J. L. Harris	La Crescent	Minnesota.
Oliver Gibbs, Jr.	Lake City	Minnesota.
R. D. Spear	Cedar Falls	Iowa.
Mrs. Prof. Sawyer	Appleton	Wisconsin.
Mrs. E. V. Richmond	Appleton	Wisconsin.
Miss Kate Peffer	Pewaukee	Wisconsin.
Mrs. C. A. Willard	De Pere	Wisconsin.
Mrs. J. Clark	Galesville	Wisconsin.

FRUIT LIST.

APPLES.

Six Varieties best adapted to Wisconsin, Hardiness, Productiveness and Quality taken into consideration.— Duchess of Oldenburg, Wealthy, Pewaukee, Walbridge, Fameuse, Plumb's Cider.

Additional List for Cultivation in Favorable Locations.— Tetofsky, Red Astrachan, St. Lawrence, Fall Orange, Fall Spitzenberg, Price's Sweet, Alexander, Utter, Westfield Seek-no-Further, Willow Twig, Golden Russet, Haas.

List for Sandy Soils.— Duchess, Fall Spitzenberg, Whitney's No. 20, Transcendent, Hyslop.

NOTE.— The question of adaptation of varieties is one so largely dependent upon local conditions of soil, elevation and aspect, that a general list will not answer fully the wants of every planter, and at best can only be a general guide in the selection of varieties.

For more specific directions, the following rules and lists are furnished by the committee chosen for this purpose:

1. Locations comparatively elevated and well drained, with a cool northern aspect and fine gravelly clay soil, not very rich, may extend the general list named above to an indefinite extent, with fair prospect of success in southern and eastern districts of the state. But for warm, sheltered locations and rich soils, which induce a great growth, no section of our state can safely plant other than those varieties known to be extremely hardy.

2. The best guide in the selection of varieties is for each to plant largely of such varieties as are found successful in locations similar to that each must plant upon. For all unfavorable locations, and extreme northern districts, only the most hardy, well tried apples of the Russian or Siberian type should be chosen for general planting.

3. In the extreme northern districts, only the crown of the hills should be chosen for the orchard, with a firm soil and porous subsoil, and if these materials are wanting naturally, they should be supplied artificially.

STRAWBERRIES.

For General Cultivation.— Wilson's Albany, Boyden's No. 30, Green Prolific, Crescent, Charles Downing, Sharpless, Captain Jack.

For Trial.— Kentucky, Prouty's Seedling, Col. Cheney, Cumberland Triumph, Miner's Prolific.

GRAPES.

General List.— Worden, Concord, Delaware, Wilder, Agawam, Janesville, Lindley.

For Trial.— Israella, Massasoit, Brighton, Herbert, Moore's Early, Essex, Elvira.

RASPBERRIES.

For General Cultivation.— BLACK.— Gregg, Miami, Doolittle. RED — Cuthbert, Philadelphia, Turner, Brandywine.

For Trial.— Ohio, Black Cap.

BLACKBERRIES.

For Trial.— Snyder, Stone's Hardy., Bartel's Dewberry.

PEARS.

Most Likely to Succeed for General Cultivation.— Flemish Beauty.

For Trial — Ananas d'Ete, Early Bergamot, Bartlett, Swan's Orange, Seckel, Winter Nellis, Clapp's Favorite, Beurre d'Anjou, Doyenne d'Ete.

PLUMS.

For General Cultivation.— De Soto.

For Trial.— Lombard, Imperial Gage, Magnum Bonum, Yellow Egg, Eldridge, Duane's Purple.

CHERRIES.

For General Cultivation.— Early Richmond, Late Richmond or Kentish, English Morello.

EVERGREENS.

For General Cultivation.— Norway Spruce, White Pine, Arbor Vitæ, Scotch Pine, Balsam, White Spruce.

For Ornamental Planting.— Austrian Pine, Norway Pine, Hemlock, Siberian Arbor Vitæ, Red Cedar, Dwarf Pine *(Pinus Montana)*.

For Timber.— White Pine.

For Live Fence Posts.— Norway Spruce.

TIMBER CULTURE.

For timber of rapid growth and easy culture. (Valuable in order named.)

Black Walnut.	Soft Maple.
White Ash.	White Elm.
Green Ash.	Box Elder.
Black Cherry.	Cotton Wood.
Butternut.	White Willow.
European Larch.	

In commencing to plant on a prairie farm, reverse the order of this list.

For timber of fifty to one hundred years' growth.

White Oak.	Red Oak.
Burr Oak.	Hickory.

For street trees. (Valuable in order named.)

White Elm.	Green Ash.
Hard Maple.	Box Elder.
Basswood (Linden).	Soft Maple.
White Ash.	

For lawn planting. (Valuable in order named.)

Cut Leaf Weeping Birch.	Horse Chestnut.
Linden.	Wisconsin Weeping Willow.
Hackberry.	New American Weeping Willow.
Green Ash.	Kilmarnock Willow.
European Mountain Ash.	Weeping Golden-Barked Ash.
Oak Leaf Mountain Ash.	Weeping Mountain Ash.
European Larch.	Weeping Poplar.
American Mountain Ash.	

Shrubs for the lawn. (In order named.)

Snow Ball.	Euonymus.
Lilac (three varieties).	Strawberry Tree.
Syringa.	Sumach.
Deutzia.	Fringe or Smoke Tree.
Weigelia.	Berberry (vulgaris).
Upright Honeysuckle.	Berberry Purple Leaf.
Flowering Almonds.	Pyrus Japonica.
Spiræa.	

Roses for the lawn. (Climbers.)

Queen of Prairie.	Baltimore Belle.
Gem of Prairie.	

Roses for the lawn. (Hybrids.)

Persian.	General Jacquimenot.
Yellow Harrison.	La France.
Madame Plantier.	General Washington.

Climbing vines for the lawn.

Ampelopsis (American Ivy).	Clematis Virgin's Bower.
Scarlet Honeysuckle.	Clematis Jackmanni.
Fragrant Honeysuckle.	

ACT OF REORGANIZATION OF THE STATE HORTICULTURAL SOCIETY.

CHAPTER 151, LAWS OF 1879.

SECTION 1. The executive committee of the Wisconsin State Horticultural Society shall hereafter consist of the president, secretary and treasurer of said society, and of one member from each congressional district of the state; said members from the congressional districts to be chosen annually by the county and local horticultural societies in the respective districts.

SECTION 2. The present officers and executive committee of said society shall hold their respective offices until the Tuesday next succeeding the first Monday in February, 1880, and until their successors are appointed.

SECTION 3. It shall be the duty of the said society to aid in the formation and maintenance of county and local horticultural societies, to promote the horticultural interests of the state by the holding of meetings for discussion; by the collection and dissemination of valuable information in regard to the cultivation of fruits, flowers and trees adapted to our soil and climate, and in every proper way to advance the fruit and tree growing interests of the state.

SECTION 4. The annual meeting of the society shall be held on the Tuesday next succeeding the first Monday in February of each year, for the election of its officers, the transaction of general business, and the consideration of questions pertaining to horticulture.

SECTION 5. All vacancies in the offices of said society may be filled by the executive committee; and should there be a failure to elect a member of the executive committee in any district, the vacancy may be filled by a two-thirds vote of the members of the society present at any regularly appointed meeting.

SECTION 6. It shall be the duty of the secretary of said society to make an annual report to the governor of the state of the transactions of the society, including an itemized account of all moneys expended during the year, in addition to such matters as are now specified in the law relating to the same.

SECTION 7. The number of printed pages of said report shall not exceed three hundred and fifty, and the number of copies shall be limited to three thousand five hundred. In all other respects, the publication and distribution of said report shall be in accordance with the provisions of the law now in force concerning the same.

SECTION 8. The sum of $600 is hereby appropriated out of any money in the state treasury not otherwise appropriated, to aid the said society in carrying out the provisions of this act; said sum to be paid by the state treasurer upon the order of the president of said society, in such sums and at such times as shall best contribute to the prosperity of the society and the interests it represents.

SECTION 9. This act shall take effect and be in force from and after its passage and publication.

Approved March 1, 1879.

CONSTITUTION AND BY-LAWS.

As Amended February, 1879.

CONSTITUTION.

ART. I. This Society shall be known as the Wisconsin State Horticultural Society.

ART. II. Its object shall be the advancement of the science of horticulture.

ART. III. Its members shall consist of *annual* members, paying an annual fee of one dollar; of *life* members, paying a fee of ten dollars at one time; of *honorary life* members, who shall be distinguished for merit in horticultural or kindred sciences, or who shall confer any particular benefit upon the society; and *honorary annual* members, who may, by vote, be invited to participate in the proceedings of the society.

ART. IV. Its officers shall consist of a President, Vice President, Recording Secretary, Corresponding Secretary, Treasurer, Superintendent, and an Executive Board consisting of the foregoing officers and additional members, one from each congressional district of the state, five of whom shall constitute a quorum at any of its meetings. In addition to the foregoing officers, the presidents of all local horticultural societies reporting to this society shall be deemed honorary members and *ex officio* vice presidents of this society. All officers shall be elected by ballot, and shall hold their office for one year thereafter, and until their successors are elected; provided, the additional executive members may be elected by the county or local horticultural societies of their respective districts.

ART. V. The society shall hold annual meetings, commencing on the Monday next preceding the first Tuesday in February, for the election of officers, for discussions, and for the exhibition of fruit; also one meeting during the fall, for the exhibition of fruits and for discussions, and such other meetings for discussions and exhibition as the executive committee may direct, at such time and place as the executive board shall designate.

ART. VI. This constitution, with the accompanying by-laws, may be amended at any regular meeting, by a two-thirds vote of the members present.

BY-LAWS.

I. The president shall preside at meetings, and, with the advice of the recording secretary, call all meetings of the society and have a general supervision of the affairs of the society; and shall deliver an annual address upon some subject connected with horticulture.

II. The vice president shall act in the absence or disability of the president, and perform the duties of the chief officer.

III. The secretary shall attend to all the correspondence, shall record the proceedings of the society, preserve all papers belonging to the same, and superintend the publication of its reports. He shall also present a detailed report of the affairs of the society, at its annual meeting. He shall also endeavor to secure reports from the various committees, and from local societies, of the condition and progress of horticulture in the various districts of the state, and report the same to this society. It shall be the duty of the secretary to make an annual report to the governor of the state, of the transactions of the society, according to the provisions of the statutes for state reports.

IV. The treasurer shall keep an account of all moneys belonging to the society, and disburse the same on the written order of the president, countersigned by the secretary, and shall make an annual report of the receipts and disbursements, and furnish the secretary with a copy of the same, on or before the first day of the annual meeting. The treasurer elect shall, before entering upon the duties of his office, give good and sufficient bonds for the faithful performance of his duties, subject to the approval of the executive committee.

V. The executive board may, subject to the approval of the society, manage all its affairs and fill vacancies in the board of officers; three of their number, as designated by the president, shall constitute a finance committee.

VI. It shall be the duty of the finance committee to settle with the treasurer, and to examine and report upon all the bills or claims against the society, which may have been presented and referred to them.

VII. The standing committees of this society shall be as follows: 1st, Committee on Finance, consisting of three members; 2d, Committee on Nomenclature, consisting of three members; 3d, Committee of Observation, as now provided. Said committees to be appointed annually by the executive committee of the society.

LAWS RELATING TO THE PUBLICATION AND DISTRIBUTION OF THE TRANSACTIONS OF THE WISCONSIN STATE HORTICULTURAL SOCIETY.

Revised Statutes, 1878.

SECTION 339. There shall be printed annually by the state printer, on the order of the commissioners of public printing, * * * three thousand copies of the transactions of the Wisconsin State Horticultural Society, together with abstracts of reports of county and other horticultural societies, and such other matter pertaining to fruit growing and other horticultural interests of the state as shall be deemed important. The volume may include such engravings as shall be necessary to illustrate the printed matter; the cost of said engravings not to exceed the sum of one hundred and fifty dollars in any one year, and to be paid out of the state treasury.

SECTION 363. The transactions of the State Horticultural Society shall be distributed as follows: Five copies to each member of the legislature; fifty copies to each town or county horticultural society that shall report its organization, with officers elect, number of members, and an abstract of its proceedings, for publication in said volume, to the secretary of the State Horticultural Society; fifteen copies to each county agricultural society reporting to the secretary of state; fifty copies to the State Agricultural Society; fifty copies to the State University; twenty-five copies to the State Historical Society; and all remaining copies to the State Horticultural Society. * * * The number of the printed pages of the transactions * * * of said horticultural society shall not exceed two hundred; and all such transactions shall be printed on good book paper and bound in muslin covers, uniform in style with the previous volumes published.

Chapter 151, *Laws of* 1879.

SECTION 6 It shall be the duty of the secretary of said society to make an annual report to the governor of the state of the transactions of the society, including an itemized account of all moneys expended during the year, in addition to such matters as are now specified in the law relating to the same.

SECTION 7. The number of printed pages of said report shall not exceed three hundred and fifty, and the number of copies shall be limited to three thousand and five hundred. In all other respects, the publication and distribution of said report shall be in accordance with the provisions of the law now in force concerning the same.

LAW RELATING TO TREE BELTS, REVISED STATUTES 1878.

SECTION 1469. Every owner or possessor of five acres of land, or more, who shall successfully grow by planting with forest trees, consisting of the following kinds, or such species thereof as will grow to the height of fifty feet or more, viz.: arbor vitæ, ash, balsam fir, basswood, beech, birch, butternut, cedar, black cherry, chestnut, coffee tree, cucumber tree, elm, hackberry, hemlock, hickory, larch, locust, maple, oak, pine, spruce, tulip tree and walnut, tree belts in the manner and form prescribed in the next section, shall be entitled to have the land on which such tree belts grow, exempted from taxation from the time the trees commence to grow until they shall reach the height of twelve feet, and after they shall have attained that height, to receive an annual bounty of two dollars per acre for each acre so grown.

SECTION 1470. Such tree belts shall be planted on the west or south sides of each tract of land, be of uniform width through their entire length, contain not less than eight trees, at nearly equi-distance, on each square rod of land, and be at least thirty feet wide for each five acre tract, sixty feet wide for each ten acre tract, and one hundred feet wide for each square forty acre tract, and upon all square tracts of land, upon two sides thereof. All tree belts owned by the same land owner must be planted not to exceed a fourth of a mile apart, and on the west and south sides of every square forty acres, and shall not exceed one-fifth of the entire tract of land on which the same are planted; provided, that when the east and north sides, or either, of any tract of land, is bounded by a public highway, a tree belt one rod wide may be planted next to said highway, although it, with the others on the west and south sides, shall exceed one-fifth of the whole tract; and tree belts may be planted on any other lines within each forty square acres, by permission of the assessor.

SECTION 1471. The assessor shall, upon the application of the owner thereof, in each year, at the time of assessing the personal property in his district, make a personal examination of all tree belts for which bounty or exemption from taxation is claimed, and ascertain whether they have been planted as required in the preceding section, and are thriftily growing, and if he shall be satisfied thereof, he shall not assess the same for taxation unless the trees therein shall have attained the height of twelve feet, and in that case he shall deliver to the owner a certificate that he is entitled to an annual bounty of two dollars for each acre of such tree belts, stating therein the whole amount of such bounty and giving a description of the entire land of which the tree belts form a part, and the amount of such bounty shall be credited by the treasurer in payment of any taxes assessed on such land, as so much cash; but if not so satisfied, the assessor shall assess the land for taxes or refuse to grant any certificate for the bounty, as the case may require; and if, after any certificate for such bounty shall have been issued, the owner of any such tree belts shall suffer the same to die out by want of cultivation or otherwise, or shall cut the same down, or in any other way allow the same to be so thinned out, that in the opinion of the assessor he ought no longer to receive such bounty, he shall give the treasurer written notice thereof, and thereafter no further bounty shall be allowed until such owner shall again receive a certificate therefor.

PROCEEDINGS

AT THE

SUMMER MEETINGS,

HELD BY THE

WISCONSIN STATE HORTICULTURAL SOCIETY,

AT

LA CROSSE, JUNE 22-24, 1881, AND APPLETON,
JULY 13-14, 1881.

At the winter meeting for 1881 invitations were presented to the State Horticultural Society to hold summer conventions for the consideration of horticultural subjects and the exhibition of fruits and flowers in connection with the Northwestern Horticultural Society at La Crosse, and with the Grand Chute Horticultural Society at Appleton. These invitations were accepted, and the executive committee were, by vote of the State Society, instructed to make the necessary preparations, and to call the respective meetings at such times as the local societies should decide to be the best adapted for the purpose.

The time fixed upon by the Northwestern Society as the most likely to be in the flush of the season for strawberries and roses was June 22-24. After this date was announced, the development of the season in that section was so rapid, that not only was the main crop of berries gone, but even the last pickings were well nigh over.

At Appleton, other considerations made it necessary to defer the convention until July 13–14, when the season for berries had entirely passed. Both of the meetings were well attended, interesting, and, we trust, profitable. The main points of the discussions and proceedings will be given briefly.

LA CROSSE MEETING.

At 9 A. M. of the 22d, the convention was called to order by President Smith. Judge J. F. Bryant, in behalf of the citizens of La Crosse, extended to the members of the State Society a friendly greeting and cordial welcome, in a few well-chosen and eloquent terms. "The welcome was genuine, coming from the hearts of the citizens, and was shown in turn by nature herself, who seemed to have made special efforts to appear at her best, in honor of the occasion. They anticipated much pleasure from social, friendly greetings, but also hoped to derive much benefit from knowledge gained in regard to the cultivation of fruits and flowers. Many had labored hard to improve the appearance of the city — to beautify its homes and public grounds — but nature was adverse. There were many difficulties to encounter. The soil was light and sandy, quick to start, and adapted to an early and rapid growth when conditions were favorable, but soon dried up in the heat of summer. Their experience in many respects had been discouraging; evergreens will not keep green; shade-trees will die out; lawns, flower-beds and shrubbery will dry up. In the first of the season, vegetation develops rapidly, as in a hot-bed; but the midsummer sun and dry winds soon parch and wither it. Some of the hardier native trees, like the cotton-wood, will thrive under these conditions, but the city fathers have recently voted them a nuisance, and tell us that we must cut them down. With what shall we replace them? By what culture can we secure them amid these adverse conditions? The task appears difficult, but we mean to undertake it. We look to you for counsel and aid, so that we may add to the attractiveness of our city and our homes."

President Smith responded in behalf of the society; thanked the citizens for the kind words of greeting and the friendly interest manifest, and hoped that the gathering would prove pleasant and profitable to them, and to all. "The society is not made up of orators and eloquent speakers, and if any expected to be entertained in this direction they would be disappointed. Visit our members at home and you will find them toiling in the garden or field to gain the necessaries of life. They are not favored of fortune; the luxuries they enjoy come in the line of their labor, and are the product of the hand of toil. Nearly thirty years ago a few men, not rich then, but hoping to secure the comforts of life in this their new home, formed a society to find out how to increase the comforts and happiness of their homes, and how to make them more attractive and beautiful. Most of those engaged in the work then are engaged in the same labor now, and those who have left it for other fields are in sympathy with it still. None of them, so far as is known, have made themselves rich, but have added much to the happiness and comfort of their own life and those of others. As we meet from year to year there is much of pleasure in the social enjoyment, and we learn much from each other's experience. At first we thought that the old fruits and trees of our early homes would thrive here, but we soon were convinced that this was a mistake. We made many mistakes, many failures — some of them very disheartening and attended with serious loss. In other things our labors were crowned with success, and we have reason to be encouraged. We are learning how to grow more and better fruit, how to increase the beauty and attractiveness of our home life, and we shall labor on, hoping that some lives may be made more bright and cheerful by our work."

In the absence of any definitely arranged programme for the forenoon session, it was proposed to occupy the time in the discussion of practical questions relating to the season's work, and President Smith called on the members for their opinion as to the cause of the injury to the strawberry beds the past winter and spring. He stated that in many places in his own beds all the plants were killed outright, and the whole beds were more or less injured. All varieties suffered about alike. Never had there been a better prospect of a good crop than there was the previous fall, but when the beds were uncovered in the spring the vines were all black, Crescents and all, and he thought that all were dead; but the Crescents soon put out new crowns and formed new fruit stems and now promised to yield a good average crop of fruit. Patches in the other beds, scattered here and there, but usually along the edges of the beds and in the lowest places, developed a new growth, and the plants now living promised a very fair crop.

Mr. Harris, President of the Minnesota State Horticultural Society, said that the strawberry beds were much injured throughout his section and in the western part of Wisconsin. Some of the fruit growers, who usually sold $1,000 worth of strawberries, did not realize one hundred dollars for this season's crop, and some did not get even ten dollars. Various reasons are assigned as the cause. He had no theory in regard to it, but thought that it might be, in part at least, the result of the very early freezing up of the ground and plants in the fall. The plants had not ripened their wood, and the sap freezing up in the cells so enfeebled them that they were not able to stand the winter. In digging plants in the spring, he found that the roots to some were all black and dead; other plants had part of their roots killed, while part were still white and uninjured. Such plants grew rapidly at first and blossomed very full, but they did not have strength to mature the fruit; the ends of the berry were green and seedy, and the cap was larger than the fruit. Where covered, the results were about the same as to injury of plants, but not as many were killed outright.

In reply to a question of Mr. Plumb, he said the ground was very dry in the fall, when it froze up, and also dry in the spring.

Mr. Marscomb, of La Crosse, had suffered in the same manner, perhaps more than the rest. He had one patch, of six acres, that was nearly all killed; so that he did not get over two hundred quarts from the whole field. The bed stood on high ground; soil was sandy; but a black sand. He had never practiced covering in the winter, and never before had lost his plants by freezing out, but this season, nearly all were killed. The few left were on the outer edges of the field. He had another patch of about two acres on low ground, which was injured but little. Knew of no reason for the difference, except it was that this field was more completely covered with snow. What injury was done was in little patches, here and there, as is often seen in fields of wheat, injured by winter killing, when covered with deep snow. The yield on these two acres was very remarkable. He had to go to market as often, and thought he realized about as much from the two acres as he usually did from the whole eight.

Mr. Wilcox said the crop with him had been very good; he had not given the beds much care, not as much as he ought to; his beds were mulched; he thought they should be mulched every winter, and that it should be put on early, much earlier than it is customarily done. The theory of mulching is said to be to keep the plants from freezing and thawing, but he believed that they were often injured by long exposure to steady cold in the fore part of the winter. Did not think that a heavy covering of snow smothered the plants. The best berries he had this season were where the snow was deepest over them.

Mr. Kramer, of Minnesota, was of the opinion that the injury was mainly done by early frosts in the fall, before the buds and woody fiber of the plants were matured. His own beds had not been hurt by the winter. They were on a side hill where grapes had stood. The soil was rich at the bottom and well underdrained, but the surface was poor and clayey. The plants had matured early in the fall, before the frosts came, and were unaffected by the winter.

Mr. Plumb stated that there had been very little injury to plants by the winter with him, or in the southern part of the state, even where the beds were not covered, but they had suffered severely by the drought and heat of the spring. The condition of the ground during the fall and winter had been unfavorable on account of the extreme dryness of the soil, and the plants were weakened by it, but they survived the winter, and, favored by the gradual melting of the snow and the thawing out of the ground under the snow, would have recovered their vitality had the usual spring rains come. As it was they grew finely and blossomed full, but then dry and hot weather came on, checked the growth and seriously injured the plants; all kinds were affected alike. It was his opinion that the causes of the injury were lack of moisture in the soil in the fall and winter, followed by dry weather and excessive heat in the spring.

President Smith said that his beds had received the usual care, and never looked more promising; the mulch was marsh hay, but it was put on rather late, after the ground was frozen up; this, however, could not have been the cause of the injury, for his sons covered their beds much earlier, yet their vines were injured much more than his. He noticed the plants in January, before the snow came, and found some of the leaves were dead; when the snow came he felt that they would be all safe, but on uncovering them in the spring and finding every leaf dead — Crescents and all — he was completely discouraged. His beds were in ridges about two rods wide, considerably the highest in the center, and this is where the plants were killed much the worst, whether because the soil was dryer, or because the plants were more exposed, he did not know. The vigor of the Crescent was very clearly shown, for while the tops were killed the same as the other kinds, not a plant was killed; each root sent up new leaves and stems, and the bed was now a mass of foliage.

Mr. Stickney remarked that there were two facts mentioned by President Smith which went to prove that lack of moisture was the cause of the injury; one was that the plants on the top of the ridges, where the soil was the driest, were injured the most; the other, that the injury was much greater on his son's land, which is still dryer than Mr. Smith's. His own plants had not been killed, but were hurt, and caused the crop to be small in quantity and imperfect in quality. Young beds were injured the most. He had no doubt but that the loss came from the roots freezing dry early in the fall, and that it would have been much worse, if not complete destruction, had it not been for the covering of snow the latter part of the winter, and the gradual manner in which it melted in the spring. These conditions of soil are alike unfavorable to fruit trees and vines.

Mr. Plumb thought if the injury was done early in the fall or winter, the snow would hardly save them, and he believed the real cause of their death was in the spring. No doubt but the plants were weakened by freezing in dry ground, but they seem to have held their own during the winter, and when the snow melted they gradually recovered and grew finely, until the hot, dry weather came on, when they were in full bloom.

Mr. Harris inquired if the chinch bug was injurious to the strawberry. He had noticed them on the plants.

Mr. Marscomb said he had seen beds where the bugs had eaten the leaves full of holes, but did not observe any evil results from it.

Mr. Peffer had not seen them working on the strawberry, but no matter what is eating the leaves of the plant, it is an injury, whether it is done before or after fruiting.

Mr. Peffer remarked that the first appearance of fire-blight this season was when the apple trees were in full bloom. The first attacks he observed were made in the flowers themselves, sometimes commencing in the petals, at others in the stamens and anthers, and gradually working into the twig or shoot. He did not regard it as infectious or contagious, but rather dependent upon conditions of the atmosphere.

Mr. Harris had come to the conclusion that there were various causes that tended to favor and produce blight. Lack of hardiness was one; our trees had not power to endure our winters, and being injured or weakened by them, were subject to attacks of blight. Another is that our trees are set too near together. Again, the elements in the soil necessary to produce a healthy, vigorous growth, are exhausted, or are not there in the right proportion. He did not think that at the first attack in the season, it was contagious, but when it becomes abundant, it seems to be an epidemic and to spread like the Asiatic Cholera.

Mr. Partridge, of Warren, inquired if weakness or lack of vigor was the cause of blight, why the Transcendent, one of the most vigorous growers and the hardiest of all our trees, is so subject to it. The same is true of the greater part of our Siberians. They are the only trees that are hardy enough to stand cur climate, yet they are nearly all more subject to blight than our Standards.

Mr. Philips, of West Salem, had not at first regarded blight as contagious, but more recently had seen it developed under such circumstances as to lead him to change in regard to it. Whitney's No. 20 is recommended as not being subject to blight, and Mr. Whitney says it is entirely free from it on his own ground. But at West Salem, when set in adjoining rows to Peck's Pleasant, which were affected with blight, No. 20 was struck with it too. Not in one instance alone, but in a number. Other trees are affected in the same manner, as the Wealthy, which only blights when standing near trees that are subject to it.

The noon hour had arrived and cut short the discussion, and the society adjourned until 2 o'clock P. M.

AFTERNOON SESSION.— At 2 o'clock P. M. the convention was called to order by the president. A general desire was expressed to have a speech from Senator W. T. Price, who was present. The senator said he must decline to respond to the request. He came there to learn of others, not to impart information ; he felt a good deal of interest in the cultivation of fruit and flowers and in other horticultural subjects, but practically he knew very little about them. They were not themes on which he could speak with understanding or profit. He was familiar and might talk on saw logs, but they had no sort of connection with horticulture, and hence anything he might say in regard to them would not be appropriate to the occasion.

Mr. Stickney thought that in one phase of the question the subject of saw logs was intimately connected with horticulture, and agriculture also, for, if the general belief is correct, and the history of other countries seem to prove that it is, that the cutting off of our heavy timber will bring about such climatic changes as to seriously diminish the productiveness of our cultivated land, then this is an important question, and one of special interest to us. The question of the timber supply fifty or one hundred years hence is a serious one. At the rate that our heavy timber land was now being cleared, there will soon be a scarcity, not of pine alone, but of all kinds of timber for economic purposes. The demand for lumber is on the increase and must continue to, but, when what we have is once cut off, it will require years to grow trees to fill even a limited demand. Not only were the largest and most valuable trees rapidly disappearing, but a large amount of young timber, standing in the forests, was being destroyed in cutting the trees most suitable for lumber. These young trees, if preserved, would soon take the place of that which was now being cut off and would become valuable for lumber and timber. If the timber lands that are now being stripped so rapidly of the growth of centuries, and left desolate, to be run over every year or two with fires, were cared for and protected, the young trees on them allowed to grow up, and seeds of the Elm, the Maple, Hackberry and other kinds were planted there, the evil effect which will result from the present course would be averted, the fertility of the land would be preserved, and these lands would again be covered with a valuable growth of timber.

Taking this view of the subject, he thought that we ought to call on the senator to give an account of the misdeeds and waste caused by him and his fellow craftsmen.

Senator Price said he was very glad to speak in defense of the lumbermen, for he regarded their calling a legitimate and honorable one, and one that was adding greatly to the wealth, progress and prosperity of the country. They were contributing largely, perhaps more largely than any other class of laborers, to the production of value. By their labor a log worth perhaps one dollar in the tree is made worth three dollars when run into the river, and worth ten when cut up into lumber. This not only adds largely to the wealth of the nation by taking what was of little value in the forest and giving it this greatly increased value, but it furnishes material needed for the comfort of the whole community and for the practical development of all other industrial pursuits. The calling of the lumberman was as important, as beneficial to the general development of the country, as any class you may name, and did not merit the bad name, the abuse they received. It is true that much of the young and growing timber in the forest is destroyed by cutting the larger trees, but this is largely a matter of necessity, to be regretted, perhaps, and avoided when possible; but he would call attention to the fact that where the native timber is cut off and another crop comes in, it is of another kind. Few if any of the old native stock remain. It seems to be one of nature's provisions to give diversity by rotation and diversity of production.

He thought there was a good deal of sickly sentimentalism, a good deal of humbug in the hue and cry made about the destruction of our timber. The ideas expressed in the oft quoted lines, "Woodman spare that tree," may be very fine, but they are wanting in good, sound sense, certainly in the application generally given to them; for he regarded it not only as right but as *a duty* to cut off a crop of timber when it is at its prime, as much so as to harvest a crop of wheat or of fruit. The fact is that a large portion of our native forest growth ought to have been cut years ago. A great deal of our timber is depreciating in value, and has been a long time. He had no fears for the future. Coming generations would take care of themselves. Look at the progress being made in every direction. Materials once regarded as valueless for certain purposes, because in their very nature they wholly lacked the quality desired, and even possessed the exact opposite, have been so changed in their character as to adapt them to common use. As an example, see paper and glass, now used for car wheels and building purposes. He has no fears but that the ingenuity of the future would find a way to supply its wants, and believed it was our duty to do the best we can, to make the most of what we have in the present.

MENTAL AND MORAL INFLUENCE OF HORTICULTURE.

J. M. SMITH, Green Bay.

Ladies and Gentlemen: — If some terrible and bloody crime had been committed in the midst of a quiet community, and some one who was likely to know something of the time, place and circumstances in which it originated, and its details were arranged, should tell us that all the plans were devised, and the arrangements for carrying them into execution had been made in some low, vile liquor saloon, and that the men filled themselves with a poison that took from them their reason and maddened their brain, before they attempted to carry into execution their wicked scheme, you would, with one accord, say that it was a fitting place for the concoction of such deeds of wickedness and crime; and further, you would say that all the probabilities were in favor of the truth of the witness. If he was a man of truth and veracity, you would scarcely think of doubting his story. But, suppose that some one tells us that the authors of this crime met in a beautiful garden, filled with the choicest fruits of the season, and everywhere adorned with fragrant flowers; and that while resting under the shade of the trees and shrubbery, and enjoying its finest fruits, and while admiring the wonderful beauty and fragrance of the flowers, they conceived and arranged the entire details of the terrible crime that shocked the whole community, what would you say to such a story.

Would you not say at once that it was utterly improbable, and not worthy of belief? The character of the witness for truth and veracity would be lost at once. The more you reflected upon it, the more firmly you would become convinced of its absurdity, until you would finally say that its truth was not only improbable, but impossible. You would say that men would not go to such a place to devise schemes of cruelty and crime, and if, perchance, they should happen to be in such a spot, the very beauty, purity and innocence of everything about them, would weaken their resolutions and unnerve their hearts for other than manly and noble deeds.

But why is this? If one is disposed to evil deeds why not plan them in a flower garden and among the fruit trees as well as in a liquor saloon? It is very possible that in the brief time I have allotted to myself I may fail to give the reasons in a manner that will be satisfactory either to you or myself. But that the statement made is, in fact, verified by the history of crime in all civilized countries, will, I think, hardly be denied. Such being the case, the question very naturally returns to us, what is the influence of horticulture, and where a love of it exists, how does it influence its possessors? I am strongly induced to the belief that a love of the beautiful is implanted in every human breast. Not of course to the same extent in all, but it is there. It is one of the faculties given us by the Great Father of all, for good and beneficent purposes. If this faculty is cultivated, it becomes a habit with us to study and admire the beauties of both art and nature whenever and wherever we find them. It is often said that we are creatures of habit. This, to a great extent, is doubtless true. It is a well known fact that both men and women are to a certain extent what their food and their surroundings make them. For instance; if a young man be placed where he is compelled to live on the coarsest of food, although it may be in abundance, with companions who are ignorant, coarse and ungentlemanly, while the only books or amusement to which he has access are of the same general character, and he continues to live in this way for a long series of years, what would be the natural result? Would you expect to see a refined and cultivated gentleman come from such surroundings? Most assuredly not. In ninety-nine cases out out of a hundred you would find a man coarse in features, coarse in mind, rude in manners, repulsive and disagreeable in almost every respect to persons of education and refinement. Occasionally you might find a strong intellect united with a strong body, under such circumstances, but coarse and unmanageable. He may have the framework, as it were, of an intellectual giant, but lacking the refinements necessary to make a truly grand and noble man. This class of men, and women as well, may be found, not only by hundreds, but by thousands, all over our country. Some of you can readily call to mind persons whom you have known who have been from their early childhood placed in such circumstances, and who will always show the effect of their early training, or rather the want of training and cultivation which might have made life worth much more to them than it now is.

I do not wish to be understood to claim that horticultural training will do away with all of these evils. The point that I wish to make is this: that the training of children and young persons to understand and practice the arts of fruit and flower growing, of setting out trees and shrubbery, of making and caring for the lawn about the house, is one of the best helps, and one of the most certain as well as one of the cheapest methods within the reach of the masses of our people, to so educate the rising generation as to make them a great improvement upon the most of their predecessors. I can show you many a home where, judging from the outward surroundings, I would not blame the boys for leaving, or find fault with the girls if they did say they would never marry farmers. Such homes are not what they should be; not what their owners might make them; not what we will hope they will be at some time in the not very distant future.

It seems to me that there is no spot upon this wide earth better adapted by nature to produce fine specimens of man and womanhood than a farm where horticulture is made a part of the business, and is attended to as regularly and as persistently as the good farmer cares for his fields, and his flocks and herds. The family of children thus trained can scarcely fail to have happy homes. The young man upon such a farm, as he invites his young friends to enjoy the evening and a dish of strawberries and cream at his home, feels the more a man that he has helped to grow that fruit. If he wishes to call upon a lady friend, the beautiful bouquet gathered from the plants he has helped to tend is more valuable to him than if purchased from a neighboring florist. The beautiful flowers that help to make bright and attractive the village church are the more enjoyed that his care has helped to provide them. He knows where to find the beautiful evergreens to make bright and joyous the Christmas time, and he will enjoy these festive occasions much more for the part he has taken in providing for their adornment. He will enjoy the fruit trees and the shrubbery all the more because he assisted in caring for them. The lawn is to him the more beautiful because he has dressed and cared for it. Perhaps the shade trees were set before he was born, but he has assisted his father to trim them, and thus added to their beauty as well as his own interest in them. He has studied books and journals which have given him a large amount of information not only upon horticultural subjects, but upon many other branches of knowledge that will be of great benefit to him in the future. In short, under these influences, without ever having seen the inside of a college, or ever having read either Latin or Greek, he is fast becoming an educated and refined young gentleman. His hands may show signs of hard labor. His face may be bronzed by the hot suns of the summer, and the storms of the winter, but he is kind and obliging to his sisters, and would as soon think of cutting off his right hand, as of being rude or unkind to his mother. When he comes to leave the home which he has helped to make so beautiful, to build a new one for himself, he will carry with him all the pleasant and helpful influences which surrounded him in the home of his childhood, to be reproduced and improved upon by the wife and children who will cluster around him. It is to educating, refining influences like these that we must look for the elevation of the masses of our country, more than to colleges and universities. From such homes must mainly come men fitted to fill positions of honor and trust in the nation, and women that will adorn and make cheerful and happy both home and social circles.

My friends, the time is fast passing away when raising wheat, corn, pork and beef, will constitute the main purpose of farming. The sooner it is past the better it will be for the farming interest generally. I would by no means discourage the growing of good crops of grain, or meat, but, on the contrary, would say, cultivate better, and make your land produce double its present yield. It is sometimes said that the reason there are no more farmers in places of public trust, is because we have not the men in our ranks competent to fill them. I fear there is some truth in this statement, yet you and I know that it is far from being wholly true. We know that there are farmers in every county in the state, who are well qualified to fill any office, from that of governor down to the pathmaster. But this is not sufficient. They should be so plenty that neither their names nor their influence can be ignored. I do not mention this as the principal reason why our people should be better educated, but as one of the incidental ones. The true, the great reason why we should add horticulture to our present means of education and refinement, is because it will assist in making better, more refined and nobler, men and women. We have a country so rich and wonderful in varied resources, that none but the best of the race seem to be worthy to inhabit it. We cannot all of us, nor indeed can many of us, send our children to colleges to be educated, and perhaps it is not best that we should do so. Let us be thankful that educated and refined men, that strong and noble men, are by no means confined to the graduates of our institutions of learning. Some, as you all know, of the noblest specimens of men that our world has ever known, were educated entirely outside of colleges and seminaries.

I have spoken of horticulture at this time not as a means of money making, or even as a means of securing comfort, but simply as a mental and refining discipline in our education. I have said it was cheap, for I firmly believe that it may be made to pay all its expenses. I have said it was pleasant, because it will add so much to the beauty of our homes in their outside adorning and will add so much to our pleasure within them. Palaces are not necessary to make happy homes, but cultivation and refinement are a necessity to a truly happy one. A gentleman who was the owner of the largest and most expensive residence in the county where he lived, called upon a lady who was once a school-mate of mine. He was upon friendly terms with her, and one day, soon after entering the house, he threw himself upon the lounge and said: "Well, Sarah, there is the most pure home in this house of any I ever entered." Yet it was a plain log building, upon a farm a number of miles from any town. A limbing rose bush covered nearly one whole side of it. A yard of flowers adorned one portion of the enclosure; fruits, shrubbery and lawns the rest. Within was a very small library, and a few papers and magazines; the furniture was all plain and inexpensive. The lady herself received her education in a very ordinary district school. She married while young and moved to the then almost boundless wilderness of Michigan. Here she added horticulture to her many other cares, and the result may be seen to-day in its effect upon the children who were born and grew up there. She is now fast growing old, but she is still a noble wife and mother, a true friend and an educated and refined old lady. Why should we not have such homes by the thousand in all portions of the northwest.

There is no good reason for it except the heedlessness and ignorance of the great majority of our farmers and citizens. We are here to day to do, among other things, what little we may to correct this evil. Let us work faithfully and well. Perhaps in the years to come some beautifully adorned and happy homes may be found, homes where beauty, refinement and happiness may go hand in hand, both within and without their walls, whose inmates shall say, we were led to appreciate and seek after these things by the teachings of your horticultural convention. Should this be the case we will not regret our labors, and this convention will surely not have been held in vain.

SIXTEEN YEARS' EXPERIENCE IN FRUIT CULTURE IN ST. CROIX COUNTY.

E. G. PARTRIDGE, Warren.

Although this is the first time I have had the pleasure of attending a meeting of the State Horticultural Society, yet I feel almost as if I were personally acquainted with many of you; for I have been a careful reader of the reports of your society for many years, and have studied the essays and discussions contained in them until the names and characteristics of the members participating therein have become so familiar as to seem almost like personal acquaintances; and when two weeks ago I was invited to prepare a paper to be read before this meeting, summarizing my experience as a fruit grower in St. Croix county, I felt both gratified and honored, and gladly accepted the invitation, hoping that, though not able to instruct others, I might receive instructions through the suggestions of others, which would assist in overcoming the difficulties which have hitherto beset me as an orchardist.

I have somewhere read that in a work upon the natural history of Ireland, the learned author in describing the various animals that inhabit that island, devoted one chapter to snakes and kindred reptiles, and commenced with the remark, "There are no snakes in Iceland;" and it has occurred to me that I might appropriately preface a paper upon apple culture in St. Croix county with a similar remark, there are no apples in St. Croix county, and as far as regards standard apples, it would be almost literally true; and yet we do raise apples in St. Croix, such as they are, and shall harvest a bountiful crop this year, if not prevented by the blight.

My experience as a fruit grower in the northwest dates back to 1859, when I procured a few trees of apples, pears and plums of B. B. Olds, of Clinton, and set them out in Washington county, Minnesota. This first experiment settled the question for me, so far as pears and plums were concerned, for though the trees lived several years, some of them, they killed back every winter, so as to render them worthless. But some Duchess apple trees thrived, and, in 1861, I raised the first apples of that variety ever grown in that locality. After the war I removed to St. Croix county and started an orchard and nursery at Hudson; mostly of Siberians, but with a few standard sort, such as were then thought to be hardy. At that time Dr. Otis Hoyt had the only bearing orchard in the county, mostly seedlings of his own raising; some of them very good apples, and supposed by him to be hardy. But they proved otherwise, and have all disappeared. Of the orchard I set there, all the standard sorts died out in a few years except the Duchess, some of which have borne several crops, but have since mostly died. Thinking the soil in that locality — a light sandy loam — unsuitable for apple trees, I removed, in 1872, to my present location, ten miles east of Hudson, where I started again on a larger scale, setting an orchard of one thousand two hundred trees, and a few thousand in nursery rows. The season was propitious, and both orchard and nursery were successful so far that nearly every tree grew, and I began to hope that I was on the road to success. But the following winter, 1872–3, was one of the most severe in twenty years, and changed the aspect of things considerably. Most of the standard trees in the nursery rows were killed back to the ground, or nearly so, and the orchard received a check from which it has never fully recovered. But though my faith was somewhat shaken, I determined to persevere; so replacing in the orchard such trees as had succumbed, and cutting back my nursery stock and adding more to it, I started anew. But, so far as standard varieties are concerned, the enterprise has been a failure. I have never been able to grow healthy trees to the age of three years, except a small per cent. of Duchess, Wealthy and Tetofsky. The soil is a cool, clayey loam; reasonably well drained, the location high, though nearly level, and there are higher grounds on two sides of it. There are more favorable locations in the county, and some for a time and on a small scale have been more successful than myself, but in the long run the result has been the same. The trees soon become unhealthy, and usually after bearing once or twice die out.

From 1865 to 1872 a great many apple trees were introduced into the county from Beaver Dam, Sparta, and some other nurseries, and as there was a succession of favorable winters, a great many orchards were set which came into bearing previous to 1872, but that winter ruined all of them, except a few which were most favorably located upon the limestone ridges. For a year or two after this, tree agents had a hard time persuading people to purchase their stock. But they were equal to the occasion. "Hope springs eternal in the human breast," and as two or three mild winters succeeded each other, and new varieties were introduced with the assurance that these were really ironclads, orchards were gradually reset; more largely of Siberians this time, and less with standard varieties. About this time Beaver Dam began to send out trees grafted upon crab roots, which they asserted imparted their hardiness to the stock and rendered them as safe as Siberians. Experiments also were made of grafting standards in the top of the Transcendent with the same expectation. But the result has proved that these are even less reliable than those grafted upon ordinary seedling roots. There seems to be a lack of affinity between the stock and cion in these cases, whether grafted upon the root or top, which, in my opinion, will always render success impossible in this direction. In 1873 or 4 the blight first made its appearance in a few localities, first attacking trees set upon low, rich ground, but spreading rapidly until within three or four years nearly all the Siberians in the county were more or less affected by it. Observing that it affected most disastrously such trees as had been stimulated by cultivation to a rapid growth, I seeded down my orchard, hoping that by retarding the growth the disease would be checked. This result did indeed follow, but it was at the expense of their fruitfulness. So we have this choice of evils, cultivate the trees and thus subject them to blight, or seed the orchards to timothy, and gather but little fruit. Unfortunately the Transcendent, which is the best and most reliable in other respects of all the Siberians, and the sort most largely planted in St. Croix, is more subject to the attacks of this disease than any other variety.

But we persevered in the face of all these discouragements, and with some small measure of success, until, in 1879, there were a good many trees of Duchess, Wealthy, Tetofsky, and some other varieties, in bearing, and many promised success in the future. But the last two winters have effectually dispelled this delusion, and I do not believe there are to-day one hundred healthy trees of any standard variety in all that region. St. Croix county is in some respects more unfavorably located as regards tree culture than any other county in the state. Except a few sections along the northern and eastern borders, it lies just south and west of the timber, and thus loses all the benefits which its protection affords to more favored localities. It has no large bodies of water to ameliorate the atmospheric conditions, and is entirely exposed on the west and southwest to those rigorous blasts which sweep the plains of Minnesota and carry destruction in their breath to every living thing less hardy than an oak. No apple tree yet introduced has been able to withstand the effect of those terrific blizzards, with the mercury at from 30° to 40° below zero. Even the Transcendent, our standard for hardiness, is often severely injured and sometimes killed outright, as the two past winters can bear witness. And now what are we going to do about it? It would seem to be useless to continue the fight any longer with the old varieties, which have been tried again and again, and as often found wanting. For myself, I have discarded all of them except the Duchess and Wealthy, and shall plant but sparingly of these. My only hope of success lies in the direction of the experiments now being made at the Minnesota experimental fruit farm, under the direction of Mr. Gideon. It seems to me probable some time, perhaps in the near future, a seedling may be found that will adapt itself to this climate, even under the unfavorable conditions mentioned as existing in St. Croix county, so that our children, if not ourselves, will be able to plant orchards, with the reasonable expectation of eating the fruit thereof.

Mr. E. Wilcox, of La Crosse, took exceptions to the statement of the speaker, that the plan of grafting standards on crab roots had proved a failure. It was far from doing so with him. All his stock, both in orchard and nursery, except some Duchess bought of Mr. Stickney, stood on crab roots, and was doing well. He would like to have the members visit his grounds and judge for themselves. It was true that he had met with set-backs and losses, but his trees stood better, were more hardy and thrifty than standards on their own or on seedling roots. The statement that his plan dwarfed the growth was not correct, as he had repeatedly demonstrated by showing young stock thus propagated side by side with standard stock. Some of those present had a chance to see for themselves at the state fair a number of years since, and expressed surprise at the large and stocky growth of his trees, compared with those propagated in the old way. In regard to the claim that there was no affinity of stock between the standard and the crab, he would admit that some kinds would not unite well, and that a beetle would form at the graft; but there were other kinds that would unite and would make a smooth and continuous growth, and by selecting the kinds that thus unite we can get a smooth and perfect tree. He budded a large portion of his stock and thought the union was stronger and more perfect than where grafted.

Mr. Stickney said he was very sorry that Mr. Partridge was compelled to give us such a gloomy report of orchards in his section, and that the prospects for the future were so unpromising. He did not believe it was possible to secure the necessary hardiness in standard trees by grafting or budding such stock on crab roots. If not sufficiently hardy on its own roots, it is difficult to see how it is going to secure greater hardiness by being grafted on to roots whose habits of feeding and growth are entirely different from the stock itself. There can not be affinity where the habits of growth are so dissimilar, and we cannot hope for hardiness where affinity is lacking. Thousands of dollars had been spent in experimenting with crab roots, but the results had, as far as he had learned, been far from satisfactory. Mr. Wilcox's experiment may have been an exception; he hoped it was, but, if so, it was not sufficient to warrant our recommending the system to others. He could speak from experience in this matter, for when so much was said in its favor he had been led to hope there was something in it, and he put out forty thousand grafts on crab roots one season. They grew well at first, but did not prove satisfactory. Out of the forty thousand he did not sell five thousand, and was sorry he sold that many. Most of them went on to the brush pile. He had but one single specimen of the lot left, a Red Astrachan, an awkward, ungainly tree, branching out at the surface of the ground, and doubtless was now standing on its own roots.

Mr. Partridge said that there were many trees that appeared to be healthy scattered throughout the county, but they do not bear, or very scantily. The orchards that do the best, in fact all the healthy trees, are on the tops or the north sides of the ridges, what are called limestone ridges.

Mr. Stickney inquired if the Siberians were all affected alike by the blight. There are some varieties that are very much subject to blight, and others that are not. The Orange crab is one of the latter kind. It is equal in quality to the Transcendent, also in productiveness and hardiness, and is free, or nearly so, from attacks of blight. He thought the people in the northern part of the state would find it a treasure on this account.

Mr. Partridge replied that the Transcendent blighted the worst, and the Hyslop the next, perhaps. Whitney's No. 20 was affected least, but yet it suffered some.

Mr. Harris said many had labored hard and long to find some way by which to raise apples successfully. He had for many years spent all he could get for this purpose; had tried all the varieties recommended by the Pomological Society, and by our state societies; had tried crab roots and seedlings, and all systems of culture, denying himself and his family of many things they would have liked and ought to have had. The losses and disappointments had been many and great, and at times he had felt like giving up the struggle, but those engaged in this good work should not be discouraged. One may discover or originate a variety that is hardy, or by experiment may find out one or two varieties of standards and crabs that will unite readily and will give us a hardier stock; others will carry on the work and add to the list, and ultimate success will be attained, and then posterity will applaud the labors which now seem well nigh fruitless.

Mr. Plumb thought that none of us had yet finished our education, our schooling in fruit raising. We are still learning by our own experience and that of others, and also contributing to the knowledge and benefit of those who are to come after us. We often hear it stated that our trees are not injured by root killing. If this is true, we do not need hardier roots. A hardy root cannot give hardness to a top that is not in itself hardy; for, while the root collects the sap, for the nourishment of the top, the leaves and the cells of the top elaborate the sap and govern the development of the top, giving it the form and structure of the original stock; but the descending sap passes from the top into the root, and gradually gives to the new cellular growth a form and qualities like those of the top in which the sap was elaborated. So that if we start with the crab root, we shall in time have the top standing on its own roots, the old roots gradually dying out; or on roots from which the original properties and characteristics have been eliminated. What we want is both hardy roots and hardy tops. But it is a fallacy to say that from a crab root we can get a hardy top. To secure the needed hardiness we must select hardy varieties, give them the culture and set them where everything will tend to produce a hardy development by securing a steady, uniform and mature growth. The fact that our best orchards are on high hills and ridges, with northern exposures, corroborates this. We have an example near at hand, in the orchard of friend Philips, where on the top of a bluff one hundred and fifty feet high he raises apples that we cannot raise in Southern Wisconsin. In regard to affinity, it makes no difference in the result whether we bud or graft, as the two processes are one in theory and effect. If the affinity does not exist, the union will not be perfect in one case more than in the other.

Mr. Wilcox said we do lose many if not most of our trees by root killing, and this is why we specially need hardy roots. He had never claimed that it made the top of the tree hardier for standing on a crab root, but that the crab root was hardier than a standard root would be, and hence the tree was hardier.

Adjourned until 7½ P. M.

At the hour appointed the convention met and was called to order by the president. The evening session was assigned to the reading of papers by the ladies. Mrs. Huntley, of Appleton, read the following on

HORTICULTURE FOR THE CHILDREN OF THE FARM.

It was said by the king of ancient Sparta, that children should be taught that which would be most useful to them when they become men. One of the eminent writers of our own time says: "There is no inheritance, no blessing, which any one can confer upon children, no money, or name, that can compare with a taste for natural scenery and rural occupations." The love of the beautiful in nature is an element of character which excludes the vicious and the vulgar, and leads its possessor in ways of virtue and refinement, and to all that is excellent and elevating in life. To those parents who have chosen the culture of the soil for their life work, who live among the beauties and secrets of nature, who are daily handling her treasures, it is a duty that they should surround their children, from infancy to manhood, in as large a measure as possible, with all the beautiful trees, shrubs, excellent fruits and lovely flowers, that can be grown in the climate where they reside. The love of flowers, and fruits, and trees, and all the growing beauties of nature, comes to us all largely by inheritance. Much may be done by example, to create a love for rural adornings, and if one in a neighborhood or town begins the planting of trees and the culture of fruits, the practice becomes somewhat contagious, but there is not the same persistent effort to overcome all difficulties, to create as it were ways and means to gratify this taste, that is seen in those who inherit a love for horticultural pur suits, and whose early life was passed amid rural scenes. It is the "bended twig" that inclines the oak; it was the early training of Linnaeus that made him the renowned botanist that he was. Everything that is good and beautiful needs a genial atmosphere and the training hand of love to develop its perfection. We have all observed how plants and flowers expand into perfect bloom beneath the care of those who love them, while others apparently under the same conditions never attain such excellence. It is love for the flowers, which makes it a continual pleasure to comply with all the conditions necessary for their growth, just as the mother's love makes the care of her child a perpetual delight.

Children who have this gift — a love for flowers — will give early evidence of its possession. The babe in the mother's arms will be attracted by the bright colors of the tulip, and will not be content till it grasps the bright blossoms, the child just beginning to walk will gather the May weeds that grow along the path, and the same little boy when a little older grown, would "play horse" for hours with a bunch of potato blossoms in his hand simply because they were flowers, never realizing the difference between them and the more wonderful beauties with which God has clothed the earth. The parent who finds in his child such a love for the beautiful in nature has great cause for thankfulness, because in it he also finds the promise of a love of industry, of virtue, and of all the finer qualities of true manhood. A love for horticultural pursuits is a better possession than the "philosopher's stone;" it will do something more than turn all things to gold, for it turns all growing things into excellence and beauty, it leads one to seek an employment that makes the useful and the necessary a perpetual delight. While it provides the necessaries of life, it also beautifies and adorns the home and makes its owner generous, genial and thoughtful for the welfare of others. It is a notable fact that wherever we find, among the laboring classes, great success in horticulture, there we also find great excellence of character. It is said that a belated traveler in a foreign land compelled to ask shelter for the night was many times refused until selecting a humble dwelling with flower pots in the window, he did not ask in vain.

"Children who are reared amid rural scenery, if rightly trained, will become cultured and refined, even in abodes of poverty, which must be ascribed solely to the spiritual atmosphere pervading their homes." There never was a prettier story than the one so often told, of the gift of a blooming plant to the dwellers in a filthy cabin, the room was small and disorderly, the window so dirty that the sunlight could scarcely enter, but the presence of that one flower suggested so many improvements, that soon the cottage and its inmates were transformed by its influence.

The work of the horticulturist is what the late learned Bayard Taylor called "the beautification of nature;" it is the gathering together the best of all the treasures in nature's storehouse, the finest trees, the choicest fruits, the most excellent vegetables, the loveliest flowers, and then devoting time and labor to their culture, joining hands with nature to give "an added beauty to the earth." We sound the praise of the artist who puts upon the canvas the picture of rural scenes, but he who plants the trees and grow the flowers, and makes a living landscape, does a greater and a grander work, and to him we think the greater praise is due.

For the children of the farm much may be done to increase their interest in horticultural work, but something more than example is necessary, something more than to supply them with the products of the garden and orchard, and tell them of best varieties; there should be also thorough, practical training in all that pertains to the care and culture of the orchard. What would be the result in our schools if there was no instruction given except what is known among teachers as "the pouring-in process?" If in mathematics the solution of problems was not required, or in music if the fingers were not educated, nor the voice trained in song, teaching theories would be utterly useless. Parents should not only teach their children how work should be done, but by practice and by training children should learn to do skillful work in whatever they undertake. Sometimes the children of excellent parents go astray, which cannot be attributed to bad example, or want of teaching, but solely to the fact that they were not trained in any line of useful work. The success of farmers' sons is due largely to the fact that they are trained to a life of labor from infancy to manhood. The promise is not to those who teach, but to those who "train up a child in the way he should go." To many children a little garden of their own is a great incentive, wherein can be grown the early melons always so delightful to children. No fruit can be grown so quickly and in such surprising quantities as the melons. They are always enjoyable in the warm days of summer, delicious for the table, excellent with the lunch in the harvest field, and the center of attraction at the picnic dinner; and when company comes to the farm some of Tommy's melons must surely crown the feast. Sometimes he has the pleasure of sending a ripe melon to a city friend, and sometimes many to sell in the city market. We have known boys that have purchased many a present for mother with the money made from their melons. Other fruits are more lasting, but these are the quickest incentive for boys of any fruit we have. Then the strawberry bed has always great attractions for children, and may also become a source of profit. Raspberries of many varieties, cherries and grapes should all have a place in every fruit garden. If to each child was given a tree or vine of that variety they preferred, their interest in fruit would be much greater, and in after years, even down to old age, they would cherish happy memories of their first little garden.

The flowers are quite likely to be most attractive to the girls of the farm, and their first lessons in horticulture should be the flower bed in lawn or garden. Of all the beauties of the floral world, we know of nothing so delightful to the children as the dear old Morning Glories, fresh every day, always ready to greet the little ones when they wake in the morning; they became the wonder of one dear little girl, who would often ask, "Mamma, when do the Morning Glories open? They are always here when I get up." To older eyes they are always charming, and bloom in such profusion, they can be made to cover every unsightly place with beauty. Next to the Morning Glories, the Pansies please the children most. Their bright faces always remind us of the eager listening ones that gather daily in the school room; as we study their almost human expression, we think of the dear child who would handle them so lovingly, turning their bright heads with her delicate fingers, exclaiming, "See, mamma, they look as though they knew something." After these, a hedge of sweet peas will delight all the household. Give them a place somewhere in the garden or door yard; plant them early, and grow them in profusion; there cannot be too many. Let the little ones gather them daily, give them to their little friends, send them to the sick and the aged, and to the flower mission, take them to the school room and to the church, and every day let there be a bouquet of Fanny's sweet peas upon the tea table. The use of floral decorations always increases the love for flowers. A bright pansy laid upon a napkin, or a wreath of morning glories for the breakfast table, is a charming thing. Children take great delight in making bouquets, and these old-time flowers will give them so much pleasure that many other varieties will be added to the little garden, and its influence will be felt wherever its flowers are seen.

But the most lasting of all the pleasures of horticulture is the planting of trees; they grow under our care till they tower above our heads, and give shelter and shade, and beauty, and high above all living things they stand in majestic splendor. Plant them everywhere, in city and country, in town and village, on the broad prairies, in orchard and garden, in school yards and the road side, let the children plant them in spring time, plant them in autumn. Let them mark the anniversary day or the departure of some loved one, and in after years they will become living monuments of good deeds done. We can never forget the trees we loved in childhood. As we recount the pleasures of by-gone years, we see again the old "acorn tree" by the school house, the beach trees on the hill, the butternuts and the graceful elms that dipped their branches in the passing stream. What precious memories they bring of the teaching and training of early years and of the dear ones who loved and cared for us then. It is these early attachments, and their potent influence, which strengthens in character a love for the good and the beautiful. To-day we come from north and south and east, to the western limit of our own Wisconsin, to this beautiful city, clothed with the verdure of summer, adorned with its treasures, and guarded by the Father of Waters. Here you have gathered your offerings, not of "Pearls from the ocean or gems from the mine," not of costly fabrics or skillful mechanism, but the growth, the beauty, the excellence of the fruits and flowers of earth. We have met to talk of the lessons of the past, of pleasures to come, of plans for future work; our motto shall ever be "Forward;" with us you will still work on, and this grand old river as it flows onward to the sea, will bear on its bosom the story of your success, the promise of future efforts; and when your life work is over, the homes you have made, the flowers you have grown, and the trees you have planted in this lovely city, will make you "remembered by what you have done."

A very interesting paper was read by Mrs. A. A. Arnold, of Trempealeau, on "Influence and Mission of Flowers," but as it is given elsewhere, it is here omitted.

ORNAMENTAL TREE PLANTING.— Mr. Stickney said he understood that a good deal of attention had been given for a year or two past to setting out shade trees in the cemetery of La Crosse, and in the streets leading to it; also that the grounds had been made very beautiful and attractive by means of fountains, flower and foliage beds, pleasant walks and carriage ways, and well kept lawns. He saw that Mr. Losey, to whose efforts these improvements were largely due, was present, and desired that he would give us some account of this work.

Mr. Losey, in response to the call, gave a brief account of the manner the work was undertaken, and the change that had been made in the cemetery and its approaches, so that instead of being a neglected, desolate place, unfrequented except by those who were drawn there by affection for the resting place of departed friends, it had become a pleasant and popular resort, one which they took pleasure in visiting and in showing to friends. They had many unfavorable circumstances to encounter at first. Their soil was light, with plenty of moisture generally in the early part of the season, but hot and dry during August and September, and trees would start out well after setting and grow for a time, but would die out when the hot, dry weather came. There were very few hardy trees of any value for ornamental purposes that grew naturally in the valley, and it was so difficult to make ornamental shade trees live that many thought it would be no use to set them out. In commencing the work of tree planting, he felt that it was necessary to take extra care in setting and tending the trees in order to make it successful, and hence in preparing the ground, he had the holes dug four feet square and six feet deep, filling them in with the best soil to be obtained. The trees were set out carefully, setting them deep, pressing the soil closely around the roots. The surface about the tree was left dishing, so as to hold a large amount of water, and when the season required they were watered once or twice a week, putting on a barrel or two at a time. The result had been very satisfactory; seven hundred and fifty evergreens had been set out in this way, of which all but three are living and doing well. Out of one hundred elms and seventy-five ash trees not one has died. He wanted to call attention to one tree which was not usually found so far north, but which grew naturally about La Crosse and did well; that was the Coffee tree, called the Kentucky Coffee Tree, because it was abundant in that state. The seeds are supposed to have been carried up the Mississippi valley by the birds, and starting from these seeds, favored by the quick, warm soil and the semi-tropical climate, resulting from the protection of the bluffs, the trees became acclimated and seemed to be as hardy as though they were native to the soil. They make fine ornamental trees, beautiful in foliage and flower, and in the buds which hang on in winter. In handling the evergreens, special care was taken not to expose the roots. They were well packed in straw when moved, and uncovered only in the shade. The sun was not allowed to strike them, and water was applied freely until they were set out.

Mr. Harris said that the Kentucky Coffee tree was quite common in the Mississippi valley both above and below La Crosse. They were to be found from six inches in diameter up to a decent sized saw log.

Mr. Plumb did not regard such large holes as essential to success, and did not believe the success so much due to them as to the fact that the man who would dig such holes would attend to everything properly and see that everything that could be done, was attended to properly and at the right time. Extra care was given to all the other things that were done. If these were attended to, the roots of the trees would soon strike down to where they could get needed food and moisture. Their fruit trees appeared to be very thrifty, and free from blight and disease. Young trees in a sandy soil are more easily affected by heat and drought, for their roots are near the surface, but with age they are more exempt from injury by these causes.

He had noticed in looking about the city that while trees, shrubbery, vines and other plants made a luxuriant growth their lawns were very defective, having a very light and uneven sward. This was caused by the sandy soil. The grass seed would not catch, or if it did start, the hot sun and dry weather of mid-summer burned it up. The remedy was to cover the surface with a thin coating of clay, then the seed would catch readily. Clay was much better than manure for this purpose as it impacted the soil. Frequent cutting of the grass increased the number of roots, but it made them shorter. It is this repeated clipping that thickens up the grass and gives the lawn the carpet-like appearance so often seen.

Mr. Losey inquired if his success was not due to those large holes, why his trees lived, and those set the other way all died.

Mr. Plumb replied that many things were essential to success, as good trees, proper treatment of the trees, when dug up, protection of the roots, proper setting, etc., etc. If part or even one of these points is not carefully attended to, the trees suffer, perhaps die. He cited the case of a lady who set out fifty hard maples. They were good trees when set, but were all dying out. On examination to learn the cause, he found that they had been set sixteen inches deep, in a heavy soil.

Mr. Losey said that he had set elm trees two feet deep, and then in grading the ground, instead of taking up the trees he had filled up around them until their roots were six feet below the surface, yet they did well. If trees are well mulched and watered twice a week, they will live and grow well the first year even if the holes were small, but the trying time for such trees comes the second year, and they will need watering two or three years before they are well established and out of danger. No one will be willing to give such care, and it is cheaper and easier to make these large holes. It was perhaps not necessary, but he still watered the large trees, and he thought they would do better for it.

Mr. Harris was of the opinion they were both right, that the whole field should be so thoroughly prepared as to make it one continuous hole. If the soil is properly prepared it is not difficult to make trees and plants, transplanted even in dry weather, live. The past season he had been compelled to set out 2,000 tomato plants in dry and hot weather, but did not lose one. It is necessary to water freely soon after setting, and if very dry to repeat it again, but if done at the right time and in sufficient quantity, trees and plants can be carried through very hot and dry weather, even when newly set.

Senator Arnold had learned from experience that it was better not to water at all than not to do it well. He had transplanted many shade trees and had found no difficulty in making them live. The thing most essential to success, he believed, was the exercise of good common sense in the setting and in subsequent care.

Mr. Stickney regarded Mr. Losey's wonderful success as due not only to the thorough preparation of the soil, the large holes, but also to the care taken to do everything thoroughly. The work was all well done, as it should be not only in tree planting, but in everything we undertake, if we would make it a success. He had no doubt but that the large holes were a great benefit to the trees, for a loose and porous soil retains a greater amount of moisture from which the trees can draw at all times.

Adjourned to 9 A. M., June 24.

9 o'clock A. M.

The early morning hour was improved by members, and the judges, in examining and deciding upon the merits of the fruit and plants on exhibition. The season for strawberries had nearly passed, but still there was a good display of fine fruit. There was also a good show of early vegetables, one much in advance of the season throughout the state. The display of house and greenhouse plants was very fine. Among them were many rare plants from private collections, and a large collection of rare and valuable plants from the greenhouse of Mr. J. Salzer. As the reports of the judges were made to the secretary of the local society and were not forwarded for publication, no official announcement of the premiums awarded can be made.

When the society was called to order, the following paper was read by Mr. J. C. Plumb:

THE MISSION OF HORTICULTURE.

Some may doubt the propriety of using this theologic, esthetic word concerning the growing of trees and tomatoes, posies and pickles, but I use the term mission, not to show the details of method, but to discuss horticulture as a reformatory element in society. Hackneyed, but applicable, is the old story of Adam and Eve in the garden, to tend which was their chief occupation, showing that this industry was consonant with their primitive purity; which lost, they were driven from the "garden," to the more barren fields, with their toil and sweat.

I will not affirm that all horticulturists are persons of high moral standing, or even of cultivated tastes, for alas, in this our loved profession, we find some who are only mercenary and who remind us that it is true to-day as when our first parents rebelled against the "thou shalt not" of the Eternal Father, that mere occupation and surroundings cannot save the race from the degredation of willful transgression of law. "By their fruits ye shall know them," is as applicable here as in other pursuits. To show that horticulture has in it an element of reform, a saving power, we have only to contrast the character and person of our ardent flower-loving friends with those who, in similar walks of life, have no love for flowers, and give no time or thought to horticultural pursuits.

The horticulturist, by his close contact with the beautiful in nature, should have his thoughts elevated and refined, and by his study of natural laws should be led to revere their author. The "worship of trees" was once the higher type of pagan religion. Better so than no worshipful spirit. The wandering Arab finds cooling shelter and nourishing food in the palm groves of the desert. What wonder, then, that with his feeble spiritual vision he should see more of Deity in the tree than in revelation. The culture of plants and trees is a source of mental and moral culture too much overlooked and neglected. Plant life is full of attraction and impressive lessons, of mathematical exactness, and perfect harmony, as well as of faith and patience. The natural faculties of form and color find their most impressive school in the symmetry and variety of plants. The perfect adaptation of the parts of a plant, and its persevering development to ultimate flower and fruitage, are valuable lessons pointing most surely to the true idea of human life, that "It is not all of life to live," and that we should live to bless others. I have, in a previous paper, spoken of a most impressive lesson witnessed at Philadelphia in the Centennial year, but will repeat. On the spot where, a few years ago, were to be seen the abodes of crime and poverty, and where rags and wretchedness kept close company, are now fine rows of brick tenements, each with its little frontage of six by ten feet beside the walk filled with plants and shrubs, mostly in pots and boxes; also many of the window sills, to the fourth story, brilliant with flowers. This was formerly the "five points" of the city, but the John Wannamaker Mission School was started there, and from its benign influence a great change was wrought in that moral desert, and now a beautiful chapel and a large Gothic church are there, the center of an industrious and worshipful community. It is said that, from the first, flowers had a prominent place in this mission work. In any event, thousands saw and went away impressed with the coincidence of the two sights— the *blessed school* and the *beautiful flowers.* I have recently learned of another incident which occurred in the same city. The front of one of these mission churches had a dreary aspect, which the school desired to beautify. For this purpose they held a concert, the price of admission being one nice plant in pot. The result was a speedy decoration of the barren ground, which received the plants the next day. This is worthy of imitation in every city.

Geology reveals the interesting fact that flowers, as things of beauty, did not have a place in the vegetable world prior to man's existence, but that they appeared to be contemporary with man. Why this unless they were to have some part in delighting and blessing humanity? Home is the place where horticulture finds its true field and mission. It comes as a "ministering angel" to make the home attractive; and to while away many an hour which might otherwise be spent in moodiness, or in dissipation. I would commend home adornment by the art of horticulture, not simply for the pleasures of sense or the enhanced value of real estate, but as the means of making home the paradise of the family. That the children may grow up with higher and more refined ideas of life. That the homestead may be so much a *home*, that only the calls of duty or the inevitable changes of social life shall draw them from its endearing associations, and then that they may ever carry with them such pleasant remembrances of early life, that they may be constrained to make their own homes thus attractive. Bayard Taylor says

> "Our life line is the *love* of *home*,
> Oh make it fast where ere you roam,
> Amid the rough world's rolling strife,
> It is the anchorage of life."

It is said of some flowers that "they grow everywhere;" do not then neglect these common flowers, as their very omnipresence may remind some straying son or wayward daughter of the care and love so willingly divided between the children and the flowers in the old home, by kind friends whose cares are forever at rest. Our churches should be made cheerful with flowers and foliage. Flowers on the bier of the departed are emblems of the glorious morn beyond. Fresh flowers strewn upon the graves of our friends show that we have them yet fresh in memory, their very withering reminding us that our mortal remains will soon beside them lie. Decoration day, with its revival of memories and flower gifts, has become a national holiday, and the only one where flowers have an important part in the day's programme. As lovers of horticulture, let us gladly bear our part in this tribute to patriotism. Well do I remember the long night's work of my dear companion in arraying bouquets for the sick and wounded in Camp Randall, that with the early morning the children might distribute the wagon load of flowers at the hospital camp, and there both rebel and Union shared alike in the distribution. Let flowers comfort the sick and refresh the homeward bound invalid. They will go where we cannot, a mission of love; type of the spirit which prompts the offering.

Plants and flowers are a never-failing source of enjoyment to children, and in very early life they show their delight at the opening of some gay flower. Even before one year of age, the child will learn to have and express a lively appreciation of flowers, as well as of birds and pictures. Direct the attention of the child to these, and awaken early a love of the beautiful, which will be a star of promise of the great future of the onward life. Some may admit the beauty but deny the utility of flowers.

Our poet again says:

> "Beauty and use were married when
> This world was finished off for men.
> And he who would divorce the twain
> Is out of heart, and poor in brain;
> Would have the fruit without the flower,
> Would have the bow without the shower,
> Would have the noon without the morn."

Indeed, we cannot disassociate the useful from the beautiful, for the beautiful may not always be useful; this latter quality is the higher attribute, and ministers more to spiritual culture than the former.

> "'Tis first the true, then the beautiful;
> Not first the beautiful, and then the true;
> First the wild moor, with rock, and seed, and pool,
> Then the gay gardens, rich in scent and hue."

Horticulture produces and develops a taste for the beautiful. The garden and orchard are used in the literature of all nations, in prose and in poetry, to express beauty and plenty, joy and solace. Genesis tells us that God walked in the garden in the cool of the evening. The gardens of Babylon are as renowned as the power of that mighty empire. Solomon sang of his most divine communings through the type of the garden, showing it to be the one place sacred to mingled meditation and comfort. It is said that the profound writings of Socrates, Plato and Aristotle were composed among the trees and flowers of the Academia. Our Savior was wont to retire to the mountains for meditation and prayer, and it was in the "garden" that he spent the last quiet hours of his life in the flesh, in that mighty struggle for victory, and there he uttered that memorable request that his followers "might all be one." This intimate association of great mental and spiritual activity, with the garden, is no picture of fancy. There is something of inspiration in the quiet yet unceasing activity of the vegetable world which inspires in us the best thoughts and purest motives of life.

Horticulture is the fine art of agriculture, and a necessary adjunct of its onward progress. Civilization demands a different dress from barbarism. The farmer of primitive ages could clothe himself with the undressed skins of the flock, and feed upon their half-cooked flesh. But the farmer of to-day must have fabrics of many skillful hands and busy spindles to clothe himself and family, and be fed with the varied products of his own and other climes. In this expansion of idea and scope of life, horticulture comes in to do its part, supplying the fruits of the orchard and garden, which otherwise would be imported from other climes. It furnishes the home with rare and beautiful plant life, making that home attractive, both for its inmates and visitors. My own love of flowers and knowledge of plant life has often furnished a ready passport to the best society and homes of strangers, a key to unlock the bars of social life.

Horticulture, as an art, has received the fostering care of all civilized nations, and dates back (says our Mrs. Lewis) to the garden of Eden, where "the first horticultural society was formed," according to the instincts and aspirations of mankind;" and the same writer says further, "here the love for a garden germinated, and this love has been by nature kept burning ever since; and we alone are responsible if it does not continue until our whole lives are gladdened and beautified by its presence."

In practical horticulture females have recreation from the ordinary cares of life, and healthful industry in outdoor air. Contact with mother earth and strong sunlight, would give bronze and health to many a woman now repining in an atmosphere which would give consumption to a rose bush. Very much can and should be said for horticulture from a sanitary standpoint, in the dietetic necessity of fruit, as well as the open air exercise in its culture, but space will not allow of enlarging in this direction, on that which is so universally accepted.

The first known society of modern time for the promotion of this art was the London Horticultural Society of England, which was organized by Thomas Knight and others in 1808. This parent society has been a mighty power in that and other lands. Organized efforts in this country made little progress until within the last thirty years; Massachusetts and Pennsylvania leading in the east, and that grand national association, the American Pomological Society, was organized in 1848. The Northwestern Fruit Growers' Association in 1853 embracing all of northern and southern Wisconsin. Of the western state societies: Illinois organized in 1857; Wisconsin organized in 1862; Iowa organized in 1865; Minnesota organized in 1866; Kansas organized in 1866; Michigan organized in 1870.

Prior to the organization of these state societies, those more local or sectional existed in the several states, which were the "John the Baptists" of pomology, and, though clad in rough garments, and having less of the dainties of horticulture than we now enjoy, they were prophetic of our advanced light and progress.

Our own state organized the Wisconsin Fruit Growers' Association in 1855. Of the members of that old association, few remain to tell the story of our early hope of Peach and Greening growing, and of the first bitter experience of losses in 1855-56. In 1862, the old society was merged into the present State Society, which, with the help of its numerous offspring in our wide state, in its literature and practical teaching, is second to none in the Union.

The work of these societies is to enlist all classes in the practice of horticulture; to encourage the halting and educate the ignorant; to collate the experience of all, that all may have the experience of each; to secure larger returns from a given outlay; to avoid mistakes and consequent failures; to secure a healthy competition, and recogniz success by judicious premiums.

And here we come to the machinery of organization. We need little of the statutory in our organization, but good sense and common courtesy will help us on our mission most of all. A few life recruits and fast friends can, in any community or state, organize and keep in vigorous life a working society, but personal feuds or prejudices should find no place in its ranks.

The work of our State Society has passed from the first stage of annual gatherings for mutual help and instruction to the wide field of dispensing our funds and wisdom among the local societies of the state. We have little enough of both of these requisites, but I trust the oldest of us have not come to dotage or got above the learner's seat. It is a matter of gratulation and a guarantee of success that our state and local societies have so much help from the ladies. Woman's part in horticulture, as in all the walks of life, is to elevate and refine. By her presence and counsel, her winning ways and almost universal love of the beautiful, she will make our meetings and exhibitions both popular and successful.

Our work demands and is worthy of the liberal patronage of the state. We now receive the paltry sum of five or six hundred dollars per annum, while the Iowa society receives $1,000 per year; Minnesota receives the same, and has a permanent endowment of one hundred and sixteen acres of valuable land for experimental purposes; Michigan receives $2,500, Illinois $4,000. By a judicious and careful use of the small fund at the disposal of our society, and the gratuitous printing of the annual report by the state, we are enabled to hold our regular and semi-annual meetings and exhibitions, and assist one or more local societies in their local work. Our field of labor is large and varied. From the great lake on the east to the great river on the west, on whose banks we now stand; from the prairies of Illinois to the Superior of the north, with six degrees of longitude, and four of latitude, with every class of soil known to the continent, and peculiarities of climate never known in the eastern states; with native resources unlimited, and a varied population demanding the products of our art far beyond our capacity to supply, we have a field before us yet scarcely explored, in its best estate, and requiring all our energies and resources to occupy and make fruitful in the near future.

As our field is enlarged, and our work correspondingly increased, we will need and shall ask for two things: First, larger appropriations from the state; and second, more general co-operation of the local societies and those personally interested in the work of our society. Shall we have your hearty co-operation in both of these requirements? With interests in common, may we have that unity of action which will ensure our efficiency and permanency.

A paper was read by President Harris, in relation to the

CULTIVATION OF FLOWERS AND PLANTS BY AMATEURS.

J. L. HARRIS, La Crescent, Minn.

Although I am, and have been from childhood, an enthusiastic lover of flowers, and have devoted considerable time to their culture, and fully realize the charms of a well-kept flower garden, I have never so forcibly felt my inability to do justice to a subject as on this occasion. Poets have sung of the beautiful flowers, the ablest writers have written essays upon their culture; the one photographing a perfect picture of their sweets and colors, the others making their management so plain that no one need err in their cultivation, and I cannot be expected to do more. One writer has said that it is a subject that points us back to a paradise lost, and invites us forward to a paradise to regain. Another has said that floriculture shuts out the darkness of sin, and lifts the veil to refreshing bowers, luxurious verdure, pure crystal streams, and breezes that waft out upon a fallen world the sweetest of fragrance, the spices of life.

The cultivation of flowers, whether it be the tiny and cheap plants, growing in cracked cups and leaky pans in the poor laboring man's cottage window, or the high priced and richest hued exotics growing in costly vases, in conservatories of finest architecture, or in elaborately laid out beds, intermingling with stately palms and other tropical glories, in the palatial gardens and palaces of the great and wealthy of our land, is wielding a mighty influence to draw man away from dissipation and crime, and to elevate the moral condition of the human race, which no one, to-day, can tell, no pen describe. It is calculated to engage the intellect, and open fields of inexhaustible treasures which the longest life is far too short to explore, and it will forever be replete with animating discoveries of new beauties. To stand upon the dome of your court house, or the state capitol, or upon an eminence in the midst of a beautiful landscape, and to behold the "king of day," after having cheered the world with light, life and warmth, as he sinks beneath the horizon, touching up the tree tops, rocks, hills and threatening clouds with lights and shadows, is glorious; it gives us a glimpse into paradise — into heaven. The first is like the passing away of the life of a good man; the brightness that follows is like the beginning of the life of glad childhood. I have beheld many such scenes, and some of them will live forever in the memory, and doubtless have influenced my whole life. Perhaps the grandest of all was upon a battle field in Mexico, where the splendor that streamed forth upon a threatening sky, and the reflections upon the surrounding mountains was an inspiration to a little band of hungry and weary soldiers that enabled them upon the following day to win a brilliant victory against great odds. But that victory is insignificant compared with the one that is being gained in this city by the inspiration of the beautiful and well-grown flowers that shed forth their brightness and fragrance from the bay windows, piazzas and lawns of your beautiful residences and from the skillfully arranged drives and walks of your cemetery, where the richest gems of Flora everywhere abound.

I doubt if anywhere in the great west, where cities spring up as if by magic, and improvements come as a flash of light, any place can be found where so wonderful a change has been wrought in so short a time as in La Crosse. Thirty years since, the site of La Crosse was but little better than a desert, covered with patches of stunted grass, interspersed with sand burrs; there was not to exceed thirty buildings all told, and several of these rude shanties; I believe that I am safe in saying that there was not at that time to exceed one dozen house plants in the place, and they were the property of Mrs. J. M. Levey and Mrs. Simeon Kellogg, and did not exceed a half dozen species. To-day the house plants will count up into the thousands, and the bedding plants by hundreds of thousands, and in the wide world there is scarcely a floral gem that has not a representative here.

Flowers add very much to the attractions of a home; they hide deformities and cover imperfections; they fill up the depressions and round the sharp angles that would otherwise be offensive to the cultivated taste. It is not the grandest architecture of our American cities that attracts the notice of travelers, so much as the sweet fragrance of brilliant flowers and the rich hues of trailing vines that adorn, drape and embower them. Rich and gaudy clothing may divert the attention from the plain face, and the humble flowers will be seen and admired before the most magnificent works of man. The house without a tree or a flower about it may well be called the "bleak house," for the greatest of all attractions are lacking, and the children reared there will have no inspiration to patriotism or love for home. I believe that much crime and misery may be traced directly to such dreary homes; for the most wonderful influence of floriculture is not felt without, but it penetrates within. To use the language of Leigh Hunt, "It sweetens the air, rejoices the eye, and links the inmates with nature and innocence, and gives them something to love." Rand, in his Flower and Parlor Garden, says "the love of flowers is universal. It is an old melody which first attuned in earliest time, in the golden age of legendary lore, has come down to us, growing more mellow and sweeter as it chimed through the centuries, and now as then echoes in the human heart with a music akin to heaven." I firmly believe that the cultivation of flowers tends to sweeten the disposition, lighten the burden of toil, and soothe sorrow. If there is any truth in what I have thus far written, the cultivation of flowers ought to be encouraged, and in and about every home, however rude and humble, they should find a place.

Would time permit, I should like to spread before you a list of the most desirable varieties, and a detailed account of the methods of propagating, cultivating and keeping them. There are scores of species and thousands of varieties to select from, and most wonderful improvements are being made every day, so that the most fastidious taste may be gratified. The last ten years has added a host of new and improved varieties to our collections, while their cultivation as bedding and house plants has been greatly simplified. There are four methods of propagating plants, viz., seeds, cuttings, layers and divisions of the roots. As by cuttings is the most practical and expeditious, I will confine myself mostly to that method. True, there are some that will not strike root very readily, but there are enough that will for present purposes. For cuttings professional florists use sections of the immature growth, composed of one or more joints, and sometimes, where a variety is scarce, split the joints, using only single eyes. With the facilities afforded by the propagating house, professional cultivators prefer very soft and immature wood, but as I am not writing to instruct them, I will pass on for the benefit of amateurs, for such as the professionals will succeed with, would only be a disappointment to the latter. Cuttings should be taken from young and thrifty newly formed wood of the plant, but the lower part of them should not be too young and soft, else they are liable to decay before a callous is formed. Nor is old, hard wood desirable, as it will not absorb moisture enough to enable it to throw out roots. A good rule for the amateur is to take the cutting off at the junction of the old and new wood. In any case, it is better to take the cutting off just below a good bud. Every element of the perfect plant is found in the bud at the base, and the roots of most plants will start directly from it, and if compelled to find their way to the soil through an inch or more of useless wood, they will frequently decay or become greatly enfeebled. The cut should be made smooth, across the stem, with a sharp knife, that the bark may not be bruised or the cells crushed. The lower leaves should also be removed. Most of the hard wooded plants may be rooted in the open air during the spring and autumn months, but tender and watery plants are better covered with a bell glass, or shaded for a few days until they become wonted to their new location. Shade is needed, because exposure to the sun evaporates the little moisture contained in them, and they will wither away. A good method for raising the cuttings in a small way is take flower pots and fill them two-thirds full of good loamy soil, and over this place an inch to an inch and a half of sand to receive the cuttings. Moisten the sand well. Set the cuttings about an inch deep and near the edge of the pot, as a near contact with the pottery has a tendency to encourage the formation of roots. A good method for striking cuttings, which I have frequently used, is to take pots of six to eight inches diameter, fill them with soil to within two inches of the top, then close the drainage hole in a three or four inch pot and set in the center, place the sand around it, water well, insert the cuttings and keep the smaller pots filled with water, and shade for three or four days. Nearly enough moisture will ooze through the pores to supply the wants of the cuttings. Mr. Henderson, a noted florist of New York, recommends what he styles the saucer system, that is, to take a saucer or rather shallow plate, fill with sand, wet to the consistency of mortar, inserting the cuttings and pressing the sand closely about them. It must be kept sopping wet, for if allowed to dry the cuttings will die.

If the cuttings do well the roots will form as soon as a new growth of leaves start. They should be potted off without delay, as soon as the roots are about a half inch long, or they will become feeble for the want of sufficient nourishment. Where many plants are grown, it is well to keep at hand a compost for potting purposes. This is usually prepared by taking two parts of loamy sods from an old pasture or the road side and one of leaf mold from the woods. Where leaf mold is not convenient, well decomposed horse or cattle manure or refuse brewer's hops may be substituted. The sods are placed grassy sides down to facilitate rotting, a layer of sods and a layer of mold until the heap is completed. The pile should be shoveled over occasionally, to mix well together, and an occasional application of the suds on wash day, will be beneficial. Such a compost heap, made in the spring, will answer for use in the fall, but grows better with age. Where the sods are too clayey, a little sand may be added. If no compost heap has been provided, any good garden soil will answer and is much better than leaf mold that has not been composted, as the new soil will not affiliate with the roots until it has gone through with a sweetening process. For the first potting two and one-half or three inch unglazed pots are the best. In larger pots and those glazed the great mass of plants, when in the condition of rooted cuttings, will not do as well, for the reason that the smaller mass of soil in two and one-half or three inch pots allows the excessive moisture to pass off quickly, while in the larger and glazed ones it becomes sour and sodden. In potting off cuttings, place a small piece of pot shred or oyster shell over the hole in the bottom to prevent the escape of soil; then fill the pot level full of fine soil. With the finger make a hole in the center large enough to receive the roots, and after they are in place, with the thumb and fore-finger draw the soil close to the neck of the cutting and press somewhat firmly about the roots; a smart rap is given to the side of the pot which levels the surface of the soil, and the operation is completed. Water and set in the shade for a day or two, after which give plenty of sun and light. Plants designed for bedding out will usually do well enough in this sized pots until time to remove them to the open ground. If any of the plants are designed for house plants, they will require to be changed into larger pots, which is termed "shifting," or "repotting." The operation is simple, and yet many people seem to make awkward work of it. Many times I have seen them performing the operation; take a knife and cut around the ball of earth to get it out of the pot, or with a hammer break the pot in pieces. All that is required to remove a healthy plant is to place one hand over the pot, with the plant between the fingers, invert it, and give the edge of the pot a light rap on a bench or table, when the pot may be removed, leaving the ball of earth adhering to the plant; take the pot designed for use, which should be only one or two sizes larger than the one discarded, place in the bottom as much soil as may be necessary to bring the top of the ball about a half inch below the top of the pot, then fill around with fine soil, pressing it firmly with a small blunt stick provided for the purpose. The potting should never be done when the soil in the pot is dried dry, nor when too wet. If too wet, the life of the soil will be destroyed, and will become about like an unburned brick.

SPECIMEN PLANTS.—To young amateurs I would say, grow your own plants, or, if possible, go direct to the florist and purchase them. Almost every paper or magazine you take up has its advertisements of cheap plants. These growers can afford to sell cheap, because they raise them in a hot-house temperature, giving them a vigorous appearance by the use of stimulants, and can work off two or three crops from the same space in a season, but you cannot afford to purchase them. They are at their best, and if they do not quickly perish on your hands, it will take weeks of careful attention and nursing, before they will give you any return in flowers. Any novice who will simply pot his plants in good soil and give them supplies of water and air to keep them vigorous, repotting as required, can grow plants, but to grow them well is one of the highest arts of horticulture, and but few of our professional gardeners seem to know anything about it. To the true lover of nature, it is painful to see the deformed and struggling specimens that are often exhibited at our fairs. If they are only crowned with a bunch of bloom and belong to some rare specie, the committee is sure to attach the blue ribbon and hand in a glowing report, while the one lone plant of some poor woman, no matter if grown after nature's perfect model, is passed by. This is doing violence to floriculture. It would be better to discard three-fourths of the number and raise a few that will be a joy to the eye. Specimen plants should be grown slowly. Start them in small pots, and shift often enough to prevent becoming pot bound. Study the habits of the plants, and by it regulate your treatment. Give plenty of light and free circulation of air. Keep the plant from sudden changes of temperature, never let it get drowned in water or suffer from the want of it. Do not be afraid to use the knife freely to keep it in the proper form, and prevent its being drawn to one side by turning it around every day unless it gets light equally from every side. Finally grow your plants well, first, last and all the time, and you will enjoy them and they will give you an abundance of bloom. Time will not permit me to give you a list to grow, so I will close by saying to the new beginner, do not try too many varieties at first, and start in with common ones, such as geraniums, pelargoniums, heliotropes, lantanas, fuchsias, tea and bourbon roses, and as you get experienced you may add to your collection the rarer gems.

In reply to an inquiry, Mr. Harris said the water should be in the inner pot, and that if kept full, or nearly so, the moisture would ooze through the pores of the pot in sufficient quantities for the cutting. He thought it was much better to make the cut square across the slip, as there was less danger of bruising the bark, which would induce decay. No callous can be formed where the bark or tender wood is injured, and no roots will start out unless this callous or ridge is first formed. Some thought it made no difference where the slip was cut off between the buds, but he had the best result when the bud was near the end of the cutting; the callous developed quicker and rooted more readily. He thought it better, in raising specimen or perfect plants, to repot often, increasing the size of the pot but a little each time. If too much earth was added at a time it would be apt to sour, and the plant could not make a healthy growth. One well grown plant is worth a dozen poor ones. We should try to develop the form so as to make each plant symmetrical in shape and stocky. This is to be done by pinching back, checking any distorted or excessive growth. Many who raise plants dislike to do this. They like to see their plants grow rapidly, thinking that if they run up they will come to maturity or blossom earlier. They may throw out one or two blossoms a little earlier, if left to grow as they please, but by pinching off the ends of the shoots it causes three, four or half a dozen more to form, giving a stronger and a stocky growth, a better form, and much larger and stronger flower buds. Where such plants are bought of professional growers, we have to pay them a high price for doing this work. It is better and cheaper to do it ourselves.

Where plants for winter blooming are wanted, slips should be started in May or June; pinch them back at first, as stated before, and repot in September. The rich, black soil of low ground is not usually good for potted plants. If it has been well cultivated, tamed, as it were, and has a large mixture of black sand, it will do much better; but leaf mold from high lands, mixed with black sand, is much better. This, too, should be cultivated soil, not raw earth from the woods.

Two papers of much general interest, written by Dr. J. R. Renzzly, of La Crosse, were read, which we would have been glad to print in full, but the limited space allowed us and the amount of matter more pertinent to the regular work of the society and better calculated to advance the interests of horticulture, forbid.

Mr. Harris said, as the noon hour is near at hand, and the afternoon had been assigned for a visit to the water works, the cemetery and the leading places of interest in the city, he wished to improve this opportunity to present the thanks of the North-western Horticultural Society, and of the citizens of La Crosse, to the members of the State Society, and especially to the ladies who had taken part in the convention, for the entertainment, social and intellectual, of this occasion. They had read with great interest the papers presented by the ladies at former meetings of the State Society as they had been published from year to year in the reports, and were very glad to be able to meet with and to thank them for the pleasure and benefit thus derived. This meeting had been a very pleasant and profitable one to the citizens, and the local society, and its good influence would long be felt.

Mr. Stickney, in response, said the thanks should come from the other side. It had been a pleasant and profitable time to himself and to the members of the State Society, one which they would long remember with pleasure, on account of the kindness and hospitality with which they had been received. It also added to the interest and enjoyment of the occasion that we had here met with fellow laborers from a sister state, who were engaged heart and hand in the same good work, and from whose labors we had derived much profit in the past, and will continue to receive for years to come. In the Wealthy we reap the benefit of their toil, and the thanks of this society and of the whole country are due to their organization for the benefit thus received.

A vote of thanks to the railroad companies for their courtesy in granting reduced fair to those in attendance on the convention was passed.

In the afternoon carriages were in readiness, and the convention visited the water works and leading manufactories of the city, rambled through the large and well-stocked greenhouses and fine grounds of Mr. John Salzer, and from thence, by a circuitous drive through the pleasant, shady streets of the city, came to the cemetery. Here an hour was pleasantly passed, though in the resting place of the dead. Shady, winding paths and pleasant drives, beds of beautiful flowers and brilliantly colored foliage plants, set in well clipped lawns, gave a bright and even cheerful appearance to a place generally associated only with sadness and gloom. The citizens of La Crosse have good reason to take pride in their beautiful cemetery grounds, and of the liberality and good taste there displayed. The thought suggested itself to very many who were present, what a contrast between this and the usually desolate, neglected condition of our cemeteries, and what more appropriate or more beneficial work can our local horticultural societies engage in than in thus beautifying the place where sorrow buries its treasures and affection mourns for the loved and the lost.

The near approach of the parting hour necessitated a hasty return to the city, where the pleasant hours of the session, and the kindness and hospitality of the members of the local society, and of the citizens, to their guests, came to a fitting close, in a special session for the practical consideration of the merits of cake, strawberries and ice cream.

APPLETON MEETING.

At 2 P. M. of July 13 the convention assembled in Bertschy's Hall, and was called to order by President Smith. The president in opening the session stated in explanation of the late date at which the meeting was fixed, that the time for a number of weeks had been so occupied with public meetings in Appleton, that it was not possible to call the meeting at an earlier date, with any prospect of inducing people to attend, and even now he greatly feared that the surfeit of literary entertainments they had enjoyed, would keep many from coming to the present meeting. He hoped that those who had come would do what they could to make it interesting and profitable, and that all might derive much benefit, though few in numbers.

SMALL FRUITS.— As some of the members who were to read papers had not arrived, it was proposed as a very appropriate subject for consideration at this time, to talk over the season's experience in small fruits while fresh in mind. The president said that raspberries with him promised a fine crop. A few years ago he obtained some plants that were highly recommended from Ohio. They had not borne until the present season, but now promise a fine crop of large fruit. Would like to learn the name and the experience of the members if they had tried it. He thought it a good time to consider the strawberry question, and would call for experience with the Crescent.

Mr. Wood had set a few rows of the Crescent a year ago. The vines grew well; after the ground was frozen up in early winter he covered these rows with green maple and basswood chips. He did not put them on very thick, but the vines were all covered. He covered some rows of other kinds in the same way, but all kinds thus covered were killed. There were some runners of the Crescent outside of the covering. These all lived and bore nearly all the fruit he had had this season. The Crescent bore best with him, the Green Prolific was next.

Mr. Peffer's experience had been nearly the same with that of Mr. Wood. All the vines covered were killed, others lived. The covering, marsh hay, was put on about the 20th of December.

He thought the cause was in the fact that the ground was very dry when it froze up and when severe freezing weather came on the roots froze dry. The snow came late, and when it melted the beds that were mulched were still frozen and the water ran off, leaving the plants that were not entirely killed to die for want of moisture.

Mr. Reynolds, of Green Bay, had a very good crop of Crescents. The bed was set a year ago; the vines grew vigorously and took full possession of the ground; the beds were covered lightly in the winter, and came out in good condition and bore well. The flavor of the berry was very good.

Mr. Plumb said that nine-tenths of the crop in Rock county came from the Crescent. The Wilson made but little growth, the berries were small and poor. Professor Whitford, a neighbor of his, cultivated some Crescent in hills, and they seemed like one mass of fruit; he never saw such a sight. Professor Whitford cultivated rows both ways, but did not get as much fruit as he would have otherwise done. It does not do to stir the soil near the plants when the fruit is forming. All the cultivation should be done early in the season. The same with raspberries. He thought the best way to cultivate raspberries was to set them in rows, eight feet apart for black caps, six feet for red, and as thick as they can well stand in the row. Would not take out the old wood in the fall but the first thing in the spring, and also cut up all stragglers. You cannot well raise fruit and suckers too. Early in the spring run the plow along near the rows, throwing the dirt away from the plants, pull out between the hills with a hook. In about two weeks plow again, throwing the earth toward the rows; then level off and drag. Would not thin them out at this time, but would cut back so as to force out the laterals, giving a greater bearing surface and a stockier growth. Would not manure highly. A neighbor set out to raise twice as large a crop as he did, and manured very heavily, but the rust set in and badly injured his crop. Mr. Stone has the best success of anyone, and he is on light soil, manures but little, does not cultivate much, but mulches.

President Smith gave it as his opinion that a mulch of anything that was green would kill the vines. He set the first bed of Crescents three years ago; a year ago he set about half an acre. They grew well, but injured in the winter about the same as the Wilson. Last year's crop was a very fair one; thought it beat the Wilson in yield; the berry was rather soft, but stood shipping about thirty miles very well. Last season the vines made a wonderful growth. They were injured by the winter a good deal, but not as much as other varieties, and seemed to fully recover from the injury, and bore a large amount of fruit. The first picking was a fair one, and moderately hard; the second was much softer, and the third, fourth, etc., were so soft they could do nothing with them, and he plowed the vines, fruit and all, under. They were so soft that he could not use them in the home market even. He could not recommend it for cultivation. As near as he could judge, the best eighth of an acre yielded at the rate of nine thousand quarts to the acre. He set a few Sharpless a year ago. They did not grow as well as the Wilson, and were more injured by the winter than any other kind he had; nearly every plant was killed.

Mr. Huntley, of Appleton, did not know what caused the winter killing of the vines generally. Part of his beds he covered with bergasse, and on digging through the covering in the winter he found the plants standing in an inch or so of ice. The old shoots were killed much more easily than the young runners. The Crescent did very well with him, but it was not as much of a lazy man's berry as it had been recommended to be, for it would not keep out all the weeds, clover and grass. His Ancient Briton blackberries were loaded with fruit, but were troubled with rust. He threw bergasse on them for a winter covering, bending the tops over some.

Mr. Plumb thought that nature indicated the best way to propagate raspberries — by the tips; for where we find the tips rooted, it is at the extreme point. They do not root as readily where the cane is bent down and the end covered, leaving a part of the tip out, exposed to the air.

BLIGHT. — Mr. Peffer said he had noticed a difference in the first attack of blight the present season. It commenced in the spring when the trees were in bloom, and was seen first in the blossoms themselves, going from them to the leaves and twigs. It affected pears and apples alike, both in cultivated ground and in sod. He thought it was caused by the hot dry air withering the tender petals of the flowers. He believed that the cause was atmospheric. It was most seen in hot, moist weather, and in the trees that are growing most rapidly, and in the tenderest, newest growth. He knew of no remedy but to cut back and prevent rapid growth, or to set the trees where they will make but a slow growth.

President Smith had noticed trees standing in the sod, which had made but a moderate growth, that had been affected with blight the present season, so that this did not seem to be a sure remedy.

Mr. Plumb remarked that he had carefully studied this subject for a long time. Ten years ago he expressed the opinion that the direct, the active cause of fire blight lay in atmospheric conditions, and his subsequent observations had tended to strengthen rather than to change the opinion then expressed. Occasionally he found those who agreed with him, but the great majority, nine out of ten, at that time claimed that the injury was done by insects, but when examination was made they could not discover the insects or find any signs of their having been there. Others claimed that it was the result of fungoid disease. There is no question but that fungus growth is present and is rapidly developed in cases of blight, but that does not prove it to be the *cause* of the injury. It is far more likely that fungi come in as the result of the disease than that they can attack healthy wood and destroy it. The spores are floating everywhere in the atmosphere, and if they were able to produce the conditions favorable for their development, they would lodge on all vegetation, germinate and soon develop other spores and carry disease and death everywhere. The present season, the first half of June was very hot and wet, and blight developed rapidly, then came a warm but dry spell and blight was checked. The last part of June was hot and wet again, and the blight spread as rapidly as before. This connection between atmospheric conditions was seen every year, and goes to prove that the development of blight is governed by them. Another thing he had observed the present season was that the blight, or what closely resembles it, can be produced by mechanical means. He girdled a section of the top in a healthy tree, one where there was no sign of blight, and in ten days that section was dead, with all the appearance of blight, even the same sour scent, and the black, acrid exudation.

He had never seen any real benefit resulting from cutting off the limbs struck with blight; if the weather was favorable for blight, it would develop again; if not favorable, it would then stop spreading without the cutting back. The only real remedy seemed to be the preventive one of checking the rapid growth of our trees. Trees standing in grass land or in poor soil are much less subject to blight. Excessive fruitage also lessens the liability to it; anything which starves the tree or prevents an excessive wood growth acts as a preventive. For this reason he thought it was better to have bearing trees stand in grass land.

Mr. Huntley thought that trees should be cultivated the first few years. That was the period when they were the most liable to injury by blight, but if set in the sod they would never be healthy, vigorous trees. His trees had not suffered from blight for a year or two. The tent caterpillar had stripped them of their leaves, so that they had made but a feeble growth, and this he supposed was the reason why they had not blighted. Standing in sod was not a sure cure, for he had seen Transcendents standing in turf struck with blight as bad as those in cultivated ground.

ADAPTATIONS IN HORTICULTURE.

J. W. Wood, Baraboo.

There is one thing well established in our horticultural experience, and that is that indiscriminate planting of choice varieties of fruits, vegetables and flowers is not all that is necessary to insure satisfactory harvests. The fact is that we live on a kind of border land between successful fruit growing and failure, which makes it necessary for us to exercise great care in attending to all the details of the business. We must study carefully the characteristics of the different varieties of fruits. Each one may be the best under some peculiar circumstances, but all are not equally good under our own circumstances. No general directions can be given which will be a safe guide for all to follow, but each one of us has much to learn, which we can only find out for ourselves.

I shall have accomplished my purpose, if I but quicken observation on these points, for I have been deeply impressed, for a few years past, with the importance of studying carefully the adaptations of fruits and varieties to localities, even to the varying localities which may be found on any farm of forty acres, or even within the area of a common vegetable garden. There is no doubt a *best place* in every garden for each variety of seed, as there is a best place on the farm for every crop which it is at all difficult to raise. In planting so small a patch as a garden, he is but a dull gardener who does not feel that there is a fitness of place for each particular thing, and who does not study to discover such place, and so avail himself of all possible advantages.

Plants whose perfection lies in their succulence, like lettuce, cabbage, cauliflower, etc., must have the richest spot assigned to them; poorer ground, if it cannot be made rich, will do for peas, beans, corn and such products as may possess their intrinsic qualities, though of but moderate growth. A rich spot, free from the seeds of weeds, must be selected for onions, beets and such things as are cultivated in close rows. It will be found, even then, that the conflict with weeds will be a formidable one. I do not wonder that people believe in the spontaneous generation of weeds; such a theory seems necessary sometimes to account for their excessive numbers on ground which we supposed to be clean. One place will be favorable for the early things, another for the same things planted later for a succession. If we look through the remains of almost any ruined orchard, we will find that some of the trees have survived and have borne profitable crops of fruit. We cannot always tell fully what makes the difference. Sometimes we can see that it was owing to better drainage, better protection or no protection, better soil, or a better variety, but sometimes the reason is not apparent. We may be sure, however, that the tree has found something adapted to its wants, which we will do well to inquire after.

We plant a strawberry bed; a cold winter passes, a part of the bed is killed, a part survives and is fruitful. It is very common for one part of a bed to be far more productive than another; so with fields of grain, portions of our winter wheat will survive our severest winters. The slight inequalities caused by ridge and dead furrows in plowing level ground, will often result in nice strips of wheat, running clear across the field. A slight variation in the slope — some accidental protection, will make all the difference between success and failure. I conceive that the adaptations of varieties and localities, is one of the profoundest studies which the horticulturist has before him, and it is equally important to the farmer. Each one will have to modify general rules to fit their own peculiar circumstances.

Nature observes certain laws of adaptation on all occasions, and nearly all of our native productions are found under peculiar circumstances of soil and exposure. This may be illustrated by the spontaneous arrangements of the trees and shrubbery in the forest. There are places to look for each variety of tree, grass, or flower, and while some are found under a great variety of circumstances, yet the arrangement is generally settled by some definite law of adaptation. A person understanding these things, and wanting to find any particular plant, will start at once for such a locality as is likely to harbor it. In leaving the side of a little brook, on my farm, crossing its valley, and ascending to the crest of its dividing ridge, this law will be abundantly illustrated. We pass first through the willows and alders which skirt its margin, through the sedges and cattails of the marsh; across the meadow with its peculiar flora, to the bank covered with hazel, crab apples, and wild plums. The elm, butternut, and basswood will grow upon the flat, while the ridge will be crowned with oak, hickory, and maple. Some varieties will be more widely spread than others, but with many things the lines are strongly drawn. The smaller growths will be more definitely divided than the timber. It will not need a very observing eye to notice, that nature has very definite ideas of adaptation in planting.

The Baraboo river separates between two very distinct floras. The timber on the north side is but scattering, and consists largely of jack oak with its usual accompaniments of poplar and hazel, while on the south side it is a heavy forest of all the varieties common to this latitude. The underbrush, grasses and wild flowers of the two regions are quite as distinct as the timber growths. Had human agency, in the first place, reversed this order of planting, there is no doubt but that in time, it would have righted itself and established the present order, so subtle and yet so mighty are the influences which determine nature's operations. There is a little plant found in Labrador, the *Epilobium Alpinum*, which is described in our botanies as being found in the White and Adirondack mountains. It is also found at the dells of the Wisconsin on the ledges of cliff which face to the north where the sun never shines enough to drive it away. How came it there, in perhaps the only spot in Wisconsin where it finds congenial circumstances? Cultivated products are more cosmopolitan in their habits than others, but yet we see enough to satisfy us that the same unseen influences are at work, modifying their growth, and affecting our success in their culture.

That the difficulties which lie in our way are great, is confessed by the efforts which we make to succeed; and our success is not, as yet, very satisfactory. These difficulties lie to a great extent, I think, in our extremes of temperature, and in the occasional excessive dryness of our temperature. We cannot overcome these extremes, but must fortify ourselves against them. In the matter of temperature, we sometimes have the thermometer at 90° in the shade, which may mean 120° on the sunny side of an apple tree; and twice in Sauk county I have carved my name on solid mercury. In view of these facts we would naturally cry out for shelter for an orchard, but in a sheltered place the excess of heat is greater than in an exposed one. At sunrise in a winter's morning the cold is as intense in a sheltered place as it is on a hill top. It is doubtless more intense, as a casual frost will strike in a valley more severely than on high ground. This would drive us away from shelter, if we would avoid extremes.

Our soil is good enough. We have no difficulty in securing generous and even rampant growths in trees, shrubs and vines. The one thing which we lack, is a cell structure in them, which can endure vicissitudes. This is abundantly confessed by the interest with which we are looking to Russia for help. The varieties which we have received from that country so far, are either the crabs on the one hand, or apples of second rate quality on the other. We have become to some extent indifferent to quality, if we can only raise the bulk of our needed fruit, but a people like ours, who can buy the old rich apples of our boyhood at moderate prices, bananas, oranges and other tropical fruits at all seasons of the year, will not settle down contentedly with inferior fruit. When our country was first settled, we gathered all of the wild crabs we could find, and made use of them experimenting, in the interest of finding what varieties and what methods are the best adapted to our own circumstances. A portion we would bury in the ground till spring, when a good resolute boy would eat them with many grimaces and call them good. In the presence of the Siberian crabs they are no longer wanted, nor are the Siberians wanted when we can get the Russian apples, nor are these wanted when we can get the Baldwins or Greenings. It is a law in nature that we go north for sourness and crabbedness in fruit, and south for luciousness and abundance. It seems to be leading a forlorn hope to go to that northern land of snow and Nihilism, where the teeth of the people are always on edge, and when a deep seated desire to push their borders southward to a land of generous fruits and beautiful flowers is the standing menace of Europe, for anything to ameliorate and improve our list of fruits. I do not believe that those northern hordes eat good apples. Still we cannot but watch with kindly interest the efforts which are now being so vigorously made in this direction.

We will do well to remember at the same time that our exceedingly strong desire to secure the fruits we need exposes us in a weak place to the designs of swindlers. We may now look for the tree peddler with his hardy Russian fruits of delightful quality and unpronounceable names, and we will be made of more than ordinary stuff if we do not purchase a bill. I am anxious to speak a word of warning here, for we can already see premonitions of the coming swindle. A man who has paid a dollar each for Tetofskys, and waited eight years to harvest a peck of apples, will not be likely to bite again at words which he cannot pronounce. I might be willing to try some of the newer sorts, at a fair price, but I would carefully avoid all trees at unusual rates. Nursery stock can be propagated so rapidly that no tree, however valuable, can long be held at unusual rates.

No matter how hardy any variety of tree may be, it is still necessary to plant our fruit where it will be likely to escape the late spring frosts, and this will still lead us onto the high ground. We lose more fruit by late frosts in the spring than we do by severe winters, and the crabs are in no wise hardy in this respect. My experience is that all vegetation winters the best in places where the snow lies the longest in the spring, and this is where protection is furnished from the south. Such places would be the ones in which to plant fruits, were this the only point to be considered. Some fruits, in order to perfect themselves, need the strongest heat of our summers, and some things we want to force to early maturity in order to advance the season for their use. This will lead us to plant on southern exposures, but we must attend to the matter of protecting our plants in the winter and early spring. A garden spot may be exposed to heat for the sake of early vegetables, but such a spot will not generally bring fruits or vegetables to their greatest perfection. Lettuce and radishes will show a prompt tendency to run to seed in such places. Strawberries will ripen early, but we will get finer fruit when grown in a cooler spot.

On my own farm I find a great variety of soil, with as great a variety of slopes — north, south, east and west; some are very hot and others are cool. I believe that every spot is good for something, and I am endeavoring to discover its fitness. The study of all these variations with their especial adaptations, is with me a very interesting study which helps to give a charm to all my labors. I am inclined to prefer the cooler slopes, believing them to be less subject to winter killing, only, that I want the hottest place possible in which to grow an early garden. I wish that I might have come before you with more of the ripened fruit of observation, but I chose this subject because it is one which interests me deeply, and in prosecuting which I expect to reach more satisfactory results than I have obtained at present. I believe that there is something especially adapted to every spot, and which may be more profitably cultivated there, than elsewhere, and my aim is to discover what it is.

There is another class of adaptations bearing upon all the pursuits of life, of full greater importance than those which we have been considering; it is the adaptation of the person to the pursuit in which he is engaged. This is a matter of pre-eminent importance in horticulture. Success can only be achieved by the most persistent labor. If this labor is likely to become irksome or be neglected by any individual, he is not adapted to this business and he will not succeed. The day of success with neglect is past, if it ever existed. If a man does not feel the utmost resolution to succeed, in the face of a good understanding of the difficulties to be encountered, he had better not engage in the contemplated business. The day of luck is passed away. It is unfortunate that there is anything, even in gold hunting, which can be described as a bonanza. It leads men to neglect the studious and diligent care which is the only true ground work for success in anything. My motto is, "That the man who works, is the man who wins." It will be found true in horticulture if not in gold seeking. I have no faith in anything else. This idea had become a proverb before the Christian era. It was embodied in the old fable of the race between the hare and the tortoise. A man is not likely to prosper in any business which he does not enjoy. If he does, it is because he holds himself to it by moral force and runs it on strictly business principles.

There is another point in which this subject of adaptations must be considered, and that is in reference to the demands of the market. To raise a quantity of vegetables or fruits at a point where they could not be sold would be very impolitic, but it is also very poor policy to fail to raise all the stuff which can find a profitable market. There are but few of our country villages which are abundantly supplied with fruits and vegetables in their season, and there are many families in such places which prefer to buy what they need, if they can do so, rather than to run the expense of a garden. The tendency of the times is toward specialties in everything. The old style of village family gardens is fast disappearing. The grounds primarily set with shrubbery and trees are too much overgrown for vegetables. Currant bushes have disappeared since the advent of the worms, so that currants are only raised by those who make a specialty of them. It is of but little use to plant isolated patches of peas, because of the birds which prey upon them. Cabbages can only be raised successfully in large patches; many families have given them up entirely, even on farms, and depend on purchasing them; and so on through the whole list of fruits and vegetables. Many people would be glad to purchase their supplies if they could only do so. It is important for farmers to watch these tendencies and step in, and fill all such opportunities. It is easy to complain about an insufficient market, but there is no one so far from market as the person who has nothing to sell.

I am deeply impressed with the idea that the general and increasing difficulties attending fruit and vegetable growing are so great that nothing but intelligent and watchful care will succeed in any branch of these pursuits. I believe that such care will win, and that there is a boundless field of profit and enjoyment open to the man who avails himself of what is already known in selecting sites, choosing varieties, fighting enemies, and caring for orchards and fruit beds generally. The market to the west of us is unlimited for fruit, and however plenty and cheap early fruit and windfalls may be, that which is well preserved and properly marketed will still sell for prices which will make the land and labor devoted to their culture and preservation more profitable than that devoted to any of the more common pursuits of agriculture.

There are laws governing the very developments of civilization which it will be well for us to heed. New England was once a wheat exporting country. Its people do not now attempt to raise their own bread. They can use their land to better purpose.

The old farms in Walworth county, in this state, among which I spent my boyhood, are not now cultivated in wheat at all; but are run to dairy products, beef and pork. The farmers buy better flour than they can raise, and at cheaper rates than they can raise it. We cannot compete with the new western lands in wheat. We can raise some wheat, and must continue to do so, but we want to catch at a glance the possibilities and adaptations of our own circumstances, and leap at once to our true position. We must not wait to be driven to it by a long agony of misfortune and failure. To pass from low culture and coarse products to higher culture and finer products, is the destiny of all agricultural communities which continue prosperous. The very farm of John Johnson of Geneva, N. Y., so celebrated in the annals of successful farming on which its owner grew rich by intelligent labor almost beyond precedent, has passed out from under the old rich crops of wheat and corn entirely, and is now put to higher uses. So with the system of farming among us. Our best men are getting away from grain, driven to it, perhaps, by a rugged road, but we want to spring into our higher position as if we were born to it. Let the intelligent men of our state look to these things. I do not advise a sudden change to any one, but I advise an intelligent looking forward to a state of things which will surely come.

A newly planted orchard will require a few years of care to bring it into bearing, and must receive it. Let no man plant one, who will not give it this intelligent care. How nice it would be, as we get old, and less able to perform our annual routine of labor, in planting and harvesting, to have an orchard, planted once for all, and which can be harvested leisurely in the cool of autumn and marketed just as leisurely, and in the shade of which, we can hide from the hot August suns, and the fruits of which, will beguile our declining appetites and feed our families with the best of good and healthful food. It is time for us to begin this good work now. I believe that the horticultural interests of our state are committed to a worthy class of nurserymen, that they are watchful and vigilant, and that we have good reason to be proud of those to whom we more especially look as advisers in these matters, in the great march of our own improvement. I pay this tribute to them from the position of an outsider, and yet a close observer of their work for the last ten years. There is a tremendous push in these last days, in the direction of new varieties; in everything which is grown. They are always offered at speculative prices, and millions of dollars are annually expended by our people for which no adequate returns are received. A true minded nurseryman will stand as a protector of his customers rather than a plunderer. It is possible for them to let slip from time to time things of doubtful value. If we get sold a little occasionally, we must look upon it as a contribution to the general expense attending the production of new varieties. I believe that the interests of Wisconsin horticulture rest in worthy hands — that all that is good among the new varieties will be sifted out from among the worthless, and placed within the reach of all.

Mr. Plumb thought the law of adaptation, as presented in this paper, was a very important subject. It was a most interesting study to follow out the manifestations of it, seen in the natural world; as in the adaptation of vegetable growth to soil and climate, the kind, character and form of growth, all adapting themselves to the conditions in which they are placed, and the same conditions favoring the same development wherever they are found. There is evidence on every side that the Creator of all was strictly guided by and has observed it in all His works Man was the first to disregard this law, and to follow his own idea of fitness, his own will, and hence came discord and ruin; and to-day it is to the disregard of this law that much of the difficulty we encounter, many of our failures, are to be attributed. We try to raise varieties of grain and fruit; we set out trees and plants, where the soil, the climate, and other conditions are opposed or at least unfavorable to perfection of their growth. We should study the law of adaptation in all we do, and thus be in harmony with nature and with nature's God.

President Smith said this law of adaptation was a very practical subject, and had a direct bearing on success or failure in our work. All will do well to consider it carefully. There must be an adaptation in the crop raised to the market, to the climate, soil and place, to the time of planting and method of culture, etc.

The lack of some one point, which may not seem important at the time, may seriously affect the result. Theie are places in his own garden where he would not think of setting a strawberry bed; others where he would not plant potatoes, and so in regard to most every crop, there are conditions, even in narrow limits, which we must consider if we would raise them with the best success. No definite law or statement can be laid down in books in regard to these conditions, except in a general way. It must be left, in a great measure, to the experience, the judgment, of the cultivator himself.

Mr. Randall remarked that there seemed to be a sort of magnetism, a charm about some persons that made everything they set out live and do well, no matter how hurriedly and carelessly it was done, while others might take all the pains in the world, tend to them faithfully, and yet the plants would not thrive. The remark was frequently heard that whatever such a one touches lives, no matter how he or she handles it, but whatever this or that one has anything to do with, will surely die. As an instance to the point, he stated that in his own garden they had ripe tomatoes the first of July, while his neighbor, who had given more care and where all the conditions seemed equally favorable, had not a plant in bloom even.

Mr. Wood said there seemed to be some truth in this, if we judge by what we see. Some say it can be explained by a love for plants and flowers which gives those who possess it a special fitness for the work, a sort of instinct that guides them in their care, but this cannot be all, for we see some who have such a love for plants and flowers as to lead them to persist in their efforts to raise them after repeated failures; they seem to labor as earnestly and as intelligently, yet they do not succeed. He is inclined to believe that the difference in the results is to be attributed largely, if not wholly, to a better understanding of what the plants really need, and better judgment in the care, in the one than in the other, as in parents' love for their children, in some cases it leads them to do what is for the best good of the child, in others not. It is not in the amount of love, but in the manner of expressing it.

Mr. Huntley thought that while they seemed to take as good care of their plants, those who did not succeed failed in doing just what was needed or doing it in the best way. There was a knack of doing things just right; in this, as well as in the care of the sick. Some who were willing and anxious to help, who were full of sympathy, were not good nurses and could not be. He did not know as there was any natural peculiarity in one person more than another which made them more successful in the cultivation of plants and flowers, but it was surely developed more readily by education, experience in culture in some than in others.

This question of adaptation is one which has long engrossed the attention of our nurserymen, and they have labored faithfully to find out what varieties of trees and plants, what methods of culture are best adapted to our soil and climate. They are justly entitled to the confidence and encouragement of the public for their long continued and earnest efforts in this direction, yet it is surprising to see how easily the irresponsible and unknown tree peddler will gull us with his smooth, but wonderful stories of the remarkable qualities of the stuff he has to sell, when the least thought should convince us that, if these stories were true, our nurserymen would have found it out long ago. Why can we not buy of those we know, and whom we have every reason to put confidence in, rather than of these strangers whom we never saw before and never will see again.

Mr. Reynolds said that he had sometimes thought there was a sort of affinity between some persons and plant life, which gave them an appreciation of the fitness of things, and a knowledge of just what was best adapted to the wants of the plants they cultivated, and that this was the secret of their success. It was not certainly due to the amount of care and labor expended upon the plants, but must be in the kind. Mrs. Reynolds was remarkably successful in the cultivation of plants and flowers, but when asked for the reason of it, she could not tell. She certainly did not take any more pains with them than many others. This spring she set out tomato plants in their garden in what seemed to him rather an indifferent manner as regards care, but they grew right along and to-day were three times as large and promising in fruitfulness as those of a neighbor who had taken great care of his plants. This subject of fitness of things is one of the greatest, most important and interesting that we have to consider. On it depends success in every undertaking in life.

Mr. Randall did not think the success of some persons in raising plants and flowers was at all due to luck or chance, but was the result of their doing just the right thing in the right way and at the proper time. Their love for flowers led them to study their wants and made them quick to perceive what they needed and the effect of the care bestowed.

CULTIVATION OF CELERY.— Mr. Finney enquired as to the best way to grow celery. President Smith said the old method of cultivating it in trenches was very laborious and prevented many from raising it. This cultivation in trenches is generally discarded now and it can be raised with nearly the same ease as any garden vegetable. It might perhaps be better for the farmer who tries to raise it to buy his plants at first, in order to be sure and have vigorous plants. They need a rich and deep soil, but the manure used should be fine and well rotted. He sets the rows three feet and a half apart and the plants thick in the row, from six to eight inches if the variety is large, but nearer if a dwarf. The setting may be done the last of June and through the month of July. When the plants are eight or twelve inches high (twelve if the variety is large), gather the leaves together and draw the earth up around the stalks, and bank them up so as to hold the stalks closely together. This will make the stalk white and crispy. The banking up should be done when the plant and earth are dry, and care should be taken to hold the leaves together so as to prevent the dirt from getting into the heart of the plant, as this would cause it to become discolored. Let them grow in this way until the latter part of September or up to the middle of October, then bank up nearly to the top, but be careful to keep the dirt from getting between the stalks. If needed for early use this banking up may be done earlier. A moderate freezing will not injure it. The greater part of the stalks will not be sufficiently bleached in this way to make it of the best quality. His way of handling for winter use was to put an inch or so of soil in a dry goods box, and then set the plants packed closely together in this, leaving a moderate amount of earth on the roots. Put the box in the cellar where it is moderately cool, but the plants must not be allowed to freeze. When treated in this way the center stalks will keep on growing all winter. Bleaching can be done in this way when not done by banking up, but the celery is not of as good color or as crisp. Can be kept over winter out of doors if kept from freezing. If frozen in the winter it is worthless.

Mr. Finney had used sawdust instead of dirt in banking up with good success, better than when he used dirt. In this way the plants could be set much nearer together. He sets out the plants as early as the middle of May. The best method he had tried to keep celery for winter use was to dig a hole in the cellar bottom and fill it with rich soil, set the box over this, removing the bottom, then fill with the plants, setting them in the rich soil. They kept on growing all winter and were very crisp and tender. The last winter, he put a tube down through the plants, so as to water the soil occasionally, and found that they did better still, and also kept better. He had set the plants only six inches apart and got just as good celery as when set two feet apart. He had even set out two plants together and secured two good bunches. It is some more work to set so thick, but you get just as good celery, and much more of it from the same ground.

Mr. Wood said the seed for the main crop could be sown in the open ground and good plants be obtained. Sow as early as the weather will admit. If the plants are likely to get too large before it is time to set in the garden or field, prick them out and they will be much more vigorous when the time comes to transplant.

He inquired if anything was to be gained by using the early varieties for the late crop, sowing and planting late.

Mr. Smith thought as a rule the later the crop was grown for winter and spring use, the better, and that where the growth was very rapid, as that of the early varieties set out late in the season would be likely to be, the stalks would be very apt to be hollow, which would injure their value.

Mr. Plumb said the proper time to sow seeds and set out plants varied a good deal with the locality. At the time of the late meeting at La Crosse, on the 24th of June, they had found vegetation at least three weeks in advance of what it was in Rock county. All through the Lemonweir valley, barley was heading out, and the season was much in advance of that in the southern part of the state. The same was true of much of Minnesota. The season opened earlier there, though much further north, than with us, not only in sheltered places, with a warm and sandy soil, but even the winter wheat on the tops of the bluffs was in advance of us.

President Smith had some fears, before the June meeting at La Crosse, that the date fixed upon would be too early for the strawberry crop, but found when the time came that the season for them was virtually gone, while at Green Bay it was but just commencing. There was at least two weeks' difference in the season in the two places.

JULY 14, 2 P. M.

At the opening of the afternoon session, Mrs. Huntley, of Appleton, was called upon to give her method of cultivating the dahlia. In response, she said that of late years she had kept the tubers through the winter in a dry, dark room, where they would be secure from the frost. All the dirt was removed from the bulb, letting them dry a number of days; then she placed them in a barrel or box, without sand or any covering whatever. They had always kept safely in this way, and would sprout a number of weeks earlier than those kept in the cellar. When the sprouts had started out well, she set the tubers out in boxes filled with earth, or, if the weather permitted, in the open ground. She had the best success in very rich soil, and where there was considerable moisture. The best place she had found for them was near the house, just outside the drip of the eaves. Here they would grow from six to nine feet high. She did not practice pruning much, but took off a few of the lower leaves and stalks when the growth was excessive or unshapely. There should be but one stalk to a tuber. Sometimes more buds would start out early in the season than the plant could grow to perfection, and only one or two would become perfect flowers, if all were left to grow. By removing part, those left would be more perfect, and the plant would bloom more freely in the fall. Some varieties will not give perfect flowers, and others only a few perfect ones. These should all be discarded, and none but the best be raised. Frequently plants that give imperfect flowers the first of the season will have all perfect ones later, when the weather is cooler. The dahlia is a large, coarse flower, but gives great satisfaction from the length of the season and the profusion of its bloom. It was the last flower to be seen in the fall, and, by a little protection, would often be an ornament in the garden or lawn after the frost had killed all the rest.

Mr. Plumb said that in his experience, and in that of others, as far as he had seen, the richest soil was not the best for dahlias. It gave a rank growth, but also formed imperfect flowers. The best success he had ever had was in very hard soil, where there had been an old road-way. This was broken up and a space as large as a half bushel dug out of the hard earth and gravel and filled in with good earth and compost. The plants here grew to a moderate size, blossomed early and gave perfect flowers all the season. From his experience, he should choose the poorest and hardest soil and serve in this way. The same was true also with sweet potatoes. They would, in this kind of soil and treatment, start early, make a moderate growth of top, but early in the season, and would ripen the tubers early.

A paper was read by Mr. Plumb on

NORTHERN FRUITS AND FRUIT GROWING.

My title is suggestive of varieties and treatment distinctively peculiar to northern territory. We find it a necessity of this region to know the climatic changes to which we are subject, and the character of the soils we have to use; and also the inherent character of the tree or plant we seek to grow and the treatment best suited to its nature. These underlie all successful horticulture, and all these must be in a measure understood before we can claim success, from a correct theory or law, rather than from accident. True, accidental success in horticulture is better than none, but very unsatisfactory is the pursuit of any calling without a knowledge of the fundamental principles which govern that department of industry. Horticulture is no exception to this fact, and our western fruit growing has been largely of this kind of work, experiment after experiment, trial after trial. Success, ignis-fatuus like, ever receding, never found, in short a "going it blind," and all for the want of a true knowledge and faithful observance of the laws of vegetable growth.

Purposing to make this paper intensely practical, I will not stop to inquire the why and the wherefore of these natural conditions, but taking these facts as they appear, will endeavor to show the practical side of successful fruit growing in central and northern Wisconsin. Premising with my oft repeated proposition: First, that fruit is a necessary adjunct of our diet; and, second, that as a rule the masses must grow it, or have it grown within easy reach, or go without it.

Northern fruits have some strong points of distinction from those grown south. They are more meaty and less pulpy than southern fruits, and it is this which gives northern fruits their superior keeping quality. Our northern climate develops starch, the southern develops sugar. The most intensely acid fruit, as well as the very sweet juices, are the products of the south, as the lemon and the banana. But our northern fruits are milder and more suitable as food than any we can import from the south. We find also a difference in the quality of the same varieties. The further north an apple or pear can be grown, the more firm and fine grained its texture, and if well matured, its juices are also richer and its coloring more perfect. Losing in size, but gaining in specific gravity and concentration of juices by northern growing.

Still more apparent is the difference of habit and constitution which adapts one species and variety to a northern climate, while others of same species are totally unfit for the north. This shows us that we must have natural hardiness or endurance to be successful in a given climate and soil. Example native fruits: Siberians, Russians, the cranberry, blueberry, currant and apple, in distinction from peach and quince. Again we have a wide difference of local conditions of soil, aspect and elevation, and a corresponding difference in the success of varieties. So that latitude is only general in its relation to adaptation. Thus the peach belt, starting on the Atlantic coast in New Jersey, follows nearly northwest, to the shore of Lake Ontario, thence south and west below Lake Erie, then meandering nearly the whole of the state of Michigan, east of the lake up to latitude 46°, thence nearly south, and across the state of Illinois on latitude 39°, and south of the Missouri river to Kansas City. Here is a wide variation, covering six degrees of latitude or four hundred miles, as the northern peach belt, in a range of one thousand miles east and west. If we were to study up the causes of this wide variation in the adaptation of the peach, we would find that purely local conditions, temperature mainly and soil formation, as an adjunct, are the causes of this wide variation. To be sure the peach is very sensitive to these conditions, and so we find our apple and all the small fruits when we crowd them to the verge of successful culture, or as we now do, a little beyond, and pay little regard to the law of adaptation.

The history of apple growing in our state shows a variation in success fully as remarkable as peach growing referred to. Take the parallel of forty-four and one-fourth degrees, about that of this city of Appleton, across the state from east to west; we commence with Manitowoc county, which is undulating, well drained limestone soil, and as fine an apple region as we have in the state. Then comes Calumet county, which is the same in general character until we strike the valley of the lower Fox, where the general level and tenacious soil is not favorable to natural drainage, and fruit trees have not done well except where special preparation and artificial drainage have been resorted to. Eastern Outagamie is of this last character, while the western portion rises into those broken hills of Trenton and magnesium limestones, where fruit trees of the hardy varieties are a fair success. Passing into Waupaca and Waushara counties, and across Adams, Juneau and Jackson, we have good natural drainage, but generally too much sand for a well developed and long-lived fruit tree, except upon the occasional bluffs, which are capped with the boulder drift. Passing to the west line of the state through Trempealeau and Buffalo counties, we find the same formations with those grand limestone capped bluffs, where fruit trees are abundantly successful.

In the valleys of all central and western Wisconsin the average life of the apple tree cannot be more than seven years. While on the other hand, on the top of these drift hills and limestone bluffs up to the latitude of 45°, a little above Menomonie, Wausau, Chippewa Falls and Hudson, even ordinary varieties are doing about as well as in our southern tier of counties. These examples are plain to all observers, and show that local conditions have more to do with the success of varieties than latitude alone, and in this direction are we to look first of all for conditions of success. I have before given the following condensed rules for successful fruit growing in this region:

1. Plant on high, dry, firm soil, or make it so by ridging, draining, or dressing with clay.

2. Plant varieties you know to be successful in locations similar to your own.

3. Top low and grow slow; secure early growth and early maturity of wood, and keep a perpetual mulch by a grass sod mowed often and spread around the tree outside of its top. I recommend and urge heading the fruit tree low, even to the ground. All the best conditions for culture, pruning, bearing, picking, and health of tree are best secured by low heads. Cultivate no nearer the trunk than the outside of the tops. My idea of perfection of culture for the fruit tree in this climate is, to seed down with clover (or weeds) as soon as the tree is well established, and mow weekly through the summer, letting the product remain where cut. Under this plan little pruning will be necessary, and that should be done little by little during the growing season. The soil of central and northern Wisconsin is much of it strongly impregnated with iron and potash, which gives peculiar luster to the fruit, and a bearing tendency which is not common further south. The limestone series are especially fitted to the most perfect development of trees. The sandy regions can be made to grow permanent orchards by the application of clay and muck

from the clay beds which are frequently found adjacent, with an annual top dressing of ashes, whole or leached, at the outer drip of the trees. Ridging and underdraining should be practiced where the soil is retentive of water. Very many otherwise good locations for an orchard are "springy," and should be under-drained, or a deep head drain should cut off the source of this superabundant water in the subsoil. Surface evaporation may render them dry enough for ordinary farm crops, but the subsoil may be saturated six months of the year, to the certain injury of the fruit tree growing in it. The subsoil of the orchard in the north must not be retentive of water.

VARIETIES — As the apple is the king of fruits for the north, I will commend any variety that, with fair eating and cooking quality and fruitfulness, has proved generally adapted to a given locality. But long experience is needed for such test, and only such exceptionally severe winters as the past can give us that absolute test which is conclusive. Where now are Ben Davis and Pewaukee in all this region? Gone to the shades with most of the old eastern varieties, and even Fameuse has suffered badly. Indeed we have seen bearing trees of Duchess and Hyslop killed to the ground in many unfavorable locations. We had hoped much from the new Waupaca seedlings, which for remarkable size and beauty were some of them competitors for honors and a place in our ornamental list, but now our own experience leaves us nothing but the Wolf River of the real worthy sorts. In some sections, the new Russians were injured to quite an extent, none showing so many good qualities as our old Duchess. Yet we have hopes of getting some really valuable northern fruits from the many now on trial. To Minnesota and Mr. Gideon belong the honor of originating, in the Wealthy, the one variety above all others, which will help the north to an abundance of really good fall and early winter apples.

Sauk county gives us the McMahon, a large white apple of Russian type, very tender flesh, pleasant acid, productive, and exceedingly hardy; fall and early winter. We might enumerate other apples of fine quality and productiveness, which show themselves very hardy. But in the improved Siberians we have the "best thing out" for the extreme north and all locations and seasons, and best quality for eating and cooking. Judging from the past, I have more hope for a really complete list of apples for the north in our many seedlings than in any importations from abroad; and whoever has a real worthy fruit, that has stood the test of 1880–81, should make it known to our state or local societies, who should investigate and report upon the same in due time. Little can be said for the pear for this region, but that the most rigidly abstemious diet alone can save it from that climatic summer complaint, blight; and this will also insure successful wintering on your dry hill tops. Your best cherry for the interior is probably the Late Richmond or Kentish, while the lake shore region will grow all the Morrillos to perfection. The same may be said of the plum, choosing our best native varieties for the interior. Of the small fruits, the strawberry, raspberry, grape and currant should be chosen in the order named, adding the Snyder and Stone's Hardy Blackberry, with more or less winter shade to the plant. All these are especially at home in all this region. The grape only to be given a warm location, to secure maturity of some varieties. With full faith that a thorough knowledge of the natural conditions, which are and must continue to exist in this northern region, will enable the fruit grower to adapt his practice thereto, I commend these brief words of advice.

Interesting papers were also presented by Mrs. H. M. Lewis of Madison, on the "Birds of our Gardens;" Mrs. A. A. Arnold of Galesville, on "Our Children;" Miss Kate Peffer of Pewaukee, on "Trials of Exhibitors at Fairs."

Mr. Wood spoke highly in commendation of the papers read and the ideas presented in them. They were on subjects intimately connected with the comfort, happiness and well being of the home life, and were worthy of the careful consideration of all. He said women of late years had aspired to stations not usually regarded as in their sphere, had sought honor and fame in more athletic and daring callings than what her nature seemed to be adapted to, and by many such efforts were looked upon with favor. He gave a brief history of the life of Mrs. Maxwell, formerly Miss Dart, a student at Appleton. She married in 1854, and afterward moved to the wilds of the west, and became noted as a bold huntress, and for her collection of wild animals exhibited at the Centennial, all killed and stuffed by her own hands. Notices had been given in the papers of her recent death, with an account of her remarkable career. She had obtained notoriety, but did it pay for what it cost? Was it of any real use to her or the world? Her home was but a myth. Would she not have been much happier, would it not have been worth more to her to have labored to make a true home?

Rev. Mr. Huntley, President of Lawrence University, remarked that he had heard of her connection with the university, and of her remarkable life, but he thought one of the kind was enough. Home life was the truest and noblest sphere. He was rejoiced to see that the papers presented dwelt so much on the home and on those things calculated to make our homes more beautiful and happy. He could heartily indorse the sentiments expressed, they were a credit to their authors and creditable to any society that was seeking to benefit mankind.

8 P. M.— Professor N. M. Wheeler, of Lawrence University, read the following paper on

FOREST CULTURE.

It is a generally accepted conclusion, founded on long and careful observation, that every country needs, in order to be best fitted for human habitation, that at least one-quarter of its whole surface be covered with forest, and that this forest should be in masses. The proportion of forest to the whole area of the United State was in 1870 twenty-five per cent. From 1870 to 1880 there were over thirty thousand saw mills in operation in the United States, and the rate of forest destruction by these and other agencies was greater than ever before. There can be no doubt, therefore, that the proportion of woodland is now considerably below the proper limit in the country at large.

This is the result already reached in a land, which at the beginning of the last century was the most magnificently wooded country on the face of the earth, and whose wealth of forest is still supposed by the thoughtless majority to be inexhaustible. How far from inexhaustible a few facts and estimates will indicate. In 1873 a detailed statement was read before the Chicago Board of Trade, to the effect that at the present rate the timber supply of Canada would not last more than ten or twelve years, for the more important kinds. This estimate attracted considerable notice and some criticism. The *Lumbermen's Gazette*, of Bay City, Michigan, published estimates that same year, showing that the pineries of the United States and Canada would stand the drain then existing for twenty years. In 1875, Hon. George B. Emerson, one of the highest authorities on forestry in the United States, estimated "that in fifteen years all the forests in America will be cut down." These prophecies are startling, but they are made independently, by practical lumbermen, by men of great scientific attainment, and by government officials.

Moreover, consider some of the factors of the problem. The census of 1870 showed that the annual products drawn by the people of the United States from their forests then amounted in value to $1,000,000,000; eight times the interest on the national debt, twelve times the annual gold and silver product, and four times the annual wheat product. The consumption of lumber, of all kinds, exceeded 20,000,000,000 feet, expressed in board measure. But figures like these give little idea of the facts they endeavor to represent. Besides, these figures express only the net product of the lumberman's direct assault upon the forests with axe and saw, and do not take into account the enormous waste involved in his operations, nor the awful devastations caused by forest fires, cyclones and the like. Added to all this, we must imagine, if we can, the grand total of the immense clearings made for farming purposes, most of the products of which never get to market. Some idea of what has been done in this way may be gained from the interesting estimate made by Fredrick Starr, of St. Louis, that from 1850 to 1860 the wood land cleared for agricultural purposes averaged ten thousand acres for every working day. At this rate, the axe of the solitary pioneer alone would "clear" the whole United States in about one hundred years from the present time.

I have said enough to show the immense importance of the subject, but the real gravity of the situation is not appreciated until we consider the relations that exist between the general life of the globe and its forest covering. The advantages that the earth and her inhabitants receive from the forests may be summed up thus:

1. Increased rainfall. I state this because it is commonly supposed to be a fact, but it is by no means proved, and is not accepted by the best authorities, such as, in this country, Marsh, Whitney, Sargant and Emerson.

2. Equable distribution of rainfall and uniformity of temperature; closely connected with these functions is:

3. The forests as storehouses of moisture. These effects, of which there can be no doubt, are of vast importance in the general life of the globe, and in very many departments of human labor. Nothing is better established than that the destruction of forests causes sudden floods at one time of the year, and drought at another; turns navigable streams into dry torrent beds, dries up mill ponds, extinguishes perennial fountains and springs, makes summers hotter and winters colder, delays spring and lengthens autumn, breaks up our once uniform winter, and in many ways lessens the fertility of the soil and intensifies the harshness of the climate.

4. Keeps off the wind, thus diminishing all the great evils produced by their cold, their mechanical force, and their dessicating or "drying up" power.

5. Their direct and indirect influence upon human health.

6. Their economic products, classified under the two comprehensive heads of fuel and lumber. Of this feature I have already spoken at large.

Some of the historic facts and illustrations which support the above conclusions are interesting. I will mention a few. Ireland was once densely wooded. It is now almost destitute of forest, the proportion being less than two per cent. That this is one of the natural causes of the repeated crop failures and famines is asserted by very high authority. Six centuries ago Denmark was covered with woods. These having been cut down, more than one-fifth of her entire area, once forest, is now a barren, sandy heath, and the government, at great expense, is endeavoring to reclothe these naked wastes. "The river Po, when first spoken of in history, was a charming river, from its innumerable sources in the Alps on the north side, and the Appenines on the south side, one of the most charming rivers in the world, and a blessing to all who dwelt on its banks." For centuries the destruction of the forests along its banks, and in the mountain valleys whence its waters come, has been steadily going on. The natural results have followed. Sudden floods have washed the fertile soil from the denuded surface over much of its basin. The earth, pebbles and rocks have been swept into the main stream. Its mouth has advanced several miles into the sea. Its bed has filled up till its waters flow over the plains of Lombardy, higher than the tops of the houses, confined within the steadily rising walls by which the threatened people strive to protect their cities and farms. Almost yearly the overstrained wall gives way, a mighty torrent devastates the fairest fields in the world, cities are overwhelmed, farms buried under vast sheets of sand and pebbles, and thousands of people made beggars. Though not a large stream, this one river has, perhaps, done more damage in the last thousand years than any other in the world, and all this is attributable directly to the destruction of the forests, and to no other cause. France has suffered more than any other civilized country. The destruction of her forests was very rapid at the time of the revolution, and immediately after. The flanks of the Alps, on her southeastern frontier, being thus left bare, the most terrible results followed. Says a French writer (Blanqui): "If you overlook from an eminence one of those landscapes, furrowed with so many ravines, it presents only images of desolation and death. Vast deposits of flinty pebbles, many feet in thickness, which have been swept down from above, spread far over the plain, surround large trees, bury even their tops, and rise above them, leaving to the husbandman no ray of hope. * * Rivers might be mentioned whose beds have been raised ten feet in a single year. The devastation advances in geometrical progression as the higher slopes are bared, and the ruin from above helps to hasten the desolation below.

"In dry weather these mountain gorges and foothills, once covered with woods and pastures, are bare wastes of rocks and pebbles, where not even a bush can be found to shelter a bird, where all the springs are dried up, and where a dead silence, unbroken even by the hum of an insect, prevails; but when a storm bursts forth, masses of water suddenly shoot from the mountain heights into the shattered gulfs, waste without irrigating, deluge without refreshing the soil they overflow in their swift descent, and leave it even more seared than it was from lack of moisture."

The provinces in which such scenes were depicted — Dauphiny, Provence and Avignon — had been among the fairest in France, but the paradise was rapidly becoming a desert. In 1842 the department of the Lower Alps had 245,000 acres of cultivated soil; in 1852 it had 184,000; 61,000 acres, one-fourth of its arable area, had been washed away or rendered worthless. The population was steadily decreasing at the rate of one thousand a year in this one small department. Southern France became sadly famous for great floods and consequent ruin. Streams less than one hundred miles in length often suddenly swelled to more than the volume of the Nile, while rivers like the Loire and the Rhone threatened the utter devastation of their wide and fertile valleys. In 1856 the flood of the Loire covered 1,000,000 acres, that of the Rhone was equally destructive, and the total damage was incalculable. These great disasters roused the French government to systematic and extensive effort. Laws were passed in 1860 for the re-foresting of the mountains, applying to private as well as to state property. Thousands of acres were annually planted in the departments above referred to; and in 1875, when Southern France suffered greatly from floods, the river Durand, formerly the most dangerous in France — a river which as early as 1789 had ruined 130,000 acres of the finest land in the province — gave little trouble; and it is around the headwaters of this river that the chief plantations have been made. So much was gained in fifteen years.

The experience of France is peculiarly instructive, because here the results of excessive clearings have been most recent, and most carefully observed; and, on the other hand, the possibility of restoring the forests, and winning back their squandered wealth and their protection, most clearly shown. Moreover the circumstances and conditions of the French rivers are very similar to those in many parts of the United States. Let the noble forests that now feed the perennial springs of the Hudson be sacrificed to the greed of the speculator, and that magnificent stream would shrink to the rank of a mountain torrent, a curse rather than a blessing to the smiling fields it waters and the prosperous cities it has nourished.

On the general question of the diminution of rainfall and consequent shrinkage of rivers, the most important recent evidence is that of Councellor Gustav Wex, of Vienna, based on the careful observations of many years, and reported by him to the Academy of Arts and Sciences at Vienna in 1873. He showed conclusively that in the last fifty years the average level of the river Elbe has fallen seventeen inches; of the Rhine, twenty-four inches; of the Danube, fifty-five inches. And both himself and the Academy agreed in attributing this result to the felling of forests around the sources of these streams. No less an authority than the last edition of the *Encyclopædia Britannica* says, "there can be no doubt that one of the causes of the terrible famines (of 1874 and since) in India and China is the unwise denudation of mountain slopes."

Examples of the disastrous effort produced on climate by the destruction of forests are so numerous and well known, that I omit any mention of them.

We may now understand the gravity of the natural question excited by all these examples; what are we to expect in America? This country is no exception to the laws of nature. It had a century ago the finest forests of the world; it has now less forest area than it needs, and the work of destruction is going on faster than ever before. What shall shield us from the disastrous consequences which other countries have suffered? We already feel the first symptoms of that "general deterioration of the earth," which is nature's "vengeance for the violation of her harmonies," in uncertain climate, dried-up streams, floods ever increasing in frequency, and ruinous effect, rivers no longer navigable, cold winds blasting the orchards and intensifying disease, the derangement of the seasons, and, in the older states, the abandonment of lands once fertile. Our country is so wide, so long, so rich, so big every way, that it can stand all this, and much more, and scarcely notice the loss, but, nevertheless, we cannot afford it, for when once we have used up our resources, centuries will but gradually restore them. The great laboratories of nature work by ages rather than days and hours.

As the experience of Europe points out the danger, so we must look to her for a remedy. In every European state the care of the forests now forms an important branch of governmental concern, and largely occupies the minds of the people. Only six of them now have more than twenty-five per cent. of forest area, and only four — Norway and Sweden, Russia, Germany and Belgium — yield more than they consume. Even Russia, which, like America, is credited with inexhaustible supplies, reports but forty per cent. of woodland, and the government, finding the great artery of Russian commerce, the Volga river, annually shrinking, and alarmed at the enormous waste in her forests, has begun extensive plantations, established forest academies, and is endeavoring to introduce economical management. The feature most essential to the efficient working of these forest departments of state, as well as perhaps most striking to an American, is the system of forest schools. There are thirty or more of these academies in Europe, the best being in Germany and France. In the German schools, the period of study and practice extends over five years, and, before entering, the candidate must pass the standard of the gymnasium, a requirement equivalent to the degree of A. B. from an American college. The curriculum embraces three years in the natural sciences, mechanics, forest legislation and police, and other branches of theoretical forestry, and two years of practical study in the forest. After this, if the pupil passes his final examinations, he becomes an *ober forster Kandidat*, and is expected to spend five years more in waiting, performing various duties as assistant in the meanwhile, before he obtains a permanent appointment as *ober forster*. Yet so eagerly is the profession of forestry followed, and so keen is the ambition for a position in the government woods, that there is no lack of candidates. The result of this care and zeal is a system of forest cultivation almost as carefully conducted as field tillage. "The forests have all been surveyed, valued and divided into blocks, and there are accurate maps representing the extent and situation of each district, and whatever be the size of the woods every tree is recorded," and no tree can be cut unless it shows the mark of the overseer. That this system is conducted on a practical basis appears from the fact that only a little more than half the income from the state forests is required to pay all the annual expenses of the whole system. In France, as in Germany, the care of the forests constitutes a state department; the magnitude of the operations may be inferred from the fact that, besides the work in the Alps provinces and elsewhere, a forest one hundred and fifty miles long, and two to six miles wide, has been formed along the sand dunes of the western coast, by which millions of acres have been reclaimed and made arable. The French school of forestry at Nancy is one of the best. Its standard of admission is not so high as is maintained in Germany, and the term of study is two years less; but it is a very well equipped and active institution. The British government has made arrangements for the training in this school of young men destined for her forest service in India, five or six of whom are sent out every year.

Returning to our own country, we find that very little has been done to preserve or restore forest lands, and, worst of all, that total ignorance of the interests involved is well nigh universal. Generally speaking, the American has regarded the forests of his country in one of two aspects: first, as affording means for great and rapid profit; second, as obstacles to the culture of the ground. Yet greater knowledge is beginning to produce its natural fruit. We may discriminate, perhaps, two phases of growing interest in this matter. In the older states of the east, the once wooded hills and mountains being stripped, and the people beginning to awaken to the serious consequences, considerable effort is being put forth to preserve the existing forests, and to make plantations. Moreover, much land, either worn out or made unprofitable, in comparison with the rich western prairies, is now suffered to grow up to timber. In the great treeless regions of the West different motives are at work. The pressing necessity for immediate protection against wind, as well as the great difficulty of procuring fuel, has led state legislatures to encourage the planting of tree belts and groves by liberal grants of land, by remission of taxes and payment of bounties. Comparatively nothing has been done to check the rapid destruction of existing forests, or to enforce economic methods in their use. In 1874, an attempt was made to secure national legislation on the subject. The American Association for the Advancement of Science presented a memorial to congress, which was made the basis of a bill providing for the appointment of a commissioner of forestry, whose duty it should be to inquire into the destruction of timber, and the means necessary for its preservation. This bill did not become a law.

The problem is, in this country, an exceptionally difficult one. No one can gainsay the necessity for an immediate general awakening on the subject. Within the lifetime of a generation the resources of the present timber-growing states must be exhausted. There now remains in the United States but one vast tract of timber yet untouched — that of Oregon and Washington territories. The secondary consequences of forest destruction will be suffered by those who are now children, unless something be done to prevent our following in the fatal footsteps of other nations. But the nature of our general government precludes national legislation such as is relied upon in Europe. Neither can we depend upon state action, since private ownership is and must ever be the rule, and we would not tolerate, much less do we desire such interference with indvidual liberty as the paternal governments of Europe exercise. Evidently our sole reliance is upon such motives as appeal to individuals. Of these the most powerful is self interest. Let it be proved that it pays a man to preserve his wood land, or to plant out trees for profit, and the future of our forest supply is secure. Two things seem to make this proof impossible; if it requires fifty years to make a forest crop, it will be hard to make a farmer believe that such a crop pays; and, secondly, the fact that is so uncommon for the son to live on the acres his father tilled, makes it impossible to rely largely on this phase of self-interest. Otherwise, it might easily be shown that an estate in trees is a better bequest to one's heirs than money in bank.

There are, however, two or three considerations which modify somewhat this rather disheartening view. First, it does not require fifty years to make a paying forest crop. You do not have to wait till the maturity of the trees before they begin to make returns. Mr. John Hall of Raynham, Mass., has a plantation thirty years old, of white pine, already large enough to make board logs. Col. Saltonstall, of the same state, transformed a bleak and worthless hill into a paying forest in seventeen years. There are many such examples. A Larch plantation is calculated to yield three times the total investment, including interest, at the first cutting, in twenty years; and at the rate of thirteen per cent. per annum for the whole time, at the final cutting, at the end of fifty years. Further, the certain rise in the value of all timber products, which must follow the further destruction of existing forests, must be taken into account. Still more immediate in effect will be the market value of growing plantations on farms, even though young, as soon as the importance of this subject is generally understood. If a young orchard is now an immense addition to the value of a farm, so, in a few years, will be a grove of ash, of hickory, of black walnut or elm. Thus may self-interest be enlisted. Governmental aid may be made an important factor in the problem, mostly in the direction and supervision. And, thirdly, public spirit may be relied on to do a great deal when the nation is as generally enlightened upon this subject as the people of Europe now are. When the burning of a quarter section of solid oaks shall be looked upon with horror, when the wanton destruction of a growing tree shall be counted the sin it really is, when the culture of valuable trees shall absorb some of the time and money now wasted in trying to coax wheat out of the hard stones of New England, or in scaring the grasshoppers away from the wind-swept plains of Kansas and Dakota, when some of our colleges shall furnish young men with instruction in forestry, and when young men whose fathers hewed houses out of the primeval forest shall be ashamed not to be able to name ten different trees in an American wood-lot, then we shall begin to see the barren hill-side reclothed; the dry millstream shall murmur through the long summer again, and the "Great American Desert" may yet furnish the fireside with warmth, and the cabinet-maker with the raw material of beauty.

The next paper presented was by Mrs. Alex. Kerr, of Madison, on

HEALTH IN HORTICULTURE.

"Blessed is the man who has a good doctor," says one, but more blessed, say we, is the man who can do without one; yea, thrice blessed is that home where health is an ever abiding, ever welcome guest; bright-eyed health, with roses on her cheek, whose firm, elastic tread, whose rippling laughter, whose cheery voice, give a hope and a courage, which are born of Heaven. What is too difficult for the inmates of such a home to attempt or to accomplish? Strong hands and brave hearts perform with ease tasks of which the tired brain never even dreams, and at which he feeble, sickly body shrinks in dismay. Every moment is available. From dawn to "dewy eve," work is a pleasure, and when darkness falls,

"Tired Nature's sweet restorer, balmy sleep,"

comes like a benediction. No midnight lamp polluting the air of the apartment tells of sickness, of weary watching, of gloomy, anxious forebodings. No ghosts of unpaid doctor's bills haunt the house, appalling in their huge proportions; but peace, and plenty and sweet content follow in the train of health, and lend to domestic life an enduring charm.

Would you seek this gracious guest? Would you win her to your hearthstone? Then follow me to the garden. It is a midsummer day. The blue bending sky is above you; on every hand are flowers of rare beauty whose perfume recalls to you the time when you were a free and happy child. You partake of the delicious fruit, you are refreshed, you are invigorated; you walk along the well-kept garden paths, and murmur, "How delightful!" But your time is precious; you must hasten back to your office, to your counting-room, to your library — or, if you are a woman, to your sewing, or possibly, to your kitchen, and the old pain and weariness come back, and as for health, you have not heard even so much as the rustle of her garments.

If you would truly seek and find health, you must spend hours in the sunshine, where you can breath the purest air. You must keep close to the great, throbbing heart of nature; your delicate hands must not scorn contact with the dark, damp soil, for out of it are the issues of life.

Do you not remember the old Roman legend of the three young men who went to consult the oracle at Delphi; and how, when they cried, "O Lord Apollo, tell us which of us shall be king at Rome," there came a voice from the sanctuary which said, "Whichever of you shall first kiss his mother." And, while two of them were for hastening back to Rome where their mothers dwelt, the third fell and kissed the earth, for he said, "The earth is the true mother of us all," and he it was who ruled at Rome. Dear old Mother Earth! We are too apt to think of her only as offering a resting-place, when work is done, and tired hands are meekly folded over a pulseless heart. But there is magic in her touch, and to the living, earnest, active man she brings a new and quickening power.

In horticulture, men would find a relief from that weariness, against which they vainly contend, day after day, the result of too constant devotion to business. The frequent and startling instances of sudden death, or the equally sad and alarming cases of paralysis or affections of the brain, whereby a man is incapacitated for any mental effort, have led us to seek for the cause. We can easily see why an intemperate or a dissipated man, a man who has an ill-ventilated, uncomfortable home, with poorly-prepared or insufficient food, should suffer the penalty. But, that a man of unexceptional habits, possessed of an ample fortune, with a happy home and all the comforts and luxuries of civilized life, should be stricken down, is accounted a mysterious dispensation of Providence. On inquiry, we too often find that this man led a tread-mill existence; that he went back and forth, back and forth, from his house to his office, from his office to his house, with never a day's recreation, much less a vacation journey. To his wife's oft-repeated invitation to accompany her, his reply was that home was the best place for him; that he was miserable away from his business. So after tea, he looked over the daily papers, then fell to planning for the morrow, till ten o'clock came, and then to bed. To sleep? "Ay, there's the rub!" Could he have slept, all might have gone well with him. But, instead of taking note of this first warning, he sought an opiate, and the end was not far off. Are we mistaken in saying that if this man had given an hour or two of every day to light and agreeable work in his garden, had learned to take an interest and a pride in it, that his health might have remained firm, and his life been prolonged? Look about you, and see if the successful men, those who possess a competence, together with a sound mind and a sound body, have not some diversion, something which takes them out of the dull round of life's activities, and opens to them a new avenue to happiness and health. In a circular, recently issued by the State Board of Charities and Reform, we read: "The number of the insane in this state is increasing faster than the population." This alarming increase has given rise to special legislation during the past winter, in regard to the building and furnishing of county insane asylums, and it demands the attention of all who are studying and laboring to elevate and improve their fellow-men. Nowhere is this increase more noticeable than in the rural districts, and especially among the wives of farmers. The farmer's life is accounted one of the healthiest, and so, undoubtedly, it is, "as long as it is pursued in accordance with the laws governing life. Dr. Kempster says: "Eight hours of hard muscular labor is as much as can be borne properly out of the twenty-four, without damaging health." It is also asserted, on high authority, that two hours of work indoors is more exhausting than four hours out of doors. What shall we say then of the farmer's wife, who performs hard, muscular labor from morning until night during the heat of summer? Is it strange that we so often find her broken in health, when we expected to see her strong and vigorous?

There is no true economy in saving the expense of a girl in the kitchen, and having the wife and mother lose her health, her mind, or her life. The farmer will tell you, with an honest air, that a hired girl is not to be had. Do not believe him. If he wants a hired man, he finds one and offers wages that will induce him to come and work for him. But the farmer's wife is uncomplaining, self-sacrificing. She says: "*He* can't afford to hire any help in the kitchen; he needs his money for other things. When the farm is paid for and the children are grown up, she can take it easier." Yes, but she may find rest in the grave, or in the insane asylum. Let the farmer's wife have help in the house so that she can find time to look after her garden, and to prepare food in greater variety, with abundance of fruit and vegetables. Not the wife and mother alone, but the whole family would be the better for it; and we should soon see the boys and girls contented to follow the pursuits of agriculture and horticulture, instead of seeking a precarious livelihood in some city or large town.

In just the opposite direction we find one of the most pronounced causes of ill health. Within the past few weeks, scores of young ladies in Wisconsin have graduated in our colleges and universities. They have pursued the same courses of study as the young men, and are not behind their brothers in scholarship. We smile approvingly upon them and congratulate ourselves upon the success of co-education. But some earnest, thoughtful men, physicians in whom the state has confidence, shake their heads and gravely ask, "Are these to be the future mothers of the republic? These girls, with bloodless lips, shallow features, whose physical development is so imperfect?" "Better that the future matrons of the state should be without a university training, than that it should be purchased at the fearful expense of ruined health." The young men on commencement day are pale and thin, to be sure, but their muscles are firm, their chests are broad, and they have an erect and easy carriage. We know that a few weeks of rest will put them in good condition again. We inquire, why this difference? Are the young women possessed of mental ability inferior to that of the young men? We will not admit this. But we find that the young men have regular and systematic physical training, that military drill is required of them, that the gymnasium is daily open to them, that base ball is a favorite game with many, and when we inquire what physical exercise is required of the young women, we are told that nothing of the kind is expected of them. Here and there is one who enjoys rowing, or practices with dumb-bells or Indian clubs, but, for the most part, the time which should be given to exercise is devoted to embroidery or to fancy work of some kind. One young lady, a graduate of the State University last June, herself the picture of health, in her practical essay, entitled "Activity of Young Women," thus referred to this subject of physical exercise: "That this is essential to health all admit, and that the delicacy and weakness of many young women is due to a lack of it, seems undeniable. They are virtually dying for want of exercise. This is sustained by the false desire for delicacy which is commonly contrasted with coarseness, as if weakness or imperfection of the body were more refined than health, its perfection." From this it would appear that "the sweet girl graduate" would prefer to look pale and delicate, for public sentiment seems to expect it. Then public sentiment ought to be corrected.

Some one has suggested that young ladies be instructed in landscape gardening, so that they may know how to adorn and beautify their homes without, as well as within; that they cultivate flowers, and have each some little plat of ground which shall be her special care. The State University ought to take the lead in this, and the young and enthusiastic professor of agriculture might direct the work. I notice that he has already added to the attractions of the University drive by laying out flower beds near the shore of Lake Mendota, where verbenas, geraniums, and foliage plants greet you in a charming, unexpected fashion, as the carriage winds along the edge of the grove.

But however attractive flowers and fruits may be to grown up men and women, it is for the children that they possess peculiar delight. A good garden is an educator; it is a necessity to the highest development of child-life. To the wife and mother is entrusted the training of the little ones, and where can she care for them more pleasantly or successfully than in the garden We may not always guard our children from sickness, but some of us are beginning to believe that "an ounce of prevention is worth a pound of cure," and to act accordingly. We try to furnish a simple diet, with abundance of fresh fruit, and never give our children highly seasoned food. Pure air in the house, and plenty of exercise out of doors, we regard as essentials. If your boy is nervous and cross, what will you do with him? "Whip him," says some one. Yes, that was the old-fashioned rule; but there is a more excellent way. Send him into the garden. Divert him, and if in an hour he is not smiling and happy, "put him in his little bed," and sleep will do for him all that is necessary. He will, provided he is a well-trained, healthy child, wake up a good boy. I know a mother, whose son, fifteen years of age, was in danger of breaking down from too close confinement in school. He had no love for play or for work, he cared only for books. This boy was taken from the high school, and his mother, day after day, kept him with her in the garden. She encouraged him to cultivate raspberries, and often needed his help among her flowers. When he began to grow weary, she would say, "Now you may go into the house and I will finish this." But he would reply, "No, mother, I should be ashamed if I could not work as long as you." When she thought he had taken all the exercise he needed, they would go into the house and the mother would say, "You may rest, and I will read to you." In a very short time the boy would be asleep. Before the summer was over, his health was improved, and the next year he was able to go to school again. He finished his college course without any interruption and is now enjoying perfect health.

Does any one ask, "Are you not greatly overestimating the benefits of out door exercise and work in the garden?" For answer, I would point to these my friends, members of our Horticultural Society. Where will you find more healthy, robust, active men? Where will you find more genial, whole-souled gentlemen? Their faces bear no signs of corroding care, or of anxious fear lest they should come to want. They are benevolent, for they have often proved the truth of the proverb, "There is that scattereth yet increaseth." They are enterprising, they are prosperous, they are happy. Long may they live to benefit and bless our beloved State of Wisconsin.

In the discussion which followed the reading of these papers:

Mr. Plumb remarked that some regard this fear of a scarcity of timber in the near future as wholly ungrounded. At the La Crosse meeting Senator Price, one of the leading lumbermen, defended his fellow craftsmen, and claimed that they were developing the wealth of the country, instead of impairing its prosperity; that they were converting the natural products of the soil into material wealth, instead of laying waste, as many charged; that were this crop not harvested, much of it would soon become worthless, as much of our heavy timber was past its prime already. Our friend here, Mr. Wood, does not regard the question as one of pressing importance, for he has too much timber now. The important consideration with him is how to get rid of it. But to a large portion of the country it is a serious question, what shall we do in a short time for our timber? They begin to see the practical bearing of the subject in the growing scarcity and advancing prices, and they look forward with great apprehension, for it will ere long be not so much a question of cost, as of supply at any price. Let a tub or stave, hub and spoke, or a factory for working up wood of almost any kind start up in a locality, and they are springing up all over the country where there is any chance to get their products to market, and in two or three years they will clear off and use up all the timber suitable for their purpose for a circuit of three or four miles, and in as many more years all within reach is gone, and they must close up or move. There is enough of public sentiment on the subject; they see the danger, and feel the importance of the question, but will not take any extra steps towards remedying it.

Mr. Wood said that this was a practical question. In many parts of the country they need more timber, and trees should be set and timber be cultivated for economic purposes, but with him there was too much of it. It was a question of more interest to him how to get rid of what he had rather than to set out more. Someone has defined a weed as a plant out of place. Trees were plants out of place with him. A maple was like a pig weed in his land, only worse, as it was larger and harder to remove. It occupied space he wanted for farm crops. A growth of maples was not worth as much as a crop of clover or of most any other crop, and the farm crop could be renewed each year, but with the timber, when once the crop is harvested, it is gone and cannot be renewed for many years. He did not apprehend any trouble as far as fuel is concerned, for there is more of wood growth adapted for this purpose in the southern part of the state, than when it was first settled, and coal is being largely used for this instead of wood. We shall need timber for economic purposes in the years to come, but even here a large portion of the demand can be supplied by iron and other material. There are many purposes for which timber must be used, and where there is a scarcity of it, or where the land is not adapted to other and better uses, trees should be cultivated. Were our timber lands that are now being cleared protected from fire and the depredations of cattle, a new growth will start up denser than the original forest and will prove valuable in years to come.

Mr. Kellogg had a good deal of confidence in the Yankee; he would take care of himself in the future. If he wants timber for building purposes, or for machinery, he will get it in some way or make something else serve in its place. Did not know how he would get along in making wooden hams and nutmegs, but if he could not get the wood, he would find something that would do just as well. It is true that our pines are fast disappearing, and it will soon be a serious question what shall we do for pine lumber, for when once exhausted it will take many years to grow it. He felt that some measures should be taken to prevent reckless waste of what is left, and to protect our waste lands from which the timber has been cut off from fires.

Mr. S. Barter, of Markesan, believed that it would take much less time to grow trees suitable for timber than many supposed. Some varieties grow very rapidly. Eighteen years ago he set out Lombardy poplars, and now they are two feet through. They have no value for timber, but other valuable kinds will reach in a few years a size suitable for many uses. He has great faith in the American people, and was sure that they would not neglect this subject so long as to suffer serious loss. If the necessity was laid upon them they would provide for it. If they could not meet it in some other way, they would plant trees and raise their timber.

He said he could heartily indorse the sentiments of Mrs. Kerr's paper. Ladies should take great interest in the cultivation of flowers, and it would doubtless be beneficial if they would work in the garden, but the American ladies seem to be too feeble. They cannot endure the heat of the sun; a little labor completely unnerves them. There was no good reason why this should be so; with out door exercise or work of this kind they can easily acquire vigor and strength and add much to the pleasure and comfort of their lives.

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9 A. M., JULY 15TH.— At the opening of the morning session Judge Collins, of Appleton, gave a short but very interesting extempore address on the importance of practical and scientific knowledge in the practice of horticulture and agriculture. He said there was too much resemblance in regard to the mental and intellectual apprehension of the facts and principles essential to the successful development of these interests by those engaged in them with that of Topsy respecting her origin and continued existence. She just "growed," and that is about all that many can tell in regard to the crops they cultivate. Why they grow, what will help or retard their development, they cannot tell. Many follow on in the old time ruts of the fathers, planting the same seed, giving the same culture — if it can be called culture where there is no intelligent adaptation of means to end — as those before them. We can still find those who pay little regard to the elements in the soil, peculiarities of the location or mechanical treatment required of the crop they wish to raise. Some still move the stable to get rid of the manure pile; burn the straw to get it out of the way; others put on what manure they happen to have, no matter what its quality, or what the condition of the soil, the wants of the crop. The soil may have all the elements thus applied in

excess, or they may be useless, because some other element is lacking to make them available; or if they are wanting in the soil, they may not be in kind or form what the plants need. It will contribute greatly to the successful cultivation of any crop to know the elements required by that crop, both their amount and properties, and the composition and condition of soil best fitted to furnish these elements. Chemical analysis of the soil may not be able to give us just the proportion and amount of the essentials therein, nor can we always supply the particular chemical element that seems to be lacking in a form to secure the desired result, but we can give the soil the material needed and help nature's laboratory in the preparation of plant food.

Mr. Geo. J. Kellogg, of Janesville, followed with a paper on

OUT DOOR FLOWERS AND PLANTS.

"Then wherefore, wherefore were they made,
All dyed with rainbow lights,
All fashioned with supremest grace,
Upspringing day and night.

"Springing in valleys green and low,
And on the mountains high,
And in the silent wilderness,
Where no man passes by.

"To comfort man, to whisper hope,
When'er his faith is dim,
For he who careth for the flowers,
Will much more care for him."

When spring first breaks the bands of the ice king, ready to beautify the earth, come millions of wild flowers all over the land. And the lovers of the beautiful have so improved nature's gifts as to give us almost beneath the snowbanks the hyacinth, crocus, tulips and a host of others, all desirable and indispensable. These must be planted in early autumn.

With, and immediately following these, come the early flowering shrubs, but the choicest can only be grown with care and winter protection. Pyrus Japanica Weigelia and Fringe tree usually need protection, or you will find neither pleasure or profit in them. You are all familiar with the double Flowering Almond, the Mexican Flowering Currant with its wonderful fragrance, the snow ball and the lilac family. There is a place for every thing, and the lilac should have its corner undisturbed, where its suckers will not intrude upon choicer friends. There is such a large class of flowering shrubs that claim hardiness, beauty and perfection, it would seem to a person not initiated, that our grounds might bloom from spring to fall and never fail from frost or drouth or blight; but alas the imperfections of human nature and some of its flowering shrubs. The list is too long, the task too difficult, even if experience had had no failure; we add to the list mentioned as deserving your consideration, Spireas in variety, Tartarian Honeysuckles, Syringas, Deutzias, Red Bud, Strawberry Tree and Berberry.

Herbaceous plants, when once started, need little care and are a joy forever; Dyelytras, Delphinneums, Lillies, Paeonies in variety, the earliest of which is Fennel leaf; herbaceous Clematis, Ash leaf Spirea, and (don't forget) the Lily of the [illegible] with all its modesty and wonderful fragrance.

Perhaps you may expect a word on Annuals — well, plant them, but take a little trouble and obtain dirt enough from the woods to cover your beds at least four inches deep, and if this is drawn and lays in a well rotted compost heap a year before using, it will be all the better; cover your beds with sand, then sow your seed, hardly covering it at all, but put on lath over each row, leaving them on till the seeds sprout. If dry, you can water, and the lath will protect at any time. It is better to plant some kinds in shallow boxes, and then transplant at a favorable time, using brush for a shade; both ways are best. Those who love it, and can take the time, enjoy it; but often the drouth or the weeds take the sweet all out of it.

Climbing vines cannot be dispensed with. Every out building should have its Virginia Creeper; every veranda its Climbing Rose in variety — the Queen for its beauty, the Gem for its delicious fragrance, the Belle for variety, and the Michigan for its late blooming, variegated clusters. Add others in profusion.

The last rose needs no protection, or the Virginia Creeper, but the other roses need a mat, hay or straw wrap; but it is better to take them down and cover with marsh hay sufficient to keep off the winter's sun.

Lastly, *The Rose*, the queen of flowers, the perfection of beauty in all its combinations; in classes numerous, in variety numberless. Of June roses, including Mosses, there are a few we would not discard; of Hybrids, we could not spare Gen. Jacqueminot and La France! But of all the Roses, the everblooming will repeat its joy daily from June to November — always a bud, always a blossom — an endless variety. We need not give you names. Order the colors you want — one dozen can be had for one dollar and a half. But amid all this beauty and fragrance there is one little drawback; of fifty fine, blooming plants we protected and left out last winter, this spring they all came out dead. By potting in October, cutting back severely, and keeping in a cool room, you will succeed in wintering them. I shall dig, cut back, and try packing in moss and earth, and putting in the cellar this fall. Try them; they pay for themselves four times over in one season. If you fail to winter them, buy more. Don't try to keep flowers without at least a dozen of the sweet-scented, ever blooming roses. One lady visiting our grounds last summer said she was "going to have an acre of them." Hoping to induce some one to go and do likewise, I submit this brief paper on outdoor flowers and plants with all their *thorns* to your compassionate consideration.

Mr. S. Barter, of Markesan, presented a paper on the

REWARDS IN THE FLOWER GARDEN.

To a practical people, composed of the most intelligent and enterprising citizens of all the leading nations of the globe, in addition to our own; cemented together by a common bond of brotherhood and nationality, the most common question usually raised in regard to any business or enterprise is, does it pay? To many persons it is difficult to understand how the amateur florist can be induced to devote so much time and labor to the care and cultivation of flowers, without any apparent profit arising therefrom. To the lovers of flowers and all that is grand and beautiful in nature, the problem is easily solved. They can readily appreciate the happiness and rewards derived from association with God's beautiful gift the flowers. It has a refining, ennobling, christianizing influence; it teaches humility and a firm, confiding reliance on the Great Creator, who provides the necessary conditions for the growth and perfect development of our loved and cherished friends, the flower plants.

The experienced florist well knows the amount of care and labor required in the cultivation of flowers; he knows that his plants need almost as much care and watchfulness as a fond mother gives in the guardianship of her lovely child, but if his heart is in the work, he accepts the responsibility, well knowing that he will be richly rewarded for all the labor bestowed.

One of the most enjoyable experiences of the florist consists in observing the gradual and perfect development of the various plants and shrubs of the garden. Changes occur every day, so that he is constantly instructed and entertained, from early spring until late in the autumn, in beholding the wonderful workings of nature's laws in its tireless course, "without haste and without rest," patiently bringing forth the leaves and buds, and unfolding and perfecting the lovely blossoms. Surely the culture of flowers is a pleasant and profitable employment. Ladies, on account of their more refined and cultivated taste, enjoy the sight of flowers more than men, but they do not always have the time and strength to battle with the weeds, and protect the plants. Let those of us who are able and have leisure, do our share in aiding nature in the production of the beautiful flowers God has provided as a token of His goodness towards us, and enjoy the rewards resulting from the consciousness of having done something to add to the attractiveness of this beautiful world. Then as we sit in our cozy homes, looking out on the world clad in its pure white wintry garb, we will long for the return of spring, when the earth shall be again clad in a mantle of verdure, when the buds will burst forth, and the roses will bloom again, to gladden our hearts and make the pathway of life purer, brighter and happier; and when the loved treasures come we will be led to exclaim in the exuberance of our joy, "How wonderful are Thy works, Oh! Lord; in wisdom hast Thou made them all."

Mr. Plumb was of the opinion that the reason why our roses were injured to such an extent the past winter was not the want of proper protection, but was back of that, in natural causes, and that no amount of protection would have been effectual. Wood growth was prolonged late into the fall, severe cold weather came on early in November, as early, if not earlier than was ever known before. On the 17th of November the mercury stood at —20° in Southern Missouri, and all over the west and northwest the cold was very severe, and coming on so early and sudden, the late immature wood growth was injured. No amount of covering would protect under such conditions. Our soil, our culture and our climate all more or less tend to produce growth late in the season, and often there is little opportunity for the thorough ripening, the perfect maturity of the wood structure, so necessary to the endurance of the sudden changes, and the extreme cold of our winters. The last winter's experience was not the result of accident or chance, but was the legitimate consequence of the violation of nature's laws. With the same conditions, this identical result must follow. The remedy for late growth is root pruning. Some say clipping the tops will answer the same end, but it will not be sufficient. The roots will still be full of sap and this will tend to force further growth. The same principle is followed by our florists in what is termed "turning out plants to rest," to secure winter blooming; they first check the growth by shutting off the water from the roots, and when growth is thus checked, they turn them down and give the needed rest. The injury to rose bushes and vines was more severe last winter than has been experienced for a number of years, affecting even the plants and varieties regarded as hardy. A rose bush, from ten to twelve feet high, that had stood unprotected for six years on the north side of his house, was killed to the ground.

Mr. Barter stated that he had been very successful in keeping his bushes uninjured the past winter. Out of over one hundred he did not lose one. His plan was to lay them down early in November, pressing them close to the ground, driving down laths or stakes each side and tying a cord across from one stake to the other and then covering all with hay or straw. He thought marsh hay was the best to cover plants with. It was a very good rule to go by, to cover about the time of the fall election and uncover at the spring election. He thought it was better to expose the bushes to quite cool weather before covering them for winter, but care must be taken not to uncover too early in the spring. Roses can be propagated very readily from cuttings and by layering, if treated properly. The best, choicest roses are generally the hardest to propagate, but still it can be done with but little trouble. If cuttings are used they should be taken from new shoots of sound growth, cut the lower end square off and remove most of the leaves. Set the slip in good loam or loam and sand mixed, leaving one bud above the surface. The slip should be protected from the free circulation of air. A tight box nearly filled with earth and covered with a pane of glass may be used for starting them in, or instead of the pane of glass, the slips may be covered with a tumbler, or wide mouthed glass jar turned down over them. The earth should not be kept very wet. For layering take a vigorous side shoot; with a sharp knife cut it half off on the under side, split the stalk for a short distance, then bend it down to the ground, holding it there by a weight or by stakes driven into the ground, and cover it slightly. When it is well rooted sever it from the old plant.

The American Banner is one of the later varieties of roses, and is still sold at high prices, but is not one of the best; it cannot be called a handsome rose. Its great value is in its peculiar markings, its variegated colors, and this, to him, seemed unnatural, out of place in the rose. The Hybrid Perpetuals were his special favorites. Of these he regarded Louis Odier as one of the best. General Jacqueminot is a well known rose, and by many is considered as the most perfect of all roses. It brings the highest prices in the flower market, and is so much sought for that there is a good demand for all that can be obtained.

In reply to an inquiry, he said there were many varieties he should be loth to part with, but if compelled to select six only, he should be inclined to take General Jacqueminot, Louis Odier, Madame Plantier, Duchess de Brabant, Malmaison, and Letty Coles. Madame Plantier is a most excellent white rose, a free spring bloomer, but blooms only once in the season. Small plants of it are readily obtained, as it is advertised very extensively to be sent by mail for ten cents each. Such plants must necessarily be quite small and not always of healthy growth, but if obtained early in the spring, and treated with the best of care, a few flowers may be raised the first season, but, when means will permit, it will be much more satisfactory to get larger plants. Most of us cannot afford the expense and must depend on time and care to develop from the cutting or small plant the coveted treasure, but then we shall prize it all the more.

The cultivation of flowers is generally regarded as more appropriate work for the ladies than for men. Surely they are generally better fitted for it, on account of their taste and love of the beautiful, and should all be interested in it; but there is no reason why men should not take the same interest in it, and should not engage in it with as much pleasure and profit as the ladies. It was a great source of pleasure and delight to him, a rest after the care and labor of the day, to work in the flower garden, and he considered that it was more satisfactory, paid him better than any other branch of horticulture could. Roses were his special favorites, but he cultivated many other kinds of flowers. He had tried the Hydrangia (Grandiflora Paniculata), brought a few years ago from Japan. It is said to be perfectly hardy, and to be able to endure our winters. The first year he left it all winter out in the open air, and it came through unharmed; the second winter, fearing it would be killed down, he put it into the cellar, but this seemed to weaken it, so that it did not do as well as the first season. Last winter he left it out without any protection, and it came out in the spring all right. He believed it was perfectly hardy, and worthy of general cultivation.

Mr. Kellogg said that the name Hybrid Perpetual was not strictly correct. These roses are not perpetual bloomers. There is a time in the spring when they blossom freely, but not as freely as our old standard sorts, and a few roses would come from time to time during the season, but generally there was but one or two sparsely blooming periods after the first one in the spring. Picking off the buds and cutting back the shoots at the first period of bloom, would increase the quantity of bloom later in the season, and to remove all the buds during spring and summer will generally give a fine crop of roses in the fall. We may have occasional bloom during the season, but not constant.

2 P. M.—Mr. Wood believed that it was rather the time and care required to raise flowers that prevented many from cultivating them, both ladies and men, rather than a want of love for them. The duties of the household and of the farm were pressing and must be attended to, and there was, with many, little time that could be given to cultivating that which would merely gratify the taste. By some, the same reason is given for not having a garden. But he did not regard this as a good excuse. He had advised before that the farmer's garden should be arranged so as to cultivate with horse and cultivator; that everything be set in rows. This would save much of the labor necessary in the construction and care of beds. Flowers might be cultivated in the same manner, certainly some of the larger varieties. This arrangement would not be as artistic and pleasing, but the flowers would be just as beautiful and usually much more abundant. If cultivated in this way, a larger variety might be raised with very little labor.

Mr. Barter said he was surprised that so little attention was given to the gladiola. He regarded it as a very beautiful flower. It was easy of cultivation, remained in bloom a long time, and presents a greater variety of brilliant colors and varied markings than any other flower in our gardens. Many of our common flowers were self-seeding, and much labor could be saved by cultivating these varieties, using the same bed for the same kind from year to year, or by transferring the plants as they come up in the spring to other beds. The phlox, petunia, pansy, portulacca and many others are of this kind. Where the beds seed themselves, the plants come up much earlier in the season and are usually more hardy and vigorous, and will bloom much earlier, and usually more freely.

Mrs. Prof. Sawyer read a paper written by Mrs. E. V. Richmond, of Appleton, on

THE BEAUTIFUL AND TRUE IN AMERICAN HOMES.

> "God might have made the earth bring forth
> Enough for great and small,
> The oak tree, and the cedar tree,
> And not a flower at all."

But instead He has painted the very weeds at our feet so gorgeously that "even Solomon in all his glory was not arrayed like one of these." Are we, then, wiser than our Creator? Have we the right to dash out the glowing and the beautiful from our lives?

"To stint our souls, and warp our inner being to gather tinsels for our coffin-lid." To lay out our inheritances and plant our hearthstones, with all the Religion of the Beautiful left out.

Is there not in this leaning to the too stern and practical side of life a vague clue to the unsatisfied restlessness of our American youth? The home of the father becomes too straight for the sons; nothing but a ranch on the Colorado, a vineyard on the Pacific, or a mine beneath the Sierra Nevadas, will bound their aspiration. Thus it too often happens that at the old gloomy firesides, sit solitary and alone, the aged father and mother, whose uneasy brood of fledglings have flown to all points of the compass in search of a freer latitude and a more exhilarating atmosphere, leaving forever the uncompromising surroundings of their childhood's home, perhaps never to re-enter it more, unless summoned by sudden telegram.

How can we expect that a few toil-burdened acres, as blank and barren of beauty as the steppes of Siberia, will long confine the young eagles we would fetter to their roost, beneath the household rafters? Our only hold upon them is to frame for them, on memory's walls, such a glowing picture that neither mountains or seas shall wipe it out; so that wherever they may roam over the broad leagues of earth, that soft minor refrain may follow them:

> "One little home amid the rushes,
> One that I love,
> Still fondly to my memory gushes,
> Wherever I may rove."

It does not require the wealth of a Stewart or a Vanderbilt to scatter seeds of beauty along the way-sides of "this work-a-day world." Beauty is as free as the air we breathe. It is only niggard souls who starve themselves. The man who allows his home and the home of his children to stand out stark and bare in the clearing or the prairie, without a tree to guard it, or a flower to mark it, is a heretic to one of the most ennobling influences of life. Says William Howitt: "I avow it is one of the most fearless articles of my creed, that it is scarcely possible for a man in whom the power of beauty is once fully established, to become utterly debased in sentiment, or abandoned in principle. His soul may be said to be brought into habitual union with the Author of Nature, haunted forever by the Eternal Mind." We have seen in our travels a little log cabin made to look as regal as the boudoir of a princess, with its shifting curtains of vines, and its festoons of greenery, interspersed here and there with royal roses and dainty clumps of mosses brought from the wild woods. Teach the little ones that God's beauty is free to all; show them His handiwork in a glowing cluster of autumn leaves and ferns; in the lillies of the valley, under the shade of the dark evergreen; in the climbing roses that cluster round your door, where the humming bird flits through and through; and across the far-off lanes of life, strange and crooked though they may be, they will still look back to the days

> "When daisies and buttercups gladdened their sight
> Like treasures of silver and gold."

A saddened wail comes to us from many, too many, of our gifted men and women, because the sunlight of their childhood was clouded by joyless and barren homes; because their earlier memories carried with them the blight of a dungeon, instead of a fresh, free air from the mountain top, thus flinging down the centuries the grieved undertone, which might have risen to interludes of praise. We add acre to acre, and field to field for the little ones in their cradles, when God knows it were better if some of the unsanctified dollars were distributed in throwing a little of heaven's sunshine and beauty into their lives. The acres they may gather themselves, if God gives them strength of hand and heart, but a blighted childhood, who shall heal?

Although not exactly under the head of the subject given us, yet growing out of it, is the question of undeveloped talent in the home. If among the little brood coming up around your hearthstones, one or two should be marked from their cradles with genius or talent in some special line, do not try to curb or repress them; do not chalk out for them a straight and undeviating mark, and say to them, "thus and thus shall you work." This bent of human souls is a complicated and perplexing question; how the young eaglet may sometimes be hatched out in the nest of a ground bird, to the utter astonishment and consternation of its simple parents. Scientists tell us there is an hereditary law which rules all this. We believe it is the "stamp of God" by which certain human beings are set apart for certain work in his great harvest fields, and that he will hold us responsible for the blighted talents of our children which we have failed to unfold. What right has a man, because he owns a paltry eighty acres of land, to say, "My sons shall all be farmers!" when perhaps the Creator has designed one for the ministry, another for the mechanics, and a third for the arts. We make but crooked business of it, trying to alter the Lord's plans to suit ourselves. The father of one of our Methodist Episcopal presiding elders, himself a Presbyterian deacon of the strongest Calvinistic stripe, had the misfortune to own a son the exact antipode of himself. The boy was irrevocably and irredeemably an *artist* from his birth. The taste for colors was deeply engrafted in his soul, though how the mistake was made was one of Nature's puzzles, for his father's bent was as straight and unwavering as one of his own stone fences. But the son was an artist, and no help for it; probably the infection had been taken from one of his progenitors, three or four generations back, but the fault was there, incontrovertible. His father, who considered this pre-natal stamp as a visitation upon him, tried to reason it out of the boy, to whip it out of him — but all in vain. Paint he must, and paint he did. In hurried hours stolen from his meals and shop; in lonely garrets appropriated to the rats, and cockroaches; sometimes far on into the midnight, in loneliness and isolation, he wrought out the work the Master had given him to do, until the talent within him could no longer be hidden under a bushel, and to-day one or two of his pictures would buy the old farm, out and out — cabbage patch, rutabaga lot and all. Let us study our children. There are often stray waifs from the land of the Genii dropped down at our firesides, with flashes from the Gods illumining their souls. We cannot make of them common clay. We warp their inner being at our peril. Let us fan the divine spark within them to the glory of the God of the universe. Let us make them also *home builders* with us, architects of the nests we are fashioning for them. Teach their busy fingers how to gather the twigs and threads, and moss, and how to weave them well. Give full play to all their undeveloped talents for construction and invention, which they bring with them from the land across the mountains. Their fertile brains are the last handiwork of the "hand which guides the stars;" oftentimes wondrous workshops of genius, and laboratories of thought, which we, clogged as we are with the moil and toil of the years, are but slow to see, still slower to appreciate. The venturesome little hands, which, with a few attempts, might throw in their quaint ideals of beauty to illuminate the highways and byways, we check and curb. We have too little faith in their handicraft, and we do not teach them to have faith in themselves, and then blame them if they impede our labors with their "mischiefs," as we style them, not remembering that they are but the overflow of suppressed energy, and it may be that some invention the patient century is waiting for is struggling in those very troublesome little brains. Would the grand old peasant father of Carlyle have benefited the world any, if he had screwed down the strong intellect of his son with the iron rivets of fate, placed a trowel in his hand and made a good mason of him? Or the father of Erickson, if he had made a bonfire of his miniature steamboats and machinery, and set him to casting horse shoes?

The world has muscle enough, what it needs is brains and time and leisure to develop them. To this end every fireside should own its library; a book or two hid up in a good library brings in more than four per cent. to its owners; it is an inheritance in chancery which may one day net its millions to the heirs at law, whether they be peasant or patrician. Says Robert Collyer: "Give a boy or girl a passion for books or business, painting or architecture, mechanics or music, and you give him thereby a lever to lift the world, and a patent to nobility, if the thing he does is noble."

These thoughts may seem foreign to the subject in hand, that of "Beauty in the Home," unless we consider our children as David did, as "olive plants round our table," and "stately trees in the garden of the Lord," and such it is ours to make them if we do not deny to them that broad development of soul which this progressive age holds out to them. It is thus that we should build up our homes, not only for this but for future generations, singing as we go —

> "Dark may the night be, and fitful and drearily
> Rush the cold winds like the waves of the sea,
> Little care I, as here I sit cheerily,
> Wife at my side, and my baby on knee.
>
> Richer than miser with perishing treasure,
> Served with a service no conquest could bring;
> Happy with fortune that words cannot measure,
> Light-hearted I on the hearthstone can sing:
>
> King, king, crown me the king;
> Home is the kingdom, and Love is the king."

Messrs. Wood and Plumb regarded the sentiments presented in the paper read as of great importance, and that a general observance of them would not only add much to the beauty and attractiveness of our home life, but the beneficent influence would be felt long after the old home was broken up and the inmates scattered, in the usefulness and happiness of the children.

Resolutions were passed by the convention thanking the railroad companies for their courtesy in granting reduced fare to those attending the convention; by the State Society to President Randell and the members of the Grand Chute Horticultural Society, and the citizens of Appleton for the cordial reception extended by them to the members of the State Society and for their efforts to promote the success of the session.

It was moved by Mr. Kellogg, and unanimously carried, that the ladies presenting papers and Mrs. Sawyer be elected honorary members of the State Society.

8 P. M.— A session was held in the evening, at which time an address was expected from Rev. Mr. Richardson of Green Bay, but he was unable to keep his appointment, and the final hours were spent in extempore speeches, toasts and social greetings.

FRUIT AND FLOWER EXHIBITION.— The display of flowers was excellent in variety and quality. There were many rare plants and fine collections of house and green-house plants on exhibition. The strawberry season was long passed, and in consequence the usual display of small fruits was meagre, and confined mainly to raspberries. The following are the

PREMIUMS AWARDED:

SMALL FRUITS AND VEGETABLES.

Best exhibition raspberries, Geo. J. Kellogg, Janesville	$2 00
Second best, D. Huntley, Appleton	1 00
Best quart black caps, Geo. J. Kellogg	1 00
Second best, D. Huntley	50
Best quart red raspberries, Geo. J. Kellogg	1 00
Second best, D. Huntley	50
Best quart yellow raspberries, D. Huntley	1 00
Best exhibition of vegetables, W. H. Rogers, Appleton	2 00
Best six heads of lettuce, W. H. Rogers	1 00
Six bunches radishes, second best, W. H. Rogers	50
Best peck white wax beans, W. H. Rogers	1 00
Best three heads cabbage, W. H. Rogers	1 00
Best six bunches onions, W. H. Rogers	1 00
Best peck potatoes, W. H. Rogers	1 00
Best six bunches beets, W. H. Rogers	1 00
Best six bunches carrots, W. H. Rogers	1 00

FLOWERS AND HOUSE PLANTS.

Best show hardy roses, Mrs. F. Proctor, Appleton	1 00
Best show pansies, Miss Clara A. Randall, Appleton	1 00
Second best, Miss Emily Smith, Green Bay	50
Show verbenas, second best, Miss Emily Smith	50

Best show phlox, Miss Emily Smith	$1 00
Best show pinks. Miss Emily Smith	1 00
Best show dahlias, Mrs. D. Huntley, Appleton	1 00
Best floral design. Mrs. L. L. Randall, Appleton	2 00
Best display cut flowers, Miss Ella White, Appleton	2 00
Second best, Miss Emily Smith	1 00
Best show geraniums, Mrs. F. Proctor	1 00
Second best, Mrs. S. Ryan, Appleton	50
Best show fuchsias, Mrs. F. Proctor	1 00
Second best, Mrs. S. Ryan	50
Best show begonias, Mrs. A. H. Birch, Appleton	1 00
Second best, Mrs. H. M. Jones, Appleton	50
Best calla in bloom, Mrs. H. Dickinson, Appleton	1 00
Best cactus in bloom, Mrs. S. Ryan	1 00
Best show foliage plants, Mrs. C. Richmond, Appleton	1 00
Second best, Mrs. Geo. I. Brewster, Appleton	50
Best show house plants, Mrs. S. Ryan	2 00
Second best, Mrs. Knox	1 00
Best show wild flowers, Miss F. Huntley	2 00
Best show ferns, Miss F. Huntley	1 00
Best show green-house plants, W. H. Rogers	5 00

MEETING AT THE STATE FAIR.

FOND DU LAC, WIS., September 28, 1881.

A call was issued by the president, for a meeting of the State Horticultural Society, to be held in the Horticultural Hall on the fair grounds at 8 P. M. of September 28.

At the appointed hour, the society was called to order by the president, who briefly stated that it was customary to meet on this evening of fair week and spend a short time in talking over the observations made and the peculiarities of the season, and thus, if possible, to derive some profit or encouragement from one another's experience. Owing to the abundant crop of fruit last season, we had but little reason to expect a crop the present one, and for one, he was agreeably disappointed to see so good a show of fruit on the tables. This is the more remarkable, when we consider that, in addition to the great yield of fruit the previous season, the winter had been a very severe one, commencing earlier than usual, and was marked by long continued and extreme cold. The conditions had been so unfavorable that before the season opened we had good reason to fear a greater destruction of our trees than we had ever experienced before. Much damage was done, but we have occasion to congratulate ourselves that our fears were not fully realized. While many of our trees were injured or killed, many escaped, and some, even, in spite of all the unfavorable conditions, had borne a moderate crop of fruit.

The winter had been especially severe on vines and small fruits. In his own garden the strawberry vines were badly killed. Those on the highest ground and the tops of the ridges suffered the most. Patches near the furrows, or where the surface was slightly depressed, were not injured as much, and partially recovered and bore a fair crop of fruit.

Mr. Plumb said that the loss in the orchard and nursery was great, but not as great as we had reason to expect from the exhaustion of the trees by an excessive crop of fruit, followed by an early and hard winter. Severe cold weather came on before the trees had completed the season's growth, and hence the wood growth was not mature. In addition to this, the ground was quite dry when the cold weather came, and continued dry all winter, for after the first cold snap in November, there was no thaw out, or let up of extreme cold, until the snow left in the spring. Trees standing on high ground and in grass land suffered the least. He regarded the injury done to the strawberry beds, as the result of lack of moisture in the soil and the consequent freezing dry of the roots. Where there is this lack of moisture in the soil and the winter is severe, no reasonable amount of covering will protect the plants from injury. A mulch applied earlier in the season that will store and retain moisture in the soil would be very beneficial, but mulch applied after the ground freezes up will not prevent the roots freezing dry, where there is but little moisture.

Mr. Kellogg stated that the injury done would have been undoubtedly much greater had it not been for the heavy fall of snow which lay on the ground the last half of the winter. The weather was very cold and the ground froze nearly three feet deep before the snow fell. The winter of 1874–75 is known as the "cold winter." February, 1875, was the coldest month we have had for twenty-five years. During that month the mercury stood below zero for twenty days, the aggregate number of degrees below was three hundred and twenty-four. In January, 1881, the mercury stood below zero twenty-two days, with an aggregate of two hundred and eighty-one degrees below. On January 10th, it stood thirty-five degrees below, and on the 14th, it was thirty-three below. The wonder is that more injury was not done.

Attention was called to the fact that notwithstanding the hard winter and heavy crop of the year previous, wild crab, plum and other native trees, were bearing heavy crops of fruit; the oaks and all nut bearing trees also hung full, and the opinion was expressed that this was due to the perfect hardiness of our native trees, and that our remedy lies in securing a hardier stock for our cultivated fruits.

The secretary remarked that hardiness of stock was an element very essential to success, but it was not the only thing to be considered. The native oaks placed in the same conditions as many of our orchards, subjected to the same treatment, would eventually die out; were their roots confined to the surface soil, where the effect of a few warm days in early spring would be to cause a premature swelling of the buds, and the heat and droughts of midsummer would check growth, and a warm and late fall would so prolong the growth that the wood could not mature, they, too, would be lacking in hardiness. We do not think too much of constitutional hardiness, but we do pay too little attention to the conditions on which it depends, and the means by which it may be secured and maintained. The character of our soil and the peculiarities of our climate have a stimulating effect on all vegetable growth, and the natural tendency is to promote an excessive growth; and consequently a growth lacking in maturity and hardiness, and too often our method of culture tends to increase the evil. Many orchards are on ground where the water stands near the surface, or where a stiff, clayey, hard pan subsoil keeps the roots near the surface, where they are easily affected by climatic conditions. Were the land underdrained and the subsoil broken up, the roots would strike down where they could get needed nourishment in times of drought, where they would not be influenced by exceptional weather, either in spring and fall, and where they would not be all frozen up solid the long cold winter through. A steady, uniform growth, in the proper season, is essential to maturity, which is but another name for hardiness.

The special adaptation of some localities for fruit culture, as seen in the success, the productiveness and hardiness of varieties that are but half hardy and even tender, in other places, may be largely due to this very fact. In the noted pear orchard near Green Bay, while the influence of the surrounding bodies of water may contribute to its success, it is more than probable that its fruitfulness and hardiness are mainly due to the mechanical condition of the soil on the terraced side hill, which gives the roots access at all times to all the elements needed to promote a slow, uniform and unchecked growth.

Mr. Kellogg was sure his orchard did not suffer from lack of drainage, for it stood over a gravel bed. He believed that much of our trouble with our trees came from excessive and unseasonable growth, especially with our pear trees. They should make but a moderate growth. The poorest soil you can get is the best for them.

Mr. Pilgrim thought that there were but few farms in the state that would not be benefited by underdraining. Many, situated on high ground, and over gravel, had a layer of clay near the surface that held the water, and kept the roots from passing down.

Mr. Peffer had made special observations in regard to a peculiar feature of mildew or blight that affected the trees in his orchard in early spring. It affected the blossoms first. The first trees to show bloom in the spring stood on a knoll. The first blossoms opened on the 4th and 5th of June. Two or three days after came a number of days that were very hot, the mercury standing at ninety-two to ninety-six degrees, with a hot, dry south-southwest wind; the petals of the blossoms wilted, turned brown and then black. The blight extended from the flower to the nearest leaves, and down the twigs to the limbs. Blossoms that opened after these hot days were not thus affected, but many of them set and developed into fruit. Later in the season the fruit and leaves were much affected with scab or fungus growth.

The secretary read a communication from Mr. Loring, commissioner of agriculture, requesting the society to send delegates to a national convention to be held at Washington, D. C., under the management of the department of agriculture. Attention was called to the fact that in the list of topics given out for consideration at this convention, the only one that in any way pertained to horticulture was " Cultivation of the grape, in relation to the manufacture of wine." This subject was of little practical value to us. It was probable that other and more important branches of horticulture would be considered. If so, the interests of horticulture in Wisconsin should be represented there.

After a brief discussion, a motion was made and carried, instructing the president to confer with Commissioner Loring, who was in attendance at the fair, in regard to the horticultural subjects that would come before the convention, and to report to the society at a subsequent meeting, to be held during the fair.

The secretary stated that the Illinois State Horticultural Society were now holding a fair for the exhibition of western fruit in connection with the Chicago Exposition. The fruits of a number of the western states were represented at this exhibition, and were attracting considerable attention, and he thought it would be well if our own fruit could be exhibited there. A very creditable exhibit could be made by taking samples from the plates on the tables in the fair. If the owners would donate their fruit, or part of it, when the fair closed, for this purpose, there would be but very little, if any, expense attending it, and he thought it would contribute much to the benefit of the horticultural interests of the state, for it would be largely seen and would tend to do away with the impression that good fruit cannot be raised in Wisconsin. Some varieties of our apples now on the tables would compare very favorably with any now on exhibition there, and in Siberians and grapes we could far surpass them.

Mr. Pilgrim said that there was no fruit on exhibition at the Milwaukee Exposition, and he should favor having our fruit represented there, rather than to send it out of the state. Those in charge of the exposition would be very glad to receive it, and would probably be willing to pay the expense of transportation.

The secretary remarked that he was not aware that there was any desire on the part of those in charge of the exposition at Milwaukee to have us exhibit our fruit there, for, had he known of it, he would not have spoken of sending it to the Chicago Exposition, for it was our duty to first secure a worthy representation of our fruits at home exhibitions.

It was suggested that there might be enough obtained to make a creditable exhibition at both places, and it was decided to see if this could be done, and to take definite action at a subsequent meeting. Society adjourned to meet at 6 P. M. of the 29th inst.

THURSDAY, 6 P. M.—The society met as per adjournment. President Smith in the chair.

Geo. J. Kellogg was appointed secretary *pro tem.*

President Smith reported that in accordance with the instructions of the society, he had called upon Commissioner Loring, and had directed his attention to the fact that the circular, sent out by the department, only mentioned one subject in the interests of horticulture, and inquired if this was all that would be considered. The commissioner expressed a good deal of surprise at this, and said it was doubtless a mistake on the part of the clerk who issued the circular, for it was the intention to have a full representation of the horticultural interests of the country at the convention and by no means to limit it to one alone.

In accordance with this report the society decided to send three of its members as delegates to this convention, and voted to appropriate $100 towards defraying their expenses.

On motion, President Smith was appointed to represent the small fruits and garden and to prepare a paper thereon;

J. S. Stickney to present a paper on the grape and wine and native fruit interests,

And Geo. P. Peffer to give a report of all other fruits cultivated in the state.

A resolution was passed, appointing D. T. Pilgrim, Geo. P. Peffer, Geo. J. Kellogg, J. V. Ott, Geo. Jeffries, and Wm. Reid, a committee to solicit fruit from the exhibitors and to make arrangements to place the same on exhibition at the Milwaukee and Chicago Expositions.

Society adjourned *sine die.*

TRANSACTIONS AT THE ANNUAL MEETING.

AGRICULTURAL ROOMS,
FEBRUARY 6, 1882, 7:30 P. M.

President Smith called the society to order, and stated that, as this, the first meeting of the session, was necessarily held at such an early hour in the week that some of the members were unable to be present, it was customary to devote the time mainly to laying out the work for the session and to informal discussion, yet it was important, on account of the amount of the work to be done, and the shortness of the time, to do all in our power to expedite the business, and he hoped the time would be improved to the best advantage possible.

COMMITTEES.— It was moved by Mr. Stickney that the president appoint the usual committees, which motion was carried and the following were announced:

Committee on Order of Business.— A. G. Tuttle, B. F. Adams, Geo. Jeffrey.

Committee on Resolutions.— J. S. Stickney, Geo. J. Kellogg, Geo. P. Peffer.

Committee on Finance.— J. C. Plumb, J. W. Wood, A. A. Arnold.

The committee to award the premiums on the fruit on exhibition, it was decided, should be chosen by those having fruit to exhibit, and in accordance with this, Messrs. Stickney, Tuttle and Hunt were chosen for said committee.

SUMMER MEETINGS.— President Smith said he would like to consider the subject of our summer meetings. While he regarded this work as an important one, the most important the society had to do, he was not wholly satisfied with the results. He had no doubt but that a great deal of good had been done, but he felt that much more ought to be, and could be accomplished. He was not disposed to give up these meetings, but thought that we ought to do something to increase their influence and interest; that there should be some way devised to draw out the members and also to secure a larger local attendance.

Mr. Stickney did not know of anything which could take the place of these summer meetings, or that there was any other way in which we could create more interest in horticulture, or do more to encourage the general cultivation of fruits and flowers, than by these meetings. There were difficulties in the way. They are held in the busy season of the year with most of the members of the society and also with farmers, and this will diminish the attendance; and further, it was impossible to secure a general exhibition of berries and roses from the different portions of the state, on account of diversity in the season. It was impossible to hit upon a time that would be favorable to all, and the exhibits must necessarily be mainly of a local character, but we had usually had a good display of berries and flowers and green-house plants. He was satisfied that the meetings had done and were doing much good, and thought we had better keep on the same as we had been doing; for one he would be in favor of increasing rather than diminishing the number of meetings. Members may not feel that they can spare the time to attend, but the dollars and cents are not all that we are to live for, and we can derive as much pleasure, and, perhaps, as great benefit, if we would employ others to see to home duties for a short time, to engage in this work.

Mr. Kellogg said it was very evident that the meetings were doing great good, and they ought not only to be kept up, but should be made more interesting and profitable. At present the local societies found raising money to pay half the premiums and to meet the expenses quite a burden, in fact it prevented holding meetings in many places where they would otherwise be held. There was little hope of receiving any returns in money for the amount thus expended. If the State Society could pay all the expenses and the local societies do the work, he thought it would make it possible to reach many places that we cannot now.

Mr. Plumb regarded it not as a question as to what we should do, but rather whether we should do anything or nothing. This was the most important work the society could engage in, and he thought we could do more to promote the horticultural interests of the state by this kind of work than in any other way. It not only encourages the local societies, and makes them more efficient, but it increases the influence and power of the State Society. He hoped that we would not think of doing less, but rather more.

Mr. Hoxie said that the influence on the local interest, where these meetings were held, was very beneficial, and that if it was necessary to the carrying out of this work he would favor the payment of all the expenses by the State Society.

Mr. Stickney did not deem this advisable, especially in most instances. It was true that it was a little difficult for some of the local societies to raise the money needed, but it was usually made up by the citizens of the place generally, and was not felt as a heavy burden, and then, at least three-fourths of the money expended was left in the place or locality where the meeting was held, and would in a measure compensate for their portion of the expense. He would favor the payment of the printing and other extra expenses by the State Society, but thought we ought to ask the local society to bear half the expense of the premiums.

The secretary thought that the State Society, in its present gnancial condition, could not bear all the expense, especially if their number was to be increased. While there was no doubt in regard to the importance of this work, and the beneficial results coming from it, he felt that it would not be advisable to increase the number of these meetings, but, on the contrary, that it would be better to hold only one June meeting, and to make that the best possible. The experience of the past season had been the same with that of previous years, namely, that it was very difficult to secure a large attendance of the members of the State Society at any of these meetings, and where a number are held, as it is impossible to attend all, the preference naturally is to go where there will be the most interest, and where they will meet with the largest number of members, and the result is the other meetings are poorly attended and spiritless. The main part of the literary work at these meetings must be done by the members of the State Society, and the number who can leave their home work at this, their busy season, is so small, that, were the attendance equally divided, there would not be enough to carry on the exercises satisfactorily. Again, as has been remarked, the local attendance is greatly influenced by the season. The farmers, who are mainly the ones interested, are too busy with their crops to go far from home, or, if near at hand, to spend much time, unless the occasion is one of remarkable interest. Both the attendance and the exhibits must be largely local, and are to be influenced more by the attractions presented than in any other way. For these reasons it would seem advisable to hold but one summer meeting, and by a combined effort, by thorough preparation, to make it as interesting and attractive as possible. He thought that the influence of such a meeting would be more beneficial and lasting than that of a number held in the usual way. It was the duty of the State Society to encourage local societies, to aid in their formation, and to help them in their work, but he believed this could be done much better by fall and winter meetings, when the work of the season was over. There are many places in the state that would be glad to hold meetings were it not for the labor and expense of the exhibition connected with them, and were the offer made to hold meetings simply for reading of papers and the discussion of horticultural subjects wherever there was sufficient interest felt to furnish a hall and bring out an audience, a much larger number of meetings would be called for, and more good be done, with much less labor and expense. What is now paid in premiums for one meeting would cover the expense of three or four of this kind. He thought money expended in this way would do much more to advance the horticultural interests of the state than if paid out in premiums, and would favor using what means we have in this way; paying the expenses, and if necessary, for the time of those who will prepare papers and help carry them on.

After a brief discussion in regard to the feasibility of this plan and the proper time for holding the fall and winter meetings, the following resolution, introduced by Mr. Plumb, was carried without dissent:

Resolved, That this society will hold one summer meeting the coming season, at which it will offer $50.00, to be paid out in premiums on strawberries, roses, plants, flowers and such other garden products as may be in season, on the condition that the local society with which such meeting shall be held will raise a like amount for the same purpose; and,

Further, That during the more leisure seasons of the year we will hold as many conventions, in connection with local societies making the necessary arrangements therefor, as may be regarded expedient by our president and executive committee; and,

Further, That the traveling expenses of such members as respond to the request of the president to attend and take part in such conventions shall be paid out of the funds of this society, it being understood, however, that this appropriation of funds is based upon our receiving the expected aid from the legislature.

Calls were made for volunteers to attend conventions to be held at Berlin and at Baraboo, to which Mr. Kellogg and others responded.

Mr. R. P. Speer, of Cedar Falls, Iowa, was introduced and officially received as a delegate from the Iowa State Horticultural Society, and by vote of the society was elected honorary annual member and invited to take part in the proceedings.

In response, Mr. Speer said that he was highly gratified at the courtesy extended, but that he came rather to learn, and to express the interest, the friendly feeling of the members of their State Society with co-laborers in their common field, rather than to take active part. There was much that was common to both societies in their work, and each could learn much from the other; could do much to aid and encourage one another, and he wished to express the desire on the part of the society he represented, for, not only friendly interest, but more active co-operation and reciprocity between the two societies; and suggested to this end exchange of reports, delegated representation at each others' meetings, free competition and reciprocity in the exhibitions.

Mr. Stickney, in reply, said he was sure that every member of the Wisconsin State Horticultural Society could reciprocate the friendly regard expressed, and also earnestly desired to aid one another and to work together as far as it was possible. We were very glad to have representatives of sister societies meet with us, and had recently voted to send delegates to the meetings of such societies in neighboring states, which he hoped would prove pleasant and profitable to us all. He suggested that the secretary be instructed to exchange such a number of reports as might be desired.

The secretary stated that he had already proposed such an exchange, both to the president and secretary of the Iowa society, but had not been able to effect it, owing, he believed, to scarcity of volumes on their part. There was only a small number printed, and the home demand for them was so great that the supply was soon exhausted.

Senator Anderson informed the society that a bill had been introduced in the legislature, asking for an appropriation of the same amount as was received last year, and that it was very important that we should secure this to aid in carrying on our work. He hoped the members would improve every opportunity to get the members of the legislature, with whom they were acquainted, to favor the passage of this bill.

The committee on programme being called upon, presented the following report:

Your committee on order of business would report as follows:

9 A. M. of Tuesday the 7th — Revision of the Fruit List.

11 A. M — Reports of Local Societies and Committee of Observations.

12 M.— Report of Treasurer.

2 P. M.— Report of Secretary.

3 P. M.— Election of Officers.

4 P. M.— Miscellaneous Business.

Special sessions during the week to be called by the president as time would permit and the unfinished business required.

A. G. TUTTLE,
B. F. ADAMS,
GEO. JEFFREY.
Committee.

This report was accepted and adopted, and the society adjourned to meet at 9 A. M.

FEBRUARY 7—9 A. M.

The society was called to order by the president, and, in accordance with the adopted programme, took up the revision of the fruit list.

The president said the first thing on the list was the six hardiest, most productive and best apples adapted to the state, and asked if any change was proposed.

Mr. Olds remarked that the Golden Russet had proved with him, and as far as he knew, in his section of the state, the best and most profitable of all the winter apples, and he would like to see it put on the first list. He regarded it as really a better apple than any that were there.

Mr. Plumb thought we could not decide on the merits of the Golden Russet to a place on the first list by Mr. Olds' experience with it. His soil and location were favorable for the Russet, more so than most places in southern Wisconsin. There were other varieties that Mr. Olds raised with good success, that would not do well in but few other locations in the whole state, proving that the conditions for fruit growing with him are very favorable. There are very many places where it would be safe to recommend the Golden Russet, but there are many others that cannot raise it successfully, and to put it in the first list would mislead those who had not the right conditions of soil and exposure.

Mr. Kellogg thought that to follow this rule strictly and not recommend anything that was not generally adapted, and could not be successfully raised in a great majority of places in this state, would compel us to cut off nearly the whole list. Our estimates should not be based entirely on hardiness. If a variety proves generally productive and valuable for family use, we can safely recommend it, stating the conditions which are favorable, or referring to our standing rule to those who want to know what to set, "to select those varieties that they see are doing the best in like conditions near them."

Mr. Plumb said Golden Russet does well on most limestone soils, and on such soils is raised successfully in the eastern part of the state as far north as Oconto county, but on heavy prairie land and in sandy soil it is very unsatisfactory, almost worthless.

It grows slow and late into the fall and needs a long season and, like all the Russet family, plenty of moisture.

President Smith thought it was one of the most reliable varieties in Brown county. They were in the market every season when there were any apples at all, and usually were very fair and smooth and of good quality. The past season they had been remarkably good; the best he ever saw.

Mr. Plumb said some locations in Brown and Winnebago counties were just adapted to this variety, the fruit was large and smooth, perfect in every respect. One orchard in Winnebago county had yielded this year eight hundred bushels, and there were no culls to speak of, not over a half bushel in all.

Mr. Samuel Hunt thought the Haas was not worthy of a place on the first list. It was set but very little, and as far as he could learn, the results were very unsatisfactory, except in a few localities. We have many other varieties that are more satisfactory. For one he would like to see it stricken from the list and the Walbridge added.

Mr. Kellogg moved to substitute Walbridge for Haas in the hardy list.

To this Mr. Tuttle objected, stating that he had propagated the Walbridge extensively, and had recommended it in days passed, but it had not proved wholly satisfactory, and he had discontinued propagating it and would not recommend it for general or extensive cultivation. It was a good bearer and long keeper, but we had better varieties, and he thought it was advisable to select the best. In early times he set quite a large number of the Golden Russet. Had no trouble with them except in their breaking down, not one had been killed by any other cause. At the time they were set the theory was low heads, branch close to the ground if you would have your trees hardy, but if treated in this way the Golden Russet was worthless, trees would all sooner or later split down. The bodies should be at least six feet to the lower limbs.

Mr. Stickney said we must not forget that hardiness is the leading idea in making this first list. We should aim to get as many of the other good qualities as possible, the more the better, but they could not take the place of hardiness, or stand without it. Let us get the hardiest, with the best good qualities otherwise possible.

Mr. Tuttle could not see any reason for raising the Haas where it was possible to grow the Wealthy; that was much hardier, and better apple every way. The Fall Spitzenberg is also a better apple both in fruit and hardiness.

Mr. Plumb said but very few had cultivated the Haas, and where tried, it had been the least satisfactory of any variety on the hardy list. It possessed some good qualities, grew fast, bore early and was reasonably hardy, but he was not in favor of keeping it in this list. He was well pleased with the Fall Spitzenberg; it was hardy, of good quality, and a free bearer; was growing rapidly in favor, and would doubtless prove a valuable acquisition to our list. He would also recommend the Walbridge. The quality was not as good as some others, but it was a late keeper and was fresh when all other apples were gone. This he regarded as an important consideration, and he would therefore move to substitute the Fall Spitzenberg for the Haas, and to add the Walbridge to the first list.

Mr. Jeffrey was opposed to putting the Fall Spitzenberg on the list. He had tried it, and could not make it grow on his clay soil; in setting the trees, he had filled in with sand, and still they would not grow. It will not do well in any but sandy soils. He did not believe in putting on our hardy list any variety that needed nursing or extra care where other varieties grew readily and did well; neither was he in favor of raising any variety simply because it was a late keeper. We have varieties that will keep all summer, and for two or three years, and never be worth anything.

Mr. Herschinger's experience with the Fall Spitzenberg had not been satisfactory, and he would not think it advisable to make the change proposed. The Golden Russet had done well with him, also the Pewaukee; regarded the Pewaukee as the most valuble apple on the list. Does not like the quality of the Walbridge as well as that of some others, but he thought it could be made as profitable to cultivate as any winter apple we have.

Mr. Stickney did not think it advisable to increase the number of varieties on this list. Six was enough, at least until we are well assured we have varieties whose merits are beyond question. He was afraid of the Fall Spitzenberg; had handled it some; was well pleased with it, but had not tried it sufficiently to feel that we could safely recommend it. Should much prefer to put Walbridge in the place of Haas in the first and add the Fall Spitzenberg to the second list.

Mr. Tuttle said we were looking for good market varieties, something that would be for us what the Baldwin and Greening are at the east. We have no such varieties now. We have no commercial orchards in this state, and if one were to go into this business, it would be difficult for him to know what to set. He thought it would be well to recommend certain varieties for this purpose, or to make up the list a little with reference to it, stating what varieties are best adapted for it. We need but few varieties for this, but want the best. Neither is it advisable to have too many of a kind; a few summer, a few fall varieties, and the greater part winter sorts.

Mr. Olds did not think it advisable to put Fall Spitzenberg on the list, no matter what its hardiness and quality. We need more winter varieties. We have too many fall apples now. This is what discourages our fruit growers. The market is soon overstocked. They can't sell for enough to pay for marketing, and the apples won't keep and so rot down, and then they say it won't pay to raise fruit.

Mr. Plumb withdrew his motion and seconded the motion to substitute the Walbridge for Haas, which motion prevailed. No further change was proposed, and the list was amended so as to read,

Six varieties best adapted to Wisconsin, Hardiness, Productiveness and Quality Taken into Consideration — "Duchess of Oldenburg, Wealthy, Fameuse, Pewaukee, Walbridge, Plumb's Cider."

And thus amended was adopted.

The list for cultivation in favorable locations was next taken up, and Mr. Plumb moved that Fall Spitzenberg and Haas be added.

This motion prevailed, and the list was so amended as to read:

Additional List for Cultivation in Favorable Locations — **Tetofsky, Red Astrachan, St. Lawrence, Alexander, Fall Orange, Fall Spitzenberg, Price's Sweet, Utter, Seek-no-Further, Willow Twig, Golden Russet, Haas.**

And as amended was adopted.

Mr. Stickney said he was much pleased to see with us Mr. J. S. Harris, President of Minnesota State Horticultural Society, and Mr. Oliver Gibbs, Jr., sent as a delegate by that society to attend our meeting, and he would move that a hearty welcome be given them, and that they be cordially invited to take active part with us, and also that the usual courtesy of election as honorary members of the society be extended to them.

This motion was seconded and passed by a unanimous vote.

The delegates, individually, in a few words, expressed their pleasure in accepting the courtesy extended, their own personal interest and that of the society which they represented, in the labors of the Wisconsin State Society, an interest which was greatly increased by the fact that both were surrounded by the same difficulties and were trying to achieve success in fruit raising under very adverse circumstances. They were pleased to take part with us, but come rather to get light than to impart it, so that they might carry back a good report and what would aid and encourage them in their own fields of labor. The society they represented was anxious to secure co-operation, reciprocity of action between the two State Societies, and they, as delegates, were instructed to present some points on which such action seemed most desirable and calculated to promote mutual benefit, which they would present more at length at some convenient time.

Work on the revision of the apple list was resumed, and Mr. Plumb moved to add a third list for trial on sandy soils, and that Fall Spitzenberg be put on it; which was carried.

Mr. Tuttle said that if they raised apples at all in a large portion of the northern part of the state it must be on sandy soils, and he thought if it was possible to recommend anything, if it was but one variety, that could be raised on such soils, we should do so. Of all the varieties, he regarded the Duchess as the most reliable, the most likely to be successful, and he would recommend that it head the list; carried.

In response to an inquiry as to whether the Wealthy was adapted to sandy soils, Mr. Harris said that there were a few trees of the Wealthy at La Crosse, and they appeared to be doing well, but he did not know that they would continue to do so. On his own place he had noticed that those trees near the sandy soil, and where there was considerable sand in the soil, had the most perfect fruit.

Mr. Herschinger proposed to add the Moscow to this list. Mr. Tuttle said he would not recommend doing so, on account of its being subject to blight. At first it was apparently free from it, but lately had blighted badly. Some of the Russians were free from blight, others were seriously affected with it. He would not recommend any variety that was subject to blight.

Information in regard to McIntosh's Red was called for, to which Mr. Harris replied that he had a number of trees of this kind and they promised well.

Mr. Plumb said the Siberian family were especially adapted to sandy soils. Some of the largest and most vigorous trees of this class are to be found in the sandy soils north of the center of the state. The largest and the oldest Transcendent in the state stands in Waupaca county, and he thought this class should be represented in the list.

Mr. Gibbs remarked that there was a great similarity in soil, climate, and other conditions between Minnesota and Wisconsin. In Minnesota they had cultivated the Siberian largely, and found that while some of the class were comparatively free from blight, that many were so subject to it as to be worthless, and they had been compelled to cut down their list. The Duchess was the least affected by it, but some did not class this variety with the Siberians. He did not know where the line between the classes should be drawn.

Mr. Plumb thought Prof. Budd was a little mixed in his classification of the Siberian and Astrachan families. He would place the Duchess among the last rather than the first. He moved that the Siberian family be added to the list for sandy soils.

Mr. Stickney said there were a great many varieties in this family, of which some are valuable, but a good many are worthless, and he thought we ought not to recommend any but those that had been thoroughly tried and proved to be valuable. He thought that Whitney's No. 20, the Transcendent and Hyslop had been thus tried, and he would move that they be added to this list; which was carried.

The Lawver was mentioned as having proved very satisfactory the past season, and Mr. Plumb stated that his experience with it had been so favorable as to lead him to hope that it would prove a valuable acquisition to our list.

Mr. Olds had fruited it a number of years. When topworked on the Tallman Sweet it did very well, but he did not think it would prove worthy of general cultivation. It was inclined to decay before it ripened.

STRAWBERRIES.— Mr. Kellogg moved that Charles Downing, Sharpless and Captain Jack be taken from the list for trial, and put in the first list. Carried.

Mr. Hirschinger moved to add the Cumberland Triumph to the list for trial. Mr. Kellogg moved that Miner's Prolific be also added. It was so ordered.

Mr. Kellogg did not think that Prouty's Seedling was worthy of a place on the list for trial. It was soft; not fully hardy; the berries were ill-shapen and were very apt to be gritty, owing to short and weak stems.

The strawberry lists were amended as follows:

For General Cultivation— Wilson's Albany, Boyden's No. 30, Green Prolific, Crescent, Charles Downing, Sharpless, Captain Jack.

For Trial— Kentucky, Prouty's Seedling, Col. Cheney, Cumberland Triumph, Miner's Prolific.

And as thus amended were adopted.

GRAPES.— A motion was made to strike the Janesville from the general list.

Mr. Harris would not favor this, unless something better could be found to take its place. It was not fine in quality, but was good if left on the vines until late in the season; was a very hardy grape, a good bearer, and was so easily raised that it encouraged the cultivation of many other and better varieties.

Mr. Tuttle was opposed to its being stricken from the list. It was an early grape, very hardy and was doubtless the most profitable grape we had for early market purposes. It colors early in the season and can be marketed before prices fall off. When the Concord and other late varieties ripen, prices are usually very low, and the market so well supplied by fruit brought from Michigan, Ohio and states south of us, that there is little profit left for home raised fruit.

Mr. Stickney thought the main objection to it was the quality. Its friends never claimed excellence, but the only points they urged in its favor were hardiness and earliness. It is the first grape to change color, usually two or three weeks in advance of other varieties. Mr. Greenman, who was the first to discover its merits, found it much more profitable on this account than any other variety he could raise; it would bring the dollars and cents in market simply because in advance of other and better varieties.

President Smith said there was no doubt as to its hardiness, but it did not really ripen until quite late in the season. In 1880, cold weather came on before he had laid his vines down and they remained on the trellises all winter; all but the Janesville and Delaware were killed; the Delawares were injured, so that they did not bear at all, but the Janesville bore full. The grapes were left on the vines until the latter part of November, and then were of fair quality.

Mr. Lowe moved that the Worden be placed at the head of the list. He regarded it as a much better grape than the Concord, it was sweeter, earlier and fully as productive and hardy.

Motion was carried.

Mr. Plumb moved that the Massasoit be added to the general list.

Mr. Lowe was opposed to this motion. As far as he could learn, wherever it had been cultivated it was lacking in hardiness and was subject to mildew.

Mr. Tuttle gave it as his experience that in rich soil and on old roots the Concord will not bear the close pruning of the renewal system. The vines should be given a larger growth. Two vines in Baraboo, treated in this manner, bore at least six hundred pounds of grapes last season and seven hundred this.

Mr. Lowe moved to strike the Champion from the list for trial. It was of little value; the birds would not touch it the quality was so poor.

Carried.

He also moved to add to the list for trial, the Essex (Rogers 41), Herbert (Rogers 44), and Elvira.

Which motion prevailed.

The grape lists thus amended are:

General List — **Worden, Concord, Delaware, Wilder, Agawam, Janesville, Lindley.**

For Trial — **Israella, Massasoit, Brighton, Moore's Early, Essex, Herbert, Elvira.**

RASPBERRIES.— Mr. Kellogg moved that the Gregg be placed at the head of the list for general cultivation. He had fruited it for three years, and he regarded it as the most productive, the largest and best raspberry we have.

Motion carried.

He also moved that the Cuthbert be placed at the head of the list of red.

Carried.

Motion was made and carried to add the Ohio Black Cap to the list for trial.

The raspberry lists as thus amended are:

For General Cultivation: BLACK — **Gregg, Miami, Doolittle.** RED — **Cuthbert, Philadelphia, Turner, Brandywine.**

For Trial — **Ohio Black Cap.**

BLACKBERRIES.— On motion, Bartel's Dewberry was added to the list for trial, making the list —

For Trial — **Snyder, Stone's Hardy, Bartel's Dewberry.**

PEARS.— The list was left unchanged.

Most Likely to Succeed for General Cultivation — **Flemish Beauty.**

For Trial — **Ananas d'Ete, Early Bergamot, Bartlett, Swan's Orange, Seekel, Winter Nelis, Clapp's Favorite, Beurre d'Anjou, Doyenne d'Ete.**

PLUMS.— On motion it was voted to recommend the De Soto for general cultivation.

In response to an inquiry by Mr. Stickney respecting the Weaver and Forest Garden in Minnesota, Mr. Gibbs stated that both varieties were giving good satisfaction. The Forest Garden is a great bearer and the fruit is of excellent quality. The Weaver bears well and the plums are very fine.

Mr. Speer said that in Iowa they had had very poor success with all the cultivated varieties, and had been compelled to discard them all and go to the native markets for the wild fruit. They had taken great pains to collect all the native varieties that promised well, and had found a number that they thought would be valuable, superior even to the De Soto, which was itself a wild variety.

Mr. Stickney said he had set out a number of trees of the Weaver, but found it such a persistent blighter that he was obliged to dig them up to save the other varieties. The fruit was good in quality. He had two trees of the Miner, set twelve years ago, that had blossomed full year after year, but had not borne any fruit until last year, when there was a partial crop. The present season they were heavily loaded, and had more than paid for themselves. He had thought seriously of digging them up, but they should stand ten or twelve years longer though they did not bear a plum. The quality was very good; another advantage with them was that they did not all ripen at once, but the season lasted two or three weeks, affording a continued use.

Mr. Tuttle had had a similar experience with the Miner. His trees had been set a good many years, but bore for the first time the present season. He thought when the trees got age they would be profitable.

No further change was made, and the lists recommended were:

For General Cultivation — De Soto.

For Trial — Lombard, Imperial Gage, Magnum Bonum, Yellow Egg, Eldridge, Duane's Purple.

CHERRIES.— No change was made. The list recommended is:

For General Cultivation — Early Richmond, Late Richmond or Kentish, English Morello.

EVERGREENS.— Objections were made to the European Larch being classed, for any purpose, as an evergreen, and it was ordered to be taken from the list. No other change was made, and the following lists were recommended :

For General Cultivation — Norway Spruce, White Pine, Arbor Vitae, Scotch Pine, Balsam, White Spruce.

For Ornamental Purposes — Austrian Pine, Norway Pine, Hemlock, Siberian Arbor Vitae, Red Cedar, Dwarf Pine *(Pinus Montana)*.

For Timber — White Pine.

For Live Fence Posts — Norway Spruce.

TIMBER CULTURE.— It was moved and approved that Green Ash should be placed in the list for "timber of rapid growth and easy culture."

No further change was proposed, and the old list as thus amended was adopted, and is as follows :

For Timber of Rapid Growth and Easy Culture (valuable in the order named) — Black Walnut, White Ash, Green Ash, Black Cherry, Butternut, European Larch, Soft Maple, White Elm, Box Elder, Cottonwood, White Willow. (For planting on prairie farm, reverse the order named.)

For Timber of Fifty or One Hundred Years' Growth — White Oak, Burr Oak, Red Oak, Hickory.

For Street Trees (valuable in order named) — White Elm, Hard Maple, Basswood (Linden), White Ash, Green Ash, Box Elder, Soft Maple.

LAWN PLANTING.— On motion of Mr. Stickney the European Alder was stricken from the list for lawn planting, and the Wisconsin and New American Weeping Willows were added to it.

Objections were made to the order of the trees for lawn planting in the old list, and after some discussion and efforts to modify it, to suit all tastes, it was decided by vote that a committee should be appointed by the president to whom the order should be referred, and who should also prepare a list of shrubs and roses for the lawn, to be reported at the earliest time possible.

The president appointed as this committee Messrs. Geo. J. Kellogg, A. G. Tuttle, Wm. Baumbach, J. S. Stickney and S. Hunt.

This committee made their formal report at a subsequent session, which report was accepted and adopted. For convenience of reference and to save space, the list reported by them is here given, in connection with the work on the lists, and is as follows:

Trees for Lawn Planting (valuable in order named) — Cut Leaf Weeping Birch, Linden, Hackberry, Green Ash, European Mountain Ash, Oak Leaf Mountain Ash, European Larch, American Mountain Ash, Horse Chestnut, Wisconsin Weeping Willow, New American Weeping Willow, Kilmarnock Willow, Weeping Golden-Barked Ash, Weeping Mountain Ash, Weeping Poplar.

Shrubs for the Lawn (in order named) — Snow Ball, Lilac (three varieties), Syringa, Deutzia, Weigelia, Upright Honeysuckle, Flowering Almonds, Spiræa, Euonymus, Strawberry Tree, Sumach, Fringe or Smoke Tree, Berberry (vulgaris), Berberry Purple Leaf, Pyrus Japonica.

Roses for the Lawn — Climbers: Queen of Prairie, Gem of Prairie, Baltimore Belle. Hybrids: Persian, Yellow Harrison, Madame Plantier, General Jacquimenot, La France, General Washington.

Climbing Vines for the Lawn — Ampelópsis (American Ivy), Scarlet Honeysuckle, Fragrant Honeysuckle, Clematis Virgin's Bower, Clematis Jackmanni.

Reports of Local Societies being called for, Mr. Harris, president of the Northwestern Horticultural Society, located at La Crosse, made the following report:

Mr. President and Members of the Wisconsin State Horticultural Society — Mr. E. Wilcox, of La Crosse, was appointed a delegate to represent the Northwestern Horticultural Society at your meeting, but being unable to attend he requested me to serve in his place. In its organization our society was designed to embrace the territory in Wisconsin, Minnesota and Iowa for which La Crosse was the business center. When the organization was perfected the membership was found to be mainly from La Crosse county, with a few from Trempealeau county and also a few from Houston county, Minnesota, and it was thought best, with your permission, to make it one of the auxiliaries of the Wisconsin State Horticultural Society. This plan met with your approval, and the aid and encouragement thus extended has added greatly to our prosperity. We have also to acknowledge the receipt of copies of the Transactions of your society, which have been much help to us, and they have been an assistance to us in maintaining our membership. Our members have had but little experience in the proper work of such organizations, but our meetings have been well attended and interesting, quite a number of valuable papers have been presented, and interesting discussions held. The favor shown by the State Society in meeting in convention with us last spring, resulted in awakening a greater interest in horticulture and rural adornment, and we hope to receive many like favors in the future.

The past season has been unfavorable for the fruit crop, in our district, with the single exception of grapes. The strawberry crop was much lighter than it has been in any previous season, and was of an inferior quality. The reason of this failure has been freely discussed, but no definite conclusions have been reached. Imperfect winter protection, depredation of the white grub, the general failure of some varieties to fertilize, are among the causes mentioned.

Raspberries were very generally injured by the previous winter and the crop was very light and poor.

It was the off year for apples, and the crop was the lightest and poorest we have had for eight years. More trees were injured by the last winter than in any winter since 1872–3. The canker worm has not caused as much injury this season as in previous years, but the codling moth has been worse than ever before, and we feel the need of taking some measure to exterminate this pest. We must look to the experience of your members for help in this work.

The grape crop was in excess of any previous year, and notwithstanding heavy rains in the fall, they ripened well and proved a profitable crop. The variety most generally grown is the Concord, and larger quantities will be planted in the future. Floriculture and market gardening are receiving increased attention, and are meeting with flattering success.

Respectfully submitted,

J. S. HARRIS,

President Northwestern Horticultural Society.

Reports, written and verbal, were presented from other societies, which will be found in the part of the volume usually assigned to them.

REPORT OF THE TREASURER.— The following report of the treasurer was presented through and read by the secretary :

Officers and Members of the Wisconsin State Horticultural Society : Your treasurer herewith presents to you the report of the receipts and disbursements of the funds of the society during the past year :

RECEIPTS.

February 4, 1881. Balance in treasury	$342 56
Received of State Treasurer	500 00
February 7, 1882. By membership fees	3 00
	$845 56

DISBURSEMENTS.

June 24, 1881, voucher 143, expenses at La Crosse meeting	$80 70
June 24, 1881, voucher 144, premiums at La Crosse exhibition	50 00
August 25, 1881, voucher 145, postage, express charges and stationery	19 30
September 3, 1881, voucher 146, part of secretary's salary	50 00
December 15, 1881, voucher 147, expenses at Appleton meeting	69 89
December 15, 1881, voucher 148, premiums at Appleton exhibition	50 00
December 15, 1881, voucher 149, printing and telegram at Appleton meeting	5 60
December 15, 1881, voucher 150, expenses of delegates at Washington meeting	100 00
February 6, 1882, voucher 151, expenses of fruit exhibition at Milwaukee	6 00
February 7, 1882, voucher 152, postage and express charges	7 78
February 9, 1882, voucher 153, premiums for fruit at annual meeting	100 50
February 9, 1882, voucher 154, incidental expenses of president	25 00
February 9, 1882, voucher 155, balance of salary of secretary	50 00
February 9, 1882, voucher 156, for assistant superintendent of exhibition	10 00
February 9, 1882, voucher 157, use of plates for exhibition	3 50
February 9, 1882, voucher 158, expenses for entertaining delegates	6 50
February 9, 1882, voucher 159, expenses of Mrs. Willard at annual meeting	7 32
February 9, 1882, voucher 160, expenses for entertaining the Iowa delegates	4 25
February 10, 1882, voucher 161, expenses of Mrs. I. Clark at annual meeting	6 75
February 10, 1882, balance in treasury	192 47
	$845 56

Respectfully submitted,

M. ANDERSON,

Treasurer.

This report was referred to the Finance committee for the usual examination.

Society adjourned.

2 P. M.

When the society came to order further reports from local societies were presented. Mr. O. Gibbs, Jr., delegate from the Minnesota State Horticultural Society, spoke again of the matters he was commissioned to bring before our society, and it being judged a favorable time he presented the following communication:

Mr. President, and Members of the Wisconsin Horticultural Society: — As a delegate to your society from the State Horticultural Society of Minnesota, I am commissioned to present some matters of business for your consideration, and in so doing I am encouraged to believe, by the cordial reception you have extended to me as such delegate, and also to our worthy president, Mr. Harris, that I shall be exercising a privilege and enjoying a pleasure quite as much as performing a duty.

Our society invites a reciprocity with yours in all matters of mutual interest, but more especially upon the following points:

1st. An exchange of transactions for the benefit of all the members. One hundred copies set aside by each society will, for the present, reach them all; and, to save delays and extra expense, they can be mailed direct to members upon the exchange of lists by the secretaries. On our part we could furnish some back numbers if desired.

2d. By delegates, or delegations sent to the several meetings, authorized to act as representatives, and admitted to a part in the discussions and general transactions.

3d. Admission of horticultural products to exhibitions for premiums, as between growers in Wisconsin and Minnesota, on equal terms.

4th. The compilation and publication of a fruit and tree planter's manual, as proposed in a resolution of our society herewith presented; and,

5th. Some agreement, if practicable, upon a plan to encourage the production of new varieties of apples and other hardy fruits.

It is not necessary that I should take up much of your time in speaking of the merits of any of these propositions. If they are practicable, you will readily see it. That some, if not all of them, have not been attended to before, is probably the result of oversight. I will say, however, that our society is earnestly endeavoring to extend and improve its work; that it is looking in all directions for light and aid in solving some of the difficult and important problems before the fruit raisers of the Northwest, and that in the consideration of them, all state or territorial lines fade away. We have already received great help from the participation of some of your members in our meetings and from the papers they have contributed for our transactions, and hope for more in the future.

At our State Fair and State Horticultural Exhibitions during the past year, members of your society have carried off some of our highest premiums on apples; and though limited more than you are in the number of varieties, we shall be ready, at any time you may receive our products for competition, to challenge comparison upon your tables on the merits of all the varieties we raise.

In regard to the proposed fruit manual, our need is doubtless greater than yours. It seems that a majority of the settlers in our new districts neither know what to buy in the way of trees and plants, or how to take care of them, and they are being imposed upon by the rogues of the tree trade to a degree that would seem almost incredible, resulting in great discouragement of efforts to raise fruits, and much injury to legitimate business in the trade; and the presumption is doubtless warranted, that, in some parts of your state, there is need of some better means than we have at present of reaching the masses of the people with information upon the essentials of fruit culture.

The subject that is perhaps engaging our most earnest attention at this time is the production of improved varieties of seedling apples — particularly long keepers. If there is a science in this, we want to know it. If there are any methods by which, with given stocks and careful crosses, we can reach any certain results, we want to find it out. If there is any probability that we can obtain a new apple that will be as handsome, as large, as hardy and as good as the Wealthy, and at the same time as long a keeper as the Willow Twig, we want to encourage hundreds and thousands of careful experimenters to try and produce it. Our Minnesota legislature has given us an annual appropriation of one thousand dollars to aid in the general purposes of our society, and from this we have voted to lay by $200 per year, till we accumulate a fund of ten or twelve hundred dollars to be given in premiums on seedling apples. The rules to govern in offering and awarding the premiums are now under consideration, and on this matter we ask your counsel, not only with reference to the final awards, if ever to be made, as we hope they may be, and deservedly, but in obtaining and spreading before the people a knowledge of how to begin the work of propagating new varieties, with as few of the elements of chance or uncertainty as possible.

The resolution of our society in regard to a fruit and tree planter's manual is as follows:

Resolution adopted at annual winter meeting of Minnesota State Horticultural Society, January 21, 1882:

Resolved, That a committee of three be appointed to confer with the Horticultural Societies of Wisconsin and Iowa, looking to the appointment of a similar committee from the societies of those states. The joint committee of nine (9) to compile a hand-book of instruction, for the use of Horticulturists. Said book to be a brief synopsis of desirable varieties; how to plant them, subsequent cultivation, etc. Said book not to exceed one hundred and fifty pages, or to cost each society a sum exceeding one hundred dollars, and to be indorsed by each society before publication.

(Copy.)

O. Gibbs, Jr., our representative to the Wisconsin meeting, was appointed one of the committee, and requested to present it to the Wisconsin meeting.

U. S. HOLLISTER,
Secretary Minnesota State Horticultural Society.

Mr. Stickney, in response, said that he was in favor of coöperation between the societies as far as it might be feasible, but he was in doubt whether it would be in all the points mentioned. Surely there are some things in which the experience of each might be beneficial to the other, but it would not in all. An exchange of reports and the interchange of delegates at each other's meetings would be mutually pleasant and profitable, and much good might also be done by encouraging the exhibition of fruit by opening competition to all, but he had some doubt as to the practical value of a joint manual or hand-book as proposed.

Mr. Kellogg introduced the following resolution:

Resolved, That all the competitive exhibitions of fruit under the control of this society shall be open to exhibitors from Minnesota, and that we will also request and use our influence with the State Agricultural Society to have the same privilege granted at its fairs.

Carried.

The following resolution was introduced by Mr. Stickney:

Resolved, That we instruct the president of this society, in accord with the executive committee, to secure the attendance of delegates to the meetings of the Minnesota and other kindred State Societies, and that, if the finances of the society will permit, they provide for the payment of the expenses of such delegates out of the funds of the society.

Carried.

The secretary stated that the number of copies of the annual report of the society, at our disposal, would not admit of an exchange to the extent mentioned by Mr. Gibbs. The demand for the volumes for distribution at home, could not be fully met, and it was our duty to supply the citizens of our own state before sending to those abroad. In accordance with instructions from the society, by which the matter of exchanges had been left to him, the secretary had proposed to exchange with the State Horticultural Societies of Michigan, Minnesota, Iowa and Illinois, a sufficient number of reports to supply the officers of each society. With the number now printed, this seemed all that it was advisable, and perhaps more than we ought to exchange. With the strictest economy in distribution, it was impossible to keep copies of back volumes on hand, to supply future demands.

In regard to the joint compilation of a fruit and tree planter's manual, there are many difficulties in the way, and he did not think the plan was practicable. In our own experience, the influence of soil, elevation, aspect, and other conditions on success is so great, and there is such a diversity in these conditions, even within very narrow limits, that the most definite direction we feel safe in giving to those who want to set out an orchard, is to look and see what kinds are doing best near them, in similar conditions with the location they have selected, and to plant those. We cannot expect those who are not acquainted with our conditions of soil, climate and location to be able to lay down for us any rules we would be willing to follow or to recommend, nor would we dare to instruct those of whose wants and circumstances we know little or nothing. In the preparation of such a manual for our own state, there would be some points on which any three members we might select would not agree, and could they agree, the society would not be willing to indorse their views unless expressed in terms so general as to leave them very indefinite. If such a work is to be prepared, it should be by some one person, and be based on personal experience and observation; stand on its own merits, and be received for what it is worth.

SECRETARY'S REPORT.[1]

Gentlemen of the State Horticultural Society: — The work of the society the past season has been much the same in character as in the two previous years, and there is little of change to be noted in the condition of its affairs. But, while it may seem to us as though we were traveling in the same old beaten path from year to year; discussing the same old subjects over and over again, and at best are only presenting old ideas in a new form, we cannot judge of the progress made, the good done, by looking at the present alone. We cannot estimate the importance, the real value of our work by its effect on ourselves. To the public, what appears commonplace and of little value to us, because of our familiarity with it in the experience

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[1] In consequence of loss of the manuscript while on the way to the annual meeting, the secretary's report was not presented in the usual manner, but as some of the points mentioned in it were given at the meeting, and part of the facts therein stated are matters of record and of general public interest, the main portions of it are given here, as if presented in the regular form.

of every day life, is of real importance and often of great value, and it is in this that the real mission of our, and of all kindred societies is to be found, and here is the test by which their usefulness and efficiency are to be judged. Are the public interested in and benefited by their work.

For the encouragement of our members and to give a better idea of the condition of our society, I would state that for some time past I have enjoyed special advantages for getting acquainted with the inside working of horticultural and other societies, and observing the results obtained, the agencies and means used, and can safely say, that in earnest, thorough work, in the interest and practical character of its meetings, in the harmony of its members and their devotion to their work, and in the beneficial influence exerted, this society will compare favorably with any.

SUMMER MEETINGS.— Two summer meetings were held the past season, one at La Crosse, the other at Appleton. Both of these meetings were as well attended by the members of the State Society as could be expected in the busiest part of the year, but there was evidently a lack of special preparation for the literary part of the occasion, and also a lack of local interest in the meetings. Many things doubtless helped to produce this, but the main cause was to be found in pressure of work. Cannot this be overcome in a measure by a greater local effort to create an interest, and by a more thorough preparation on the part of members to get up a more attractive programme? Practical discussions are very interesting and useful at our annual meetings, and in farmers' conventions, where the greater portion of the audience are specially interested in the subjects discussed, but at meetings like those held the past season, there is a large class who come to be entertained, and to whom a well written paper, even on a dry subject, and a more varied programme, would give greater pleasure and be more benefit, perhaps, than the most practical discussion. I would here repeat the suggestion of last year, that perhaps we might accomplish more by trying to do less, by holding but one meeting, making that the best possible.

In accordance with the resolution passed at our last annual meeting, fifty dollars were paid to each of the local societies where the summer meetings were held, to be given, with a like amount raised by the local societies, in premiums for fruits and flowers. The traveling expenses of those taking part in the literary exercises of the meetings were paid by the society. The total expenditure for the La Crosse meeting was $130.70; that for the Appleton meeting was $125.49. At the meeting held at Fond du Lac, State Fair week, it was voted to send three delegates to the Agricultural and Horticultural convention at Washington, called by the Commissioner of Agriculture, and to appropriate $100 towards paying their expenses. That these expenditures have been judiciously and economically made must be evident to all, for in no case has money been paid for the pecuniary advantage, or the personal pleasure or gratification of any one, but simply to lighten the burden of those who were giving their time and also of their own means for the public good.

There were other objects for which it had been expected a portion of the funds of the society would have been paid out, which were deferred on account of our homeless condition. Soon after the last annual meeting the state needed, and took possession of the room we had occupied in connection with the Academy of Sciences, Arts, and Letters. Efforts were made to retain it, but without avail. It must be evident to all that it is very essential to the usefulness and prosperity of the society that it should have a home, rooms for exhibition and convention purposes, a place for its library and collections, and that by these means it would be enabled to do much more to promote the horticultural interests of the state. The states of Michigan and Illinois, recognizing the importance of the work being accomplished by their Agricultural and Horticultural Societies, have provided and fitted up rooms well adapted to their wants. Iowa is intending to make similar provision for its societies, and our own state should not and will not long be behind sister neighboring states in fostering interests which will contribute so much to its prosperity. Cannot we secure prompt attention to this by a united, earnest effort. The time seems to be favorable. Our present need is a good argument and the benefit that would accrue to the public should have much weight.

In this connection I would say that the case made by the state at the request of the society, for an entomological cabinet, has been completed so far as the cabinet maker can do the work. It was intended to put in the glass covers and line the drawers and commence the collection of specimens at once, but there was no place where the collection could be put on exhibition or even stored in safety, and consequently the work was deferred.

A few additions have been made to the library, mostly by the means of exchanges. Other volumes have been promised, among them a few valuable scientific works published by the government. The expenditures for this purpose thus far have been confined to express charges and postage.

At an informal meeting of the executive committee, the plan of getting a collection of wax casts, representing the fruits of our state, was considered and regarded with favor. A trifling expenditure from year to year for this purpose would soon give a collection of standard samples, not only of our iron clads, our promising seedlings and local varieties, but also of the leading varieties throughout the country, which would not only be very attractive for exhibition, but also valuable for comparison and reference.

STATISTICS.—The government census statistics of 1880 have not yet been issued or compiled so as to be given to the public. Those taken from the returns of our own assessors are very encouraging. Of all the estimates made in regard to the amount of the apple crop, the most extravagant fall far short of the real figures. All must admit that a yield of 3,743,374 bushels of apples in one season is doing remarkably well for a state where the possibilities of successful fruit culture has been so often and so persistently called in question. Who can doubt but that a productive industry that can give such returns, even occasionally, can be made a source of profit and revenue to our state. Fourteen of the counties of the state report a yield of over 100,000 bushels. The following is the list:

	Bushels.
Jefferson	287,978
Waukesha	283,190
Rock	251,508
Walworth	250,230
Sheboygan	221,503
Milwaukee	217,760

	Bushels.
Columbia	208,022
Dodge	197,482
Fond du Lac	197,365
Dane	195,898
Grant	160,697
Racine	143,275
Green	135,971
Washington	130,006

The seven next highest in yield and in the order named, are Green Lake, Winnebago, Kenosha, La Fayette, Sauk, Ozaukee and Iowa; all over 50,000 bushels. (A table giving these statistics in full will be found at the end of this volume.) Is it any wonder that with a yield of over 3,000,000 bushels in excess of any previous year our markets were glutted and all our facilities for handling and preserving the crop were entirely inadequate? Years of preparation in establishing markets, and of experience in handling, will be necessary to enable us to properly utilize such a yield. The fruit growers of Wisconsin have encountered many discouragements in their efforts to raise fruit, but this is the first season they have experienced the disheartening effort of too great success, but this is an evil that will be easier to bear the oftener it is repeated.

The reported number of trees of bearing age, and also the number of acres in orchard, are less than a year ago. This may be the result of inaccurate returns, or it may be a fact, and due to natural causes, as the depletion of the vital energies of the trees by excessive fruitage, so that the trees were broken down by the rigors of last winter. Taking into consideration the loss of vitality and consequent lack of maturity, which must have resulted from such a yield, together with great lack of moisture in the soil in the fall, and the earliness and rigor with which winter set in, and the extreme and long continued cold, the wonder is that the loss is not much greater, for these conditions would seem to be a more trying ordeal than many which have brought wholesale destruction to nurseries and orchards in years past. There are two facts to which I would like to call attention here. One is that in the midst of these adverse conditions some of our trees, hardy and half hardy alike, not only escaped injury, but have even borne a fair crop of fruit the present season. The other is, the remarkable yield of wild fruit, plums, cherries, crab and thorn apples, acorns and nuts of all kinds. Why these exceptions? Is it sufficient to say because those varieties are hardy? A portion of them are, but many are not, and it is a practical and important question, whence came the vitality that enabled them, not only to live through such unfavorable climatic changes, but also to bear fruit. Is it in the composition or mechanical condition of soil, elevation or aspect, the effect of natural or artificial agencies on manner of growth and fruitage? When we can determine what these conditions are, success will be virtually achieved, for it will enable us to both maintain and develop hardiness. It is well to seek after hardy varieties, for we must have them, but do we not overlook the influence of culture and local adaptations, and by neglecting to furnish the conditions necessary to a hardy growth, impair the hardiness with which we commence. In our hardy native trees, and varieties of fruit, we always find each one in its own peculiar conditions, and do not look for them where these conditions are not present. Should one of these important natural elements become wanting, then the variety, hardy before, loses its hardiness, its adaptation, and soon disappears. This must be true to a much greater degree with our cultivated fruits, and there is good reason to believe that many varieties which at first were regarded hardy, but in a few years proved tender, would have retained their original promise and vigor, had we understood and used the means best calculated to secure a perfect development. Will not this same fact account for the remarkable diversity of opinion among our members in regard to the value, the productiveness and hardiness of the different varieties. These local conditions in one case give them value, and the want of these in others, makes them less reliable and even worthless.

Some attention has been given to this subject before, but it seems to me not near the amount the importance of the subject demands, and that we ought to make special efforts in this direction by taking notes, and putting on record every exception to the general experience, and all the conditions connected with them, both of success and failure, in our hardy varieties, and in the half hardy and tender varieties and the seedlings as well.

We have many kinds of apples of fine quality, lacking, in fact, but this hardiness to make them all that could be desired. Now if we can in any way supply this requisite, we will secure at once, better quality of fruit, and a greater variety than we can hope to obtain from Hybrids or Russians for a long time to come, if ever.

ELECTION OF OFFICERS.— The president called up the order of business appointed for three o'clock, and the society proceeded to the election of officers. Separate ballots were taken for each office, and the following persons were elected to serve for the coming year:

J. M. Smith, Green Bay, *President.*

J. C. Plumb, Milton, *Vice President.*

F. W. Case, Madison, *Recording Secretary.*

B. S. Hoxie, Cooksville, *Corresponding Secretary.*

Hon. M. Anderson, Pine Bluff, *Treasurer.*

B. F. Adams, Madison, *Superintendent.*

The following additional members of the executive committee were elected; those for the first, second, sixth, seventh and eighth congressional districts by the representatives of the local societies in those districts, the others by the State Society, as provided by the constitution:

1st Congressional District — George J. Kellogg, of Janesville.

2d Congressional District — B. F. Adams, of Madison.

3d Congressional District — A. L. Hatch, of Ithaca.

4th Congressional District — J. S. Stickney, of Wauwatosa.

5th Congressional District — Geo. C. Hill, of Rosendale.

6th Congressional District — D. Huntley, of Appleton.

7th Congressional District — Hon. A. A. Arnold, of Galesville.

8th Congressional District — W. Reynolds, of Green Bay.

The following were chosen to serve as a Committee of Observation each in their respective districts:

1st District — J. S. Stickney, of Wauwatosa.

2d District — Geo. J. Kellogg, of Janesville.

3d District — Geo. C. Hill, of Rosendale.

4th District — A. L. Hatch, of Ithaca.

5th District — H. Floyd, of Berlin.
6th District — C. W. Potter, of Mauston.
7th District — D. Huntley, of Appleton.
8th District — Wm. Springer, of Fremont.
9th District — A. J. Philips, of West Salem.
10th District — G. W. Perry, of Superior.
11th District — A. R. McDonald, of Sheboygan.
12th District — J. M. Smith, of Green Bay.

President Smith stated that he had received a letter from Professor Tracy, Secretary of the Mississippi Valley Horticultural Society, announcing that that society would have an exhibition of horticultural products at Chicago the coming fall, and inviting us to secure a full representation of Wisconsin fruits thereat. The president thought, as it was designed to be a representation for the Western States, we should take the matter into consideration. Did not know as our finances would allow us to be at much expense for this purpose, but we might encourage it in other ways.

After a brief discussion, the following resolution was offered by Mr. Plumb, and passed:

WHEREAS, The Mississippi Valley Horticultural Society have, through our president, invited us to contribute to the exhibition of our fruit at their next meeting to be held in Chicago the coming autumn; therefore,

Resolved, That we recommend our members to unite in a display of Wisconsin fruits at their exhibition.

A similar desire was expressed to secure an exhibition of the fruits of the state at the Milwaukee Exposition, should an invitation be received to do so.

PREMIUM LIST.— Geo. P. Peffer, Charles Herschinger and B. B. Olds were appointed a committee to revise the premium list.

REPORTS OF COMMITTEE OF OBSERVATION.— The following reports were received and considered:

FIRST DISTRICT — GEORGE JEFFREY, WAUWATOSA.

COUNTIES — *Kenosha, Racine, Waukesha, Milwaukee, Ozaukee and Washington.*— After such a year of abundance as 1880, we looked forward with gloomy forebodings to the summer of 1881, surmising that after a year of such abundance, scarcity would follow. With pears and apples this was the natural result. Although very many trees bore average crops, and some fine specimens, yet, taken as a whole, the result was very unsatisfactory.

Early summer and fall apples were comparatively plenty. Carolina Red June, Kirkbridge White, Early Red and some others were quite plenty. Further on in the season, the Duchess of Oldenburg, Sharp's Spice, Fall Orange, Sops of Wine, Porter, Keswick Codlin and some others averaged fair crops. Whilst the winter apples were very scarce, a few Ben Davis, Golden Russets, Westfield Seek-no-Further, Vandevere Pippins, Cayuga Redstreak were fine, but not a full crop. Northern Spys were quite scarce, owing to full crop last summer. Talman Sweet, where not bearing the year before, were fine. The sweet apples were more abundant than sour, so that the merchants in Milwaukee city complained, and asked us why we did not bring them some sour apples. The two varieties that produced the most revenue were Sops of Wine and Duchess of Oldenburg. A great many trees were barked by mice and trimmed by rabbits, on account of the deep snow. Tender varieties suffered severely from root freezing, bark bursting, and long continued cold.

The pear crop was small. Some kinds, whose buds passed through the winter's freeze, partially unharmed, bore average crops, among which may be mentioned Bartlett, Flemish Beauty, Ananas d'Ete, Sugar, Clapp's Favorite, Buffum, Sickel, Louisa Bonne de Jersey, and Duchesse d'Angouleme. Others which could not withstand the severity of the winter bore no fruit. Some considered hardy, as well as the more tender, root killed entirely, and are gone.

Grapes were hardly an average crop. Numbers of Rogers' Hybrids were killed, or hurt so badly that they did not produce but little fruit. Some Janesville and Concord vines were so nearly killed that they bore but a few specimens.

Plums were scarce. Among those doing the best were Miner, Lombard and De Soto. Some other kinds bore a few specimens but were very scarce.

Currants of all varieties were hardly an average crop.

Raspberries, with some exceptions, were a very fine crop. The Turner bore well, Doolittle the same, whilst Gregg, the Big Black Cap, for hardiness, prolific qualities, and large showy fruit beat them all. Clark and Pride of the Hudson winter killed badly; notwithstanding this drawback they produced some fine fruit, but it was too scattering for a paying crop.

Crabs were very fine. The Hyslop, Transcendent, Yellow and Red Siberian were very plenty, and sold well on account of the general scarcity of fruit.

Strawberries were fine on account of the frequent showers that we had during the ripening season. Crescent and Sharpless Seedlings again carried off the honors from the Wilson, Colonel Cheney and the Monarch of the West. Prouty gave us some fine berries, also Capt. Jack, which is an immense yielder, fruit medium to large, good flavor, resembling the Wilson, of which it is said to be a seedling, foliage healthy, and a good berry to tie to.

Take it as a whole, the fruit crop of 1881 was better than we were led to expect, from the severity of the previous winter.

THIRD DISTRICT — GEORGE HILL, ROSENDALE.

COUNTIES — *Jefferson, Dodge, Columbia and Fond du Lac.* — There is no very flattering report to make as the results of my observations. As anticipated a year ago, the heavy apple crop of 1880, followed by the extreme cold winter, finished off two-thirds of the bearing trees. The smallest crop of apples was produced the past year, of any season since 1860, and the general unkept appearance of the orchards about the country, seem to indicate that farmers are discouraged about raising fruit. However, in talking with some of the best farmers, there is a desire and determination to continue fruit growing on a small scale for home consumption. The varieties that have sustained the least injury are Duchess, Tetofsky, Tartbough, Talman Sweet, Fameuse, Walbridge, Red Astrachan, Westfield Seek-no-Further and Golden Russet. These standing for hardiness about in the order named. My observation has not extended to some of the newer varieties originated in the northwest.

The pear trees are disappearing from our gardens, while the cherry trees are increasing in number. Of small fruits the Ancient Briton Blackberry continues to be successfully grown by covering in winter.

Of strawberries, the Cresent Seedling and Sharpless as well as the Wilson were very productive the past season, and our markets are being supplied, partially, from the newer varieties.

The grape crop was a partial failure with some growers, from some unknown cause. A blight coming on the foliage and fruit, soon after the young grapes had set, stopped the further growth of both. One extensive grape grower in an adjoining county thinks the cause of the disease to be the extreme cold weather of last year. But I cannot see how even 40° below zero can affect vines which are covered with earth. We very much hope that the trouble is not extensive or lasting.

FIFTH DISTRICT — H. FLOYD, BERLIN.

COUNTIES — *Green Lake, Waushara, Marquette and Winnebago.*— Through extensive personal observation and inquiry, I am able to give a full and complete report of the condition of fruit trees in the fifth district. I can truly say that at no previous time in the history of fruit growing in this district, has the outlook for fruit been so dubious as the present one. The enormous exhaustion of vital forces, incident to the production of the largest crop of fruit Wisconsin has ever known,— that of 1880,— was alone sufficient to leave our trees in a low, feeble condition. But when thus exhausted, to be called upon to stand as severe a winter as has ever been known or experienced by Wisconsin fruit growers, was quite too much for a very large per cent. of our pets, especially those standing on dry soils; hence the outlook is dark. General destruction tells the whole story.

The eastern part of Waushara and northwestern Winnebago was formerly covered with heavy timber, the soil of which is sand and clay loams, on a moist clay subsoil, in which is found lime diffused through it, giving it a lively, friable consistency when worked up with surface soil. Through all this region, in favorable locations, small orchards had been planted, and were generally doing well, in defiance of cold winters, heavy cropping, etc. But the tent caterpillar, assisted by canker worms have claimed and appropriated to their own use at least ninety per cent., without hindrance, of all these trees. I cannot understand this wholesale neglect on the part of their owners, unless it was the magnificent over-production of 1880; since all are anxious to grow fruit for home use at least, and since, also, it is but a very small job to clear any orchard of the tent caterpillar by the aid of a tin kerosene lamp suspended in a wire frame, in which the lamp is always right side up, and attached to a pole long enough to reach the highest nests; or, in other words, what is called a torch lamp. With this lighted lamp go through the orchard once a week during the last half of May and all of June, applying the fiery torch to every nest that can be seen. This work, when once got at, is so absorbing in interest that naught but a house on fire will take you from it as long as a nest can be seen to destroy.

A wholesale destruction may be made of canker worms and caterpillars by the use of arsenic dissolved by boiling in a kettle of water out of doors, making a strong solution, which must be reduced before using, weak enough not to injure the foliage of the trees on which it is to be used. There is not much danger in getting it too weak. This point must be determined by experimenting on small branches, by dipping them in the weak solution and watching results. To apply this remedy, use any of the machines that are made for forcing or throwing water, and force through a spray nozzle over the trees from casks containing the poisoned water. Arsenic costs but six or eight cents per pound, and I think would be good economy to use it in place of Paris green for the destruction of the potato bug. The casks of poisoned water could be transported through the orchard on your back, if you prefer that way instead of taking them in a wagon.

In regard to varieties, all suffered alike in root killing. Ironclads are in no better condition than half hardy varieties. More depended on the condition of the soil in regard to moisture than on anything else. Early varieties do not seem to suffer as great a degree of exhaustion as fall and winter varieties do, in producing a heavy crop of fruit. In this climate of great extremes in temperature I find it necessary, after trees come into general bearing, to feed and stimulate them with barn-yard manure and wood ashes to make a good annual growth, in order to fortify against hard winters and great reduction in vital forces from heavy cropping.

Condition of varieties in my orchard: Tetofsky, healthy, produced a moderate crop of rather under sized apples. Red Astrachan, healthy, produced one-third crop of smallish apples. Duchess, very healthy, produced a full crop of fine fair fruit, up to full average in size. Fall Orange and Utter, moderately healthy, produced no fruit to speak of last year. Fameuse, produced four crops in succession from 1877 to 1880, and are in low condition from heavy cropping and poor care. Perry Russet, healthy, produced a good fair crop of average sized apples, it being the fourth crop in succession, and following such a hard winter as that of 1881 speaks well for this variety. Grimes' Golden, quite healthy, produced three good crops of fruit in succession previous to this year, and is nearly as hardy as any winter variety I cultivate. It works best on Transcendent of any variety that I have ever tried; and stands highest in regard to quality, or richness of flavor, of any variety that I have ever fruited. Pewaukee seems to be doing well. Walbridge, healthy, good bearer, good keeper, but too small on young trees. I think the fruit should be thinned out one-half. Ben Davis, not quite half hardy, fruit good to keep but not to use. Baltimore, good fruit, good keeper. I like it top-worked best; it works on Transcendent very well. Northwestern Greening, of E. W. Daniels, of Aurora, is looking well after the hard winter. I have hopes of this variety.

Strawberry crop was very light, new beds almost a complete failure. Varieties that have stood the test of actual trial are Miner's Prolific, Sharpless and Chas. Downing. Crescent I think would do well if planted with fertilizers, but a failure without. Wilson stands at the head for a general market berry.

The culture of Ancient Briton blackberry is on the increase since we have commenced covering for winter protection. One grower of this berry had thirty rods of ground set three by four feet apart; the fourth or fifth year from setting it produced 2,132 quarts, which he sold for ten cents per quart at his house; this was the crop of 1881.

Plums are not grown in this district to any extent.

Grape culture, in favored localities, continues to be successful. Worden, Delaware and some of Rogers' Hybrid, are the varieties most generally planted.

SIXTH DISTRICT, C. W. POTTER, MAUSTON.

COUNTIES — *Juneau, Adams and Monroe.*— The past season has been one of unusual disappointment and loss to the fruit growers of this district. Disappointment in not having apples to supply their own tables, to say nothing of the few bushels they have usually had for a friend or dealer at the village, and the greater loss of the trees. About twenty-five per cent. of all the orchard trees through this district are either dead, or so badly injured that they will never recover, and many of them were varieties that have been heretofore regarded as perfectly hardy. If we were to have many such winters as that of 1880–81, I should be very slow to recommend *any variety* as being *perfectly hardy*, but hope never to suffer such a loss again, and judging from the present winter, do not think we will very soon. I think the dead trees will all be replaced next spring, but greater care will be taken in point of hardiness, making quality a secondary matter, and not try Baldwins, Greenings, etc., because they are good, and grow in the Eastern States. Experience teaches us we must plant only such varieties as are adapted to cold Wisconsin.

The varieties that came through last winter the best were Tetofsky, Duchess, Red Astrachan and Walbridge, the latter being injured, but not as much as Pewaukee or Utters, while the Russets, Fameuse and Talman Sweet were much worse, and Ben Davis the worst of all. Those who mulched their orchards in the fall suffered alike with those who did not. The crab apple crop was very light as a rule, although some trees were loaded. But little blight was seen.

Grape vines that were protected for winter came through all right, and ripened a fair crop, but those who left their vines on the trellis or stakes over winter had no fruit, for the canes were nearly dead.

The strawberry crop was light, some beds being winter killed.

The currant worm made his appearance again, and took the best part of the crop.

What few cranberry farms there are in this district (most of them uncultivated) ripened a good crop, and brought a good price, on account of other fruit being scarce.

SEVENTH DISTRICT, D. HUNTLEY, APPLETON.

COUNTIES — *Outagamie, Shawano and Waupaca.*— If the year of 1880 was one of great encouragement to fruit growers in the northwest, the season of 1881 was one of equally great discouragement. Instead of having our cellars well filled with apples, there were not enough to supply the wants of the family even, in autumn, when so many usually go to waste. At this writing — February 4th — I presume that not one farmer in fifty has an apple in his cellar. The cause, I suppose, was the great crop in 1880, together with the very severe winter which followed, and, in this locality, the great increase of the Tent Caterpillar and its destruction of the foliage during the first part of summer. These causes combined not only to destroy our apples, but to seriously injure the trees. Nearly all of the tender or half hardy varieties which bore so well the year before, utterly refused to put out a leaf the past season — or, if any did try, the growth was so slow that the Tent Caterpillars had it all their own way, and finished what the winter had nearly destroyed. The varieties that suffered least by the winter were the Duchess, Tetofsky, Talman Sweet and Fameuse, about in the order named. The lesson is, stick close to the hardy kinds. Those who have lost largely have had another lesson of experience, which, although a dear one, may prove valuable in the end.

I have but little that is new or valuable to offer in this report, which I very much regret. Perhaps I should say, that some of the varieties of apples mentioned in my last report as doing well both in tree and fruit, are now dead, viz., the Minkler, Jonathan and Red Romanite. Others are more or less injured.

The small fruits were also somewhat injured, but not so much as to materially affect the price, and the lesson is, plant and grow some of all kinds — strawberries, raspberries, blackberries, grapes, etc., selecting those varieties that promise best by the light of past experience. For further particulars see report of our local horticultural society.

REPORT OF THE DELEGATION TO WASHINGTON.— The members of the society delegation to the agricultural and horticultural convention at Washington were called upon and made a brief verbal report.

President Smith stated that each member of the delegation prepared a short paper, giving, in a general way, facts and statistics in relation to the different horticultural interests of the state, so as to present as full an account of all the branches as possible. As the time allowed for papers and discussion at the convention was limited, these separate parts were united and presented as one paper. It was the only thing of the kind there, and the only topic of a local or practical character that was presented at the convention. All the other subjects were very general in their character; interesting, but lacking in practical adaptation to any special branch of horticulture, or locality. The same was also true, as far as he was present, in the agricultural and other departments of the convention.

Mr. Stickney said the meeting was very interesting, and the papers read were very good; but President Smith's account fairly represented their character.

The call for the convention sent out by Commissioner Loring gave only one subject, pertaining in any way to horticulture, to be brought up for consideration, "That of wine making, and the cultivation of grapes for that purpose;" and when the subject of sending a delegation came before the society at Fond du Lac, this feature of the call was mentioned, and the opinion was expressed that, if only this branch of horticulture was to be considered, it would not be best to send any delegates there; but a committee appointed to see Commissioner Loring, who was at the fair, reported him as saying it was an oversight — a mistake — in giving such a narrow range to the horticultural part of the convention; therefore a delegation was appointed. But at the convention, the announcement made in the call virtually was carried out; wine making, in connection with the best method of grape cultivation for that purpose, was almost the only horticultural subject of common interest, and that was very largely local, adapted to California, Missouri, and some of the Southern States, but of little use to us. He didn't know but that this was a matter of necessity — thought perhaps it was; for the variety, methods of culture, and other points connected with fruit raising adapted to one locality, are not so adapted to another, and that too within a very limited range sometimes; and to hit upon anything of a common interest for such a gathering, it must necessarily be general in its character.

While east he took advantage of the opportunity to visit some of the magnificent fruit orchards and gardens of Western and Central New York, and was much interested and surprised at the extent to which the business was carried; whole farms, towns, and counties, it might be said, are there mainly devoted to fruit raising.

Mr. Peffer gave a brief account of a visit to the experimental grounds in connection with the Agricultural Department at Washington, and of the Russian apple trees there. Of the many varieties originally set out there, nearly all were dead, and the few that were still living were nearly dead. Blight seems to affect them in the dry atmosphere of Washington more than here at the west, and there the Russians are an entire failure.

Mr. Tuttle thought that this was largely due to the fact that the climate at Washington was not adapted to them. The hot, dry air, long summers, short and open winters were entirely different from the conditions where they were raised, much more so than here. He had experimented with them for a good many years, and has varieties that he believes will prove better than any apples we have. The Duchess, our hardiest and most productive apple, is a Russian, and is also free from blight. Some of the varieties promise to be better even than the Duchess. Some of the Russians are coarse-grained and of inferior quality, others not. Yellow and White Transparent are fine-grained, and fine quality, as good as Early Harvest. A variety called Long Arcade is a most beautiful apple and very fine in quality. Hopes to get fruit from seventy-five varieties the coming season. Does not think as a class that they are more subject to blight than our standard varieties. Some blight badly, while others are free from it.

Mr. Speer, of Iowa, said he had experimented considerable with the Russians, many had failed, but a few were doing well. Professor Budd was much interested in them, and was experimenting largely with them, on the Agricultural College grounds at Ames, and had strong hopes of finding some valuable varieties among them. In his correspondence with Prof. Arnold in regard to Russian fruit, soil and climate, the Professor says that the soil of Iowa resembles that of Moscow and the climate does not greatly differ.

Professor Arnold in response to a request to send over some of their best varieties had forwarded forty varieties of the same kind as those they had already received and about one hundred others.

Mr. Plumb stated that he saw these trees in 1876. They were then very promising in appearance, with no signs of blight. Thought none of these varieties would prove to be winter apples. The kinds that are winter fruit in their native climate, will be early, or at least Fall apples, here. At Washington the Russians are entirely out of their latitude, and cannot be expected to make a healthy, hardy growth. The Alexander is worthless in Southern Wisconsin, but further north and around Oshkosh it does well and is free from blight.

Society adjourned, to meet at call of the president, at such times during the joint convention as business might demand.

THURSDAY, 9 A. M.—Society met, at call of the president, in the exhibition room. The following reports of awards was made:

Best ten varieties winter apples adapted to Wisconsin, Chas Herschinger, Baraboo	$5 00
Second best, Geo. Jeffrey, Milwaukee	3 00
Third best, Geo. J. Kellogg, Janesville	2 00

Best ten varieties winter apples without regard to adaptation, Geo. Jeffrey	$5 00
Second best, Chas. Herschinger	3 00
Third best, Geo. P. Peffer, Pewaukee	2 00
Best five varieties winter, adapted to Wisconsin, Chas. Herschinger	3 00
Second best, George Jeffrey	2 00
Third best, Wm. Reid, North Prairie	1 00
Best five varieties winter, for market purposes, George Jeffrey	3 00
Second best, Geo. J. Kellogg	2 00
Third best, Chas. Herschinger	1 00
Best five varieties winter, long keeping, Wm. Reid	3 00
Second best, Geo. P. Peffer	2 00
Third best, Chas. Herschinger	1 00
Best five varieties fall apples, Chas. Herschinger	3 00
Second best, George Jeffrey	2 00
Best plate Plumb's Cider, Geo. P. Peffer	1 00
Best plate Haas, Geo. P. Peffer	1 00
Best plate Fameuse, George Jeffrey	1 00
Second best, Chas. Herschinger	50
Best plate Walbridge, Chas. Herschinger	1 00
Second best, Geo. J. Kellogg	50
Best plate Westfield Seek-no-Further, Geo. P. Peffer	1 00
Second best, Chas. Herschinger	50
Best plate Talman Sweet, Wm. Reid	1 00
Second best, George Jeffrey	50
Best plate Golden Russet, George Jeffrey	1 00
Second best, Wm. Reid	50
Best plate Willow Twig, Geo. J. Kellogg	1 00
Second best, Chas. Herschinger	50
Best plate Wealthy, Underwood & Emery, Minnesota	1 00
Second best, Geo. P. Peffer	50
Best plate Pewaukee, Chas. Herschinger	1 00
Second best, Geo. P. Peffer	50
Best plate Utter's Red, Oliver Gibbs, Jr., Minnesota	1 00
Best plate Ben Davis, M. E. Emerson	1 00
Second best, Wm. Reid	50
Best display Showy Apples, George Jeffrey	3 00
Second best, Geo. P. Peffer	2 00
Third best, Chas. Herschinger	1 00
Best exhibition new varieties, Geo. P. Peffer	3 00
Best Winter Seedling, Geo. P Peffer (No. 35)	3 00
Best display Crab Apples, Underwood & Emery	2 00
Second best, J. C. Plumb, Milton	1 00
Best display Pears, Geo. P. Peffer	2 00
Best display Grapes, V. Lowe, Palmyra	5 00
Second best, Wm. Reid	3 00
Best single variety Grapes, V. Lowe	1 00
Largest and best display of fruit of all kinds, George Jeffrey	7 00
Second best, Geo. P. Peffer	5 00
Third best, Chas. Herschinger	3 00

Among other very fine specimens from Minnesota, we find an excellent sweet seedling apple from Wm. Forster, of Chatfield. It seems very choice in quality, and if hardy and productive, must prove very valuable.

Mr. Spear, of Iowa, presents for inspection and for testing a can of sauce, made from a native plum, which in fine flavor and freedom from astringency, and for very slight appearance of the fruit, surpasses anything of the kind which we have ever tasted. This plum is a recent discovery, not yet propagated, named or brought to general notice. If all the qualities of the tree equal the flavor of the fruit, it will be very valuable.

J. S. STICKNEY,
A. G. TUTTLE,
SAMUEL HUNT,
Committee.

PREMIUM LIST.—The committee on revision of the premium list made their report, which was accepted by the society. A few of the specifications were amended, and the list was adopted as follows:

Best ten varieties winter apples adapted to Wisconsin	$8 00
Second best	6 00
Third best	4 00
Best five varieties of winter apples adapted to Wisconsin	5 00
Second best	3 00
Third best	2 00
Best five varieties of winter apples for market purposes	3 00
Second best	2 00
Third best	1 00
Best five varieties of fall apples, with written statement of manner of keeping	3 00
Second best	2 00
Third best	1 00
Best plate of Plumb's Cider	1 00
Second best	50
Best plate Haas	1 00
Second best	50
Best plate Fameuse	1 00
Second best	50
Best plate Walbridge	1 00
Second best	50
Best plate Westfield Seek-No-Further	1 00
Second best	50
Best plate Talman Sweet	1 00
Second best	50
Best plate Golden Russet	1 00
Second best	50
Best plate Willow Twig	1 00
Second best	50
Best plate Wealthy	1 00
Second best	50
Best plate Pewaukee	1 00
Second best	50
Best plate Utter	1 00
Second best	50
Best plate Ben Davis	1 00
Second best	50
Best display of showy apples, not to exceed ten varieties	5 00
Second best	3 00
Third best	2 00

Best exhibition of new varieties, not to exceed ten	$3 00
Second best	2 00
Third best	1 00
Best new variety	2 00
Best single winter variety, seedling	3 00
Second best	2 00
Third best	1 00
Best and greatest display of Crab apples	2 00
Second best	1 00
Best and greatest display of Pears	2 00
Second best	1 00
Best and greatest display of Grapes	5 00
Second best	3 00
Third best	2 00
Best plate, single variety	1 00
Second best	50
Grapes to be in good condition for use, with written statement of manner of keeping.	
Largest and best display of fruit of all kinds	$7 00
Second best	5 00
Third best	3 00
Best exhibition of flowers	3 00
Second best	2 00
Third best	1 00

Adjourned.

FRIDAY, 9 A. M.— The society convened in the exhibition room for the transaction of unfinished business.

The committee appointed to revise the List for Timber Culture, and to arrange a list of Shrubs for the Lawn, made their report, which was accepted and adopted. (This list has been already given, in connection with the fruit list.)

An invitation was given in behalf of the Northern Agricultural Society, to attend the convention to be held at Berlin, which was received with favor and a number of members agreed to attend.

The committee on Resolutions presented the following:

Resolved, That the thanks of this society are due to the ladies whose papers have added so much to the interest of our meetings.

Resolved, That we are under obligations to the delegates from abroad, for earnest work and good suggestions in our common cause, and that they will always be welcome to our councils and our homes.

Resolved, That we deeply and earnestly sympathize with our Friend and Brother, J. C. Plumb, in his recent sad bereavements.

Resolved, That our thanks are due to the Railroad Companies who have so generously granted reduced fare to this convention.

And they were passed by a unanimous vote.

A fine collection of Tube rose bulbs was received from Mr. J. C. Vaughan, seedsman, of Chicago, and distributed among the members, who expressed their appreciation of the favor by a unanimous vote of thanks to the donor.

The Finance committee, to whom the accounts of the treasurer had been referred, reported, that on examination, they found the said accounts were correct and in due form.

Mr. Stickney moved that the secretary be authorized to draw the usual amount for his services. Carried.

It was also moved by Mr. Stickney that the sum of twenty-five dollars be appropriated to the president for his incidental expenses. Carried.

Society adjourned *sine die.*

JOINT CONVENTION.

On Tuesday evening, February 7th, at 7:30 P. M., the society united with the State Agricultural Society in holding a joint convention. At the opening session addresses were delivered by Messrs. Smith and Fratt, the presidents of the respective societies. Of the numerous papers read and various subjects discussed during the joint convention, only the part pertaining to horticulture will be here given.

At the conclusion of the address of President Smith, Mr. Harris of La Crescent, Minnesota, president of the Horticultural Society of that state, said that though a citizen of another state he felt great interest in the subjects presented here this evening. At home he was connected with the Agricultural and Horticultural State Societies and was engaged in tilling the soil, and he had come to represent these societies at this convention, not to instruct, but to get light on subjects in which we had common interests and to carry it back to them. While the last paper was being read and market gardening was mentioned, his mind was carried back to the time when he commenced gardening twenty-nine years ago on the sand banks of the Mississippi valley, near La Crosse. For the first two years he supplied all the vegetables that that market required with a wheelbarrow. From that time the demand increased so that a team was necessary. After a time he moved over into Minnesota, still making La Crosse headquarters. He had been engaged in the business there for twenty-five years and had seen the business grow from a small beginning until now hundreds of hundreds of loads of produce are brought into that market, much more than La Crosse can consume. Much is shipped from there down the river to St. Louis, and a great deal is shipped over the river again and distributed along the line of the railroads throughout Minnesota and Dakota. Gardening and the various branches of horticulture may not be as extensive and important as agriculture, but it embraced many and various interests and gave profitable employment to very many men, and it furnishes a field for the display and the gratification of a great variety of tastes.

In agriculture some have a special taste for horses of the different breeds, or for neat cattle, Jerseys, Short-horns, etc., sheep, hogs, grain or hoed crops. In horticulture some have a taste for fruit, orchards of apples, plantations of small fruits, or for well kept lawns, set with evergreens and ornamented shrubs and beds of flowers, for beautiful shade and rare ornamental shade trees; for conservatories, and flowers and foliage plants to adorn the home. All varieties of tastes here found gratification, and horticulture is in many ways a noble, a pleasing and a profitable employment.

He did not fully agree with President Smith in his statement that the market value of strawberries was greater twenty-five years ago than it is now. It is doubtless true that a thousand quarts are raised now to one then, but they are not really more within the reach of everyone now, than they were then. Those who have any knowledge of the gardens and markets then must admit that strawberries will bring more per quart in the market of to-day than twenty-five and thirty years ago. When he first commenced gardening near Cleveland, Ohio, about forty years ago, the first berries of the season would bring a York shilling, twelve and a half cents, a quart, but in five or six days the price would drop to six cents. Strawberries would be peddled about the streets of the little village of Cleveland as it was then, for sixpence a quart, and often the people would be invited to go to the beds and pick for themselves. Now in the same market, a first class berry often sells as high as thirty cents a quart, and the price seldom, if ever, goes down to six cents. The quantity raised has been greatly increased, but for some cause or other the price and demand have also increased. If we have a first class article, whether it is berries, or other garden or farm products, we cannot raise too much, but can always sell it at good prices. The world is wide and there are many millions to consume if they can have that which is good in quality. If it is poor they will not use it and we lose our labor.

Mr. Kellogg thought that President Smith was below the mark in regard to the apples raised in Wisconsin twenty-five years ago. To his own knowledge there were trees in Rock, Walworth, Racine and Kenosha counties that twenty-five years ago bore over thirty bushels of apples to the tree. The first tree he planted in Wisconsin was set in 1833, in what is now Kenosha county. The facts given in regard to the advancement made in horticulture for the last twenty-five years were all true, and might be given in still brighter colors. It is astonishing to see what an amount of fruit is consumed during the season. He doubted whether a thousand bushels of strawberries would supply the demand in Janesville in a season, and other cities would doubtless use a proportionate amount. In Milwaukee there is always a ready market for anything in the shape of fruit. They will eat anything that is colored, whether grapes, strawberries or lard. They have wonderfully poor tastes and a good appetite.

Mr. John S. Dore said he would like to ask President Smith why it was that where the pine was cleared off and wild berries sprung up, the red raspberry came first, then the black cap, and lastly the blackberry. He understood him to state this as the order in which they came. In his observation in the northern part of the state, in Clark county, the three varieties all sprung up very soon after the pines were cut off, and continued to grow until the forest fires run through and destroyed them, when they would soon spring up again. He had never noticed this order or change, though it might exist, for new tracts were continually being cleared, and it might have escaped his observation.

President Smith replied that he could not and did not attempt to account for it, and thought it might not be true in all parts of the country; in the part of the state that had come under his observation, the red raspberry comes in two or three years after the heavy timber is cut off; these continue to flourish from three to five years, and are then succeeded by the black cap, which last four or five years, when the blackberry comes in and usually remain until the land is broken up. He thought that where careful observation was taken the red raspberry would be found to come in first.

Mr. Dore said he had tried to raise tame blackberries and had failed in every attempt, and with a number of varieties. When the fires are kept out of the clearings and the season is favorable, there is an abundance of wild berries all around his home, but he never could raise any cultivated berries; they killed down every winter.

Mr. Smith thought that he would succeed in raising them if protected in the winter.

Mr. Dore asked why they should require protection, when the wild bushes did not, yet were seldom if ever killed down by the winter.

Mr. Harris could easily account for the raspberries and blackberries coming in when the forests were cleared off; the birds are continually carrying those seeds into the forests. They go out and feed on the berries and then go back to the timber in the heat of the day, dropping the seeds, and when the trees are cut off and the light and heat are let in, these seeds spring up. He was not sure that the red raspberry made its appearance first, but if so, it was probably owing to the fact that the seeds of this variety germinated quicker after the light was let in, and they would grow more readily with less heat and more moisture.

Hon. A. A. Arnold alluded to the theory of Judge Knapp, a former efficient member of the society, but now a resident of Florida, that a change of climate or local conditions caused one variety of plants to die out and another to come in. The idea of Judge Knapp was that "there were cycles in which certain plants and animals would flourish; as these pass one race or variety would disappear and another come in." We have animals in existence now that were once unknown here, and those that lived here formerly are now extinct. The same fact is seen in the wheat crop. We cannot raise wheat here now as we could years ago, and we cannot tell why. We see that the same is true in other countries, and that after desisting from sowing wheat for a few years, the seasons, the climate or the soil or something else, are changed, and wheat can be profitably raised again. Some claim that when we get a hardy variety we can raise it again the same as at first, but this is very doubtful unless we have the right elements and conditions in the air, climate and soil. It seemed to him that the reason why the red raspberries gave way to black caps and these in turn to blackberries, was a change in the conditions essential for the perfect growth of each from favorable to unfavorable. What these conditions are we cannot tell. Scientific men can, by the aid of chemistry, tell us the composition of the soil necessary to produce any particular crop, the different ingredients in it, but they cannot tell us the exact conditions that will secure success in raising it.

Mr. J. C. Ford was not willing to admit that these results were produced by changes in climate at all. He had traveled through the region where Mr. Dore lives, and had noticed that where fires had run through these forests and killed the pines, oaks came in immediately, not in one instance alone, but in many. The pine forest was succeeded by a forest of oaks. The climate had not changed but the soil had. The pine had exhausted certain elements in the soil essential to the perfect development of another forest of pine; but the conditions were favorable for the growth of oaks and they came in in succession. We see the same in forests of other kinds, one variety follows another as the soil and climate are fitted for them. In his opinion that is the trouble with the wheat. Twenty years of cropping has exhausted or greatly reduced the requisite elements in the soil.

He thought there was no such thing as spontaneous generation, but that the birds scattered the seeds of the berries as stated by Mr. Harris. These seeds dropped in the forest and were protected from the influence of the sun and the air, and remained dormant until the timber was removed by fires or by clearing up the land. Then the sun came in and the conditions were favorable to their growth and they started up at once. The fact that in all parts of the country we see the same class or order of vegetation existing in similar conditions of soil also proves that it is the quality of soil that governs the succession of crops and of timber growth. Take the little swales and the large swales all over the state and you find the same class of plants, or those nearly related, in each one. So on the uplands, with a given character of soil you find the vegetation is identical. On the white clay lands you find the White oak, on the sandy lands the Black oak, and on the openings the Burr oak. Each has its own peculiar conditions. The climate may, and doubtless does, have some influence on the growth and development, but it seemed to him that the main cause lay in the character of the soil.

Mr. Newton, of Dakota, inquired, how shall we account for the second growth of Black oak which has sprung up all over this country within the last thirty years. When the country was first settled Burr oaks had full possession of the openings; there were not enough Black oaks in the whole country to raise sufficient acorns to seed the country as has been done. The timber now growing is almost entirely Black oak. The Burr and White oak are nearly run out.

Mr. Ford replied that the gentleman doubtless stated the case stronger than the facts would warrant, but there could be no doubt that where the Black oak comes in and takes the place of the Burr oak, there must be some change in the conditions of the soil that favors the one and is unfavorable to the other. Where the fires are kept out these Black oaks start up sometimes very thick, so as to shade the ground. As a rule the Black oak grows best where the ground is shaded and the surface moisture is retained, and these conditions are not favorable to the Burr oak.

Mr. Boughton wanted to know, if there was no such thing as spontaneous generation, where the seed came from.

Mr. B. F. Adams, of Madison, said while he could not explain satisfactorily why the Black oak follows and supplants the Burr oak, he could easily account for the scattering of the seeds by means of the squirrels and other wild animals, in the same way as the birds carry seeds from place to place.

Mr. J. N. Ames, of Oregon, inquired how we could account for the widespread growth of the poplar trees. When the country was first settled a poplar was seldom seen; now they cover a vast extent of country, and are springing up everywhere.

Mr. Ford could readily account for the spread of this tree, as it belongs to that class whose seeds are borne far and wide by air currents. The cottonwood, and other soft-wooded trees, have very light seeds, and are easily carried by the winds and dropped into the soil. Where the ground is turfed over, these seeds do not germinate readily, but let it be broken up, and they start at once, and young trees will be seen in abundance where there has not been a tree for years.

Mr. Kellogg had seen Blue Jays carrying and planting these acorns. They would carry them for long distances and deposit them, like squirrels, for future use, and they would spring up and grow.

Mr. Harris stated that in many places in Minnesota, in breaking up the sod, they cut off roots of the Red, Black and White oak, and, if the fires are kept out for five or six years, a thick grove will start up. There was a piece of meadow land near him that was turned into a pasture five or six years ago. The fires were kept out, and in a year or two, hazel brush came in, young Black oaks and Hickories started up here and there, and the growth soon became so thick that the ground was almost worthless for a pasture, and there are trees there now thirty feet high. The seeds for these trees were carried there by the birds and squirrels. The soil is specially adapted to the Red oak, and that predominates, but there are other varieties scattered in. Another piece of ground near by, where the soil is sandy, has grown up mainly to Black or Spanish oak. Most of the seeds from which this forest growth comes are deposited by the birds. They distribute a variety of seeds, but the kind or kinds which the soil is best adapted to will get the preponderance, and in time root out the others.

STRAWBERRY NOTES.

GEO. J. KELLOGG, Janesville.

Everybody wants strawberries; everybody wants something better than the Wilson; everybody can have better, if they have a garden. One hundred Crescent plants in one season will grow plants enough to produce five hundred quarts the following year, but you want one-third as many plants of Capt. Jack, Sharpless, Chas. Downing, Glendale, Cumberland Triumph, Crystal City, Wilson, or some other variety that is perfect in the blossom, to plant alongside the Crescent, when that is planted. The Green Prolific is another choice family berry, which is also pistillate, and needs every third or fifth row of some of the above kinds, except Crescent, to fertilize it.

Miner's Great Prolific is claimed to have fruited seventeen thousand quarts per acre; has a large, firm berry, of good quality for home and market. I have dug so close for plants, that I have not given it a fair chance on my grounds.

Champion or Windsor Chief is good for market purposes, handsome, vigorous, hardy and productive (P) (pistillate).

Col. Cheney (P), very large, irregular, soft, excellent, productive; needs rich soil; is one of the most satisfactory amateur sorts; has fruited berries that measure eight inches in circumference.

Duchess, very early, medium size, productive.

Duncan, very choice quality, one of the best for family, large, productive.

Downer's Prolific, exceilent quality, productive; rather small, but profitable for family and market.

Reed's Late Pine (P), choice flavor, productive.

Black Defiance, very attractive, choice, large, productive.

Golden Defiance (P), very choice, large, productive.

Red Jacket, early, very large, soft; excellent for family use, if it did not hull so hard; this "Injun" is hard to scalp, while Captain Jack, unless picked carefully, will scalp himself.

Russell's Advance, very large, soft, but choice family berry.

This closes the list of the best nineteen out of fifty varieties, for light soils, and the first ten kinds include the best for profit and general planting; most of these last nine are worthy a place in the amateur list.

I will name a few kinds that succeed best on clay soil and that need high culture and a good deal of petting; some of them need so much petting it takes away all the profit. Forest Rose is claimed to have fruited berries eleven inches in circumference. Great American, twelve inches. Jucunda, perhaps the most profitable of this list of six; President Lincoln, which has produced a berry measuring fourteen inches in circumference; this is the largest on record; Pioneer, nine inches, and Triomphe de Gand.

Any one who spends $1,000 on any of these six will never get his money back; and yet any one of them will pay on clay soil with careful attention, in large, choice fruit, where size is of greater consequence than quantity.

Prouty's Seedling, which is highly praised by some, is so short in stem and the berries crawl in the dirt and rot so badly while they ripen, that we do not recommend it.

French's Seedling, bought of an eastern firm, is the greatest humbug we have had in the strawberry list.

The points of success in strawberry growing are, 1st. Good soil, well prepared. 2d. Good, pure plants, of choice kinds. 3d. Early spring planting. Let the crown of the plant be even with the surrounding ground, and not in raised beds. 4th. Clean culture the first season as long as weeds grow. 5th. When the ground first freezes so as to bear a team, cover the entire bed and walks with marsh hay, corn-stalks, refuse from the sugar mill or clean straw, just deep enough so you cannot see the leaves of the plant. See that this is not blown off, and in the spring leave it all on; if the plants cannot get through, poke it away a little. This mulch will keep down the weeds and protect from late frosts and drouth. What few weeds appear hand pull; do not hoe or cultivate until after the fruit is all gathered.

The yield of strawberries will vary according to the kinds, soil and treatment, but most of all, the season. One hundred plants of the Crescent will in one season grow a bed which may produce five hundred quarts the following year; but recollect this must have a row of some other variety, perfect in the blossom, within about ten feet.

Wilson has yielded five bushels to the square rod, and we claim that there are five kinds that beat the Wilson now, in quantity.

Soil has very much to do with success. Supposing that new virgin soil was the best, I cleared a wood-lot of black oak, wild crab and hazel brush, and planted nineteen kinds. This was a failure. Most of the kinds were not worth picking, while ten feet from this patch, on ground worked twenty-five years, without manure, the same kinds, in a very poor season yielded two hundred and sixty-five bushels per acre.

At the conclusion of the reading of Mr. Kellogg's paper, Mr. Harris said he had noticed that the Green Prolific and Crescent Seedling were highly recommended for general cultivation, but they are not what is called "perfect plants," that is will not fertilize themselves, and will not bear unless male plants, or varieties that are "perfect," are set out with or near them. A large proportion of farmers do not understand this peculiarity, and their efforts to raise berries from these varieties will generally result in disappointment and failure. Unless the conditions are very favorable, the Green Prolific is a very unsatisfactory berry, poor in quality, poor to yield, and too soft to market even near home. A man at La Crosse had six acres of this variety but did not realize, he believed, over sixty dollars from the whole plantation. He was compelled to pick evenings and market early in the morning the fruit was so soft, and with all the care they were so poor in quality that they were not fit to eat. While there are other varieties of good quality that do not require other plants to be set near to fertilize them, it did not seem advisable for horticultural societies to recommend berries of this kind.

In regard to the best slope for a vineyard, he regarded a southern aspect as much the best. In his own experience the grapes ripened earlier and were of better quality in such locations. He knew that a slope to the west was not good for them, the moisture hangs on the leaves until late in the morning, and has a tendency to produce mildew. The same is also true of northern slopes.

To an inquiry as to how often strawberry beds should be reset, Mr. Kellogg replied, that when the beds are well filled with plants the first crop is much the best. Frequently, where the beds are well cared for, the second crop will be nearly as large. Some make a practice of plowing the beds under as soon as the first crop has been gathered, and to set new every year, others plow up after the second crop. The condition of the bed, and the character of the soil had a great deal to do in determining which was the best course. He had beds that had yielded four good crops in succession. Had now a bed of Crescents that had given him three good crops and would have given the fourth but for injury from insects that came in last season. You cannot expect good continued crops if you let the beds grow up to grass the first year. They should be kept free from grass the first year. If this is done, and the bed is mulched in the fall and well covered in the winter, it will probably give good returns for two years without much further care. If mowed over and allowed to stand longer, it may yield fairly for two seasons more, but he would not recommend the practice.

Beds may be injured by too much hoeing and cultivation. If the mulch is taken off in the spring, and the ground kept hoed and stirred frequently up to the time for fruiting, the crop will be greatly injured. It is better not to disturb the beds or the alleys near them from the time the frost comes out until the fruit is picked. If grass or weeds come in they should be pulled by hand, not hoed up. The Crescent grows so vigorously as to keep down or starve out grass and weeds, and the plants themselves take full possession of the ground, and form a perfect mat of vines. If they are not thinned out the fruit will be smaller, but you will have a large quantity, if there are other fertilizing varieties near at hand.

Mr. I. Huyck, of Sun Prairie, said he had tried to raise strawberries year after year, but had failed every time until this last season, then he stumbled on to success. He knew nothing of this plan or necessity of mixing plants, but happened to set a bed with Crescents at both ends and Wilsons in the middle. The Wilsons did not do anything, but the crop from the Crescents was very large. Most farmers do not understand this peculiarity of the different varieties, and think that if they get any variety and set it out, it ought to bear fruit, and usually they get but one kind, and if this happens to be one of the varieties that needs another kind to fertilize it, they fail, and think they cannot raise strawberries. If they would get half a dozen different varieties and set them out together they would have no trouble, even if they did not understand it, and he thought they ought to be advised to do so, and not to depend on one alone. He had tried to raise the Wilson year after year, but with poor success. Had he set a number of kinds he would have come out all right.

President Smith was sure that it could not have been the Wilson Mr. Huyck had, for that variety of all others was the most perfect in self fertilizing power, and that in hardiness and fruitfulness was most reliable.

Mr. Oliver Gibbs, of Minnesota, said that twenty-five years ago he thought he understood strawberry culture and felt competent to give instruction to others in regard to it, but the longer he had been engaged in raising them the more he learned, and the less he knew perfectly, the less inclined he felt to lay down definite rules, or to give instruction for their culture without first fully understanding the conditions in which they are to be raised. He would relate something of his experience, but wanted special attention given to the conditions mentioned, as he regarded the success he had met with was due to the adaptation of the culture to these conditions. His soil was a sandy loam, with a sandy subsoil, with a very slight intermixture of clay. The method of culture that had succeeded the best with him, giving the largest berries and the greatest quantity, is to cover the ground very thickly with straw before setting out the plants, putting on enough to prevent the growth of the weed seeds that may be in the soil. This straw should be put on in the spring after the ground had been thoroughly prepared, and had become warm. About the time for setting out garden vegetables is the best. Then he sets the plants, parting the straw and setting the plants in the usual manner and drawing the straw close up around the plant thus set. His experience had been that when set in this way there was not as much care required in the setting or for some time afterward. Occasionally a weed will push up through the straw. These should be pulled by hand. When the runners commence to come out, he would go over the bed about once a week and put these runners down under the straw, close to the ground. They will take care of themselves and strike root in the earth and crowd up through the straw. Thus you will soon have the surface of the soil completely covered with a bed of straw, through which the plants will spread, covering the straw with their leaves. If the soil is good the plants will make an enormous growth. The Wilson is the only variety he had tried in this way; others might do as well, but he could not speak from experience in the matter. He had trained them in rows, but thought it would be better if there was time to distribute the runners evenly, to spread them over the whole surface, scattering them as much as possible. This would give larger and more highly colored berries and by the shelter would tend to prolong the bearing season. Where the soil and fruit are exposed to the hot sun in picking time, the season is much shorter.

Another benefit resulting from this treatment, where the plants as set are taken from beds near at hand, and they are not exposed to sun and air any length of time, is that a fair crop of berries can be raised the first season. He set the plants about the first of May, and picked berries enough the last of June to pay all expenses of preparation of the soil and cultivation up to that time. The reason of this bearing the first season is that the straw protects the plants from the rays of the sun, and also increases the moisture in the soil, and they keep on growing about the same as though they had not been moved.

Whenever he heard papers read giving accounts of remarkable yields, and the different kinds of berries, with methods of culture, he felt like adding a word of caution to those who were to depend on one or two varieties for their fruit, to get only those varieties that had perfect blossoms, and that they should make those of whom they bought the plants guarantee that they were self fertilizers. The reason why so many fail is because they get plants that need to be set near other varieties to be fertilized. Sometimes plants sold for Wilson are not the Wilson at all. Where a plant blossoms freely, and there is no frost to blight the blossom, and no fruit is raised, it is very certain that it is not the Wilson. The Wilson is rarely, if ever, known to fail in seasons where there were any blossoms on the plants. He had not known it to happen during the last twenty-five years.

President Smith said that if you buy plants for Wilsons, and they prove to be something else, it is not certain that the one who sells them is dishonest. There are other varieties that look like the Wilson, when they are growing, both in form and leaf. He was among the first in the state to get the Wilson, but with all his experience he had had a number of varieties that out of their own beds, comparing the leaves and plants with the Wilson, he could not say with certainty that they were not the Wilson. But the practical test is the sure one. If you have the pure Wilson, and put them on good land, and give them good cultivation, you cannot keep them from bearing in an ordinary season, unless you pick off the blossoms. Frost may possibly kill them, but it will not kill all. Their tendency is to overbearing. It had been his experience that they would bear themselves to death, and on account of this peculiarity he had made it a rule, when the first crop was a good one, such as they usually bear, to turn the plants under, as they have not enough vitality left to bear a good crop the next season. If the plants are Wilsons they will bear. During the last twenty years he had been to see many beds of those who said they had Wilsons, but they would not bear, and in every instance he had found that they were something else than the Wilson.

Mr. Kellogg did not believe that there was any excuse for a dealer in strawberry plants, who sent out plants marked Wilson, that were not. It was often done, and they are not readily detected until they have made quite a growth. He could cite an instance near here, where an acre or more had been set in this way, and in the Fall their character was detected and the bed was turned under. There were a few Wilsons among them, but the greater part were something else. At the December meeting of the Illinois Horticultural Society, one of the best growers of that state said he did not know of any pure Wilsons, and he is engaged in selling plants, too. He should not regard it much of a recommend for a dealer to continue to send out plants which he was not certain were pure. The greater part of the failures of this kind occur where one neighbor gets his plants of another. The first one starts his beds with Wilsons and Green Prolifics, perhaps, or with Wilsons and Colonel Cheney, or Crescent, or some other variety that needs hermaphrodite or perfect flowering plants to fertilize them, and it is the tendency of these staminates to run out other kinds. They are rank growers, and in a few years will take full possession of the beds. They are the strongest, nicest looking plants in the whole bed, and the neighbor coming to get plants to set, knowing nothing of their character, would be very apt to select these worthless plants. Perhaps he can get no other, they having run out the pistillates and hermaphrodite plants.

In speaking of the different kinds in his paper, he had indicated the fertility and non-fertilizing varieties by the letters P. and H. preceding the noun, so that they can be readily told. He regarded the man who would set six acres of Green Prolifics without knowing whether they were pistillates or staminates in the right proportion, was a fit subject for the lunatic asylum. Green Prolifics on light soil, if properly fertilized, is prolific. A citizen of Janesville had a bed about ten rods long and one rod wide, from which he picked three bushels a day, every other day, right through the best of the strawberry season. To secure proper fertilization it is not necessary that the different kinds should be mixed in the same bed. If put in beds or rows entirely distinct, four, six or eight feet apart, the object will be gained. The wind will carry the pollen, and bees will carry it farther and more effectually then the wind.

Mr. R. P. Spear, of Cedar Falls, Iowa, stated that where the plants were allowed to run together it was difficult to keep them pure, for seedling plants would come up. A neglected patch in his garden become almost entirely seedlings. He would like to know if Mr. Kellogg thought ground on which a crop of potatoes had been raised was in good condition for strawberries? Potatoes take a good deal of potash from the soil, and strawberries need it also.

Mr. Kellogg, in reply, said if the ground was rich enough there would be no trouble from exhaustion of the potash, and that he thought the cultivation of potatoes left the ground in the best possible condition for strawberries the following season. In regard to these seedlings there need be no trouble in getting pure plants. If any seedlings appear they will be in the center of the bed, and will not develop runners for some time. By taking the runner sets on the outer edges of the bed you will get pure plants.

Mr. Harris thought that in many cases where the variety sold was not true to the name given, the fault was not justly charged on the nurseryman. They buy varieties to propagate, and do not know for some time that they have not got the true kind. A strawberry raiser who tries to keep his stock pure, wanted to raise a large number of plants of a new variety, so he bought several thousand plants of a New York dealer and set out a large piece. They proved to be another variety and were perfectly worthless. The Wilson has been disseminated in many cases in the same way. We want pure Wilsons and send an order east to some one who advertises pure plants, and we sometimes get a mixture or anything that comes handy.

President Smith knew of two orders for Wilsons that were sent to Boston and there was not the slightest resemblance to the Wilson in the plants received.

Mr. J. S. Stickney knew from experience that it was easy for this error to be passed along and to be repeated many times in the same year before it was detected. Some years ago, the same year probably with the case to which Mr. Kellogg referred, they planted a full acre in the same way. They bought the plants in Michigan, set them out with great care; removed every blossom so as to throw all their vigor and strength into new plants. The variety so closely resembled the Wilson that they did not discover the error until they had already sold plants to at least two hundred different people. When it fruited the next spring they detected that it was a fraud and did what they could to correct the mistake. In this instance it was done in perfect innocence, and he had no doubt but that the same thing occurred frequently.

APPLE TREE BLOSSOMS — BLIGHT.

GEO. PEFFER, Pewaukee.

At the last meeting of the Minnesota State Horticultural Society, the following questions were presented with the request that I should answer them, and, as the points then brought out may be of interest and also beneficial to us, and they may serve to throw some new light on the vexed question of blight, I have concluded to present my observations and the conclusions drawn from them to you.

The questions all relate to apple tree blossoms, as follows:

1st. The date of their opening?

2d. What varieties bloom simultaneously?

3d. What varieties have perfect, and what imperfect flowers?

4th. What varieties should be planted together for mutual perfection of fertility?

5th. What varieties have the greatest power to endure spring frosts and cold winds?

The season opened three weeks later than usual on account of the large body of snow on the ground, but the observations made, though not as complete as I would like, will show the relative time of opening and the points bearing upon the questions proposed.

The first blossoms appeared on the 4th of June, on the Talman Sweet, Lyman's Yellow, Transcendent, Whitney's No. 20, and the Bellflower crab.

On June 5th, Lyman's Early Red, Haas, Early Strawberry. These trees stood on a gravel knoll.

June 6th, a Duchess of Oldenburg standing on the knoll opened its first blossoms, also Plumb's Cider, Golden Russet, Tetofsky, Fall Stripe, St. Lawrence and Allen Russet.

On June 7th, the Hyslop and nearly all the other varieties of crabs were open, also Limber Twig, Fall Orange, Sour Bough, Summer Queen, Wine Sap, Summer Pennock and Western Beauty.

June 8th the Duchess on the level ground showed their first blossoms, also the Red Astrachan, Pewaukee, Golden No. 4, also

Nos. 1, 17, 35, Willis' White, Pomme Grise, Cranberry Pippin, Wealthy, Fall Orange and Felix, all in the same location.

On the 9th, Westfield Seek-no-Further, Northern Spy, Fameuse, Utter's Red, Alexander, Baltimore, English Russet, Clark's Orange and a Yellow Bellflower Seedling.

June 10th, Jonathan, Rawle's Janet, Sweet Wine, Long John and several new seedlings. These last varieties named were on the east side of a knoll running through the orchard in a north and south direction. I would also state that the varieties named as blossoming at an earlier date in other places, opened here on the same date as those last given. By this time all the blossoms on the trees that commenced the first to bloom were open, and in some the petals had begun to drop. On examining closely I found that some of the petals had an unhealthy look, that they were wilted and adhered to the calyx, and the pistils had turned a grayish yellow and were limber. On further examination I found that all the varieties that commenced to bloom on the 5th and 6th were thus affected, but those that opened later were not affected, but opened evenly. They all had finished blooming by the 15th, and had shed their petals and had set for fruit.

In answer to the second question, I would say that as some parts of my ground were high and others low, and some places were covered with two feet of snow long after the rest was bare, it was impossible to determine what varieties would have bloomed simultaneously if all were placed in similar conditions. In some instances they were thus situated, in others not. Where the ground was bare early in the season the blossoms appeared several days in advance of other parts of the orchard where the snow lay on late. This seemed to affect all varieties, but some more than others. For example, a Wealthy standing on the gravel knoll commenced to blossom the same date as the Transcendent, but the greater part of them stood on the level ground and blossomed on the 8th. A few that stood where the snow lay on the longest did not open until the 13th, a difference of eight days. But the tree that blossomed first did not bear fruit, as the blossoms were affected, as has been already mentioned. Those that blossomed later bore good crops.

In answer to the third question, I would say that the flowers that opened first were to all appearance as perfect as those of the same varieties coming later. The reason of their failure to set was not due to imperfection, but to other causes which will be given further on. There is a great difference in the size, form and color of the petals or flower leaves of the different varieties. Some are larger and some much smaller than others. Also the pistils are longer, thicker and broader in some than in others. In a few instances there were a few of these pistils that were distorted or doubled up, apparently by crowding their way up through the petals. All the varieties examined seem to have plenty of stamens, and in fact to be perfect flowers, but I should judge that the size and form of the pistils had some influence on the impregnation, as where they were longer and straight they came up through the petals first and seemed to have more perfect stigmas also, and to be ready to receive the pollen as soon as it commenced to fall. To all appearance there is pollen enough in each flower to fertilize fifty or a hundred times as many pistils as there are in each cluster of flowers. The only way to get a definite answer to this question, and to determine fully whether a variety has perfect flowers, is to enclose a cluster of flowers in a glass bulb or paper bag until all the flowers are open and the petals have dropped off, then remove the covering and watch it. If the fruit sets, perfects itself, and the seeds are full and perfect, then you can be sure that the flowers of that variety are perfect, but if the little apples drop off, while those on the balance of the tree grow and ripen, it would prove that the stamen or pistils were imperfect. A single spur or cluster of flowers on each variety would be sufficient to determine this question. Seeds from fruit thus covered, if the variety is perfect, would give fruit like the tree from which they came.

In answer to the fourth question I would say, ascertain what varieties are in full bloom at the same time when similarly situated, and plant them together.

In regard to the fifth question, we find that some varieties have short pistils, and hollow or curved petals, which tend to shield the embryo, protecting it from the cold winds. Fourth of July, Wealthy and Fameuse are of this kind. There are others which have a similar form, and must give some protection against frosts and cold winds.

To return to the fact mentioned, that while the first flowers that appeared were perfect in form yet failed to set, on examination, the petals seemed to be burned or scalded soon after they fully opened and before the later varieties commenced to bloom. At that time we had two or three days when the thermometer stood at 90° to 96°, with a hot dry wind from the southwest, and in a short time not only the petals but the leaves around the flower stems showed signs of blight, and the black liquid usually seen with fire blight ran down from these twigs and affected the last year's wood growth also. Nine-tenths of the twigs thus affected perished, a few escaped, where the blossom stem was broken off at the start. Standard apples and crabs were affected alike, also the north and south sides of the trees. All the trees that were in full bloom during those hot days were thus blighted, and in a few days looked as though a fire had run through them, while the same varieties standing only a few rods apart that had no blossom stems or were not yet in bloom, escaped altogether, not only then, but all through the season, even in hotter weather, when there was a greater tendency to produce blight. The cause of this may perhaps be that the sap was in a better condition and circulated more freely in the trees where there was no bloom, or that the flower petals presented a larger surface and a thinner leaf to the hot, dry wind, absorbing the sap faster than it could be supplied, and thus causing them to wilt and dry up. All the flowers of the stem were not affected alike at first, as they were not all open when the blight first struck the trees. When the cooler and damp weather came the petals of the later blossoms turned a grayish brown, and were affected the same as the others of the cluster. It is at this time and in these conditions that the spores of fungi commence to germinate (or, as Prof. Burrill stated at a recent meeting of the Illinois Horticultural Society, a lower, more minute organism called bacteria, which he says are found in all blighted trees, and live on dead substances the same as fungi).

The leaf turns dark, and finally black, and the rotten sap or poisonous fluid runs down the petal to the calyx, along the stem of the little apple to the base, or where the fruit stems started out of the flower bud, and then all are affected, if they have not been before. From this point, if the weather is favorable, it works down the new wood growth of the shoot, but if no shoot has started out, to the leaves surrounding the flower stems. If the part affected is here removed, or dry weather comes on, the progress is usually checked in most apples, and some of the crabs, on account of the thicker bark, or from other causes; but with the pear it is apt to run down the older wood and to extend until the tree is killed, unless the limb or part affected is cut off some distance below where it is discovered. Where this is not done the tree usually dies, the second year if not the first. I find that, instead of cutting off the limb, it serves the same purpose to girdle it, taking off all the inner bark below the diseased portion, being careful not to use a knife that has been used in cutting the poisoned, blighted wood.

My observations have been very interesting to myself though not wholly satisfactory, and I shall continue them another season if I live, and make closer examinations if possible. Among other things, I have noticed that there is as marked a variation of form in the flowers of varieties as there is in the fruit, and I think that they can be distinguished in this way more correctly than in any other. Another remarkable fact noted was the starting in of the blight from the blossoms. While all the western fruit growers that have discussed or written on this blight question, myself not excepted, have held that it was the forcing of the sap through the stomata, in the tender sap cells on the under side of the leaves, or by puncture, etc., or the pressure of the sap circulation that gives the parasitic fungi a chance to germinate in the dead, or decaying fluid, or that it is the result of an over supply, a crowding of the cellular structure with sap, as we find it first and most severe in young, rapid growing trees, especially in rich and highly cultivated soils, but I found it just the reverse ; there was not a sufficient supply, and hence the petals wilted because they could not get what they required to meet the absorption of the hot, dry winds.

After hearing Professor Burrill's remarks at the Illinois State Horticultural Society meeting, last December, I sent him a few samples of the blighted blossoms and twigs I had preserved. In his letter, dated January 19, 1882, he says: "Your samples of blighted twigs came safely to hand, and prove to be very interesting, indeed. There is no question in my mind but that your idea that the blight starts in the blossoms in these cases is true. It is quite new to me, but I now find similar evidences of the fact here. This disease may start elsewhere, but I think it is pretty well proved that it does not do so without some puncture of the bark or epidermis. The stigma of the flower has no epidermal covering, and so is exposed to the destructive effects of the organisms. I shall closely observe the flowers, next spring, and shall be glad of any further notes by yourself. We will know sometime the full facts about this injurious disease."

My attention was particularly called to the subject of bacteria as the cause of blight, by remarks in the report of our secretary, in our last volume (page 99), and I therefore listened with greater interest to Professor Burrill's remarks, and his theory in regard to the effects of this organism. But my observations of blight, as seen last spring, to me proves conclusively that they were not the cause, and I so stated to him in a letter accompanying the samples sent. In his reply he acknowledges that he thinks there must be some puncture or injury of the bark or epidermis.

Dr. Taylor, Microscopist for the Agricultural Department at Washington, says that "Bacteria can only exist in dead organic matter, and he mentions some of the ways in which they and other similar organisms are made useful in the operations of baking, brewing and the production of wine and vinegar, and while bacterian fermentation or putrefaction is an essential part of the process which fits dead organic matter for plant food, it also appears incidentally to be the cause of one of the common practical difficulties encountered by the farmer and the horticulturist, viz.: the tendency of the soil to become sour. * * * If the material once used by the life principle in building up organic bodies could not be used over and over again for the same purpose, life would soon be extinct through exhaustion of material. Before organic matter can be made again available for plant food, it must be reduced almost to its primitive elements, and this reduction is mainly effected through the process of fermentation or putrefaction, in which bacteria appear to be an active and important agent. Stupendous as is its work, it is an agent so minute that twenty million individuals of this class may be enclosed within a globe small enough to be passed through the eye of a cambric needle."

Professor Burrill deserves much credit for his observations and careful experiments, but he cannot safely assume that they prove bacteria to be the cause of blight in the pear and apple or of the yellows in the peach, for when he applied the virus to the bark without wounding it, and even to the tender twigs and leaves, there was no evil result, but where the bark was first injured the disease in some instances followed. Does not this go to prove that bacteria are not the cause of the disease, that they cannot enter the bud leaf or bark of themselves, but depend on other causes to prepare the way. The saliva of a mad dog on unbroken skin is harmless, but apply it where the skin has been injured and death ensues. When the trees were inoculated the bark was injured and the fluid containing the bacteria was inserted; a fluid so poisonous that it kills all it touches when it flows down the blighted tree, not by causing bacteria to develop, but by burning, poisoning the tissues of bark and wood. What would be the effect of this deadly infection aside from the bacteria on the tender tissues of the bark?

I do not think it proves that the bacteria are the cause of blight because he found them in connection with it, or even in the limb below the part visibly affected, where the limb appeared to be sound. A part of a leaf, the tender petals of the flower, or a small patch of bark becomes affected or injured, and decay sets in, and then bacteria develop. There are several kinds of blight, or blight produced by different causes, as tender trees or tender growth, frozen sap, injuring the cellular structure of the tree, so that when warm weather sets in fermentation commences. This is sometimes seen before the leaves appear, but usually soon after. There is also a leaf blight caused by the bite of a small insect, an aphis rather, and by a small gnat, which raises small blisters on the leaves; these turn brown and then black, and sometimes extend to the whole leaf, causing it and those near it to drop off. At times drops of dew or rain standing on the leaves in a very hot and sultry time produce the same result; the part of the leaf covered by them first turns a yellowish green, then yellow, and brown, first light and afterwards darker, followed by a fungus growth. These are my own observations, and from them I conclude that blight may be produced by various causes, by anything which will injure the vitality and cause decay to set in, then fungi, or bacteria, will commence their work.

The question will be naturally asked, what are the remedies? If the blight has struck the tree so as to discolor the twigs, the parts affected should be removed at once, cutting some ways below where the visible effects are seen. Where the limbs are large, too large to be easily removed, taking off the bark so as to prevent the downward flow of sap will serve the same purpose. If the weather and other conditions are such as to lead you to expect blight, mulching the ground under the tree, or applying salt to keep the temperature down, will doubtless be beneficial. Also it is well to whitewash the body of the tree and the large limbs with a mixture of lime-whitewash and sulphur. Mr. Saunders, of the experimental gardens at Washington, thinks this is good as a preventive. Any method that tends to promote the vitality of the tree, and secure a steady, uniform growth, will also tend to prevent blight.

Mr. McDonald inquired why a tree was more apt to blight standing near a house.

Mr. Peffer answered that it was probably owing to a greater degree of heat from the reflection from the house and the interruption of free circulation of the air. A high degree of heat seems to scorch the ends of the leaves and the blight extends to the tree.

Mr. McDonald said a neighbor of his had a tree standing on the south side of a stone house, so close that the limbs touched the building. This tree had been loaded with fruit for the last two seasons and was not troubled with blight, while his own trees, half a mile from there, blighted badly. He should think, if heat produced it, that this tree would have been affected, as it was a very hot place. He thought that being sheltered from the cold northwest winds of winter had some effect upon it.

Mr. Peffer believed that the air, from some cause, circulated freely there, and that the tree made a slow growth. The soil might be such as to cause a slow growth, and fruiting would have the same effect. Wherever the tree stands in a sheltered position, and makes a rapid growth, it is much more subject to blight than those on the top of a hill, where the air circulates freely, even with the same degree of heat. A pear tree in his orchard, standing in a grove of evergreens, where the sun beats right in, always blights, while others of the same variety, standing on the outside, do not.

Rust on grain comes when we have a hot, still day, with frequent rains or heavy dews. Sowing salt or plaster, or seeding the wheat or barley to clover — anything which tends to keep the ground cool, seems to be a preventive of rust.

In reply to a question of Mr. Kellogg, whether blight did not affect trees on the north side of a house, Mr. Peffer replied that fire blight is seen there, but not rust. Grain along the north side of a fence is safe from rust; the best apples and strawberries are often seen where protected on the south side.

Mr. Spear regarded this subject as one of great importance. In his observations he had noticed that rust, mildew, and blight generally made their appearance at the same time and under the same atmospheric conditions. By the microscope we find that mildew and rust are caused by fungi, and therefore he concluded that they also caused the blight in the fruit trees. There is a good deal said about fungus growth, but it is little understood. It differs from all the forms of vegetable growth with which we are most familiar, in that while the plants of the latter order have the power to assimilate food taken up by the roots or from the air, the former cannot assimilate food, but only exist on food already prepared. These belong to a lower order of plant life and are about as extensive in variety as the higher order. The mildew seen on old bread is one kind, the fibrous roots covering and permeating old logs is another, and the rust on wheat with its roots spreading over the stalk is yet another. They all must have the food prepared for them, and can flourish only where they thus find it accompanied with a high temperature and considerable moisture.

Some regard blight as the result of severe cold weather in the winter. If so, our hardiest plants and trees should be affected the least, and tender ones the most, which is not always the case; and again blight occurs where they have no extreme cold weather, and is often the lightest where and when the weather has been the most severe. Still further, where the trees are injured by the winter, their growth is feeble, while blight is always connected with rapid growth. Blight is never very severe except in remarkably warm and damp weather, and it is at such times that grain is attacked with rust and grapes with mildew. Rust and potato rot are also forms of blight, but they cannot be caused by cold weather.

Botanists and microscopists generally believe that these diseases are produced by fungi, but they disagree as to whether they are the primary or secondary cause and as to the method by which they make their attack and get into the plant or tree. He had arrived at the conclusion that the spores of the fungi germinate in sap that has been forced through either the stomata of the vegetable growth, or through wounds made in the trees, whether by accident, insects or the pressure of sap circulation. If the spores can germinate in a drop of water on the leaf, and thus gain power to force its roots through the stomata of leaves or through the bark to the sap within, it should have the power to do it in all cases, but we see vines, plants and trees of the same variety standing in the same row or bed, surrounded by the same atmospheric conditions, that are free from mildew, rust or blight, while others by their side are badly affected. We little understand the power with which plants force sap from their roots to their leaves. When we do we may better understand this question, how blight, rust and mildew force their way into and develop in plants. From experiments that have been tried, it has been found that the force with which the sap is driven up in a vine in the spring is in one instance equal to the weight of fourteen and one-half inches of mercury or to a column of water one hundred and ninety-five feet high; in another experiment the sap pressure was found to be equal to thirty-eight inches of mercury. It has also been ascertained that this force varies with atmosphere pressure. Now rust, blight and mildew all develop most rapidly in extremely hot and damp weather. This is the time of low atmospheric pressure and also is a time in which there is a greater flow of sap and consequently of rapid growth: The atmospheric pressure is lessened and presents little resisting force to the enormous pressure within the plants, and more sap is forced into the leaves than they can assimilate, and is even forced through the pores of the leaves and bark of the tender twigs, giving the spores of fungi just the opportunity they need to germinate and to send their roots into the cells within. The moisture of the atmosphere at such times also favors the development of the spores by preventing the drying up of the sap and thus checking germination. Some varieties are more susceptible to the influence of heat than others, and hence are more apt to attacks of blight or mildew. Their sensitiveness to the effect of heat causes them to make a more rapid growth, thus increasing the pressure of the sap circulation and the tendency to blight. Anything in local conditions that increases the power of this pressure, increases the tendency to mildew and blight, and anything that diminishes it will act as a preventive, as root pruning, underdraining, deep plowing, lowering the temperature or fertility of the soil.

There are two classes of fungi. One that has fibrous roots, or mycelium, that spread out over the leaves and bark of the plants and force their way into the cellular structure. Another that has no roots, but consists only of cells. Microscopists say that it is a variety of this last class that produces hog cholera; another, diphtheria; and others cause Asiatic cholera, typhoid fever, and the whole list of contagious diseases. There is another variety of this last class, called bacteria, that are the sole cause of putrefaction. The first class of fungi may attack living plants and animals, but the office of the class called bacteria is to produce putrefaction in dead organized matter, and to destroy it. They are found in decaying vegetable tissues, and wherever putrefaction is going on. In the decaying cabbage and the blighted tree.

He cited certain facts in his experience which seemed to verify these views in regard to the cause of mildew and blight. In the spring of 1880, he grafted a part of a row of crab apple trees, cutting back the tops to about one-third their size. The trees stood in a row about four feet apart. The trees thus cut back blighted severely, the others not at all. The same season a neighbor grafted five crab trees, cutting off all the limbs. The grafts started and grew nicely and did not blight at all, doubtless because the circulation was entirely stopped, and when the season for blight came there was no superabundance of sap in the tree to blight. While in the trees where a portion of the tops were left on, the circulation was forced into the diminished top with such power as to force the sap through the pores. He had also placed ligatures of wire around limbs of trees where there was blight; the limbs thus bound did not blight, while the rest did. He knew of no remedy or preventive, but to keep down the temperature of the soil, and secure a slow, constant growth, and to guard against any extraordinarily rapid growth.

PRESENT AND FUTURE OF HORTICULTURE IN WISCONSIN.

J. C. PLUMB, Milton.

Horticulture in its several departments of fruit growing, tree growing, flower culture and gardening, is so intimately connected with the every-day life of our advanced civilization, that its value must be estimated by other than a money standard. To one class the several products of our art are looked upon as luxuries, to be indulged in when the condition of the purse will allow. To another class they are necessities of life, active agents of health and wealth. One considers the growing of flowers exceedingly esthetical. Another finds in them a contact with nature, which feeds the soul and lifts the aspirations toward the infinite creator. Thus horticulture has a broad field of usefulness in the progress of humanity toward health and wealth, beauty and perfection. Our state has had a wide and varied experience in horticulture, which it would be interesting to review in detail, but to which I can here only briefly refer. The pioneers of our state were mostly native Americans, and largely eastern people, and hence they commenced the culture of fruits and flowers soon after the first opening up of the farm. Thus about 1836 to 1840, the southeastern and southern counties commenced tree planting. Jefferson county commenced in 1840; Dane county in 1845; Columbia, and other eastern counties, in 1850. While ten years later found fruit tree planting in the lake shore region to Sheboygan, and in the Rock river valley to Fond du Lac, and so westward across the state, and up to La Crosse in the immediate valley of the Mississippi and other streams.

Central southern Wisconsin, up to the region of the granite rocks, was generally first settled with a class of people who made laudable and persevering efforts to grow fruit with the opening of their farms, so that it is now ten to twenty years since all this region has been a field of experiment and observation in horticulture.

The heavy timbered regions in the northeastern portion of our state, commenced general fruit growing some years later, and both the old and young orchards are now very promising, though the first attempts were, in general, failures from the excess of water in the soil at that time.

Nearly all attempts at fruit-tree growing in the northern six-tenths of our state are yet in the green of less than ten years, therefore comparative results are not well known. But I have no doubt of their success with hardy varieties and *thorough soil drainage.* Thus we have for southern Wisconsin thirty-five to forty-five years of experiment, in the southern central region twenty to thirty years of trial of most of the varieties of fruits and flowers now growing in this latitude.

Horticulturists, may we not now well pause and ask for results? Out of very many varieties of grafted apples which have been grown under my observation in this state, only six are now commended by our State Society for their hardiness, and general adaptation, and for favorable locations only eleven more are added, namely, first six: Duchess of Oldenburg, Wealthy, Fameuse, Pewaukee, Walbridge and Plumb's Cider. Second: Tetofsky, Red Astrachan, St. Lawrence, Alexander, Fall Orange, Fall Spitzenberg, Price's Sweet, Utter, Seek-No-Further, Willow Twig, Golden Russet and Haas; possibly individual opinion would double these lists for local planting.

Of pears we recommend but one, Flemish Beauty, and that under a sort of protest; with nine more for trial. Of cherries three — Early Richmond, Late Richmond or Kentish, and English Morello. Of plums the native De Soto for general culture and others for trial. The grape we do grow in perfection, all that are reasonably hardy and early in ripening, while the small fruits are at home in all the settled portions of the state.

Of the very many varieties of our native and foreign deciduous trees which thrive well here, we select fifteen as especially adapted to timber growing, and add twenty more for ornamental, street and lawn planting. These with about twenty-five varieties of hardy shrubs and climbers give us an abundant variety for all needful use and ornamentation. Of evergreen trees, we grow nine varieties of native and five of foreign, in great perfection — the foreign adding greatly to our list of adapted trees, and both lists could be increased by careful selections from the mountains of the Pacific slope and Asia.

In the way of flowering plants, we have the tuberous, bulbous, perennial, annual and greenhouse plants, which make our gardens gay in summer, and our dwellings pleasant in winter. And what shall I say of our garden products! Do they not supplement the grain fields in the food supply for the family?

I may further say, that we have an horticultural record, a published history of twenty-five years of labor for the public good, which is more and more prized, and sought after, not only in our own state and the east, but in the newer states to the west, in our annual reports. Our experience has been worth thousands of dollars to Iowa and Minnesota.

It took us ten years to prove the Baldwin, Rhode Island Greening and most other of our old eastern favorites to be worthless in Wisconsin, and ten more years to show that Ben Davis and Stark are not equal to the test of our soil and climate. After the first twenty years we commenced looking up our hardy native varieties, and another ten years to prove them. We have in all these years found the Russian and Siberian species eminently hardy and fruitful. And now, with large additions to the former by importations, and a wonderful improvement in the latter by hybridization, we have in these three classes of the apple family a very hopeful outlook for the future of our pomology. We have passed the *green* stage of experimental fruit growing, and in the study of native conditions of soil and climate, and of the law of adaptation, we have touched bottom, and can now build on solid rock — with Iron Clads — Russians and Siberians for our superstructure.

With this brief glance at our horticulture in general, let us see what its real status is: By the statistical reports of the farm products of our state as collected by the township assessors, and tabulated by our secretary of state, we learn that the number of bearing trees in our state in 1878 was 1,840,572; in 1879 was 1,901,424, gain, 60,852; in 1880 was 2,140,629, gain, 139,205; in 1881 was 2,189,596, gain, 38,967.

The number of bushels of apples in 1879 was 718,687; in 1880 was 3,743,374, gain, 3,024,667.

The statistics for 1880 of ten best counties are as follows:

COUNTIES.	Bushels yield.	Order in yield.	Bearing trees.	Order in trees.
Jefferson	287,978	1	114,055	4
Waukesha	283,190	2	117,026	3
Rock	251,508	3	129,764	1
Walworth	250,230	4	122,834	2
Sheboygan	221,503	5	86,582	....
Milwaukee	217,760	6	63,743	....
Columbia	208,022	7	73,022	....
Dodge	197,482	8	105,436	7
Fond du Lac	197,365	9	113,921	5
Dane	113,892	10	113,892	6

To be sure, 1880 was a remarkable year for fruit in the west, but not so exceptional that it may not be repeated this present year, for while large numbers of trees bore their last crop in 1880, two stand ready to fill their places by the rate of increase in bearing trees. How much surplus of even that great crop did we have for exportation? Taking the population of the state for that year, which was 1,315,480, and allowing that two-thirds of the crop was good for market and house use, or 2,016,445 bushels, we have for the year's supply of green and dried apples less than two bushels per capita.

We learn from the same report also that ten counties, embracing about one-half our state on the north, produced about two thousand bushels of apples, a mere fraction of the great total of over three and one-half million bushels. This region now has 40,000 inhabitants, to be increased to a million within the life of some who hear this paper.

Our statistical figures may be only approximately correct, yet they do give us the only data from which we can estimate the extent and product of our orchards as well as other farm crops, and will in time become reliable and exceedingly valuable. They show, 1st, the magnitude of the crop; 2d, its distribution; and 3d, the ratio of increase or decrease as a whole, and in the several counties. It is desirable that the way may be open for the annual statistics of every important industry, as well as of its entire commerce that is inter-state. I believe this not only practical, but one of the best educators of the people. I believe a fair estimate of the money value of the apple trees alone of our state will place it at least equal to that of the milch cows, or of the whole dairy interest of our state.

But the great and most truthful lesson of these statistics is the fact, 1st, that the limestone series of our state are producing the greater part of our apples, thus establishing their value for general orcharding; 2d, that nearly one-half of the area of Wisconsin is producing no appreciable amount of apples. Are these conditions permanent? Certainly the natural conditions will not materially change by time, nor by any but very costly measures, and the absence of home-grown fruit will be more and more felt as the northern half of our state becomes settled and populated with its million of apple eaters, as it surely will be at no distant day. Where is this supply to come from? You say Michigan; perhaps so, but if so, we will have to pay larger prices, or take up with second class fruit, for Michigan is already sending her best fruit to the east and south to a higher market; besides we should count the cost of importing the immense supply we must have. Suppose we take two-thirds of the product of Jefferson county for 1880; with its aggregate population of 32,155, we have less than six bushels per capita. We have no means of knowing their export of apples, but it is safe to say that they imported of green and dried apples, even that year of plenty, as much as they exported. Query: Did any county of our state export more fruit in 1880 than they imported? Exports were mostly of green, while imports were both green and dry. In other words, if all the apples grown in that county in 1880 was only enough to furnish liberal supply for the entire year — which we assume to be the case — then we needed for the entire state for that year nearly eight million bushels of apples, or about four times the quantity we grew that year of plenty. To carry this statement of the case further, when our state has a population of three million, as it will within the next forty years, the required supply of apples will reach three times our present production on the basis of 1880.

Well may we pause and ask, Whence is all this supply to be obtained? Herein our state and local societies have a great work yet to do. Every agricultural society, every grange and club, and every form of farmers' associations should take up the work of dissemination of facts among the people. Our state farm should be a school of practical horticulture as well as of experiment in farm crops, and intelligent, careful experiments should be made in, and reported from every county of the state to determine the best conditions that do exist, or can be made to exist for growing good fruit in these several localities. The same holds good for all other industries of our state as making for the general welfare, but as horticulture is one of the higher arts of our advanced civilization, it needs special protection and fostering care from every citizen of the state.

And what is the future prospect of horticulture in Wisconsin? It is hopeful, and I trust will parallel the rapid growth of the live stock and dairy interest of our state. I hope to see the day when prairie farmers will not suffer the piercing winds of winter to exhaust vitality and fodder, when their habitations and farm yards can be so easily and cheaply protected by evergreen and timber belts; when city will compete with country in good gardens, and country vie with city in horticultural adornments of the home. Churches and cemeteries will be made cheerful with trees, shrubs and flowers, and even the country school yard — that last place to beautify — where now our children play "wild Arab" as if they were real children of the desert — yes, even the country school yard will have the charms of horticulture in its fittings, as a co-educator of the future citizen.

In the way of fruit growing, we will plant understandingly, and grow successfully, and with economy, good apples as food for man and beast all over our state. We will learn the limit of each variety, and that those are of most value that can be grown with certainty in a given locality. We will learn to conserve our fruits in seasons of plenty, and learn the art of marketing our surplus without pandering to depraved appetites, or tempting the weak with the ferment of the press.

Horticulture is ennobling to the individual, and wherever you go the world over, it is an accompaniment of refined wealth, and of the higher attributes of mankind. There is no occasion for jealousies among horticulturists, for, like every other industry, it creates its own market and thrives best where competition runs high. The horticulture of Wisconsin is so linked with our every other industry that it should have not only the sympathy of all, but its chief agent, the State Horticultural Society, should be liberally supported by appropriation of public funds, that it may fulfill its work of instruction and example until every part of our great state shall have its own home-grown fruit.

BERRIES FOR THE FARMER.

I. N. STONE, Fort Atkinson.

There are farmers who furnish their families with an abundance of choice home-grown berries, giving them a succession of fresh fruit during the season of extreme heat, when the human system craves and demands such a diet. But there are many farmers' families deprived of the luxury and benefits of a succession of berries, because the farm help will not bother with "small things." Others do not understand how to manage them and will not experiment.

Farmers who do not grow a supply of berries may often be heard to say that it is cheaper to buy berries than to grow them; but this does not mean an abundance. It means a few quarts now and then for table use, and perhaps about one-half bushel of some favorite kind for canning. If we go into our cities and villages we find a good supply of berries in the market, and nearly all classes purchasing freely, except the farmer. He will look upon it with a keen appetite, and very likely, instead of purchasing, he will resolve to raise some another year. And why not? He has the land and is successful in growing good crops of grain and grass. Why not berries?

If we travel in the farming districts of our state, we will scarcely find a farm in cultivation without an orchard consisting of several varieties of apples. These orchards have been cared for in various ways; costing thousands of dollars for the trees, which are generally placed on the choicest land on the farm, interfering more or less with the cultivation of any crop put on the same land. After waiting from four to seven years the owner will begin to realize on the investment by having a home supply of apples during about nine months of the year.

It is not the aim of this paper to discourage apple growing. We need even more apples; and may expect them as soon as the newer hardy varieties that are now being planted are old enough to fruit. While we find an orchard on nearly every farm, we find but very few which have *even a strawberry* bed, to say nothing about a succession of berries. We are *surprised* at this, when we compare the cost and length of time required for the fruit from the orchard to become plenty with that of growing a supply of berries.

Farmers that have not, should add a liberal supply of home-grown berries, thus bridging over the time between the old and new crop of apples, a period in which the farmer's wife finds it difficult to provide anything to stimulate the appetite. It is a great relief to a housekeeper to have an abundance of fresh berries for the table, morning, noon and night; thus promoting health and contentment in the home. Farmers will often follow wheat growing ten consecutive years without succeeding in raising one good crop, and still have the grit to try it again; but if one feeble effort to grow a supply of berries is not crowned with success they are ready to give up in despair. A good farmer knows the importance of having a well developed plan for managing the different crops which he expects to cultivate during the season. He is also aware that success depends largely upon doing everything at the proper time. If such farmers will include the growing a supply of berries for their home use in their general plan, and give them an equal chance with other crops, they will undoubtedly succeed; provided hardy varieties which are adapted to the locality are selected.

There is no class of people that can grow a liberal supply of berries with as little expense as the farmer. Still, there are some hindrances which he encounters that seem to discourage him in making an effort. He finds it difficult to spare the little time required from the cultivation of crops from which he expects to receive a cash income. We would not have him neglect the main crops; neither would we have the farm help overworked; but would have the farmer include growing a supply of berries in the farm plan each year, caring for them with as much promptness as he gives other crops, by hiring, if necessary, one or two days' work during the busy season in the spring; the balance of the work can usually be done by the regular farm help, if rightly managed.

If farmers who use salt pork freely will furnish a good supply of home-grown berries, during the strawberry, raspberry and blackberry season, they will find that the value of the pork saved by having the fruit will more than pay the expense of growing the berries. There are still other dividends in favor of the berries: doctors' bills will decrease; hired help will work freer; children and young people will be more contented on the farm; and friends will be well served.

Another reason why farmers do not plant small fruits is because they usually have more or less poultry which have free range over the garden. This should not keep any from planting small fruits, as they can be set a few rods away from the usual range of the fowls and still be near enough to the home so they will be gathered daily with but little extra trouble.

In order to raise an abundant supply of berries with as much certainty and as little expense as possible, select a piece of land that is ten or fifteen rods long, free from sod, and not made excessively rich; plow deep, harrow fine and level. Set blackberries on the side of the ground where they will be most out of the way; next to blackberries plant black raspberries; red raspberries next; then the strawberries. Cultivate raspberries and blackberries shallow, and mulch heavy in the row with old straw or hay that free is from seed. If the raspberries and blackberries are thus treated every two or three years, they will not become weedy or sodded over in the row; and will fruit well, eight or ten years, on the same ground.

Cultivate strawberries with a cultivator that will not ridge the rows, and keep well hoed the first season. As soon as the ground freezes in the fall cover with marsh hay, straw or leaves, thick enough to hide the plants. In the spring leave as much mulching on the bed as the plants will come up through, having a good healthy color. A farmer's fruit garden should be large enough to furnish his table with berries at least twice a day and a supply for canning, and still have berries on the vines and bushes, so that the whole family and friends could go into the garden and feast upon them during the best of the season.

Professor Henry stated that a young man, a classmate of his and one who had given much time to the study of botany and subjects intimately connected with horticulture, was coming in the spring to give instruction in the university, and he hoped that the horticulturists and agriculturists would stand by him and give him a kindly welcome.

Mr. Kellogg said that friend Stone had very plainly set forth the comparative profits of small fruit culture, but he did not think farmers would care to raise strawberries and other small fruits largely. If they did, he thought they might practice the plan of mulching given by Mr. Gibbs. It seemed plausible and might be of great advantage in keeping the weeds out of the beds. He thought there were some objections to it; one was the labor required to put the runners under the mulch and the growth of weeds in the hill itself. He would like to have Mr. Gibbs give his experience more fully.

Mr. Gibbs in response stated that it was a rather delicate matter to recommend any new plan or method of culture, for others might try it under different conditions and fail, and then they would throw blame on the one giving the advice. He had practiced this method of culture more or less for ten years. His soil was sandy. On heavy soils the ground might be kept too cool and the plants "damp off." But on sandy soil he was satisfied it would do well. The straw mulch prevents the growth of the weeds. The pigeon grass is the worst weed we have, but a good coat of straw will cause the seeds to rot. A few weeds may come up in the hills, but these can be pulled by hand. All the weeds must be removed in this way, and hence the straw should be put on thick enough to keep the weed seeds from germinating, and you will have less work in cultivating than in any other way. It is some little trouble to put the runners under the straw, but once there, they will readily strike root and push their leaves up through a heavy coat of straw and spread out on top. They make a very strong and rapid growth, and the plan seems to present all the essentials to a healthy and vigorous growth. In the fall and winter he added a light covering of straw; did not know as it was necessary, but after taking so much pains to get a good bed he did not like to run any risk of winter killing. He had tried only the Wilson in this way. Would plant this variety about three feet apart. It would then soon occupy all the ground. Other varieties should be set further apart. By a little care the runners could be turned so as have the plants in rows, but he thought it was better to have them spread over the whole ground. Other varieties might not do as well as the Wilson, but it was a great success with them.

He accidentally discovered the benefits of this plan ten or twelve years ago, by emptying some straw beds, when the straw had been broken up fine, on the ground where he was going to have a strawberry bed. On coming to set the plants, he raked the straw up into windrows, but it was so fine that it worked back around the plants, and for two years he sold the berries from that end of the bed for ten cents a quart, extra. It made the berries larger and handsomer, and the plants stood the heat much better, and were less likely to sun scald.

When set out in this manner, and the plants are taken from beds near at hand, so as to prevent loss of vigor from exposure, a very fair crop of berries can be raised the first year. When set in the usual way, cropping the first year injured the plants, but not when set in this manner. The second season the strongest sets will push their roots down through the straw and take root, while the weaker ones will lie on top of the straw and soon die. This is what you want, as it gives strong plants and prevents the beds from being too thick set. He had been led to believe that the Wilson could only bear two crops, and then the beds must be reset, but cultivated in this way he had picked seven successive crops from the same bed, perhaps not full crops, but fair ones. He did not think it paid to cultivate the beds more than two years, if you got two full crops, but it was better to turn them under and reset.

ESTHETICS IN HORTICULTURE.

Mrs. C. A. WILLARD, West De Pere.

Fearing that some may think that the silly, verbose utterances of Oscar Wilde may have induced the selection of the title to this paper, I want to say by way of preface that the title was selected, and given by our worthy president, long before Mr. Wilde's advent upon our shores. This apostle of a rose-water culture has, by his assumption of a superior esthetic development, brought under severe criticism an essential element of fine art. At the risk of being considered as aping this man Wilde, I will venture a few thoughts on the subject of Esthetics in Horticulture.

The husbandman in the pursuit of his occupation is in constant contact with mystery and wonder. The processes of nature that he has to do with in all his labor, are filled with exquisite and beautiful combinations of matter. The occupation of the husbandman, more than any other in all the range of industry, affords the best opportunity of becoming familiar with the most interesting revelations of creative power; he is toiling in the laboratory of the Most High, and may and does become a co-worker with the Creator in perfecting wonderfully beautiful and useful results. Such are the possibilities and opportunities of horticulture that it only needs a refined intelligence in its pursuit to make it the companion of art, science and literature, as a means of culture and refinement.

Pantheism in Pagan mythology teaches that God is present in all that lives. Science, in modern thought, has revealed a secret that, if it does not teach the same thing, is very suggestive at least, when it teaches that the fundamental element or principle of life is the same in the vegetable and animal, consisting of a colorless pulpy substance without form or structure, yet capable of motion, assimilation, absorption and organization; this substance is known as protoplasm. From this germ of life, matter runs its course through all the changes and transformations in the vegetable and animal kingdom, thus covering and peopling the earth, in all its variety and beauty.

There is a theory in science, that three conditions are essential, and absolutely necessary to this life, and that no life, either vegetable or animal, is found without these three, to wit, consciousness, force and matter. And in this substance known as protoplasm, these elements are combined, working out through their environment the highest forms with which we are familiar. This view of the potency and power, locked within an element of nature so simple as that represented by protoplasm, impresses us with a feeling of awe and sacredness akin to that that once attached to forms of beauty in the days of Pantheistic art; more than that, it has the effect, as we contemplate the fact, to make us more considerate of the tender bud and delicate blossom, feeling that in some degree, at least, it may be conscious of our tender care and of our needful ministrations. Thus in the forms that matter assumes in the transformations familiar in horticulture, do we see the beauty of its art.

John Stuart Mill, however, a pessimist of wide reputation, says there is no indication in nature of any act of beneficence; the higher prey upon the lower without mercy; each exists upon the other, until it may be said that the highest is at the cost of the lowest; living by dying, seems the process from the foundation up. In the vegetable world the same is true, as illustrated in the peculiar habits of the insectivorous plants, feeding as they do upon the insects attracted by their seductive charms; especially is this true of the *Drosera rotundifolia*. It is a singular fact that there is a wonderful correspondence between this peculiar plant and the animal, in the provision made for digestion of food; the gastric fluids, we are told, being the same in each. Not only in these insectivorous plants is the pessimist's theory of life verified, but in the decay and decomposition of vegetable life, that still better results may follow. It is only when the great forests give way to the woodman's ax, and the great prairies submit to the husbandman's plough, and the life that for so many centuries has held control becomes extinct, and a new life follows, fed by the results that have gone before, directed by the skill and industry of man, that we get the best results of mother earth's productiveness. In our judgment, in contradiction of the theory of Mr. Mill, all this preying each upon the other are only methods of change that work out higher and better results, and that in their production are full of wise beneficence, necessary in the design of the all-wise creative power. The pessimist's mistake is when he looks upon these changes in a pessimistic way, judging the change as the end of a particular form, and not as it relates to the whole, of which that particular form is only a part; we see how this is in the life of man; each preceding generation is the pioneer of an advance for the generations to follow. The present is what it is, because of the past; the product of all that has been before. Thus the value of life extends beyond the present, and if we attempt to estimate its best value by the present of any age, as some do, we find it counts for an unknown quantity.

The compensation of the present is largely in its occupation. If our farmers could realize this, and look for compensation, in some degree at least, in the occupation and satisfaction that a study of nature would bring, they would not only add largely to their stock of knowledge for practical use, but would find in their occupations an interest and attractiveness that otherwise they would never experience or know. Their days and their labor are filled with opportunities. Take, for instance, a habit of observation of the birds of our locality; how few are there of those engaged in horticulture who know of the value and importance of these songsters and busy workers in our gardens and orchards. Perhaps but few of our farmers know whether it pays better to spend time in killing them, to save the fruit they eat, or to protect them, that they may increase and multiply, to destroy the bugs, insects and worms that prey upon our trees and growing crops. Are we aware of the destruction that occurs from insects, that may be largely saved by protecting the birds common to our locality? It is estimated that in a single year the loss of cereals in the United States from insects has been as high as four hundred million dollars; seventy-three million in a single year in Illinois alone. The amount destroyed by insects in the United States is more than double of all that we export in a year of grain. The effect of this loss is felt not alone by the farmer, but by those who labor, and by the manufacturer, whose ability to compete with the world in the production of manufactured goods depends upon the cheapness of subsistence for the labor he employs.

When we consider the enormous quantity of insects that birds destroy, we can, in some degree at least, form an estimate of their value; for instance, it has been ascertained by careful observation that our birds subsist on insects three hundred and five days of the year; that there are sixty days when fruits are abundant that they live more upon fruits than insects. It is estimated that a single pair of sparrows will destroy six thousand three hundred caterpillars in a week. The warblers are entirely insectivorous, and we can certainly allow them as great a destructive capacity as the sparrows; by sparrows we refer to our American varieties, not to Passer Domesticus or English sparrow, which has now become so thoroughly naturalized. There is a question whether *they* ought not to be ostracized from the society of birds, as their pugnacious habits, and rapid increase, tend to drive out other varieties of birds more valuable and much more beautiful than they. The American Naturalist for February, in an article written by Dr. Elliot Coues upon the English sparrow, entitled the Sparrow Pest in Australia, says: "1st. That the sparrow is established over an immense area in South Australia. 2d. That sufferers in such area 'cry for relief from sparrow depredations as if from a pest.' 3d. That the sparrows are increasing at an astonishing and alarming rate, their work being 'done under conditions despairing to the cultivator, and under conditions that he cannot control; for the seed is taken out of the ground, the fruit-bud off the tree, the sprouting vegetable as fast as it grows, and the fruit ere it is ripe.' 4th. The cultivated plants attacked are apricots, cherries, figs, apples, grapes, peaches, plums, pears, nectarines, loquats, olives, wheat and barley, peas, cabbage, cauliflowers and garden seeds generally. 5th. All means of defense have hitherto proved inadequate. 6th. The commissioners suggest in addition to the usual means of defense, the tender of rewards for sparrows' eggs and heads; the removal of gun licenses for the season, poisoned water in summer, sulphur fumes under roosts at night, plaster of paris mixed with oatmeal and water. It is further declared that the united action of all property holders, including the government, is essential to effective results." This experience in Australia tends to confirm the opinion that they ought not to be allowed to increase and drive out our other birds here.

A pair of thrushes have been seen to carry over 100 insects, principally caterpillars, to their young in an hour's time. While most of the birds common in our locality are of inestimable value in the destruction of insects, and deserve to be protected in every possible way, there are, however, some, the crows and jays for instance, who, by devouring the young and eggs of insectivorous birds, are chargeable with more loss than gain, and deserve to, and should be destroyed, that others more valuable than they may increase and multiply.

Aside from the utility of these feathered songsters that inhabit and make gladsome our fields and gardens, we may by cultivating a closer acquaintance with them, and observing their habits and characteristics, be interested in a very fruitful and profitable study that will bring us into intimate acquaintance with an order of beautiful life, possessing many of the characteristics common to man. They are fond of domestic comforts and social life, enjoy the beautiful in form and color, and are ever ready to respond to kind attentions, remembering their safe and pleasant haunts as their seasons of visitations return.

A pleasant incident is related by a writer, urging the importance of protecting our birds, of the simple manner in which he provided for a family of bluebirds. At the opening of the season he put up three tin cans, such as are used in canning tomatoes, having first filed a small hole in the lower end to let the water out; these were immediately occupied by bluebirds; one pair laid five eggs, four of which hatched, and the young grew to maturity; the other two pair each had two broods of four eggs to each brood, and all hatched; as a result, twenty young bluebirds and their parents were induced to make their home in our orchard during the season, who, by a close estimate, during the five months, destroyed no less than forty-eight thousand insects.

There is a fact mentioned by Wallace in his geographical distribution of animals, that should interest the farmers of this latitude. This is what he says: "A bird can only breed successfully where it can find sufficient food for its young, and the reason probably why so many of the smaller birds leave the warm southern regions to breed in temperate or even in cold latitudes, is because the caterpillars, and other soft insect larvæ, are there abundant at the proper time, while in their winter home, the larvæ have all changed into winged insects." By availing ourselves of this characteristic and habit of the birds, and taking pains to protect and provide for their safety, we might very largely increase the number that would come here to breed, and thereby do much to save our cereals, trees and fruits from the destruction of insects.

We have in mind an incident that illustrates that some of our farmers, at least, are not unmindful of the value and good work done by the birds. A naturalist, on observing a large number of robins in some cherry trees near by where a farmer was plowing, stopped and asked him if the birds were very troublesome in his trees. He replied that when the cherries were ripe and the ground dry, they fed principally upon them, but, said he, "I began to break up this piece of ground yesterday and it seems to me as if all the robins in the country are flocking on it; they prefer the worms and insects to cherries, and I can well afford to indulge them in a little fruit dessert for the service they render in the destruction of insects that injure and would ruin our trees, except for them." While our attention is directed to the value rendered horticulture by our birds, we would suggest the importance of legislation having for its purpose the destruction of crows, by bounty, and the protection of other birds by suitable laws against wanton destruction by boys. In Massachusetts, game birds are protected during seasons of incubation and breeding, while all others with their nests and eggs, except crows and jays, are protected the year round, with penalties severe enough to secure the observance of the law.

More than any other laborer, the husbandman has need to be familiar with the processes of nature, and by observation seek to understand what may help or hinder success and profitable results. It is not rare to see persons passionately fond of flowers, expend money and time, and yet complain that for them flowers will not bloom, unmindful of some little thing that they would have been only too glad to have bestowed had they only known what was required. We have in mind the experience of a lady friend, who for several seasons had carefully nursed a thrifty Amaryllis, but lamented that notwithstanding all her care, it would not bloom, while for others they seemed so profuse of their charms in the beautiful blossoms they yielded. We called her attention to the fact that she should not cover the bulb with earth, but leave the upper half exposed to the action of the air and light, if she wanted it to bloom. This simple understanding of a necessary condition made her very happy in the enjoyment of her hopes, in seeing the long coveted bud and blossom.

There are plants under cultivation removed from the conditions of their nativity, which, until something of their native habits are understood, refuse persistently to gratify us with the sight of their blossoms. Take for instance the Tube Rose, one of the most fragrant and profuse flowering of our bulbs when all the conditions are favorable, but so chary when those conditions are not complied with, that but few succeed in getting it to blossom, particularly if they attempt to raise them from the offset or small bulb. Many prefer buying the bulbs from the florist, ready matured for a season's bloom. So slow is the process in preparation for the blossom, that two, and sometimes three years are required, without hope of anything but leaves. After a summer's growth, the bulb must be kept warm and dry during the winter, in a temperature not below, at any time, 50° Fahrenheit. Last summer some of my bulbs sent up a second flower stalk after the first bloom had all gone, but too late to blossom in the garden in this climate.

It not unfrequently occurs that a lack of knowledge respecting the kind of soil adapted to the plants under cultivation, defeats success. I have in my own experience been baffled and disappointed on this account, and as often on account of the soil being too rich as too poor; especially has this occurred in the cultivation of monthly roses. The best and only way to determine the kind of soil best adapted is by experiment; yet one may, if familiar with the nativity of plants, know something of what is required. I had supposed that the beautiful trailing blue Lobelia, that is so much used for hanging baskets, was a tender, delicate plant, and had treated it as such; imagine my surprise a year or two ago, when wandering among the rocks upon a small peninsula between Sawyer's Bay and Green Bay, about sixty miles north of the city of Green Bay, to find it growing and blossoming profusely in crevices so small between rocks that you could hardly insert a knife blade. Around an old stone quarry I found quantities of Alleghany vine in full blossom; and on the point of land on a very thin layer of soil, not more than two or three inches thick, over solid rock, I found numbers of what we call Waxberry or Snowberry bushes, growing and covered with an abundance of berries.

Last summer I found some beautiful plants of Clarkia in full blossom in our Fox River Driving Park. I imagine that here the cutting down of some of the trees helped to bring this plant to perfection, as I have never noticed them before, although I had been over the ground many times. Thus by observation in their nativity may we glean many important facts.

At best, in horticulture, success depends largely upon an attention that involves not only labor and patience, but careful study and observation. There are many theories advanced by our scientific men, respecting the distribution, propagation and hybridizing of plants, that are interesting studies, when followed with experiment and practical results. If, by any means, the farmer and his family can be induced to become interested, and seek for knowledge by experiment and observation, the result would be largely to increase their general stock of intelligence and refinement. There is no occupation or opportunity, when directed by a commanding degree of intelligence, that would grow to be as important in determining the future of our country, as that in control of the great resource resulting from the cultivation of the soil. More than any other, the farmer's occupation is the foundation of all industries; his work has to do with the subsistence of all labor, and under our free system of proprietorship, with proper attention to a larger development of intelligence, the time will come when the proprietors of the land will be accorded a position in our body politic that they do not now occupy. They hold the key to the situation, and it is they who are to determine the future of our republic.

We cannot close this paper without recognizing the great good that is being accomplished in the direction we have indicated, by organized effort, through societies similar to your own; and we are certain that this state does not expend money in a wiser way than to encourage efforts to disseminate knowledge pertaining to agriculture. That this is being well understood is evident by the appropriations made by our legislators in general government for this purpose. That we have been slow in arriving at this wise conclusion appears in the fact that the first national agricultural convention was held this winter, demonstrating in its results, however, the great value to the country of such opportunities to bring together the most intelligent of those engaged in the development of our great and varied resources.

THE MENTAL OUT-REACH OF WOMEN.

Mrs. J. CLARK, Galesville.

The mental out-reach of a large majority of our American women, farmers' wives in particular, is necessarily circumscribed to a great degree. The discharging of the domestic duties of the faithful wife and mother tends to narrow down her field of thought, and keep her mind too exclusively intent upon immediate household duties, and the welfare of those she is by the ties of nature interested in. Her daily habit of thinking and planning for the family, of which she is maternal head, ultimately dwarfs her capacity for thought and conversation, and the constant dwelling upon the minutiæ of daily duties causes her to turn mole-hills of little nothings into mountains of trials, and in many cases to become exceedingly prolix in the common daily affairs, in which few feel but little interest.

The husband's vocation, let it be what it may, calls him out in the world. He has a greater or less chance for mingling with his fellow beings. The daily manifold suggestions quicken thought, the constant friction of other minds brightens and develops the power of intellect, and the exigencies of business draw him out in competition, which is daily educating him, while the wife, to be a dutiful wife and mother, a model housekeeper, and a good economist, has so little opportunity for change and interchange of thoughts and ideas. She must, to a certain extent, bring her mind down to the monotonous routine of housework. There are days, and perhaps weeks, she sees only those of her own family; her time is so fully occupied with her manifold duties, she scarcely finds time for reading. The result is she is fast losing ground as a companion to her husband and an educator to her children. To be really entertaining and companionable to her husband, her theme of conversation must take a broader range than her kitchen or nursery, and it must not consist of neighborhood gossip. His mental out-reach stretches far beyond these themes. It takes in all the themes of discussion that require a keen, shrewd and active mind, and she must be able to converse fluently upon the current topics of the day, and to discuss freely the political world, in order to entertain him to his own satisfaction; otherwise her conversation grows wearisome, and is estimated as meaningless prattle.

The mental abilities of the wife and mother are usually underrated by the "sterner sex." He believes her mind to be narrower than his and less able for ample scope for thought, for the simple reason that her domestic duties give her so little opportunity for its expansion. Here is where he makes a grievous error. Could she have the same opportunity he has, having the same intellectual faculties, with her natural intuitive powers and fine sensibilities, her mental abilities would be as acute and capable as his, her observation and judgment as good, her conclusions as correct, and her discussions as pure and more effectual. Sisters, this is a deplorable mistake, because it so operates to our disadvantage. We must manifest in our home life a greater mental scope if we would not be treated as "the weaker vessel." Woman's thought is so hampered in her domestic circle that the public hamper her privileges, thinking her incapable. The public, which is composed of husbands, brothers and sons, have formed their opinions and drawn their conclusions from their experience with the women in their own home circle. This being the case, this subject demands the gravest consideration on our part.

No woman has a right to be weak or of meager influence, or a slave to domestic toil, or to let her faculties shrivel, while there is such a broad and limitless ocean of knowledge, and it is her privilege to stand upon its shore and gather one after another of its many pebbles, thereby becoming strong, influential, and a woman of robust faculties.

It is usually the case after marriage that the wife, mentally, begins to retrograde, while on the other hand, the husband's business is a daily educator and he is steadily advancing. The mental separation is fast widening. Perhaps he sees and knows this to be the case, but he shrinks from saying: "Wife, I am growing away from you, I tire of the many little things that seem to absorb your thought and attention. Can you not drop all these puerile whims and talk of something nobler and more worthy of your time and attention?" Husband, you need not say this much, nor even feel it your duty to do so; neither need you keep silent and let this mental separation grow broader till you have attained the highest mental culture and she has mentally degenerated. If when you married your wife you intended her for your companion and not your housekeeper altogether, you can keep her your companion without wounding her feelings, or making her feel inferior to you. To succeed in this without a word from you requires patience and tact. You may lack the latter requisite, but you can cultivate the former, and you can make ways and means a study. Talk with her; tell her the news of the day; enlarge upon all subjects you think worthy of thought; when you have read some article that merits attention and requires consideration in order to form an opinion, point it out to her and ask her to read it, giving her to understand that her opinion will be desired and appreciated at some future time; discuss all subjects as freely with her as you would with some gentleman friend; read to her evenings, giving her a chance to give her opinion upon the different subjects as they are read, instead of absorbing all the newspaper or book yourself, while she sits silently by your side, laboring with the needle to meet the demands of necessity. There are numberless other little ways in which you can interest her in these noble, worthy subjects, and thus detract her mind from domestic toil and cares. If you will only take an interest in her mental advancement and give her some encouragement, surely she will become incited and manifest a greater mental scope.

In the far past it was not considered necessary to educate a woman. If she knew how to make, mend, cook, make butter, and was an excellent housekeeper, that was considered the highest achievement woman needed to attain. But thanks be to our Maker, the times are changing and it is our privilege to change with them. There is no need to be hampered in our privileges by domestic toil, and thus wrong ourselves. Our domestic duties do not require us to burden ourselves with the many little things of a dwarfing and circumscribing nature. To be sure, many little things come into the domestic routine, but they need not be our masters and absorb all our thought; they need not claim our whole attention, nor need we think of them and nothing else. Even midst our domestic cares and toil we may meditate upon noble subjects. It certainly is our privilege to step out of this "domestic rut" and walk side by side with our husbands, surrounded by broadening influences. Why not avail ourselves of the privilege?

The habit of thought is powerful. We can habituate ourselves to poring over daily occurrences and petty trials, or we may rise above these and let our thoughts take a holier and nobler direction. Therefore let us not be willing slaves to the common every-day occurrences of life, but practically fit ourselves for a higher level. The remedy lies within our reach. Let us take a few moments every morning for reading, having previously made the selections; and let these selections be of an ennobling character, and of a nature that requires study; then we shall have a theme for thought through the day. If we read an article or hear anything read that is truly elevating, study it, write it down, enlarge upon it, and make it our very own.

Methinks I hear some domestic toiler say: "Oh, that advice will apply very well to those that have but little to do, or such as keep servants." I think it will apply to a certain degree to every case. It will take but a few moments of time to read a short chapter or a sketch, and a little food for the mind will give you elasticity and cheerfulness, and quicken the energy, and you will have accomplished as much when night comes as though you had toiled all day, thinking of nothing but commonplace events, and you will have the satisfaction of having developed, benefited and enriched your mind.

Allow me to relate an incident which I read not long since: "In the report of the secretary of the Boston Home Society, mention was made of a student, a farmer's wife, who had charge of a dairy of twenty cows, and the care of four children between the ages of two and twelve. She wrote: 'I feel that it is just as necessary to my family that I improve my mind, as that I patch pants and darn stockings. If I allowed my interest in study to wane while I have the care of my children, it would be buried beyond all hope of resurrection.' The same lady contributed an admirable paper on the 'Science of Mathematics' which was read at the meeting." If a lady with all these cares can find time for mental culture, why cannot every woman of our country do the same.

The road we are traveling is steadily leading us away from what our ambition should desire most to achieve. It is the ambition of all true women to prove good and agreeable companions to those with whom their path in life is blended. There is no earthly ambition purer. An ambition designed by God and witnessed with great delight by the angels in heaven. Here is the great question to be solved by every wife: How can I be truly companionable? This is a deep and solemn question; one which every wife can define to a certain degree. Are we all sure that we are as companionable as we are capable of being? How many of us, were we weighed in the balance, would be found wanting? Furthermore, do we not expect our daughters will some future day fill the place of wife and mother? Is it not our duty to teach them to develop the mental faculties and to cultivate and refine their tastes mentally and socially that they may attain the highest level in society? We can do this more effectually by example than by precept.

If only for the gratification of our children, we ought to "keep up with the times," as the saying is. If we do not, I fear, when we find it too late to retrace our steps, we will be awakened to the painful fact that our daughters are blushing at our "solecisms," and desire to "keep us in the background;" our sons will be ashamed of our ignorance; even the little innocents will wonder that mamma does not know this or that, "Papa can tell us all about it."

Mothers, has not God endowed us with intelligence and intellect? Ah! I fear we are folding the talent He has given us in a napkin to be returned to Him without increase. God has created woman as well as man, for thought, for intelligence, for constant mental elevation, and rather than to sink with the uncongenial drudge, let us seek to rise above circumstances which would enslave us, and in our thoughts and conversation attain a higher level. "Our lives mark the boundaries of our being, and if we will, they may be broadened until they reach the highest possible level for the finite mind." We certainly have a place to *fill* and not *occupy*. Let us fill that place in such a manner that our husbands may love and adore us, our daughters may be proud to call us mother, and our sons may "rise up and call us blessed."

RESETTING OLD ORCHARDS.

E. W. DANIELS, Auroraville.

There is one fact in horticulture of which I have never had a satisfactory solution, one too which is susceptible of ocular demonstration by every orchardist in our part of Wisconsin, or country; that is, that apple trees will not grow with thrift, or at all, to pay for culture, on ground once used for an orchard or a heavy crop of nursery trees. I tried a few grafts two years ago on ground that was set with nursery trees twenty or twenty-one years ago, and dug out clean eleven or twelve years ago. I secured about one hundred out of every one thousand set, of very inferior quality and size. These I removed last spring on to ground no better, only that it had not been cropped with trees before. The ground where they were set the first time had been well manured and cropped. Set some of same kind of ground with grapes, and they flourished as well as any on the farm. Last year again I set grafts on ground plowed for that purpose where there had been a few orchard trees previously, and which was well adapted. Most of them grew well; but where I plowed within a rod of an apple tree and planted my grafts, I found they would not grow more than a few inches during the summer, while those some little distance from the old line of trees grew an average of two feet, and the line of demarkation is so very conspicuous that the trees standing on the old ground, in juxtaposition to the others, appear like dwarfs. Another sure indication, in this patch of trees I observed that a circular form through which three or four rows passed were much smaller than the rest. I inquired of a Mr. Dunham the cause; "why," said he, "I dug up an apple tree there two years ago." I took up all these dwarf trees last fall, and shall reset them on other ground, where I think they can get the right kind of food for their growth if their vitality is not destroyed.

The distance for setting trees, I have hitherto advised, is two rods each way with one in the center of the squares; but will, if ever I set a new piece, put them farther apart than that. I think that a probable cause why the trees do not endure longer in thrift in this country, is their close setting. They exhaust the tree or plant food and cannot remain in vigor until old. I find in the nursery that the elements of tree food are entirely lacking within a circle of five or six feet from the extremities of the branches.

There is a case in an orchard set by A. W. Davenport, about a mile or so from here, now owned by his son, D. L. Davenport, set in 1863–5. There were two thousand trees, the admiration of the passers-by and neighbors as the best in the town or state; but alas! in six or eight years after the orchard commenced fruiting, say about seven years ago, it failed to give its bountiful supply of large, fine apples — seven hundred dollars worth in one year. The foliage has a yellowish, sickly look, all except the outside rows, which look a little better, although they bear but little fruit.

Like other nurserymen, until a few years ago, I sold trees to reset old orchards, but have not done so for the last six or eight years, as the trees will die, and then the farmers curse the nurseryman and all his trees, and try eastern or peddler's stock at three or four times the price. Now it is probable that some parts of Wisconsin have more of the elements necessary for tree growth than this section, but I know there is no place in this country where the second setting is not more or less affected by a former crop of trees; but I am not well posted in regard to the middle and eastern states, in reference to the first crop of trees injuring the second. I have a brother in Vernon, Waukesha county, who says he has succeeded in growing a tree where a large one had died out, by digging up the roots and cutting up the top and burning the whole on the spot where it grew, and I will try next year to grow a tree or two as resets by putting in plenty of ashes where we have burned the apple wood. Some of the timber trees are ruinous to an apple tree, if standing within two or three rods of them. Lombardy Poplar is one of the worst. Now, if our professors of chemistry can find a cheap and efficient restorative for the exhausted tree food, they will confer a great benefit on orchardists and nurserymen who wish to replant on the same soil.

REPORTS OF LOCAL SOCIETIES.

BROWN COUNTY HORTICULTURAL AND AGRICULTURAL SOCIETY.

The Brown County Society has held its regular monthly meetings during the entire year, except that two meetings were held in January and none in July. The dates and places of the meetings were as follows: January 8th, at the house of President J. M. Smith, Green Bay. January 19th, at Klaus' Hall, Green Bay. February 19th, at the house of J. H. Potter, Pittsfield. March 19th, at the City Council Room, Green Bay. April 30th, at the Council Room. May 28th, at the residence of Wm. Rowbotham, Preble. June 26th, on the society's fair grounds, at Depere. August 20th, at the Temperance Hall, Pittsfield. September 22d, at the Exposition Building, on the fair grounds, Depere. October 29th, at the Council Room, Green Bay. November 26th, at the Council Room. December 31st, at the house of President J. M. Smith.

Topics Discussed.— Besides numerous incidental matters which came informally under consideration, the leading subjects proposed and discussed at these meetings are the following:

1. Various arrangements for the fair.

2. February meeting. What shall we plant?

3. February meeting. The value of plaster as a manure.

4. March meeting. The Amber cane convention at Appleton.

5. April meeting. Floriculture; considered mainly in written essays, by Mrs. D. C. Ayres, of Green Bay, and Mrs. C. A. Willard, of Depere.

6. May meeting. What is the best substitute for hay for keeping stock?

7. June and August meetings. The Dignity of Labor. Formal address by the Rev. H. Stone Richardson.

8. October and November meetings. The Faults and Defects of the Late Fair.

Most of the meetings have been well attended, and interest in the work of the society generally well sustained.

ANNUAL FAIR.— The second annual fair of the society was held on the fair grounds at Depere, on the 20th, 21st, 22d and 23d of September. The weather was not propitious on the opening day of the fair, and this fact, combined with the unfortunate announcement that all entries must be made previously to ten o'clock in the morning of that day, contributed largely to prevent such a full exhibit of the industrial products of Brown county as the members of the society had anticipated. Though by no means discouraging, the results of the fair, both in financial and in other respects, came so far short of realizing the general expectations as to give occasion for the discussions which mainly occupied the attention of the society at the meetings of October and November.

The following is the financial statement reported to the secretary by the special treasurer of the fair:

FINANCES.— The current receipts and disbursements for the year ending December 31, 1881, were as follows:

Received for membership fees and dues	$52 00
Received from State Treasurer	130 00
Total receipts	$182 00
Paid rent of Klaus' Hall for convention	$25 00
Paid incidental expenses, printing, postage, express, etc	20 15
Paid secretary for service	25 00
Total disbursements	$70 15
Excess of current receipts over disbursements	$82 85
Cash in treasury at beginning of the year	40 78
Amount in treasury December 31, 1881	$123 63

The following statement covers the receipts and expenditures in full for the year:

RECEIPTS.

From the state	$100 00
From memberships	53 00
From admission fees	1,532 79
From entries	129 50
From subscriptions	00
From other sources	487 58
Total receipts	$2,302 87
Cash on hand at date of last report	40 78
Total	$2,343 65

DISBURSEMENTS.

For premiums and purses	$752 48
For fair expenses	1,121 59
For secretary's office	88 41
For improvements	232 54
For other purposes	25 00
Total disbursements	$2,220 02
Cash on hand at date of this report	123 63
Total	$2,343 65

BOOKS.— Fifty volumes of the Transactions of the State Agricultural Society for 1880–81, and fifty of the State Horticultural Society have been received and distributed among the members. The latter is a volume of special interest to us, containing as it does a full report of the joint convention of the State and Brown County Societies held in Green Bay in June, 1880, our own Historical report for that year, and the essays on Floriculture, read by Mrs. D. C. Ayres and Mrs. C. A. Willard.

FAIR RECEIPTS AND EXPENSES.

RECEIPTS.

From sale of tickets	$1,532 79
From entries	129 50
From advertisements in premium lists	138 00
From privileges	280 96
From grand stand	68 62
Total receipts	$2,149 87

DISBURSEMENTS.

For large posters and posting	$145 81
For hay used on the grounds	26 05
For Oneida band and board	57 25
For assistant secretary's services	25 00
For gate keepers, police and attendants	127 50
For meals for employes	35 30
For painting, lettering boards	17 01
For printing premium lists, etc	232 55
For Green Bay band	35 00
For portable engine	40 00
For envelopes, wrappers and stamps	18 26
For Warriors freight and board	405 12
For premiums and purses	752 48
Total disbursements	$1.917 33
Excess of receipts over disbursements	$232 54

The whole number of entries was 489, just 200 less than at our first fair, a decrease sufficiently accounted for by the facts above stated. Compared with the fair of last year the total receipts of the second were $24.08 in excess of those of the first, a fact which does not indicate any abatement of public interest in the annual expositions of the society. It may be here stated that the net avails of $232.54 were appropriated to the payment of expenses incurred by improvements made upon the grounds preparatory for the fair.

The experience and observations of two years should enable us to present, at our third annual fair, the products and industries of Brown county, especially those of the farming population, in a much more complete and satisfactory exposition than either of the two which have now been held, and it is to be earnestly hoped that the society will make early and ample arrangements for such an exhibit of all departments of industry and improvement — horticultural, agricultural, mechanical, artistic, and educational — as will place Brown county in these respects, at least, not below where she stands alphabetically among the counties of the state.

MEMBERSHIP.— At the date of the last annual report the male membership of the society consisted of two life members, ninety-six annual members and four honorary members, one hundred and two in all. During the year there have been eleven additions to the class of annual, and two to that of honorary members, making the male membership, at this date, to consist in all of one hundred and fifteen members. The secretary is not able to report the exact number of ladies who should be regarded as members of the society. By a standing rule all married ladies become honorary members on the admission of their husbands. By another standing rule all unmarried adult daughters of members in good standing shall, on handing their names to the secretary, be accepted as honorary members, and their names be enrolled on the record as such. Only one addition of this class has yet been made.

The effect of the action of the meeting of January 8th, was to annul, in part if not in whole, the distinction previously held between life and honorary members. A proper classification of our membership is, therefore, now a desideratum, for the purpose of enabling the secretary both to render a correct report to the secretary of state, and to distinguish between those who should be charged with annual dues and those who should not be so charged. We have at present on our roll two life members, five reverend gentlemen, two aged persons and one honorable gentleman from abroad, none of whom are liable for dues according to previous action of the society. There are also in the ledger the names of several former active members who have removed to other counties or states, relative to whom no action of the society has been taken, and the secretary is not, therefore, authorized to discontinue the collection from them of annual dues. A number of others have persistently neglected, from the first, to cancel their annual indebtedness, though their attention has been duly called to the matter, in accordance with the order of the society at its meeting of January 17, 1880.

The secretary suggests that the subject of membership be referred to a special committee with instructions to report, at a subsequent meeting, a proper classification, with definition of the rights and obligations of each class, and also just and proper rules regulating the continuance and termination of membership.

SPECIAL BUSINESS.— 1. On the 27th day of May, the president and secretary, in obedience to the instructions of the society at the meeting of April 30th, effected the purchase of one hundred and forty-four shares of stock in the Fox River Driving Park Association, for which they gave the obligation of Brown County Horticultural and Agricultural Society, for the sum of $720, to be paid on demand out of any monies accruing to said society, and being in its possession as *net proceeds* from fairs and other exhibitions held under its auspices on the grounds of said joint societies.

2. At the meeting of April 30th, the following resolution was adopted:

Resolved, That at the next meeting of the stockholders of the Fox River Driving Park Association for the election of director, the president of the Brown County Horticultural and Agricultural Society be authorized to cast ts full vote for such officer.

3. At the special meeting of January 19th, Wm. Rowbotham was duly elected delegate to the annual meeting of the State Horticultural Society to be held at Madison during the first week in February. The secretary here suggests the question whether it would not contribute to the advantage and interests of this society to be customarily represented by a chosen delegate at the annual meetings of the State Society, to pay the necessary expenses of such delegate, and to require of him, at the next meeting after his return, a written summary of the proceedings of said State Society.

From this survey of the past year's doings, it is evident that the society still preserves its vitality, and that its operations and influence are highly conducive to the best interests of the county. Indeed we need not fear the charge of self-glorification from any intelligent source, if we should boldly maintain that Brown County Horticultural and Agricultural Society ought to be accredited high rank among the forces at work in the county for its most needed improvement and its highest general good. Occupying such a position, it becomes the members of the society, individually and collectively, to preserve unabated their interest in our work, and continue with undiminished vigor their active operations for the accomplishment of its objects. No cause of discouragement yet appears; on the contrary, the favorable results of the past promise higher successes in the future, and the good we have done opens a wider door for good yet to be done. Let our motto be "Excelsior," and under a banner thus inscribed, let each member of the society work on, animated and inspired with a zealous resolve to render Brown County Horticultural and Agricultural Society one of the most efficient instrumentalities that ever has been or ever can be employed for the paramount interests of the county he lives in.

Respectfully submitted,

WERDEN REYNOLDS,

Secretary.

FREEDOM HORTICULTURAL SOCIETY.

At the annual meeting of the Freedom Horticultural Society, held January 15, 1882, the following officers were elected for the ensuing year:

President — Charles Hirschinger, Baraboo.

Vice President — E. N. Gramble, North Freedom.

Secretary — George Faller, Baraboo.

Treasurer — George Armbruster, Sr., Baraboo.

Executive Committee — S. D. Slentz, Wm. C. T. Newell, J. M. Blachley.

Delegate to the State Horticultural Society — Charles Hirschinger.

Various meetings have been held during the season at North Freedom and at the school house in district No. 4. Papers were read before this society by William Tool, of Excelsior, Prof. J. W. Wood, of Baraboo, Mrs. R. H. Strong, of Baraboo, Mrs. M. M. Davis, of Baraboo, W. C. T. Newell, of North Freedom, and the president. Prof. Henry, of Madison, was also with us one afternoon and evening, and gave valuable information as to how plants grow and the value of manure, to the apparent satisfaction of all. The meetings of this society have been interesting and usually well attended.

GEORGE FALLER,
Secretary.

GRAND CHUTE HORTICULTURAL SOCIETY.

The year just closed has been one of great discouragement in fruit growing, especially in tree planting and the culture of the orchard. The Tent caterpillar made its appearance earlier in the season than formerly, and in greater numbers than the year previous. Many trees were entirely defoliated and all were greatly injured; later in the season the denuded trees put on new foliage, but their vitality was so weakened, there is great reason to fear they will not survive the winter. The ravages of the Tent caterpillar occurring in the off-bearing year, wholly destroyed the apple crop in many orchards; in others there were a few crabs, and some specimens of the hardy varieties.

But few apple trees have been set the past season. Some planted the Wealthy, a new apple in this locality; others have now more trees than they can protect from the ravages of the Tent caterpillar, and are waiting to see if this troublesome pest will ever take its final departure. Concerning its destruction, we have learned that any remedy that will kill the worms or destroy the eggs, without injury to the trees, is a good one. Sprinkling with soap suds or poisoning the foliage is the most effectual after the worms commence feeding; but we believe if any fruit grower will destroy all the eggs that can be found upon the trees in winter and early spring, and then with the same vigilance continue the destruction of the tents or nests of young worms, they can nearly all be destroyed before the foliage or fruit buds are injured.

The strawberry crop was much injured by the severe winter, in some gardens entirely killed, even when well covered; in others there was a fair crop in spots where not killed. Various reasons were assigned for their destruction; either too much covering, or too little, or removed too soon, or not soon enough in spring, was thought to be the cause. Whether we shall ever learn to guess the exact amount of protection needed to carry the strawberry through our capricious winter is quite a problem.

Red raspberries were very abundant the past summer; some of our members consider them more hardy than the black cap, and think they continue longer in the fruiting season. Black caps in this locality have not done as well as formerly, either for want of proper culture, or the severe winter.

The Ancient Briton Blackberry set two years since has not yet borne much fruit; several have set this variety and another year will test its bearing qualities and adaptation to this climate. Last spring the society purchased a new blackberry, known as Stone's Hardy, a variety which has been thoroughly tested in Wisconsin; a portion of them grew well and we have high hopes of feasting on their delicious fruit.

Grapes set two years since have made a fair growth with few exceptions. The most successful grape grower in our society trims his vines in the fall, lays them down soon after the ground freezes, puts the trimming on the vines and covers with marsh hay. Although the last winter was very severe, his vines wintered well, and bore abundantly the past season. He has just purchased a new variety, the Pockington.

Several of our society are much interested in planting shade trees. Our oldest member set the hard maple twenty-five years ago, most of them lived; those that died out were immediately replaced, and now his house and the roadside near it is shaded by beautiful trees, some of them twelve inches in diameter; another spring he intends planting many more. Some of our members prefer the soft maple because of its rapid growth and handsome foliage, especially in autumn, when it becomes the most brilliant of all our forest trees, but in growth it is not symmetrical. The elm is the most graceful of all our native trees, is very hardy, and easily transplanted. The butternut is considered a desirable tree in some situations. These trees are all found growing upon our farms, and with a small amount of labor each year, our homes and the roads that lead to them may be made attractive and enjoyable. The lesson of the last three years for the horticulturist in this locality has been that we must plant no more trees, shrubs or vines than we can give the best care and culture; that we can have no fruit without great labor, and that eternal vigilance, in all directions, in cultivation, in protection, in the destruction of insect enemies, must be the price of our orchard fruit. This society has held four meetings the past year; the membership is confined mostly to the farming community, and the meetings, with one exception, have been held at the residences of the members. The summer meeting of the State Horticultural Society was held in Appleton under the auspices of that body, and in connection with our local society; it gave great pleasure to those interested in horticulture who attended the meeting; unfortunately it was held in the season when farmers found it impossible to leave their midsummer work, consequently, to many it was a lost opportunity. At the annual meeting held January 14th, the following officers were elected:

President — L. L. Randall.

Secretary — Mrs. D. Huntley.

Treasurer — A. H. Burch.

MRS. D. HUNTLEY,
Secretary.

JANESVILLE HORTICULTURAL SOCIETY.

Only two meetings have been held this year. The spring meeting and annual meeting held October 26, 1881, for election of officers, etc.

The membership is the same as last year, viz.: Fifty-two life members.

The financial treasurer's last report shows ninety dollars ($90) in the treasury.

The display of fruits at our last fair was not so large as usual. Flowers very attractive and a fine display.

The officers elected at annual meeting for 1881 and 1882, are,

President — F. S. Lawrence.

Vice President — Geo. J. Kellogg.

Secretary — E. B. Heimstreet.

Treasurer — J. B. Whiting, M. D.

Delegates to State Horticultural Society — F. S. Lawrence and Geo. J. Kellogg.

The transactions of the State Horticultural Society for 1880 and 1881 received and mostly distributed.

E. B. HEIMSTREET,
Secretary.

MARKESAN HORTICULTURAL SOCIETY.

This society was organized in Markesan, Green Lake county, May 9, 1882. The following officers were chosen for the present year:

President — Miss Fannie Mather.

Vice President — Mrs. C. S. Whittier.

Treasurer — Mrs. Ada Atkinson.

Secretary — Mr. A. C. Harmon.

The executive board consists of the foregoing officers. It is provided in the by-laws that any person may become an annual member by paying an annual fee of $1; or life member by paying a fee of $5 at one time. We now have a membership of twenty-five annual members.

Regular meetings are held once in two weeks. Some very interesting meetings have been held, and much interest is manifested, particularly among the ladies. One feature of these meetings which meets with much favor is the announcement by the president of a programme for the ensuing meeting, which consists of readings, an address, music, recitations, and discussion on the cultivation of some particular kind of fruit, flower or vegetable. A committee is appointed to furnish vocal and instrumental music. The names of the persons chosen for the readings, address and recitations are given so that they may have time to prepare the subjects for the next meeting. House plants in bloom, and baskets and bouquets of choice flowers are exhibited at all the meetings of the society, making them very attractive to all lovers of the beautiful in nature. But little fruit has been exhibited. We hope to give more attention to this in future. Fruit of all kind is remarkably plentiful in this locality.

The society is in a flourishing condition, and hopes to secure a large accession to its membership in the near future.

A. C. HARMON,
Secretary.

NORTHWESTERN HORTICULTURAL SOCIETY.

This society has made some advance since its organization two years ago. While we have but few active members, there is a growing public sentiment in our favor. We only need to make an earnest effort to secure a large and active membership. We have held three meetings the past year. The last, December 13th, was an annual meeting, at which the following list of officers were elected for the ensuing year:

President — J. S. Harris, La Crescent.

First Vice President — Mrs. W. P. Powers, La Crosse.

Second Vice President — S. S. Luce, Galesville.

Third Vice President — A. J. Phillips, Hamilton.

Secretary — L. W. Brigham, La Crosse.

Treasurer — Mrs. W. P. Powers, La Crosse.

Executive Committee — E. Wilcox, John Salzer, Mrs. L. W. Alger.

Delegate to attend the meeting of the State Horticultural Society at Madison, E. Wilcox, with power of substitution if unable to attend in person.

Upon motion it was voted that the society pay traveling expenses of delegate to Madison.

The following committee was appointed by the chair to solicit an increase of membership for the society: J. A. Salzer, Mrs. W. W. Webb, Mrs. W. P. Powers, John C. Kramer, A. J. Phillips and S. S. Luce.

Several very interesting papers have been read upon "Gardening for Farmers;" "Utility of Flowers;" "Entomology;" "Cabbage and Apple Worms;" "Flowers;" "How to Utilize Poor Soil;" "Horticulture as a Means of Education;" "Horticulture for the Children;" and other kindred subjects.

The two first papers will be found in full at the close of this report.

A meeting of special interest was held in June, at which time the State Horticultural Society, by invitation, met in La Crosse. We feel under great obligation for this visit, and the assistance they gave us. This was a very profitable meeting for us, and resulted in awakening much interest in our society. An influence went forth from this meeting tending to advance the interests of horticulture in the entire county.

An exhibition of vegetables, small fruits, plants and flowers was held in connection with this meeting. It was demonstrated that there is no lack of material for such an exhibit in our city and vicinity. Some very choice plants, and several very large and fine collections, were put on exhibition, notably those owned by Mrs. G. C. Hixon and Mrs. David Polleys. Our florists, John A. Salzer and H. Keanchs, displayed large and fine collections of green-house plants. The exhibitions of small fruits and vegetables were not large, but choice and far advanced. All that we need is a little more effort to secure members and to collect the yearly dues promptly. At the annual meeting steps were taken toward consummating this object. We hope another year may find us with largely increased membership, a stronger working force, and the society placed upon a basis that will secure its perpetuity and increase its efficiency for good.

L. W. BRIGHAM,
Secretary.

GARDENING FOR FARMERS.

JOHN S. HARRIS, La Crescent, Minnesota.

The real luxuries of life are the products of the garden. In vegetables, they are the early salads, asparagus, green peas, snap beans, Lima beans, cauliflower, etc.; in fruits, strawberries, raspberries, currants, blackberries and grapes. It requires but a little land to raise an ample supply of each of these in their season, for family use, the year round. The farmer has the land to spare, and the leisure to plant and cultivate it, and many people believe him to be a good liver. This is a mistake; at least here in the west, the farmers, as a class, are very poor livers. Instead of consuming the largest amount of fruit and vegetables, the truth is that those who dwell in villages and cities use largely more of them than the same number of farmers. The every-day living of our average farmer is bread, meat and potatoes (and the meat means salt pork), with coffee at breakfast, tea at supper, and dried apple pie, sometimes, for dinner, varied with an occasional boiled dinner of pork, cabbage, turnips and potatoes, or pork and beans. One-half of them have no garden, or at best only a patch set off in the corner of some grain field, which is overrun with weeds. Some have a place set apart for the purpose, but put off planting it until the bulk of the farm crops are in, thereby making it too late to secure any early vegetables of the kinds that require early planting, and thus the garden proves to be a failure. The peas mildew, the onions are only scullions, heat and drouth have spoiled the cabbage, the frost nips the tomatoes, and the calves are often turned in there to wean them. And usually, where we find a comparatively good garden, it is due to the skill and labor of an already overworked wife. The reason usually given for being without one is that they have no time to attend to it. With many, the true reason is that it requires a little attention almost daily, and demands thought, patience and system in order to make it a success. The fact is they would much rather attend the larger crops, where the horse furnishes the muscular power, and others have furnished the brain power in machinery, which makes it possible to go over a number of acres in a day. It would be far better to neglect some other crop, and spare the time for the garden; for it is a well-established fact that a single half acre of ground devoted to garden culture, and which may be planted and attended without encroaching very much upon the regular farm work, by economizing odd spells, while waiting for teams to feed and tools to be repaired, and perhaps all hands putting in a Saturday afternoon occasionally, would annually produce more of the essentials for good living than four or five acres of any other crop on the farm, without taking into account the health, comfort and refinement that is sure to follow. After viewing the actual facts in the case, I am not surprised that some of our farmers are morose and cruel, and that their sons and daughters early desert the old homestead for a situation where salt pork and soggy potatoes are not the chief article of diet. Without a garden of fruits and vegetables, the diet of the farmer's family must be mainly confined to bread, meat and potatoes, or a large draught must be made upon the profits from the sales of stock and farm crops to purchase the extras that are essential to a fairly good living.

This style of living may be tolerated in winter, but when warm weather returns the system requires less strong food, and the appetite craves cooling and juicy vegetables and fruits, fresh from the garden. It seems to me that it must be revolting to the stomach of a weary and hungry man to sit down to a dinner of boiled fat pork and old potatoes, in the season for asparagus, green peas, string beans or new potatoes. Could these things be purchased as cheaply as they can be grown, it would be economy to grow them and have them always at hand fresh as wanted; but the facts in the case are that more than one-half of the expense will be saved, and a much better article secured, by growing them. Early vegetables and summer fruits are luxuries within the reach of every farmer's family, at a very trifling outlay of time and money, and if he must procure the support of his family from his farm, why not give them the most healthful and best as long as it is the cheapest?

LOCATION OF A FARM GARDEN.— The garden should be near the house, so that it may be readily accessible and under the constant supervision of the household. It ordinarily devolves upon the housekeepers to gather its products from day to day as they are wanted, and they do not always have time to go very far to gather its products in time for dinner, and, if it is near by, a great many leisure moments may be utilized in weeding and taking care of it. It should be so enclosed with hedge or fence that neither fowls or stock can enter it. It is not reasonable to expect success if cattle occasionally break in and the poultry are allowed a free range in it at all times, as their instinct leads them to the freshly moved soil for some of their most essential food. They will always scratch where not wanted to, and have a partiality for the place where the gardener has formed his new beds and planted his choicest seeds.

SOIL.— It is a mistake to suppose that some specific soil is indispensable to success. Good gardens have been made on rocky hillsides, on arid sand banks and on heavy clay soils. One of the most successful market gardeners in the state, J. M. Smith, of Green Bay, is located upon sandy ground, said to be lighter and poorer in its natural state than the prairie of La Crosse. By good cultivation and liberal manuring he is able to raise good crops of the choicest vegetables and fruits, at a profit; but neither rock, sand or heavy clay are desirable, and there are but few farms in the west that cannot furnish us a better. A variety of soils would be convenient, allowing us a dry, sandy place for the very earliest vegetables, and one that is cooler and more moist for cabbage, cauliflower and celery. The very best soil for all purposes is a sandy loam which will work easy, dry off quickly after a rain, and yet sufficiently retentive of moisture to withstand drouth, and it should be brought into a high condition of fertility by deep plowing and liberal application of animal manures. Where sand predominates, it will be benefited by the addition of lime, ashes, and muck or peat. If too stiff a clay, it will become more arable by subsoiling or trenching, and the application of wood ashes, sand and manure. On clayey soils, good drainage must be secured or the soil will become sour and sodden, and derive but little benefit from fertilizers. Every fall after the crop is gathered in, all rubbish and weeds should be cleared off and a liberal coat of well-rotted manure spread over and plowed under. This fall plowing is for clay and the heavier soils. Sand is better not plowed until spring, but would be benefited by manuring in fall. Plow again in spring as early as the frost is out and the ground is dry enough to work. During the summer no weeds should be allowed to grow and mature their seeds or afford harbors for noxious insects.

We will now suppose that we have located, fenced and manured a spot for a garden of an acre, more or less, as we estimate our wants and ability to attend to it. It is well to bear in mind that a small garden thoroughly cultivated is better than a large one neglected. Now, what shall we plant, and how shall we manage it? If it comprised an acre of ground, I should devote at least one-third of it to the growing of summer fruits. To facilitate cultivation with the use of a horse, I should plant everything that will do as well in long rows instead of square plats. It would be well to lay off a border on the north side and the two ends, or all around, six or eight feet wide, chiefly for a permanent plantation of fruits or perennial plants, having a three or four foot walk inside, separating it from the remainder of the garden, and for convenience in using a wheelbarrow, turning the horse in cultivating, etc.

In making the permanent plantation commence on the north side at the end nearest to the dwelling. First leave room for hot beds and cold frames, also a little spot for early lettuce and radishes; next plant a few roots of rhubarb or pie-plant for pies and sauce before the early fruits mature. The remainder of the north border set with two-year-old grape vines, six feet apart and three feet from the fence. The east and west borders are best kept for strawberry beds, digging up and renewing a portion of them each year. Next I would commence upon the south side and plant one hundred or more black raspberries four feet from the fence, and about four feet distant in the row, planting the second row six feet distant from the first; next plant a row of red raspberries six feet from the last, and two and one-half or three feet apart. These rows I would not have run the entire length of the garden, but would fill out the end of each for about thirty feet with Snyder blackberry. The reason for this is that a row of blackberries planted along with other fruits would soon become troublesome on account of their disposition to propagate from the roots. Next I would set two rows of Red Dutch currant six feet from the last row, and six feet apart; plants distant in the row, four feet. This quantity of fruit, shrubbery and vines, if well cared for, will furnish all the fruit that a large family can consume while fresh, and afford a supply for canning, drying or preserving. Should they some seasons produce more than can be used, we will always have some neighbor without a garden who will be ready to purchase the surplus at a remunerating price. A row of asparagus will now finish the permanent plantation. This plant delights in a warm, rich soil, and pays well for liberal manuring. This row may be six feet from the currant bushes, or on the other side of the garden, eight or ten feet from the grapes.

Now the cheapest and best way to make the asparagus bed is to use a strong team and plow and run back and forth until a ditch is opened, say three feet wide and fifteen inches deep. In the bottom of this ditch place six inches of strong, well rotted manure — that from stall-fed cattle is the best — and run the plow through again to somewhat mix it with the soil below; then plow the soil back until the ditch is filled. Now we are ready for the plants. Having secured well grown two-year-old roots, with the plow or a spade open a straight furrow, eight inches deep, drop the plants in the furrow eighteen inches to two feet apart, stretch a line so that the crown of the plants will come under it, and make the row absolutely straight. Next spread out the roots in a natural position and draw about three inches of soil over them, then press it down, being careful to throw out all gravel and stones. After the sprouts have appeared, give frequent hoeing, each time drawing a little more earth over them until the ditch is level full. Each fall, after frost has killed the tops, they should be cut away and the row receive a liberal mulching of barn-yard manure. Every spring as soon as the frost is out and the ground dry enough, rake off the straw and coarsest manure and dig the remainder in with a fork, not deep enough to disturb the roots; a few days later plow a shallow furrow each side and leave it open, throwing the loosened soil over the plants, and smooth and fine off the top with a rake, leaving a bed about three feet wide, and do not allow grass or weeds to get a foothold. Toward the last of June, after the season of cutting is past, the earth thrown over the plants should be thrown back with the plow, first scattering manure in the open furrows. Run the harrow over it to level off, and let the plants do their best in growing for the rest of the season. This will give the roots strength and mature the buds for the next year's crop. The first year no cutting should be done. The second, a few messes may be taken from it. Ever afterwards keep it cut clean as fast as the shoots get six inches above ground, until toward the last of June, using a long knife and cutting below the surface of the ground, and let the whole grow as before the balance of the season. A dressing of salt after the cutting is done will do no harm and probably not much good.

The remainder of our acre is designed for the growing of vegetables, and may be arranged to suit the different plantings and planted in varieties and quantities to suit the wants of the family. The ground can be fitted mostly with the farm plow and harrow, and to insure the greatest success, each species of vegetable ought to be planted in its appropriate season. Peas, onions, beets, radishes and lettuce, for the earliest crop, may be planted with safety as early in the spring as the ground can be worked. Onions for the fall crop will do better if sowed early, and a few early potatoes should be planted as soon as the frost is out of the ground. It is useless to plant beans, corn, cucumbers, tomatoes, etc., until about the first week in May, or until the ground becomes somewhat warm and dry. Cucumbers and melons may be hastened a few days by placing over the hills a box without top or bottom and covered with a light of glass for each hill. An ingenious boy can quickly make the boxes, and if housed when not in use, they will last many years. Cucumbers, melons and Lima beans may be started in the hot bed by planting them in berry boxes, three or four seeds in each, afterward transplanting them into the open ground, cutting the bottoms of the boxes away to allow the roots to run out in search of nourishment. Carrots and parsnips usually do the best when planted early in May. Beets, peas, string or snap beans, sweet corn, radishes and lettuce, should be sown or planted at intervals of two or three weeks, until the first of July, that a supply may be at hand until frost comes. Cabbage and cauliflower, for early use, may usually be transplanted into the open ground as early as the plants can be got ready, and for winter use, about the 20th of June. Celery from 15th of June to 15th of July. Tomatoes, peppers, sweet potatoes and egg plant from 15th of May to 20th of June.

BEST VARIETIES OF VEGETABLES FOR HOME USE.— With an experience of thirty-five years as a market gardener, I would select the following as the best varieties to grow for home use, viz.: *Beets* — Egyptian Turnip Rooted, Dewing's Imported Early Red. *Beans* (for snaps) — Early Valentine, Golden Wax, Horticultural. *Beans* (for shell) — Large White Lima, Large White Kidney. *Cabbage* — Early Jersey, Wakefield, Henderson's Summer and Premium Flat Dutch. *Cauliflower* — Early Snowball, Algiers, Dwarf Erfurt. *Celery* — Sandringham Dwarf White. *Corn* — Early Minnesota and Stowell's Evergreen. *Cucumbers* — Early White Spine, Green Prolific Pickling. *Lettuce* — Curled Simpson, Black Seeded Butter and Large India. *Musk Melons* — Green Citron, Cassaba and Yellow Antelope. *Water Melons* — Mountain, Sweet and Black Spanish. *Onions* — Top Sets, Large Red Wethersfield and Yellow Danvers. *Parsnips* — Long White Hollow Crowned. *Peppers* — Sweet Mountain and Long Red Cayenne. *Peas* — Laxton's Alpha, McLean's Advancer, Champion of England. *Potatoes* — Beauty of Hebron. *Radishes* — Long Scarlet and French Breakfast, Rose China Winter. *Squash* — White Bush Scalloped, Boston Marrow and Hubbard. *Tomatoes* — Canada Victor, Trophy and Acme. *Turnips* — Early Flat Dutch, Red Top Strap Leaf and Golden Ball.

As a garden is not complete without sweet and pot herbs, sage, caraway, fennell, dill, sweet majorum, summer savory, tansy, thyme and mint will be found among the most useful. The tools used to the best advantage in garden work are the common plow and harrow of the farm, a bright Ames spade, a spade fork, a manure fork, steel hoe, shuffle hoe, steel rake, wheelbarrow, garden trowel, garden line, ten foot pole, and a few stakes. The line should be used in planting everything, that the rows may be equi-distant apart, and perfectly straight. If we have followed the directions thus far given our newly made garden will look well, and we will begin to feel proud of our accomplishments, and the whole family, even to the hired men, will become interested and often lend a helping hand, and we will strive to have the best garden in all the neighborhood. It will be seen that we have run the rows of shrubs and vegetables east and west. There is nothing arbitrary about the direction they take, unless the ground should slope considerably to the south, but the appropriate place for hot beds and grape-vines would still be upon the north border. In many cases it might be more convenient that the rows should run north and south.

Here is where my paper on account of its length ought to close, but with your permission I will devote a little time to hot beds. After going so far, we feel that our reputation is at stake as gardeners, and it would be aggravating to have our neighbor get radishes, lettuce, cucumbers and tomatoes before us. Market gardeners fully appreciate the importance of being the first in the market with these things, and use every available means to hasten them forward, such as the artificial shelter and protection afforded by hot beds and cold frames covered with glass. The supposed expense and trouble of making and managing them debars many farmers from constructing them, but even a cheap and rude hot bed, that could be tended and watched by the younger members of the family, would answer to bring forward a supply of lettuce, cucumbers, cabbage and tomatoes, several days in advance of those planted in the open ground. Sashes about two and one-half by five feet are a convenient size to use, and can be made by an ordinary carpenter, or purchased at a sash factory, ready glazed and painted, at a cost of about $1.50 each, and if housed when not in use will last many years. Four to six of them will be sufficient to start the plants for a half acre garden and furnish a few messes of lettuce. A frame of inch boards is required, of a size which the sash will just cover. The front side to be twelve inches high, and the back eighteen to give a slope for carrying off water and admit the direct rays of the sun. The frame being ready, dig out a pit (which should always face the south) six or eight inches larger everyway than the frame and eighteen inches deep. Fill this pit with fresh litter and manure from the horse stable, that has commenced heating. Shaking it on evenly to the depth of two feet or thirty inches, tramp the whole down firmly with the feet, turn on from one to two buckets of water for each yard in length; put on frame and sash, and bank up the outside with coarse manure. After the heat is up, which will be in two or three days, place over the manure within the frame at least six inches deep of good mellow soil, and after raking out the lumps, put on the sash again, and in a day or two more the soil will be warmed through and be ready to receive the seed. Sow the seeds in rows, about three inches apart, covering one-fourth inches deep, and sow a little lettuce seed along the lower edge of the bed where other plants would be injured by the shade or drip of the sash. If the bed is a success, the seeds will come up quickly and grow rapidly. The plants will require watering whenever dry, and fresh air whenever the weather outside will permit. Upon warm, bright days the sash may be taken entirely off, but must be replaced at night and kept closed in cold, stormy weather, unless the bottom heat is greater than the plants can bear; in that case, they should be raised a few inches on the back side. In this latitude, from 20th of March to 1st of April, is early enough for starting the farmer's hot bed. About a week before time to take the plants out for transplanting into open ground, keep the bed open night and day, unless there is danger of frost, in order to harden them off. The plants should have been thinned to stand an inch apart in the row as soon as the second leaf appears. The thinnings might be transplanted into a cold frame. A cold frame is made the same as a hot bed, except that the fermenting manure is left out, and in addition to the sash it should have an extra covering at night of mats, shutters or blankets. Another method which may be adopted to yet bring forward plants of early cabbage and tomatoes, where hot beds are out of the question, is to sow the seeds about the middle of March in good soil, in a shallow box, keeping it in a warm place near the stove until they come up, and then set them on a bench or table inside and close to a south window, raising the window for fresh air when the weather will permit. When the plants are two or three inches high transplant them into other boxes of fresh soil, to stand one or two inches apart, or they will get crowded and spindling, and if they get large enough for the open ground before the weather is favorable, another transplanting will be found beneficial; in fact, twice transplanting always pays, as in ensures better roots and stocky plants that will be sure to live and grow right along, if they have been properly hardened off and taken up with a ball of earth attached to the roots. The best time for transplanting is at evening.

FRUITS.—The best varieties for this climate are of *Grapes*—Concord, Delaware and Janesville. *Currants*—Red Dutch. *Raspberries*—Doolittle and Seneca Black Cap, Turner and Purple Cane. *Strawberries*—Wilson, Albany, Downer's Prolific and Crescent Seedling. *Blackberries*—Snyder and Ancient Briton. The grapes will require pruning and laying down every fall and tying up to stakes or trellis every spring, and clean cultivation. Currants also appreciate cultivation, and old wood should occasionally be thinned out to give place for new. Raspberries are greatly benefited by mulching with old hay or manure. The young canes should have the tops pinched off about the 1st of July to induce side branches, and the old canes should be cut away each year after fruiting, as they have fulfilled their mission and will not live to bear again.

THE UTILITY OF FLOWERS.

REV. ROBERT NOURSE, La Crosse, Wisconsin.

A man may love music very much and yet know nothing more about it than that it pleases him. In this instance he may be an excellent critic, offer some good advice, and above all, enthuse his friends with a love for music, far better than the most skillful performer himself or the most learned theorist. This is just my relation to flowers. I love them, but I don't know anything of them. I worship them and through them, and yet I am as ignorant as most folks concerning them.

I cannot forget that when the Lord made man he placed him "in a garden to dress and to keep it." From the description given of it and its location, I infer that it was full of flowers; that the features and tone of beauty prevailed. Nor can I forget that it was the fruit of a tree and not the blossom of a plant that tempted our first parents to sin. It behooves us to remember that our Lord was buried in a garden, rose from the dead in a garden, and was supposed by one who loved him much to be "the gardener." We are familiar with the fact that though He wrought wheat and tares and trees and vines into His parables and sermons, yet it was of *flowers* alone that he said, "Consider how they grow."

It occurs to me, as undoubtedly it does to all, that there is a use for flowers. Of what use are they? is often asked. We cannot eat or drink them, and because we cannot they are regarded by some as useless. Hence it is a joke on the lips of some, so often repeated in a snarl that it has become a bitter proverb, that "the best flower in any garden is a cauliflower." We commend to those who have this preference — the thistle. They must be of some use or they would not be here. We will name a few of the functions they perform.

1. They educate the mind. It takes considerable mental power and intellectual development to cultivate flowers. A man may grow potatoes, parsnips, cabbage, carrots and corn, and utterly fail in flowers. He may be a successful farmer, and take the blue ribbon for corn, cabbage and hogs, and yet be utterly

incapable of cultivating flowers. Hence we find in the large manorial estates of England three grades of gardeners — those who cultivate vegetables, those who cultivate fruit, and those who cultivate flowers. Those who are devoted to vegetables receive the smallest wages, those who attend to fruit a little more, but those who cultivate flowers a really good salary, which, with care, in many cases becomes a fortune. Those who cultivate vegetables are young farm laborers with little or no education, men of brawn rather than brain; those who are devoted to fruit are the experienced vegetable growers, and those who cultivate flowers are often learned botanists and skillful engineers. Say what we may, it certainly requires more mind to grow a geranium than a potato, a lily than an onion. He who cultivates flowers increases unconsciously in intelligence. Mind is developed by attention to every plant. Knowledge of its origin comes and takes the thoughts over all the world. One is the better for knowing that the dahlia is a developed potato, that it is indigenous to Peru, and that it was evolved from the one to the other amid the snow and ice of Norway by a man named Dahl; that the delicious stock was once a cabbage, and might have gone to sauer kraut but for our French cousins, who, bye the bye, are not always so successful in winning the delights of our Teuton neighbors; that the sunflower might have remained tobacco to cloud the brain of youth and stain the teeth of men, or else continued an artichoke, but for a merciful interposition of Providence, which, in the one case, would save men, and, in the other, enable us to save our bacon. They also develop patience. "The greatest of all great things is patience," and in the culture of flowers one has to labor and to wait.

2 Flowers are useful in the formation of a correct taste. We do sometimes see men, and I am sorry to add women, ill-dressed, over-dressed, unbecomingly dressed, slovenly dressed; but it is never so with a flower. The sense which we call taste comes largely from them. You will observe that Christmas and Easter cards which are doing so much to form right ideas of beauty in the minds of the masses are almost entirely floral. You will

again observe that in laying out beds in borders, in ribbon and in carpet gardening (which as yet has not appeared in our city), that flowers themselves must be followed, or the result is an abortion. It takes considerable skill as well as refined taste to make a boquet beautiful. Anyone can make it gay, but to make it beautiful — "ay! there's the rub." Mercenary folks will underdo it, and uncultivated people will overdo. Only those who in heart and life are as simple, pure and quiet as flowers can do it well. No one who loves flowers can be vulgar, loud, false or mean.

3. Flowers are the gauge of civilization. Barbarians don't cultivate them. Hard, coarse, mercenary men care nothing for them; they "leave them to the women folks." I will tell you the exact state of a city by the appearance of its door-yards and the condition of the cemetery. If these are flowerless, unkempt, unclean, you have a city where the people are ignorant, selfish, or sick; it is in a state of decay, or else awaits further development. It is within the nineteenth century that trees have been planted in streets, and flowers made to adorn public parks. Now as the old world is blossoming into such beauty as it never before has known, we take our flowers to church and make them in silence preach the gospel of content; we give them to the bride as pure and white as she; we lay them on the tomb in all sorts of significant emblems to express our sorrow, and to encourage the hope of immortality. These things are not done among barbarous or uncultivated people.

I need say nothing about the cheerfulness they give to the home, nor attempt to describe the desolate condition of the home where they do not shed their perfume and show their beauty. Nor need I say a word concerning their ministry to the soul, and that the Christian who affects to ignore them, rejects a very profitable means of grace which is as necessary for his spiritual life as prayer, fellowship or bible study. My object is not now to preach, and therefore I purposely refrain from saying all I might. But I will urge all to cultivate in the home and elsewhere those apparently useless plants for their greater service to the mind and soul.

WAUPACA COUNTY HORTICULTURAL SOCIETY.

We still hold our regular meetings. They are pretty well attended, and generally interesting. There is quite an interest taken in horticulture by our members. We have about fifty members.

Our constitution has been changed, so that our meetings for election of officers are held in January, instead of March, as formerly; also an admission fee of twenty-five cents is charged all males who join our society.

We have many discouragements, but are bound to keep trying, even if we have to fall back on the crabs. Apples we must have, and if the finer varieties "go back on us," we must put up with those less desirable. But our faith is not yet exhausted. Some of our Waupaca seedlings, at least, are still "promising," and several of them are not "bad to take." We must content ourselves with the hardy, and leave the tenderer varieties for novices, and those who never learn anything only by experience. We have had our "experience," and it is about time for us to profit by it. The day of patronizing "itinerant tree peddlers" is about over, but we must reluctantly admit that the fools are not all dead yet.

Last June we held a strawberry festival at the house of Prest. Rich, in Weyauwega. It was an interesting meeting, and we were very agreeably entertained by our worthy president and his estimable lady. Some very fine strawberries were shown, Robt. Callendar, of Fremont, exhibiting the biggest, which were "whoppers," of the Crescent variety. Some members preferred the Downing, while others took kindly to the Crescent. For a late berry, friend Springer favors the Capt. Jack. The members generally prefer setting in the spring, although some, the secretary among the number, advocated setting in August or early in September.

The kinds of apples most popular with our members appear to be several of our county seedlings, and Tetofsky, Duchess, Haas, Talman Sweet, St. Lawrence, Utter, Walbridge, Snow, Alexander, Fall Orange, and perhaps one or two others.

Our September meeting was a failure on account of the weather, but on the last day of the fair a call meeting was held, and a few notes taken.

Of course the exhibition of apples was slim, but enough was there to keep up the reputation of our county as one of the fruit raising counties of Wisconsin. The show of grapes was splendid, some of the choicest varieties. Friend Springer had fifty-three kinds; R. M. Hubbard, of Fremont, forty; C. F. Eaton, of Fremont, thirty-six; J. A. Mathews, Weyauwega, fifteen; A. V. Balch, ten.

At our meeting in January the subject of grape raising was discussed. Rev. J. P. Roe, of Oshkosh, gave us some very good suggestions. He prefers the Concord, Delaware, Rogers No. 15. Rogers 22, 44 and 28 are excellent. For an early grape likes Rogers No. 3. Of black grapes likes Moore's Early, Champion. Was much pleased with the Duchess and considers it a farmer's grape.

The following officers were elected:

President — O. A. Rich, of Weyauwega.

Vice President — John Mack, Evanswood.

Secretary — J. Wakefield, Fremont.

Treasurer — J. A. Mathews, Weyauwega.

Executive Committee — W. A. Springer, Ch'n, A. V. Balch, E. W. Wrightman.

Delegate State Society — J. Wakefield.

J. WAKEFIELD,
Secretary.

COMMUNICATIONS.

POTATO ROT.

The main facts in regard to the history and development of this destructive disease have long been familiar to scientific men, and the results of their investigations have been so fully made known to the public that it is not possible to present much that is new on the subject, or to throw much additional light on the question in regard to its primary cause, or on the methods for prevention or cure; but as it is a subject in which not only farmers but the public generally are largely interested, both on personal and pecuniary grounds, it seems advisable to restate, in another form, facts that are already known in regard to it. To those who are not acquainted with the hidden agents, forces perhaps, that are operating in the natural world around us, it will be instructive, and should the presentation of the subject at length lead to a closer observation of the conditions accompanying the disease in its various stages, facts may be brought to light that will prove beneficial.

Dr. Thomas Taylor, microscopist of the agricultural department, in response to a personal request, and in accordance with instructions courteously given by Commissioner Loring, has kindly contributed an original article and also sent a number of communications from Professor Worthington G. Smith, a well known English observer on this subject. Professor Taylor also furnished the accompanying cuts or drawings from which they were made. It might have been in better taste to have limited the presentation of the subject to these papers alone, but as each paper presents different parts or stages of the disease, and taken together do not give a full history of it, a plain, connected statement of its complete development may not be regarded as out of place, and by the explanation of some of the scientific terms used, may enable the general reader to get a better understanding of the whole subject.

The views herein stated, and the conclusions presented, are mainly compiled from the opinions and observations of Professors Cooke, Berkeley, Taylor, Smith, Farlow, De Barry and others. Perhaps no one of the authorities named would be willing to assent to the complete statement as made, or accept entirely the deductions drawn, for there is much diversity in their individual opinions on some of the points presented, but the conclusions presented are those to which a limited personal observation and a careful study of the different views and observations given by these investigators seem most naturally and conclusively to lead.

Various theories have from time to time been advanced as to the primary cause of this disease. Many of these theories have been proved to be fallacious, but there are two still held, both of which have earnest adherents. One is, that it is the result of a general loss of vitality, a deterioration of the plant itself, brought about by unfavorable conditions of soil or climate, or both; the other is, that it is primarily, wholly caused by fungoid or parasitic growth. All agree that fungus is found in connection with the disease and, that in certain conditions, it is an active agent in hastening decay. Those who hold the opinion first stated claim that this fungus growth comes as the result of, and is only made possible by, a previous unhealthy, diseased condition of the plant, and that it is a natural provision for the reduction of decaying organic matter to its original elements. The others say that it can lay hold of healthy tissue and unaided destroy the vitality of the plant. With one or two exceptions, those who have investigated the subject the most thoroughly favor the first theory or express strong doubts as to the correctness of the last, but the exceptions noted are very positive in the assertion of the truth of their position. Facts, clear, unquestioned facts alone can demonstrate which view is correct, and those investigating the subject must, each for himself, draw such conclusions as the facts at command seem to warrant, or hold the matter in abeyance until we have more light.

The fungus found in connection with the potato rot is called

Peronospora infestans, or *Botrytis infestans*, two names for one and the same thing. The first name is the one most commonly used, and is given to indicate the form of growth of the part bearing the spores in the open air; the other, from a fancied resemblance to the grape cluster in the grouping of the spores themselves. The first indication of the presence of the fungus is usually a change of color in the leaves, a turning from a dark luxuriant, to a pale green, and at length to a yellowish tint. On examining the leaves closely, especially those near the ground, small spots, dark brown or black, will be seen on their upper surface, with little patches of white mould on the under side, right opposite the spots mentioned. On examination of this mould with a microscope of high power, it will be found to consist of a mass of very slender tree-shaped stems, or threads, often having four or five branches, with a further subdivision of the branches into limbs and twigs, the terminal points of which each bear an ovate-shaped body, or vesicle. On tracing the downward extension of these stems or threads they will be found to enter the leaf through its breathing pores or stomata, and to be connected with larger white threads within. These threads are termed mycelia (root-like fibres) or spawn, and are found to extend throughout the cellular structure of the leaf, to the stalk and even to the tubers, crowding and matting the inter-cellular passages wherever they go. Soon after these brown patches are seen on the leaves they also appear on the stems, but the mould is rarely seen there.

The oval-shaped bodies on the extremities are the fruit or seeds of the fungus, and are termed spores or conidia. In the higher orders of plants, which bear seeds for the reproduction of their species and also in some of the cryptogams, some form or process of fertilization is usually found, but nothing of the kind has yet been discovered in the immediate development of these aerial seeds of the *P. infestans*, and they are therefore often called asexual spores to distinguish them from another form produced in the same plant, in connection with which the fertilizing process has been seen. Whether this fertilizing process is present in any form in the *Peronospora infestans* has long been doubted, and is still answered in the negative by some of the leading investigators. Others reasoning from analogy as seen in the general principles of reproduction in nature, and especially from the fact that this process is clearly seen in other species of the genus *Peronospora*, as in *P. vitacola* (grape mildew), and also in the *Cystopus* (white rust), which it closely resembles in nearly all other respects, and from the fact that some more enduring germ than any yet known seemed to be necessary to account for the sudden and abundant development of the myriad germs that all at once make their appearance, from season to season, have been led to carefully investigate the winter condition of the fungus, and the observations made tend to confirm the opinion that there is a winter or resting spore of the *P. infestans* and that there are fecundatory organs like those in other forms of fungus growth. The subsequent papers by Professor Worthington G. Smith relate to these investigations and their results. Some of the conservatives claim that these observations are not conclusive, because more care was not taken to guard against the growth of other germs in connection with the experiments, but as Professor Smith states, the fact of similar results in the different trials, and the subsequent development of these winter or resting spores into undoubted *P. infestans*, ought to be conclusive.

The asexual spores have, as stated by different observers, various forms of development or germination. In some instances they are but simple spores, containing a single germ. Again, when placed in conditions favorable for growth, they will increase rapidly in size, and at length bursting at the apex will send out an irregular mass of protoplasm, or dust-like spores, each particle of which is a living germ which only needs the opportunity to develop into a perfect plant. Yet another form of development is seen where there is a vigorous growth of the fungus, or where the conidia fall into water, as on a leaf wet with rain or dew. In these conditions they rapidly absorb the water and increase in size. The fluid contents of the conidium assumes a granular character and is soon divided into from six to sixteen granules or parts. A short time after this internal division the conidium bursts open and the granules or spores pass out one at a time. Their form is that of a plano-convex lens with obtuse edges. They gather in a cluster and remain motionless for a short time, but soon they separate. Two cilia, or fine threads like hairs, start out from the same point on the plane or underside of the spore. These cilia are of unequal length. The shorter one soon straightens out towards what is called the front, the other extends in the opposite direction, and commences to move about with a quivering, undulatory motion, and the spore sails off through the water or drop on the leaf as though endowed with life. On account of this power to move from place to place as though possessed of independent life, they are called zoospores.

At times these conidia, instead of directly producing zoospores, are seen to send out a tube with an enlargement of an oval form at the end; part of the contents of the original conidium passes into this vesicle and it soon separates itself from the original germ tube and forms an independent conidium, which in turn may develop in the same way into a third, and each one, if planted in favorable conditions, will produce zoospores.

The number of living germs that can be produced by these various methods on a single plant is incalculable. It has been estimated that a single square line on the underside of a leaf can produce over three thousand conidia, each one of which may contain or develop at least six zoospores, and possible more than double this number. Multiply these by the number of times this can be repeated on one plant with its hundreds of leaves, and it ceases to be a wonder that the fungus is so abundant, or spreads so rapidly. Had it the power to lay hold of and destroy the vitality of healthy plants, the great wonder would be that a single plant should escape destruction.

The rapidity of the germination of the spores, and the growth of the fungus, will but serve to increase this wonder. Where the atmospheric conditions are favorable and the fungus finds a suitable soil in the plant, the spores will mature in a few hours after the appearance of the threads through the stomata. They soon sever their connection with the stem and fall to the leaves below, or are borne by the winds to other plants or fields. If they meet the requisite conditions for rapid development on the plants on which they alight, the spores whether simple, conditional or zoospores, germinate at once, sending out a mycelium which enters the nearest breathing pore and penetrates the cellular structure of the leaf in every direction. Once established their growth is very rapid; spore-bearing stems start up through the stomata under which the mycelium extends, and in a very few hours the second crop of spores is matured. Zoospores have been known to germinate, pass through all the stages of growth and to produce a crop of ripe zoospores in twenty-four hours from the time they were given the necessary conditions. Where these conditions are wanting, either in whole or in part, growth is prevented or much retarded. Spores falling on a healthy leaf while covered with moisture, may germinate and send its mycelium into the stomata, filling the air cavity underneath it, but not finding suitable nourishment in the leaf "while it is kept in a living, vigorous condition by remaining attached to the plant, no further change will appear; the germs may remain in the same condition, dormant, yet fresh, for days and even weeks." Again, on the other hand, the fungus has been seen to make slow growth and gradually to extend through the plant when the climatic conditions, regarded as essential to its very existence, were entirely wanting, and such instances have been cited to prove that the fungus was not dependent upon conditions, but an active primary cause. Is it not more natural to infer that in the first instance that as long as the vitality of the leaf was maintained it had no power to injure, and in the second that it found favoring conditions in the plant which alone made its development possible.

To the methods of reproduction already mentioned, there is but little doubt that there must still be added, to get a full history of the development of the fungus, the formation of winter or resting spores, as they are called by Professor Smith. The manner of their development, as observed by him and others, appears to be identical with that seen in the related species of fungus growth already mentioned. In the mycelia which traverse the tissues of the plant, there is seen to be quite a difference in form and size. Some of the threads are much larger than the others. and on the larger threads, at certain periods of their growth, cells or globular bodies resembling the regular cells of the plant are observed. These sometimes lie right in the line of the mycelium, but at others are attached to it by a short stem. (See Fig. 5.) At first they are transparent, and are filled with a fluid or protoplasm of a granular character. These cells are called oogonia, and in their mission represent the ovules of the flowers in plants of higher order. Near these oogonia there are usually seen similar bodies or cells, borne on the extremities of branches growing out of the smaller mycelia. These cells are more obtuse in form, and much smaller than the oogonia, and are also filled with a finely granulated fluid. These represent the male organs of the flower, and are called antheridia. In their development, these cells gradually draw nearer together, and at length are brought into close contact. When they have reached full size, the granules which had heretofore floated independently about in the formative fluid in the oogonium, gather at the center and assume a spherical form, which is termed a gonosphere. "This gonosphere having been formed, a straight tube shoots out from the antheridium, which perforates the wall of the oogonium, passes through the fluid which surrounds the gonosphere, elongating itself until it touches that body. From this period a membrane begins to be formed about the gonosphere, which thenceforth maintains a regular spheroidal form. It may be observed that the extremity of the tube which proceeds from the antheridium does not open, and the fecundation, if such it be, seems to be produced solely by contact. After this contact of the two bodies, the gonosphere is called an oospore. The membrane which at first invests this organ is very thin, but by deposits from the surrounding fluid it attains to a greater thickness, and becomes at length of a yellowish brown color, having its surface studded with prominent obtuse warts. One of these warts, larger than rest, incloses the fecundating tube."

The production of these resting spores may be carried on in all parts of the plant, but they are found most abundantly where the tissues are reduced to a soft pulpy mass. When the fall is a dry one, they often remain through the winter months in the tissues of the leaf, stalk or tuber, but they are generally washed out of this decayed matter by heavy fall rains and pass the winter in the earth or on the surface of the ground, and start into new life as soon as the weather becomes favorable the following season. In the germination or development of these resting spores, the same variety of simple spores, sporidia, zoospores and cellular vesicles producing zoospores are seen, as has been described in the asexual form. In both instances, the more favorable the conditions for the growth of the fungus and the more vigorous its development, the greater the proportion of zoospores produced to the other germinal forms.

There are many facts connected with the earlier history of this parasite which it would be interesting to consider, but the space already given to the subject is much beyond what was intended, and they must be passed by to consider briefly the relation of the fungus to the disease, viz., whether it is the primal cause or only an attendant result. As already stated, there are different opinions on this question. Those who hold it is the original cause of the disease rely mainly on the facts that it is always present where the disease is found, and that the disease can be produced in seemingly healthy plants by the artificial application to them of the germs of the fungus. But neither of these facts are proof conclusive, for there are many instances where the fungus is not only present in a germinal form, but even where the germs have so developed as to gain hold of the plant tissues and the usual results do not follow. With such a variety and multitude of germs, such a rapidity of development possible, and such facilities for wide spread dissemination, there can be hardly a season during which each plant in our gardens and fields has not more or less of these germs upon it. If, as Professor Smith states, the wind blowing over an infested field on the continent of Europe would bear spores enough to thickly seed every field on the British Isles, where is the immunity, if they can produce the disease? Again we have, from actual test, seen proof that inoculation or artificial communication of the fungus does not always, and cannot always, carry the disease, but that the fungus is limited, or dependent in its development by the conditions in which it is placed, and on the condition of the tissues of the plant. Experiments have been made where diseased and healthy tubers were cut and bound together, and planted, each sending up stalks and growing together, interlaced at root and top. In some instances both plants perished. In others the plant from the diseased tuber rotted down, and the other was partially affected, and in others the diseased one had no effect on the other. Healthy stalks and tubers grew in the same hill with diseased ones. If it is the primary cause, surely it would seem to have been favorably situated in those instances to produce its legitimate result.

Another fact that points to the same conclusion is that the spores sometimes germinate, sending their mycelium into the stomata of the leaf, and then remain dormant for days and weeks even, not making further growth unless there is a change of conditions which apparently makes development possible. There are also instances noted where the atmospheric and other outward conditions regarded as essential to the growth of the fungus, are entirely lacking, and yet it grew right along. Put these two points together and do they not indicate, at least, that other agents contribute to, or prevent its development and limit its power. In fact, if a cause at all, that it is controlled by other causes.

The fact often noticed, that certain varieties are much less apt to be affected by the disease than others, and in some instances can stand in the midst of affected fields and plants where the spores of the fungus must be abundant, and yet receive little or no injury, shows, at least, that there is a resisting power, an innate vitality in them, which limits the power of the fungus, and the further fact, that where the local conditions are favorable to a healthy and vigorous growth, varieties predisposed to the disease will be little affected while in other fields near by they are rotting down, would naturally lead to the conclusion that this resisting power can be increased by adapting outward conditions to the promotion of a strong and healthy growth, or take the converse, that the predisposition, the liability to the attack of the fungus, comes from debility, or loss of vitality in the plant itself.

This view is corroborated by the results of the experiments of Professor Smith already mentioned, in which he bound together sections of healthy and diseased potatoes and tested the power of contagion by planting them together. Duplicate sets of the tubers were thus prepared: one set was placed out in the open field; the other in pots and tubs, where there was sufficient soil for the strong development of a healthy plant, but which would lessen somewhat the vigor of the growth. As stated before, of those set in the open ground, part decayed, part were injured, and in others healthy and diseased stalks and tubers were mixed in the same hill, but every one that was planted in the confined soil rotted down.

A microscopical examination of the tissues of the infested plant reveals the fact that a change has taken place and is going on in the organic elements there, and that it is not confined to the parts where fungus growth is found, but is also seen in advance of it. In a healthy plant there are but few starch grains seen in the cells, but where the potato rot is present there is a great increase in their number, and often the cells are crowded with them. It hardly seems probable that the presence of fungus can produce starch, but it appears a far more reasonable explanation to attribute the change to a disordered circulation, a loss of vitality in the cellular tissues of the plant, preventing the normal elaboration and assimilation of the sap, and that it is owing to this condition of the plant that the growth of the fungus is made possible.

The following chemical analyses made by Professor Jellett, of Dublin, may be of interest in this connection. Tubers in four different conditions were taken, both in the natural, green state and dry. I, the healthy tuber; II, the sound part of a tuber in which a small point at the other end had been just touched with the disease; III, the apparently sound part of a tuber where the disease had made some progress, but was not visible to the unaided eye; and IV, one where discoloration was just becoming visible:

	PER CENT. GREEN.				PER CENT. DRY.			
	I.	II.	III.	IV.	I.	II.	III.	IV.
Water	73.09	77.24	80.04	79.28				
Cane sugar	.08	.29	1.14	.21	.29	1.27	5.71	1.00
Grape sugar	.42	.65	.76	.40	1.59	2.85	3.81	1.93
Nitrogen	.27	.35	.31	.25	1.00	1.53	1.55	1.26

These figures indicate that the change from a healthy to a diseased condition is attended by a marked change in the chemical elements, especially as to amount of water and cane sugar; and the conditions in which the analyses were made lead to the conclusion that this change commences in advance of the appearance of fungoid growth. Thus the results of both microscopical and chemical investigations tend to confirm the opinion that there first takes place a falling off in vitality, a change from a healthy to an abnormal condition in the plant, and that in consequence of this change fungoid growth comes in and hastens decay and death. This is in harmony with what we see, and what we expect in the development of other forms of fungus growth around us. They are ever found in decaying organism, but we do not look for them in fresh cuts or wounds in either vegetable or animal tissue; not until some little time has elapsed, and there has been a deadening of the exposed parts, are they visible.

It must be evident to all that there has been a loss of vitality in the potato. Many of the old favorite varieties are now comparatively unknown, or are only raised to a limited extent, and where cultivated, they do not have their original productiveness or quality. The newer and more popular varieties do not hold up to the promise they give at their first introduction, many deteriorating more rapidly than varieties of former years. This is attributed by some to the method of reproduction by cuttings, tubers, or offsets, rather than by seeds, but it is doubtless largely due to conditions of climate, soil and culture, one or all combined, that are not fully adapted to perfect maturity of growth, which simply means hardiness, health.

other garden products, flowering bulbs, wheat and other grains;

successive plantings from the germs raised from year to year diminishing in vigor and productiveness, showing that a change of conditions under which the plants are grown does affect their constitutional vitality.

The potato is a native of the high tablelands and mountainous regions of South America and Mexico, where the soil is moderately fertile, warm, light, and well underdrained, the climate uniformly cool and comparatively dry, little subject to great extremes of temperature. In these conditions the potato is in its natural habitat and makes a quick, steady, but moderate growth of top and tuber. Droughts and extremes of heat seldom occur to check its early maturity. . M. Bousingault, in giving its history in Bogota before its introduction into Europe, states that the *Peronospora infestans* is also found there, but is powerless to injure, on account of the vigor and uniform healthy growth of the plants. It is with us, in the locations and in seasons where the conditions are similar to those of its natural habitat, that the largest, the finest and best crops of potatoes can be raised, and where alone their cultivation can be made profitable. Great and sudden changes of outward conditions are of themselves sufficient to prevent that healthy development and perfect maturity upon which vitality and productiveness depends, but when you add to these an entire change of climatic conditions, and of the elements and mechanical condition of the soil and the excessive stimulus of high culture to an abnormal development of root and top, it ceases to be a wonder that there is a loss of constitutional vigor and hardiness, a predisposition to disease. In causing an unnatural, an excessive development, or, as we call it, in refining and improving the breed, both in animal and vegetable life, we change the structure, the cellular tissues, making them more dependent upon favoring conditions for their successful growth, and also increase the liability to disease by lowering their innate hardiness. Therefore it seems to us to be the most natural conclusion that these unfavorable conditions to a perfect hardy growth, both of the individual plant and of the species, are the primary cause of the disease, and that the parasitic growth is only an attendant result, induced or made possible by the previously enfeebled condition of the plants.

The question arises, In what way, if any, can the disease be prevented? Various methods have been tried and claimed by some to be successful remedies, but on an extended trial they have not proved generally satisfactory, and the natural conclusion is, that the benefit attendant upon their previous use came from other causes rather than from any virtue in the so-called remedies. Sulphur, lime, ashes and dust have all been tried, but are of little, if any, benefit. They may destroy the open air portion of the fungus, but the strength, the real life of the parasite is within, and no external application will be of any avail in causing more than a temporary check, unless it also destroys the plant itself. A few threads and spores on the outside may be destroyed, but these will soon be replaced by a new growth from within.

Cutting off the tops as soon as the presence of the fungus is discovered has been recommended. This may check its growth for a time, but it is rare that it will prove a permanent remedy, as the mycelia have usually occupied the tissues of the stalks and well down to the tubers before the outward growth of the fungus is noticed, and the part nearest the ground is that which is usually affected first. Cutting away the whole top diminishes the amount of the yield and also injures the quality.

Ridging up the rows is also practiced by some, especially in Europe, covering the tops with earth. In some cases very satisfactory results have been reported from this practice; greatly reducing the per cent. of diseased potatoes in the hills, but in other instances the reduction in size and in market value of greater numbers thus obtained, made the net returns less than they were on portions of the field not thus treated.

The means usually regarded as the most effectual and important are those of a precautionary character. As avoiding, in planting, ground where the crop was affected the previous season, or proximity to such ground; planting tubers wholly free from disease; destroying all the diseased leaves, tops and tubers left on the ground at the close of the season. This may somewhat reduce the germs left over for the following season, but in seasons adapted to the growth of the fungus, such is the rapid development of the spores, that the few or many destroyed will make practically little difference in their numbers.

The selection of early varieties, and of those kinds that are the least liable to be affected with the rot, is recommended as beneficial. Also early planting, may ensure the ripening of the tubers before the disease usually makes its appearance, and if they are harvested at once, and stored in some cool, dry place, the crop will be secured.

Drawing up the earth around the hill early in the season, giving it the form of a sharp ridge, with four or five inches of soil over the growing potatoes, is confidently announced by some as a sure preventive. The experiments reported seem to indicate that this greatly reduces the number of diseased tubers. Those who recommend this treatment claim that the protection is given by the thickness of the earth over the tubers preventing the spores from washing down through the soil to them, where they are supposed to germinate and penetrate to the interior, and also that the form of the hill carries the spores, as they fall from the leaves, away from over the tubers, and they are then washed by the rains into the furrows. This explanation can hardly be the correct one. Those who have studied the growth of the fungus most thoroughly hold that the spores do not and cannot enter the tuber either before or after germination through the skin, but only through the leaves, and that, too, through the breathing pores on the underside of the leaves. In fact no evidence has been discovered that they can enter the potato direct where the skin is unbroken and sound. The beneficial results from this treatment may, and probably do, come from the protection given to the plant from heat, moisture and other injurious climative influences. The covering over the roots tends to keep them cool, giving them greater power, the sharp pitch of the hill turns off excessive moisture, and the necessary furrow between the rows gives the plants thorough drainage, so that the conditions for growth are favorable and a strong, healthy growth throughout the season is secured. In thus adapting outward conditions and culture so as to secure a hardy, mature growth seems to be the best remedy, the most effectual method of preventing this disease.

POTATO BLIGHT AND ROT.

By THOMAS TAYLOR, M. D., and Microscopist Department of Agriculture.

The potato disease was first observed in Germany, near Liege, in 1842; in Canada in 1844, and in England in 1845. In the following year it prevailed very extensively over almost all parts of Europe. The summer was unusually cloudy and moist, a circumstance which doubtless had great effect in fostering the disease. It has been estimated that the damage sustained by Great Britain and Ireland in the year 1845 was not less than £21,000,000, and in 1846 probably twice that amount. The *London Times* in 1872 stated that the loss sustained by Great Britain during that year, in consequence of this disease, amounted to from £20,000,000 to £30,000,000.

FIG. 1. SECTION SHOWING STARCH CELLS, VASCULAR BUNDLES. RIGHT SIDE HIGHLY MAGNIFIED.

For forty years past the potato-rot has been attributed wholly to a parasitic fungus known as *Botrytis infestans.* It has been observed that this fungus attacks the leaves at first, causing brown blotches. The disease is next transmitted to the stalks and tubers, and in a few days the leaves, stalks and tubers become a fermenting mass.

By the aid of the microscope, the spores of the fungus *Botrytis infestans* may be easily observed, although very minute. With a small pencil brush remove the spores from an infected leaf, place it on a slip of glass three inches by one in diameter, add a drop of water, and place over the whole a very thin glass cover of the kind generally used, and view under a magnifying power of about five hundred diameters, when their structure and peculiar life-like motions will be observed. These spores multiply with great rapidity during wet weather. The offspring of a single spore will probably exceed forty millions in twenty-four hours. This explains the rapid destruction of the potato plant when exposed to the ravages of this fungus. Large premiums have been offered from time to time for a remedy, but as yet no successful mode has been found to fully restore the potato to its wonted vigor. With this end in view many plans have been tried; new varieties from the seed tested, and the changing of soil, climate and fertilizers proposed, and it is now commonly believed by the present scientific cultivators of the potato in Great Britain, that varieties which mature very early or very late in the season will escape the blight. This would indicate that the condition of the sap of the potato has special reference to the growth of the fungus. The scientific committee of the Royal Agricultural Society of England also favors the planting of early and late varieties.

Many mycologists assume that the *Botrytis infestans* is wholly the cause of the blight, while acknowledging that a moist, warm atmosphere greatly accelerates the growth and germination of the fungus, but evidence is not wanting to show that in some cases where two distinct varieties have been planted together, one of them only was blighted, thus showing that some peculiar condition of the plant affected was favorable to the growth and reproduction of the fungoid spores. The following case illustrates this fact:

"Mr. Martin McKinzie, of Boston, Massachusetts, wrote to the department under date of November 1, 1872, stating that, in a field near his residence, Early Rose and White Jackson potatoes were planted the preceding season, adjoining each other; the first, or Early Rose, proved nearly an entire failure, from blight fungus, while the second, or Jackson Whites, grew to perfection. Not the slightest appearance of blight was manifested, in any instance, on them. The writer further states that the conditions of planting, manuring and soil were practically the same in each case. Facts similar to these have been collected from time to time, and form an important point for further examination."

It will be at once admitted that in the metamorphosis of varieties as well as species, a change of cell-structure is brought about, and, as a natural consequence, their cell-product will correspondingly change more or less. The sap or juices may change materially in the proportion of their composition and thus become favorable or unfavorable as a nidus for the fungus to propagate in. To suppose that a fungus, which is a plant, is not

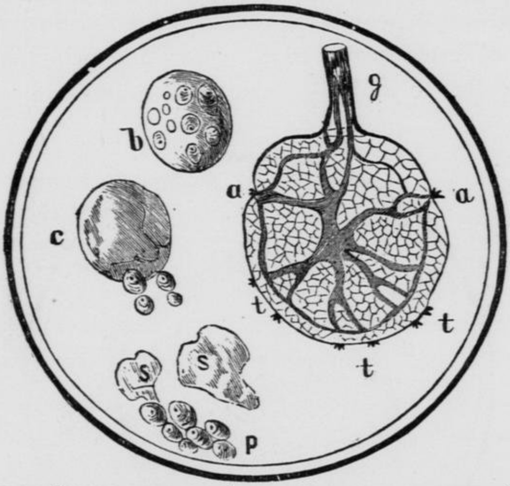

FIG. 2. SECTION OF POTATO SHOWING STEM AND CONNECTION WITH EYES; CELLS ENCLOSING STARCH; RUPTURED CELLS AND ESCAPING STARCH GRAINS.

thus affected would be erroneous; all our experience demonstrates that all plants and animals are affected more or less by the nature and condition of their food and other considerations, such as their habitats. Thus we find in practice that at the present day on the sandy soils of New Jersey, the blight is unknown, while in the moist New England States it is seldom absent, and the plague still continues to be very destructive in Great Britain and Ireland, where the climate is very moist. Last year's potato crop suffered severely from blight in the above mentioned countries. Where the foliage of a potato is affected with *Botrytis infestans* its mycelium or spawn quickly descends within the stalk and enters the tuber. Fig. 1 represents a section of a potato showing its vascular bundles, air-passages and starch-cell structure. In the case of the potato-rot the decomposition first starts in the vicinity of these air-passages, ultimately destroying all the nitrogenous matter which covers and holds together the entire cell-structure. These vascular bundles form a perfect zone over the entire potato, branching at points to the surface, where they terminate and form the bud or so-called eye of the potato.

Fig. 2 represents a section illustrative of this fact. *g*, *a*, and *t*, are the air-passages as above described. When a potato is broken down by fermentation it is resolved into a soft, pulpy mass, a condition to which all potatoes are reduced when subject to any kind of fermentation or rot, consisting principally of starch-bladders or cells. *c* and *b* — *s*, *s* are broken cells — *p*, starch-granules.

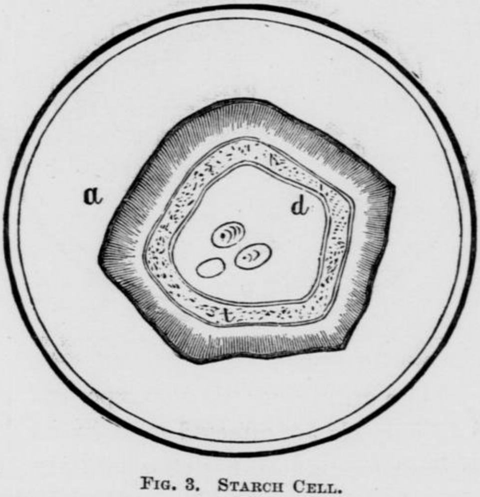

FIG. 3. STARCH CELL.

Fig 3 represents a single starch cell, *d*, as seen on viewing a section of a sound potato, and which is composed wholly of cellulose, but is held in position by the nitrogenous and cellulose substances, *a* and *b*.

When a sound potato is grated down the cell-structure and attachments are broken up because of their perfect cohesion to one another. One cell cannot be broken without destroying all its attachments. But in the case of rotting potatoes the nitrogenous cell-structure *a* and *t* is destroyed by fungoid action and bacteria combined, but the starch is in no case destroyed and may be recovered by the use of suitable machinery.

Having received a supply of seemingly healthy potatoes from New Mexico, Ohio and other places, as well as a few diseased tubers from Boston and Swanpscott, Massachusetts, I commenced a series of preliminary experiments to test the chemical and structural theories of Dr. Lyon Playfair and the fungoid theories of M. J. Berkeley and other leading mycologists. In each of four glass jars I placed a pint of water. In No. 1 was placed a portion of fungus *Peronospora infestans* and the half of an Ohio potato remarkable for its healthy appearance. In No. 2 were placed a diseased potato containing *Peronospora infestans* and the half of a potato received from Santa Fe, New Mexico. In No. 3 was placed the second half of the Ohio potato alluded to, and in No. 4 the second half of the Santa Fe specimen. In Nos. 3 and 4 was also put one-half ounce of pure sugar, to assist fermentation. These specimens were subject during the experiments to a temperature of about 75° F. The respective jars were examined from day to day. On the sixth day the Ohio specimen in No. 1 was found to be rotting rapidly, while the Santa Fe specimen in No. 2 was apparently uninjured. Specimens of Nos. 3 and 4 were undergoing slow fermentation. At first the water containing the Santa Fe specimen became more milky in appearance than the Ohio specimen, but the deterioration on the third day was greater in No. 3 than it was in No. 4. On the 20th day the Ohio specimen was entirely dissolved, forming a pulp, while the Santa Fe specimen retained its perfect consistency throughout. On examining the pulp of No. 4 under the microscope, I found that the starch-granules were still confined to their cells, no liberated cells appearing on the field of view. Bundles of mycelium and budding spores appeared in profusion between the cells. A few infusorials were present. The odor was slightly sour. The appearance of No. 4, as seen under the microscope, of about eighty diameters, was remarkable as contrasted with No. 3. The latter specimens presented a mass of infusorial life, mycelium and budding spores. I made many examinations of the pulp to detect starch cells, if present, but found none. The fermentation had completely destroyed them, although the starch seemed unaltered. The odor was very bad. The Ohio specimen in No. 1 rotted much quicker under the influence of *Peronospora infestans* than it did under *Torula* fungus favored by the action of sugar in No. 4 solution. The Santa Fe specimen in No. 2 resisted the *Peronospora infestans* fungus better than it did the *Torula* fungus in No. 4; but, by the use of either fungus, the tendency of any variety of potato to resist fungus-action may, by this mode, be easily decided. Since the preceding experiments were made, other northern and eastern varieties have been tested by fungoid solutions in contrast with some of the New Mexico varieties, giv-

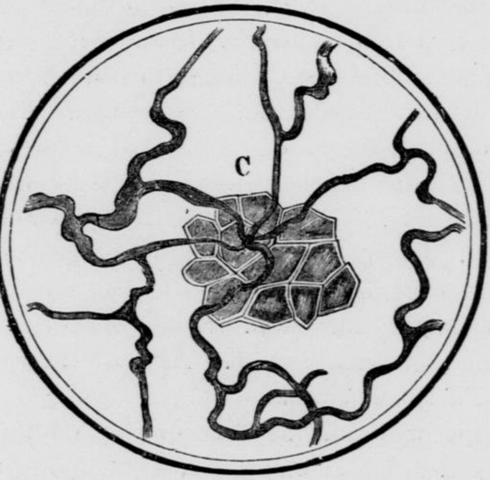

FIG. 4. SECTION SHOWING MYCELIUM IN CELLULAR STRUCTURE OF THE SKIN.

ing like results, clearly demonstrating the superiority of the Santa Fe potatoes over all others so examined, in respect to their power to withstand fungoid and infusorial action.

In examining the skin of an affected potato, I have found on its inner surface generally large quantities of mycelium. (See Fig. 4.) The central portion, C., represents the skin from which the mycelium grows. This form of mycelium I have frequently found in the soil where affected potatoes had grown and decayed.

THE POTATO FUNGUS—GERMINATION OF THE RESTING SPORES.

By WORTHINGTON G. SMITH, F. L. S.

Before describing the germination of the resting spores of the fungus which causes the potato disease, it will be well to briefly state how these resting spores were obtained and how preserved alive in a state of hybernation for so long a period as a whole year. Last July, I obtained the oospores or resting spores by keeping potato-leaves and tubers continually moist. For many years past moisture has been well known to greatly excite the growth of *Peronospora infestans*, and De Barry in his recent essay classes the potato fungus with "other water fungi." Mr. C. Edmund Bromne, of Betheaston, who is known as one of the first cryptogamic botanists of this country, repeated my experiments in the following manner: He selected potato leaves badly infested with Peronospora, partly crushed them, and placed them in a saucer of water underneath a bell-glass. The saucer was kept in a sloping position, so that the leaves (being partly submerged) were allowed to absorb the water naturally. The result was that he obtained an enormous number of resting spores in all parts of the leaves, many being within the spiral vessels and hairs. These resting spores were in every way identical to mine, and could only belong to the Peronosporeæ or Saprolegnieæ, because similar bodies are unknown to other families of fungi. The first-named family has jointed threads, the second bears threads without joints; now, as the threads seen by me and last year illustrated in connection with the resting spores, had jointed threads, they must belong to Peronospora and not to Saprolegnia. As there are no other Peronospora than *P. infestans* known to grow on the potato plant, it is clear that the resting spores cannot rationally be referred to any other than the potato fungus. Added to this, I last year saw the secondary bodies clearly growing from the Peronospora threads, I attach great importance to the jointed threads because De Barry, when he figures Artogrotus from 'Montagne's original specimens, shows the threads with many septa. From the first I said that

Montagne's Artotrogus and the bodies discovered by me, are the same. That both belong to Peronospora the sequel will prove.

It was of the highest importance that these resting spores should be preserved alive until the time arrived for their renewed activity, and with this purpose in view I preserved the material in which the resting spores were present in sealed bottles, each bottle containing more or less pure water or expressed juice of horse-dung diluted with water. As I was quite in the dark as to the habits of these resting spores, of course I did not know what to do for the best, or what the result of my experiments would be. I have described before how these resting spores at first float on the surface of the water, how they at length deposited themselves in the sediment at the bottom, and how, on opening one of the bottles at the last meeting of botanists at Hereford, the resting spores were found still intact and apparently alive. Happily, nearly all the spores retained their vitality. Mr. Broome, being equally uncertain with myself, trusted to chance, and chance so far favored him that all his resting spores in the slanting saucer of water retained life. It might have been (and ever was) said that possibly some fungus foreign to the potato-fungus had got into my material, but if so, it must be regarded as a coincidence in the highest degree extraordinary that Mr. Broome should also get the same new and foreign fungus in his Peronospora material — a body so puzzling in its nature as to be referred to no less than eight different species of fungi.

All who have studied the habits of the lower fungi know the extreme difficulty of preserving the specimens alive. This difficulty almost amounts to an impossibility. The fungi under study may be present one day and all gone the next; a few drops of extra moisture or a slight current of dry air is sufficient to destroy or collapse the whole lot. Besides this, myriads of other parasitic fungi and whole tribes of infusoria commonly make their appearance and prey upon the material it is desired to preserve.

Now one of the most extraordinary facts about the recent potato investigations in this country is this: These other fungi and infusoria have not appeared to any damaging extent. Since I opened my sealed bottles last April, I have kept the material under a bell-glass, and there has been no offensive odor and to no appreciable extent has there been any mould, infusoria or parasites except *Peronospora infestans* itself, and the other which is equally destructive to potatoes, known under the name of *Fusisporium Solani*. In investigating the potato disease it was almost as important to discover the entire life history of the Fusisporium as of the Peronospora, and fortunately the materials preserved gave a perfect clue to the entire life history of both. Mr. Broome's material has in the same manner been free from an excessive number of other fungi and infusoria.

The germination of the resting spores was awaited with the greatest anxiety; and, as I never knew from one day to another whether or not these bodies might all collapse and perish, I was under the necessity of dividing the material and keeping a constant lookout for results under different conditions. With this object in view, therefore, I kept some of the bodies moist in pure water, others in diluted expressed juice of horse-dung, others in expressed juice of fresh potato leaves, others upon extremely thin slices of potato or on crushed potato-mash, others in saccharine fluid, others in nitrogen gas, some between pieces of glass kept constantly moist, some upon broken tile (also kept constantly moist), and some upon potato leaves as they grew upon the living plant. Besides this, I have had a quarter of a hundred of slices, kept damp and under examination every day (almost night and day) for the last three months. All these preparations I have kept constantly and uniformly moist under darkened bell-glasses, as darkness invariably assists the growth of spores of all kinds.

The first new fact worthy of note is this: many of the resting spores grew in size during nine months of their rest to twice their original diameter, or about four times their original bulk, and their aspect gradually changed from almost smooth, semi-transparent bladders, to brown, more or less rough and warted or echinulate spheres. These latter brown, mature bodies were quite the same in character with those so sparingly seen last June and July. How they arose last year no one saw, but probably the wet weather of the early summer caused their appearance. It does not follow, because the resting spores have taken a year to artificially mature with me, that therefore they always take a year to ripen; it is quite possible that in a state of nature and under different conditions, they may mature rapidly. At any rate, two sorts of bodies were seen together last year, transparent, smooth bodies and rough, brown ones. I considered them to be different states of the same resting spores, and subsequent facts have proved my supposition to be correct. * * * The Rev. J. E. Vice, Forden Vicarage, Welshpool, a gentleman who has made a special study of microscopic fungi, has had some of my living material under examination during the past winter and spring, and when

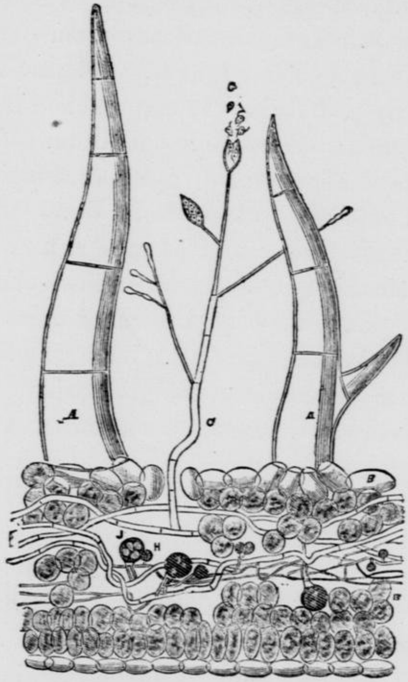

FIG. 5. MAGNIFIED SECTION OF LEAF. *A A*, HAIRS. *B*, CELL TISSUE; *C*, SPORE BEARING STEM FROM MYCELIUM. *G*, CONIDIAL SPORES ESCAPING. *J H*, RESTING SPORES CONJUGATING.

the first signs of germination showed themselves in my oospores, I wrote him to keep a good lookout for results. He wrote me as follows under date of April 21st: "My idea certainly is that the oospores are germinating; bottle No. 1 had a thin film on it which developed into a lot of mycelium and threads of Peronospora." I, too, observed the same fact in London.

Throughout May the habit of the oospores appeared to change remarkably, for instead of producing zoospores they protruded a thick and generally jointed thread, agreeing in size exactly with the average *Peronospora infestans* threads. * * * At the beginning of May, while observing the habit of Fusisporium and its resting state, I observed typical *Peronospora infestans* growing upon the drier parts of the year's crushed and decayed leaves; this observation was confirmed by Mr. Vize, who wrote on May 22d: "According to my examinations the Peronospora are on the drier parts of the magma. I do not observe it growing on the very wet." * * * Mr. Chas. B. Plowright (surgeon of King's Lynn, a gentleman who has long studied fungi) has patiently examined some of the living material with which I have been working this spring and early summer, and he writes me on May 19th: "I find plenty of branching, nodose conidiophores, especially among the drier portion of the substance sent. I also found living conidia. I have many conidiophores with convoluted bases, but in the vast majority of cases long ere the conidia come, the oospore is gone; I see the granular protoplasm distinctly ascending the base of the conidiophore." As regards the first coil of my mycelium, Mr. Plowright writes: "I distinctly saw this curved in two oospores, and I believe the mycelium comes out with a curl." The same gentleman, under date of May 19th, writes: "I saw a great many conidiophores, both with conidia in situ and not; most of the conidia had fallen off; latterly I saw plenty of convoluted bases." The evidence of identity seems complete, and much data here published, as well as much as yet unpublished, has been confirmed by Messrs. Vize and Plowright. * * * On examining the oospores in saccharine fluid, I observed some of the discharged bladders to be carrying from two to four secondary bladders inside; these inside bodies were in their turn expelled and grew and produced mycelium, while a few bursted and produced from three to six very small zoospores, generally but three. It is a most singular fact that these secondary bladders and zoospores are exactly the same in size with De Barry's *Pythium vexans* and about one-sixth or one-eighth of bulk of the resting spores from which they are discharged. With this exception there has not been the slightest approach in any of my material to organisms which might be referred to Pythium. Mr. Plowright writes: "None of my oospores ever burst and produced Pythium or Pythium-like spores."

My material has contained a large number of dead mites and aphides, and a few nematoid worms; the oogonia and threads were to be seen in all parts of the dead insects, but not in the worms.

De Barry, in reviewing my observations, says: "Even if the often mentioned warty bodies were hibernating oospores of Phytophthora (Peronospora), like the similar oospores of *P. Arenaria* which resemble them, we should not gain much information bearing on these questions, since their occurrence is, at the best, extraordinarily rare." This sentence is very erroneous, for bodies which were *apparently* rare when I first recorded their discovery, were not necessarily so in a state of nature, for on continuing the experiments after my first essay was written, the resting spores were produced in myriads, and that, too, within the tissues of a comparatively few leaves. During the spring I have sent mounted preparations of the mature (or almost mature) resting spores to many of the foremost cryptogamic botanists of Europe, but not one has denied their possible identity with *Peronospora infestans.*

For more than thirty years our potato crops have been systematically destroyed by two virulent fungi, viz.: *Peronospora infestans* and *Fusisporium Solani;* these two parasites invariably work in company with each other; they suddenly, for a few weeks, destroy our crops, and vanish for ten or twelve months, then reappear, and repeat the work of destruction. I claim for my work that it is new, and that it has proved how both these fungi hide and sleep through eleven months of the year. As I have kept the resting spores alive artificially in decayed potato leaves, in water, in moist air, and in expressed diluted horse-dung, it conclusively proves to me that the resting spores hibernate naturally in the same manner. The seat of danger from both parasites is clearly in dung-heaps, ditch sides and decaying potato plants.

Any method of destroying the resting spores of these pests, or of warding off or mitigating their attacks, obviously depends in a great measure upon a full knowledge of their life history. That life history I have endeavored to the best of my ability to watch and describe, and I am willing to let the observations stand on their own merits. Sensibly conducted and extensive field experiments might probably teach some valuable lessons, but it is difficult, if not impossible, for any single individual, whether farmer or botanist, to institute and carry out such experiments.

Plate 5 represents the various stages of *Peronospora infestans*, as described by Worthington G. Smith. B B B, cell tissue of a potato leaf; A A, hairs of same; F and H, resting spores, conjugating; C, a conidial branch growing from the mycelium and fruiting, showing its various stages up to perfect conidial (dust-like) spores, G.

FUSISPORIUM SOLANI AND ITS RESTING SPORES.— In reference to this fungus, Mr. G. W. Smith sends us the following quotation from an article which recently appeared in the "Gardener's Chronicle" from his pen: "*Fusisporium Solani* is a fungus which very commonly occurs on diseased potatoes in company with *Peronospora infestans.* One is as destructive to the potato as the other, and Mr. Berkeley, writing of the former in 1857, described it as a second enemy of the potato, equally destructive with the Peronospora, and, according as the two are separate or combined, different appearances arise. In some cases, continues Mr. Berkeley, it produces an extreme degree of hardness, inducing a condition like that of the mumified silkworms. Sometimes, on the contrary, it causes rapid and loathsome decay, especially when in company with Peronospora. Like the latter, it suddenly appears on the potato plant, carries on its work of destruction, and disappears. Till now, I believe, the resting condition of *Fusisporium Solani* has never been described. In my attempt to work out the life history of *Peronospora infestans*, the undoubted resting spores of the Fusisporium came to light in the following manner: A quantity of badly infected potato-leaves were selected and isolated with the view of watching the Peronospora. As the presumed oospores of the latter gradually appeared, there also appeared much smaller bodies, which also went to rest; these were so similar in size and appearance to antheridia or dead zoospores, that they were thought to belong to one or the other. When I recently placed some of the presumed oospores of Peronospora in pure water to promote germination, all the small bodies at once burst, and in the short space of six hours developed into perfect plants of *Fusisporium Solani.* In size the spores measure about the $\frac{1}{2500}$ of an inch in diameter, palish brown, with a very finely muricated outer coat and a light central nucleus. The Fusisporium is frequently produced close to the resting spore, and I have observed the direct germination and production of the Fusisporium in innumerable instances. How these resting spores arose last year I am not certain, but it is not improbable that they may be a different condition of the aerial fruit broken up into four parts.

INJURIOUS AND OTHER FUNGI.

Prof. BYRON D. HALSTED, in Massachusetts Horticultural Society Transactions.

From the early days of botanical science, the vegetable kingdom has been divided into two grand divisions, namely: *Phænogamous* or flowering plants, and *Cryptogamous* or flowerless plants.

It is unnecessary for us to point out illustrations of this first great group, because they are as familiar to us as household words, in the trees which spread their lofty tops above our heads, or the grass which grows in the meadows and pastures at our feet. With the cryptogams the case is somewhat different. The *Ferns*, the royal members of the cryptogamic series, are, with us, only herbs of yearly growth; while *Mosses* and *Lichens* lay but a carpet on the rocks and hillsides. The *Sea-weeds*, though certain species grow large and cumbrous, are usually small, and many are microscopic, and *Fungi*, the last of all, are too often known to the natural sight only by their effects. It is to a consideration of some of the members of this last mentioned group that your attention is invited.

Fungi make up a group so diversified in characteristics that it is almost impossible to give any description of them as a whole. Suffice it to say, they are all parasites, deriving their nourishment directly from the organic substance upon which they feed, having no green leaves in which crude material can be transformed and fitted for the growth of the plant. They are all thieves, then, either stealing their sustenance from the dead, or robbing the living tissue of all its vital fluid.

Their range of growth is limited only by the boundaries of other forms of life. The housewife, to her great dismay, finds upon the top of her can of fruit a portion that is white and worthless; a plant has found its proper element and has been feeding upon her dainties. Yeast is employed to make our bread light and wholesome; and myriads of little plants do the work and do it willingly. Fungi flourish upon our walls, find their way through our books, and pick to pieces the frame-work of the stoutest ships.

In the Mushroom, *Agaricus campestris*, perhaps as well known as Toadstool, we have a species of fungus with which every one is familiar. It is the famous *Champignon* of the French, the *Patiola* of the Italians, and was known to the ancients by upwards of a score of synonyms, growing almost everywhere, from the chilling atmosphere of Lapland, to the hot climate of the tropics; from the Japan islands on the east, to California on the west. Though it is by no means confined to old pastures, with us it is to be found there in the greatest abundance, and especially after a warm shower in the evening. The rapidity of its growth is proverbial. If we go out in the morning we may see them in clusters exhibiting all gradations, from the young "buttons," resembling eggs in size and color, to those of middle and old age, consisting of a stalk somewhat larger than a man's middle finger, bearing at the top a broad, umbrella-like expansion, which is called the *pileus*. When young, the outer edge of the pileus is united with the stalk, but as it approaches maturity it breaks away, leaving the *ring* to mark its former place of attachment.

If a full grown mushroom is taken, and the under surface examined, it will be found to consist of a multitude of radiating gills of a beautiful pinkish color. It is on the surface of these gills that the reproductive bodies are borne — bodies which, though different in structure, perform for this plant the same office the acorn does for the oak; but instead of being called *seeds* they have, in this and all other species of fungi, received the name of *spores.* At the base of the stalk, hidden from sight, is to be found a mass of fine threads which make up the true vegetative portion of the fungus, and is called the *mycelium* — a term applied to this part of all species of fungi. In France, where the satisfaction of the palate is a matter of no secondary consideration, the mushroom has received the greatest care, and been quite extensively grown. In this peculiar market gardening, caves are often put to valuable use; and old deserted mines have been appropriated for the winter culture of the champignon. The growth and consumption of the mushroom in the United States is rapidly increasing. In Italy this species of fungus is always rejected in the markets as being poisonous, while its place is filled with another upon which the French look with distrust.

The fact that some species of toadstools are poisonous, is as evident as that others possess real worth as articles of diet, bearing, as it does, the testimony of many who have ignorantly eaten of the former, supposing them to be edible. Among the illustrious who have perished in this manner, we find the names of the Emperor Jovian, Pope Clement VII, and the Emperor Charles VI. The dread of being poisoned, mixed with no small amount of superstition, together with the difficulty of distinguishing the good from the bad, have all combined to prevent the accordance of justice to this family of plants.

Any one who presumes to give instruction concerning fungi is expected to lay down certain infallible rules for distinguishing the edible from the poisonous, so that in the future no serious inconvenience or loss of life may arise from their injudicious consumption. Up to the present time this has never been done, and it would not become me to attempt it here. There are certain *general* rules which may be given, but they all have their exceptions, both in including poisonous species and in excluding those which experience has shown to be delicious.

Those which are bright colored, as red, blue, or green, are to be looked upon with suspicion. Those which change color when bruised, cut, or broken, are usually unfit for food. A milky juice is a bad sign. Those with a moist, waxy surface, are to be avoided. A disagreeable odor while still fresh is a *strong* indication of their not being edible. But, as has been stated, these rules are not infallible, therefore a last safeguard must be laid down, as follows : *never eat a fungus about which there is any doubt.* The best and shortest method for those who wish to make use of these plants as articles of diet, is to become acquainted with the distinct characteristics of a few of the most common edible species, and use no others.

One of the leading fungi recognized as valuable for food is the Morel (*Morchella esculenta*). It has a short, thick stem, terminating in a large ovoid top, very irregular on the exterior, owing to the many compressed folds of which it is composed, thus forming a surface of numerous indented polygons. They are found to some extent in most countries, but those in commerce come almost entirely from the states of Germany. They show a peculiar preference for those portions of woodland, on sandy soil, over which fires have passed. This fact became so evident to the peasants who gathered them, that in order to increase the range of growth they set fire to the forests to an alarming extent, and rigid laws were enacted to prevent such damage. The morel is extensively used as a flavoring for sauces and soups, but chiefly in the manufacture of one of the finest qualities of catsup.

The most highly prized of all edible fungi are Truffles, of which there are several species, the most common one being *Tuber æstivum.* They are roundish in outline, of the size of a black walnut, having the surface black and much wrinkled, as if by pressure. The interior is quite solid, of a brownish color, and exhaling when cut a very agreeable odor. Their habit of growth is peculiar, as they are subterranean during their whole life, being buried beneath the soil to the depth of several inches. The condition most favorable for the growth of truffles is a soil of a calcareous nature, permeated by the roots of the oak; and the method pursued in France, the only country where the culture has proved successful, is to select the required quality of soil and sow it with acorns. When the saplings have attained a few years' growth the truffles begin to grow. Owing to the subterranean habit of the truffle, the difficulty of finding them, when growing in the wild state, is great, and to this end several processes are in vogue, one of which is quite effectual, and at the same time unique. Dogs and pigs are very fond of these delicate bits of vegetable growth, and being endowed with a sense of smell far superior to that possessed by man, are enabled to seek out the truffles in their hiding places. When the dog, or pig, as the case may be, has found the locality of the plants, he is repaid by a more available, though less palatable morsel from the truffle-hunter's hand.

Besides those already mentioned, there are many other species of fungi which have won a general acceptance into the list of those that are fit for food.

Among the poisonous toadstools the *Amanita muscaria* holds a leading place, receiving its specific name from the fact that it is sometimes steeped and the solution used in the destruction of the house fly. The pileus is raised on a long stalk, and often attains the diameter of four to six inches, having its upper surface studded with large white protuberances, making the plant, if richness of color and beauty of outline are considered, better fitted for the throne of a fairy than the stool of an ugly toad. Though so tempting in its beauty, its poisonous effects have become well understood through the sad experience of many who have eaten freely of its tender tissue, to suffer the severest pain, sometimes only relieved by death. A variety of this species grows to some extent in Northern Asia, and especially in Kamtchatka, where it is highly prized by the natives for its exhilarating effects, possessing, as it does, the power of producing a peculiar intoxication. The fungus is gathered and dried with great care, and when a state of inebriation is desired, a small piece is swallowed, and in the course of one or two hours the drunkard is in his glory. This fungus has a peculiar effect over muscular exertion. In his

"Vegetable Kingdom," Dr. Lindley tells us that a talkative person, under its influence, cannot keep silence or secrets; one fond of music is constantly singing, while he who wishes to step over a straw takes a stride sufficient to clear the trunk of a tree.

With us the *Phallus impudicus* is the most disagreeable species, and commonly bears the not over-classic name of Stinkhorn. It has a stalk five to eight inches in length, bearing at the top a small cap, which, when young, is covered with a green slime. This soon liquefies, and dropping off, covers the ground with an offensive mass, to be eagerly sought for and devoured by carrion insects. The top, when thus relieved of its green outer covering, exhibits a honey-combed surface, and exhales the most disgusting of odors. Many stories are told of the encounters botanists and others have had with this peculiar plant. A case is related of an enthusiastic botanist, who, while on a tour, found some of these plants of unusual size, and wishing to preserve them, placed them in his box; returning home by rail they caused such discomfort to the inmates of the car that every occupant left it with amazement and disgust as soon as possible.

Let us now turn our attention to some of those smaller members of this assemblage of plants, which more truly deserve the name of *Destructive Fungi*, and therefore fall more particularly within the province of this lecture.

The bread, cheese, and cake moulds, though belonging more strictly to household economy, are not without their influence upon the fruits of the horticulturist, and for this reason warrant a passing mention here. They only grow upon organic matter after life has become extinct, but in their growth they rapidly hasten decay, and in this way often do serious damage to fruits and vegetables. An explanation of the cake mould, *Eurotium Aspergillus glaucus*, will answer for them all, though among these little plants great differences are to be observed. The general appearance of this little blue intruder is so familiar to you that a description of it as seen by the naked eye is unnecessary. Under the microscope, the little specks resolve themselves into small heads of radiating cells. These cells are formed one upon another from the filaments, and are spores, but of that kind known as conidial or asexual spores. On other *mycelial* threads, at the base of the stalks bearing these conidial spores, the true sexual spores are produced in something like the following manner: Certain filaments first begin to coil up into a close spiral, after which another thread grows up and touches the tip of this coiled filament and fertilization takes place, a process essentially the same as the pollenization of the ovule in flowering plants, though differing in method and results. After this fertilization, sacs or cells arise from the coil, in which spores are formed, and the whole coil and sacs of spores become surrounded by a covering of cells. On account of the sexual spores being borne in these sacs or *asci*, this fungus comes among the *Ascomycetes*, one of the highest groups of fungi.

We come now to speak of species of fungi which flourish on living tissues, and on these only, including, therefore, the most destructive members of the group.

Puccinia Graminis, one of the most widely distributed and generally known, is one of the many species of that destructive agency which is often vaguely spoken of as rust. All agriculturists who have made the raising of grain their leading employment, will at once turn in thought to the time when their whole field of growing wheat or oats, the pride of their vocation, was turned, as by the stroke of some unseen demon, into a yellow, premature old age.

The different stages in the growth of this plant are quite distinct and peculiar, and though somewhat complicated, it would not be justice to the plant or to science to omit the history of the forms through which the rust plant passes from the perfect state to the perfect state again.

The transformations in the life of a butterfly are so evident that the merest schoolboy may observe the truth for himself; but with the rust plants the objects are so very small that the changes can only be seen by the keen eyes of a skilled observer, with the best powers of the microscope. Beginning with the spores of the mature rust plant, as seen in the black stains on the old stubble of any grain field, it will be found, when the warm and moist days of spring come, that these spores germinate, producing in a few days a short stem, bearing a crop of other spores of very much smaller size. To avoid confusion we will call these by their scientific name — *sporidia*, while the parent spores are styled *teleutospores.* The sporidia have never been known to grow upon the grass or grain; but when they find their way to the leaves of a barberry bush they soon begin to germinate, the filaments enter the tissue of the leaves, and in the course of a few days make themselves manifest on the under surface of the leaves, in what are known as "cluster cups." The interior of these pretty little cups is closely packed with spores of a still different kind, which are called the *æcidium* spores. These in turn will not grow upon the barberry, but when they fall upon a blade or stalk of grain, they soon germinate and produce the yellow rusty covering so often seen, caused by a multitude of another form of spores, called *uredo* spores, clustered upon the surface. In this, the true rust state, the fungus first consists of minute filaments, which run in all directions through the tissue of the grain plant, stealing its nourishment as they go, and is noticeable to the naked eye only when these threads break through the epidermis and bear the yellow or orange uredo spores. The rapid and destructive development of this fungus depends much upon the weather. Should there be a series of warm showers, or a muggy atmosphere, just at the time the grain plant begins to form its grain, the growth of the rust plant is especially favored. It absorbs rapidly the food which is on its way to the seeds, and uses it up in producing a vast number of spores upon the surface of the leaves and stalks, at the expense of an empty head of husks at the top. Later in the season, from the uredo state the final perfect teleutospores are produced, thus completing the circuit of life in this little rust plant. Long before rust was discovered to be a plant, farmers had noticed that there was a close relation between it and the barberry; and at present the latter is being rapidly destroyed, with good results, though it can scarcely be expected that the rust plant will thereby become extinct, as probably the æcidium state grows on other plants than the barberry, though not as yet discovered elsewhere.

The plant is an excellent illustration of polymorphism, so common among fungi, and it also answers well to show the vast number of spores these microscopic plants produce. The teleutospore usually bears from five to ten sporidia; and allowing only one of these to find the barberry leaf, there may be from one to fifty clusters as a result. In this case suppose only one, and a very low estimate for its contents would be 250,000 æcidium spores, and if only one of these in a thousand finds a place on the grain stalk, and each brings forth its 250,000 fold, there would be, under such circumstances, 62,500,000 from the single one from which we started. Taking the same teleutospore, and supposing every spore in all the stages found in place to fill it, the result would be 1,562,500,000,000,000,000 (one quintillion, five hundred and sixty-two quadrillions, five hundred trillions) spores, which may be looked upon as its descendants for the season. Or giving each inhabitant of the globe his equal share of these reproductive bodies, he would have nearly as many as there are individuals in the whole human race. This may seem like a very large story about a very small matter; but it is not the only wonderful truth the microscope has revealed.

It is much easier to tell in what rust consists than how to avoid it. Knowing the nature of the plant, and that in one of its stages it grows upon the barberry, the cutting away of all barberry bushes may do much to check this unwelcome pest, if not to improve the landscape and the general appearance of the farmers' boundary lines. As to the best time to sow a crop to avoid the rust, little information can be given. Sow when you would expect the best returns were there no such thing as rust. Many trials have been made of soaking seeds in various chemical solutions before sowing, but, from the nature of the parasite, little good is to be hoped for from such a practice. Until the weather is under man's control we cannot hope to eliminate the conditions for the rapid development of rust, causing, as it will, a partial or entire failure of the grain crop.

The *Ustilago maydis*, generally known as Corn Smut, is another of these microscopic plants which often grows in fields of maize. Though less prevalent than the rust, it is, like that, a sworn enemy of the agriculturist. Sometimes it makes its appearance only at one or two of the joints, causing a bending, so that the stalk frequently reclines on the ground. Again, it seems to take possession of the whole plant while it is still quite young, and as a result there is only a dwarfed and rotten mass, but a few inches above the surface of the soil. The greatest damage is done when the thief takes possession of the kernels while they are still quite young, transforming their tissue into its own long mycelium threads, which at maturity produce, in infinite numbers, the minute blackish spores. Frequently, only a few of the grains are affected, making a striking contrast with those of natural size. It was long supposed that this smut was a diseased state of the corn plant; but there is no longer reason to doubt that it is a small, dirty plant, growing at the expense of one of the most useful members of the vegetable kingdom. Vegetation and reproduction in these plants are reduced to their simpler forms, and the space from the time when a spore germinates to the time when spores are again formed may be reduced to weeks, and even days, instead of being months and years as in plants of a higher and more complex organization. The grains of corn that, to the naked eye, appear perfectly free from the smut, may have their tissue interwoven with its mycelium threads; and when the grains thus affected are planted, the fungus is planted with it, and as the corn plant grows so does the parasite, until the presence of the latter becomes evident in its black, dusty fruitage. This is one of the methods of propagation which is of great importance to the existence of the smut plant. As with the rust, there seems to be no available method of staying its ravages when moist and warm weather comes at just that season of the year best fitted for its rapid development. Still, much could be done to reduce the number of its reproductive bodies, by cutting off and burning the affected portions before the smut plant has ripened its spores. Concerted action is required in a movement like this; and when farmers, as a whole, see that it is for their interest to go through their fields of growing corn, and destroy this pest in its early stages of growth, we can assure them that from that day on they will have more and better corn for their labor.

In all cereals to some extent, but especially in the rye, may frequently be found a fungus which has long been known under the name of Ergot (*Claviceps purpurea*). Like the corn smut, this plant attacks the young grain and causes it to assume a very much enlarged form, protruding far beyond the husks and resembling a cock's spur, whence its common name "spurred rye." The whole enlarged mass is made up of hard mycelium, on the surface of which the conidial spores are borne. The fungus may exist in this indurated form for a long time without further development, but when these ergot grains fall upon moist earth, sprouts soon proceed from them which form club-shaped heads at their extremities, in which spores of the second form are produced in little sacs. These different forms were for a long time considered distinct species; but the hard state, that in which ergot exists as sold in the shops and used in medicine, is only a form which many fungi have the power of taking on when they prepare for a season of repose. Ergot is one of the most poisonous of the smaller fungi. In several provinces of France and Germany, epidemics of nervous derangement, resulting in gangrene and frequent loss of limbs and even of life, have been traced to the consumption of this plant in the bread made from rye which was largely spurred, the result of an extremely favorable season for the growth of this pernicious fungus.

It is to be presumed that no one species of plant has caused so much suffering to the human family as *Peronospora infestans*, or Potato Rot, as it is called in common parlance. Those of you old enough to glance back in memory to those fatal years for Irish peasantry, when their almost sole source of sustenance was swept from them by the ravages of the rot, can form an idea of the influence even a microscopic fungus can exert over the comfort and civilization of the race. The potato rot is one of those small microscopic fungi best known to the naked eye by its terrible effects. Its first general appearance was in the year 1845, when it was first seen in the Isle of Wight, and a few weeks after was observed with great wonder and dismay by all growers of the potato throughout Europe. It is a plant which flourishes only in damp weather, and its prevalence depends much on the condition of the atmosphere. The fungus is first recognized by the potato leaves turning brown, owing to the absorbing threads of the "rot" within the tissue. Soon certain threads come to the surface, pass through the breathing pores, divide into several branches, and bear the conidial spores on the tips. In this condition the leaves look as if covered with a fine frost. The spores thus produced germinate at once, and in this way the disease is rapidly spread to other plants throughout the field. The fungus soon passes down the stem to the growing tubers, and they in turn give up their substance to this parasite, and then become rotten. As the rot does not make its appearance until the hot and moist days of July, the earlier varieties stand a greater chance of escaping it than the later. In all cases where the disease is gradual in its appearance, and the tubers are nearly mature, they should be dug at once. If the fungus has reached the tubers they will rot to some extent; but when placed in a dry cellar the rotting is considerably retarded. In raising potatoes, select a well drained or naturally dry soil; plant early varieties and plant them early. Always plant the soundest and most mature tubers. Gather the crop as early as possible and burn all tops at once, thus destroying the spores which might otherwise carry the pest over the winter season. When every condition is the most favorable for its development the rot will take its most violent form, and the crop will fail as it has so often done in the past.

The potato rot has long been known to the South American Indians dwelling in the regions of the Andes, showing that this plague is not of recent origin, and also that the land which gave us the wild potato has likewise produced its most destructive parasite, which has followed it across the seas. There is no object in nature concerning which men have given more curious and conflicting theories than the plant in question, and to-day the list is long of those who fail to recognize in it a member of the vegetable kingdom. But when the plant can be cultivated, the spores sown on sound potatoes, and the vegetable watched through its whole existence, culminating in the rot, it is time to believe that it is as much a plant as the one upon which it grows.

Another species of this same genus, *Peronospora*, is the American Grape-vine Mildew. The true grape disease, the one which has proved so disastrous at different times to the vines of Europe and Madeira, is caused by another fungus, to which Berkeley has given the name of *Oidium Tuckeri.* It is a form of a fungus which had not been recognized in its perfect state, and is supposed to occur to some extent on this side of the waters; but as many species have this conidial form, and some nearly identical with it, and also growing on the grape, there may be some doubt as to our vines ever being attacked by true grape disease of Europe. The *Peronospora viticola*, the mildew which most interests the grape growers of America, is quite common, appearing on the under

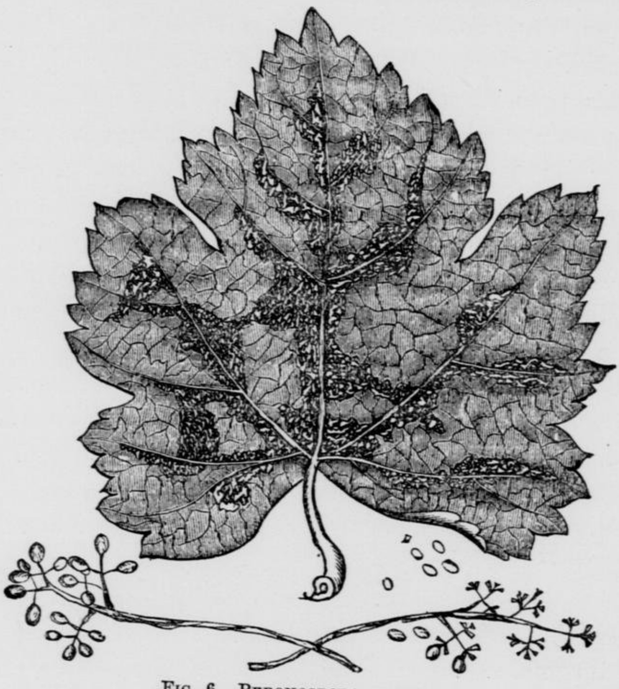

FIG. 6. PERONOSPORA VITICOLA.

surface of the leaves about the first of August, and continuing to flourish until the leaves will nourish it no longer. It can be most easily seen on the smooth leaves of the *Vitis cordifolia*, having the appearance of small, frost-like spots, which rapidly spread and soon cover the whole leaf, frequently extending down the petiole to the stem. This fungus, like the potato rot and other closely-related species, flourishes best in moist, warm weather. Under the microscope, the tissue of the grape leaf is seen to contain an abundance of minute threads, which force their way in all directions between the cells of the leaf, thrusting their suckers into the cells to rob them of their nourishment. When the time for fruiting comes, the threads pass out of the stomata of the leaf and branch in a definite manner, and bear the asexual spores on their tips, as we have observed in the potato rot. Under the head of the germination of these asexual bodies, Dr. Farlow has performed some interesting experiments. He finds they germinate equally well in the dark as in the light. Those sown in the morning germinate more quickly and abundantly than those sown in the afternoon. It was not possible to keep the spores which were formed in the night until the afternoon, as they generally fell from their attachments in the morning and began to germinate. In all cases the germination took place with surprising regularity. At the expiration of an hour and a quarter the contents of the spores had formed small oval bodies, which, before long, ruptured the cell wall and made their escape from the mother cell. They passed out rather slowly, usually one at a time, and paused for a moment in front of the opening, where they remained as if not quite free one from another. In a short time, each body began to extricate itself from the common mass, moved more and more actively, and finally darted off with great rapidity — a full-fledged zoospore furnished with two cilia. The average number of these rapidly-moving spores is from six to eight. Their movement gradually grows slower, and in from fifteen to twenty minutes they come to rest. Soon an outgrowth proceeds from one side and rapidly develops into a new plant. The sexual spores are found in autumn, within the tissue of the shrivelled leaves, as spherical, thick-walled bodies. They escape by the breaking up of the dry leaf, or through the decay of the surrounding tissue. The statement is often made that the mildew does not grow on the *Vitis vinifera*. By carefully conducted experiments, Dr. Farlow found it could be made to grow on the leaves of this European species, and with the usual luxuriance.

The Black Knot, to quote from Dr. Farlow, is "without doubt the most striking disease of vegetable origin occurring on fruit trees in this country. The disease takes its name from the unsightly, black, wart-like excrescences, with which every one is familiar on plum trees and different kinds of wild and cultivated. cherries. It is found in all parts of our country, east of the Rocky mountains, and is so common and destructive that in some districts one seldom sees a plum tree free from the knot. In some parts of New England, particularly in Maine and along the sea-coast, the raising of cherries has also been almost abandoned in consequence of the ravages of the black knot. The disease is peculiar to America, and has been the bane of fruit-growers from early times; and although much has been written in agricultural papers about its injury to the fruit crop, the subject has been almost entirely neglected by botanists. As a preliminary step it will be well to trace the development of the knot as it occurs on a single species, and for this purpose the choke cherry *(Prunus Virginiana)* may be selected." The size of the knots varies greatly, being found on the species of *Prunus* under consideration all the way from a few lines to several inches in length, with an average of two inches in circumference. The knot does not usually entirely surround the branch, but growing from one side, often causes the stem to bend or twist into an irregular shape. In the winter, when the branches are leafless, the knots are much more noticeable, and at this season they are often cracked, broken, worm-eaten and hollow.

In the swollen portions of the branch, above and below the knot, sections under the microscope show the vegetative portion of the fungus in the form of minute threads, twisted together and extending from the cambium towards the outer portion of the stem, where they become separated. The fungus first reaches the cambium, either by germination of spores on the surface of the branch, or by mycelium proceeding from a neighboring knot. The part of the cambium free from these bundles of mycelial threads grows in the usual manner; and in an old branch shows one more layer of wood on the sound side than on the diseased side. From this it is to be concluded that the growing layer of tissue of the plum or cherry branch is the place in which the fungus begins its destructive work. In the spring the swollen portion of the branch increases in size, and the mycelium soon reaches and bursts through the bark, so that by the time the choke cherry is in flower the knob has reached nearly its full size, though differing from an old one in being still greenish in color and solid or pulpy in consistency.

With a hand lens one can see small hemispherical protuberances which are the beginnings of the "perithicea," or pits in which the sexual spores are to form. The whole surface of the protuberances is covered with filaments, which are somewhat flexuous and branched. At the terminal joints, or frequently a little to one side, conidial spores are borne. These spores continue to be formed until near the close of summer, when the filaments dry up and only their shrivelled remains are to be seen. The knots now assume this black color, the inner pulp being either destroyed by insects or reduced to a powdery mass, with only the hard outer shell which contains the perithicea left in place. About the middle of January the spores in the sacs in the perithicea begin to ripen.

The knots on the choke cherry when compared with those on the plum and cultivated varieties of cherry are seen to be slightly different in general appearance, but when viewed with the microscope all prove to be identical, the difference noticeable to the naked eye being due to more favorable circumstances for its growth afforded by one species of *Prunus* than another.

Dr. Schweinitz was the first to describe the fungus causing the black knot, under the name of *Sphæria morbosa*.

The black knot is far from being of recent origin, and has furnished a subject about which vastly more has been written than was known. Many, especially the early writers, held it to be of insect origin, while, later, others have looked upon it as a vegetable growth, and still others include in its production both these forms of life. During the last thirty years the insect theory has been gradually given up by the entomologists, but it still remains for many fruit growers to accept the knot as being of fungous origin. The proof given by Dr. Farlow is very conclusive on this long disputed point. "First, the knots do not resemble the galls made by any known insect. Secondly, although insects or remains of insects are generally found in old knots, in most cases no insects at all are found in them when young. Thirdly, the insects that have been found by entomologists in the knots are not all of one species, but of several different species which are also found on trees that are never affected by the knot. On the other hand, we never have the black knot without the *Sphæria morbosa*, as was admitted by Harris, and the mycelium of that fungus is found in the slightly swollen stem long before anything which could be called a knot has made its appearance. Furthermore, the *Sphæria morbosa* is not known to occur anywhere except in connection with the knots."

With a knowledge of the nature of this contagious disease, the remedy at once suggests itself, namely, to cut off the knots, together with the swollen portions of the branches, whenever and wherever they are found. In autumn, as soon as the leaves fall, the knots can be most easily seen, and all branches bearing them should be cut off and burned at once. Though the sexual spores do not form until late in winter, it was carefully observed that were the knots left undestroyed they would ripen after the branch was cut from the tree. The choke cherry, bird cherry, and wild plum furnish means for rapid propagation of the knot, and they should be gladly sacrificed for the good of their more worthy allies. Knowing the cause, nature, and means of propagation of the black knot, it is for the fruit growers to profit by their instruction and use their best endeavors to destroy this pest. It is now peculiar to America, and any means of introducing it into other countries should be carefully avoided.

In concluding this general and very incomplete account of fungi, perhaps it will not be more than justice to give a notice of some of these parasitic plants which prey upon living animals.

Who has not seen house-flies in autumn, crawling slowly upon the wall with their bodies covered with a white powder, making them appear as if they had paid a visit to the flour barrel; or, later still, found them fastened in death to the wall or window pane? The struggle between the animal and vegetable has been won by the latter, which in due time must also perish when the substance of the fly is all destroyed. The tender and valuable silk-worm has long been subject to epidemics, by which large quantities have perished, causing such fluctuations in the price of silk that the trade in this product has been frequently threatened with a panic. The fungus, which is commonly called *muscardine*, begins its growth within the body of the insect, soon to increase in size and burst through the skin, thus producing death.

One of the most curious of these insect infesting or carniverous fungi grows upon or from the head of the larva of a certain species of moth. It is an amusing sight to see the heavily burdened larva bearing erect upon the front of its body a vegetable growth, often three or four times its own length, the signal of distress as it must be, telling plainly the slow but inevitable approach of death.

Thus we have seen that the members of this peculiar group of plants which has received the name of fungi, are all parasites, and from their very nature do not increase the amount of organic matter in the world, but on the other hand, are powerful reducing agents, seizing upon that which is highly organized, and aiding rapidly in its reduction to a more simple state.

Though fungi furnish delicious articles of food, it is in the light of their power to hasten decomposition that we see their great importance in the world ; aiding in the cycle of life by facilitating decay. Sometimes they encroach upon our fields of growing grains and fruits, and do us serious damage ; but even here the moralist would say there is a lesson of appreciation and care for our crops, which only the school of sad experience is able to teach.

MINERAL CONSTITUENTS IN PLANT GROWTH.

A paper presented by Prof. GŒSSMAN to the Massachusetts Horticultural Society.

A careful examination of the circumstances which have favored the recent introduction of a more rational farm practice for the production of crops, cannot fail to prove that the recognition of the important influence which certain mineral constituents of plants exert on plant growth in general has contributed more to our success in agriculture than any other one which may be stated. The confidence in the correctness of the current opinion, that the presence of these mineral constituents in an available form in the soil is essential for the reproduction of any plant from its seeds, is so firmly established in the minds of thinking agriculturists that we are apt to forget how recent the date when the first comprehensive experimental investigations in that direction rendered the existence of these relations between soil and plant more conspicuous. It seems at the present time almost incredible to notice in the writings of Justus von Liebig that, as late as 1830, one of the leading botanists of the University of Berlin, Sprengel, still asserted that ground bones are of no use as a fertilizer in Germany; or that the distinguished French chemist, Dumas, even ten years later, considered the mineral constituents of plants a mere incidental feature in the vegetable economy; or that before 1840 not one pound of Peruvian guano was used upon the farms of Europe, although Alexander von Humboldt, in 1814, had described its use as a fertilizer in Peru, and some shiploads of that material had found their way to the London market. In citing these instances I need not state that neither Liebig nor any other well-informed student of the agricultural practice in previous ages denied the high appreciation of wood-ashes, bones, gypsum, lime, marl, and other mineral substances, besides the various kinds of animal manures, in the farm management of earlier times. Modern rational agriculture does not rest its claim of progress on the mere introduction of any particular new mode of operation. For to try to maintain a remunerative fertility of the soil under cultivation by fallow and the rotation of crops, or to enrich one portion of the farm lands at the expense of another one by retaining a certain proportion of meadows and pastures to secure manure for the grain-bearing lands; or to enrich the surface soil at the expense of the subsoil by raising deep-rooting plants, as root crops, or leguminous crops, as clover, etc., for fodder and manure; or to improve the natural productiveness of the lands by deep ploughing, or by drainage, or by irrigation, are all modes of farm practice known, more or less, for hundreds of years. Our real progress in this direction consists mainly in the discovery of the *principles* which control the successful application of these practices in the management of farms.

Rational modern agriculture recognizes as the foundation of a successful farming the necessity of a strict restitution to the soil, in an available form, of those substances which the crops have abstracted, and it promises to that class of farmers who strive to comply with that requirement in the most economical way, the best chances of a *continued* financial success.

From a similar stand-point the earlier practice of using the above-named mineral substances and others in the farm management has to be judged as compared with their application at the present time.

As long as the composition of the air and the water was but little understood, and that of the soil practically unknown, no correct idea could be formed concerning their mutual relations, and still less regarding their connection with the life and the growth of plants.

For this reason, the first *successful* attempts to study the relations of the vegetable kingdom to these three agencies date only back to the close of the past century. They are largely the results of the labors of Lavoisier and Priestley. Foremost among the scientists who, at the beginning of the present century, devoted some attention to the chemical physiology of plants and the application of chemistry to agriculture, are De Saussure and Sir Humphry Davy. The former was the first who called attention to the variations of mineral constituents in plants, and pointed out some of their relations to the soil and the growth of plants, whilst the latter recognized already the atmospheric source of nitrogen for plant growth. The works of these illustrious investigators remained comparatively unknown to agriculturists until Liebig, in 1840, called the general attention to their excellence and importance. Although more exact analyses of the ashes of plants had been accumulating and some interesting features of the results had been pointed out,— as, for instance, the limited number and constant occurrence of the same mineral elements, as well as their varying proportions in the case of different plants,— no material change of opinion regarding their possible more intrinsic relations to plant life took place during the time which passed between the first publication of the investigations of De Saussure and Davy, and those of Liebig. The year 1840 is, on this account, usually cited as the beginning of a new era in the history of agriculture and its associated branches. It is justly claimed as one of the most valuable services which Liebig has rendered to scientific and practical agriculture, that he demonstrated by the aid of previous investigations, as well as his own, the true connection which exists between soil and plant, and the *intrinsic* value of the mineral constituents in the growth of plants.

Accepting, as we do, Liebig's teachings that a certain kind and a certain amount of mineral elements are indispensable for the complete development of a plant through all its various stages of life, and that, in case the ash constituents of the plant are not supplied in due time, the plant may come to blooming, yet cannot produce a perfect seed, it becomes quite obvious that the time-honored practice of using wood-ashes, or lime, or marl, etc., above referred to, for manurial purposes, presents quite a different aspect to us from any that it could possibly claim in previous ages; for, knowing now, in consequence of previous careful analysis of the ashes of its particular kind, what elements the perfect plant contains, the practical experience of the past receives a more intelligent interpretation of its results, and future success a better chance.

The direction which Liebig's genius has given to the study of plant growth, with reference to its application in practical agriculture, has been pursued since with an interest and success unparalleled in the history of any province of science. Practice and science have already for years worked hand in hand to study the influence of physical and chemical agencies on the production of vegetable growth, and to reconcile real and apparent differences of experimental results. Much has been accomplished — too much, in fact, to find here a mere passing enumeration; yet much more remains to be learned to free our present system of manuring from that degree of uncertainty which a reasonable prospect of success still demands. The unsatisfactory condition of our current modes of fertilizing our lands is, in a great measure, due either to limited information or almost entire ignorance concerning the following points:

1. What are the mutual, physical and chemical reactions of the various kinds of soil on the *different* materials we apply for fertilizing purposes? In other words, what becomes of the fertilizer in the soil?

2. In what *particular* form do the different plants absorb the various kinds of mineral plant food?

3. What are the *specific* functions of the different mineral substances of the plant food in the life of plants? What effect do they produce when applied in *different* combination?

The history of all well conducted field experiments points upon every page to the necessity of a closer study of every one of the above specified points, before any material improvement in our present mode of fertilizing our lands can be expected. The recently introduced practice of supplying our markets with special fertilizers for particular crops, if carried on beyond a limited generalization, deserves attention on account of the purpose of dealers to meet the desire of the farmers, rather than on account of either good economy or of a superior information in regard to the *special* wants of the *particular* kind of crop raised *under all conditions.* This remark applies with particular force to their use in horticulture and fruit culture; for the composition of most garden crops, as well as of fruits, is far less known than that of the majority of our farm crops.

A few ash analyses of plants do not suffice to decide what *kind* and what *amount* of mineral plant food a crop *needs*, and still less in what combination they produce the best effect. They simply tell what kinds and amount the plants under examination *contain.* It is a well established fact that the same variety of plants, when raised upon different kinds of soil, or upon the same soil of a varying degree of richness, may contain a widely differing absolute amount of the same mineral constituents. There is, apparently, in plant life, a possibility of an excessive consumption of food, as we know there is in the case of animal life. Science has not been able, thus far, to ascertain the existence of any *definite numerical relation between the exact amount of essential mineral elements of* *plant food* and *the amount of organic matter which may be produced by the aid of the former.* Whilst we are thus still ignorant in regard to some vital points in plant life, it is quite encouraging to notice the steady progress in studying the more intrinsic relations which evidently exist between the composition of the organic and inorganic portion of the plant. The very circumstance that the various mineral elements cannot substitute each other to any extent, if at all, without altering the relative proportion of the proximate organic constituents of the plant, or even endangering its very existence, suggests that dependency. The question, Can we alter the composition of plants, and if so, in what direction, and by what means? has become of late one of the most prominent subjects of agricultural investigation. The best scientific resources of our time are called on to ascertain the principles which underlie a successful practice, if for no other reason than the prospective large pecuniary interests involved. Agriculture has already realized considerable advantages from investigations in that direction, by learning how to cultivate certain plants, with either a view to increase their value for fodder, or to enhance their market price for some industrial application. Numerous experiment stations do at present attend to the wants of agriculture; and horticulture, the most successful branch of agriculture, begins to realize the advantages it may secure by adopting the same course. Experiment stations for the promotion of its special interest date from 1870, Germany claiming already three or four, to experiment solely with fruits.

My peculiar situation, as far as time and means were concerned, as well as a personal interest in the progressive work of the present, induced me some years ago to undertake, with the kind assistance of Professor S. T. Maynard, of the State Agricultural College at Amherst, a series of experiments upon the college grounds for the purpose of testing the action of more or less compound chemical manures, and of simple chemicals, on the production and composition of some fruits. Some of my results obtained in that direction are already, in part at least, published; others, of a more recent date, are only known to those connected with the work. I propose to relate both here, as far as they may add some interest to the matter under discussion.

EXPERIMENTS WITH GRAPE VINES.— The Concord grape vines which served in the experiments were planted in 1869 upon former pasture land. No fertilizer had been applied in the new vineyard excepting wood ashes but once, in 1871, previous to my investigation.

In 1873 several plats containing three rows of Concord vines, six in each row, were set apart in a suitable locality for the application of the special fertilizer. Directly adjoining were planted, at a similar distance from the Concord vines, corresponding every way with the arrangement of the former, in each plat, twelve wild-growing specimens of the *Vitis Labrusca* (wild blue grape), taking care at that time that a part of the wild grape vine remained in its original place, to secure the identity of variety, etc.

The original plant was left to its natural resources, and the transplanted part treated, in common with the Concord vines, with the following fertilizers per acre: four hundred and fifty pounds of dissolved bone-black, containing twelve per cent. of soluble phosphoric acid, and one hundred and eighty pounds of nitrate of potash, containing forty-five per cent. of potassium oxide, and thirteen per cent. of nitrogen; or fifty-two pounds of soluble phosphoric acid, eighty-one pounds of potassium oxide, and twenty-three pounds of nitrogen. One-half of the fertilizer was applied in the fall, the other half early in the spring.

The examination of the grapes from fertilized and unfertilized localities began three years after the first treatment of the various plats, and only the fruits of a corresponding state of ripeness served for the tests. The berries, freed from the stems, furnished the ash constituents. The juice of the entire grape was tested for grape sugar only.

The results of all ash analyses contained in these pages, including grape, strawberry, and peach, are reported here only with reference to five prominent constituents: Potassa, Lime, Magnesia, Iron, and Phosphoric acid. Other constituents of the ashes, as soda, silica, etc., although quantitatively determined, are for the present excluded from the discussion. The various subsequent analytical statements do, therefore, not represent the composition of the entire ash, but refer to the relative proportions in one hundred weight parts of the specified constituents. This course has been adopted to render the changes which occur in that direction more prominent. I gives the ash constituents of the unfertilized wild purple grape, from the original locality (1876); II, those of unfertilized Concord grape, from the college vineyard (1876); III, of fertilized wild purple grape, from college vineyard (1876); IV, of fertilized Concord grape, from experimental plat (1876):

	I.	II.
Potassium oxide	52.54 per cent.	67.70 per cent.
Calcium oxide	22.93 "	13.39 "
Magnesium oxide	5.77 "	3.67 "
Ferric oxide	0.81 "	0.47 "
Phosphoric acid	17.95 "	14.77 "
	100.00	100.00
Sugar in juice (1877)	8.22 per cent.	13.89 per cent.

	III.	IV.
Potassium oxide	66.35 per cent.	69.68 per cent.
Calcium oxide	15.08 "	9.84 "
Magnesium oxide	4.15 "	3.91 "
Ferric oxide	0.57 "	0.54 "
Phosphoric acid	13.85 "	16.03 "
	100.00	100.00
Sugar in juice (1877)	13.67 per cent.	15.43 per cent.

The fertilized vines appeared, on the whole, more vigorous, and the leaves, as a rule, retained their vitality longer in autumn than in the case of the unfertilized ones; they escaped repeatedly a serious attack of mildew when the remainder of the vineyard suffered with it more or less. The sugar seemed to be somewhat increased in the fertilized fruit of the Concord grape, and had increased one-third in quantity in the wild purple grape. The increase of sugar was accompanied by a marked increase in potassa, and, at the same time, a remarkably reduced percentage of lime in the inorganic portion of the grape. The influence of fertilization on the composition and the character of the fruit manifested itself in a higher degree in the case of the native wild grape than in the case of the improved variety. The results of these experiments afford an additional illustration to the opinion that special fertilization must be considered a factor of more than ordinary importance in fruit culture. Of course, sugar alone does not control the quality, yet the fact that its amount can be altered by fertilization shows the existence of still untried modes of treatment to promote the interests of horticulture; for what has been noticed to affect the quantity of sugar may, by some modification, prove efficient in regard to other constituents.

The entire vineyard has been for several years fertilized, with satisfactory results, with fifty pounds of soluble phosphoric acid, one hundred pounds of potassium oxide in form of muriate of potash, twenty-five pounds of nitrogen in form of Chili saltpetre,— sodium nitrate,— and twenty pounds of magnesium oxide in form of crude sulphate of magnesia, or kieserite.

EXPERIMENTS WITH STRAWBERRIES.— The varieties used for the experiment were the President Wilder and the Charles Downing. In the case of the Wilder strawberry the following fertilizer was used per acre: three hundred pounds of rectified Peruvian guano, two hundred and fifty pounds of dissolved boneblack, and two hundred pounds of muriate of potash. The following analyses convey a good idea of the difference in ash constituents between the common wild variety, without special manures, and the cultivated variety. The Wilder was raised with the aid of the above-mentioned fertilizers. I. Ashes of the fruit, of the wild strawberry (Richardson). II. Same of fertilized Wilder strawberry (College grounds):

	I.	II.
Potassium oxide	38.38 per cent.	54.07 per cent.
Calcium oxide	25.89 "	14.79 "
Magnesium oxide	trace	8.92 "
Ferric oxide	10.56 "	1.91 "
Phosphoric acid	20.30 "	20.31 "

The common wild strawberry contains usually one part acid to two of sugar, whilst it changes in the cultivated varieties from one of acid to four and more of sugar.

The experiments with the Downing variety were carried out for the purpose of studying the effect of five different kinds of special chemical manures on the ash constituents of this variety of strawberry. Five plats, fourteen hundred and thirty square feet in size, received the following fertilizers:

Plat one.— 15 pounds of superphosphate (12 per cent. soluble phosphoric acid) and 5 pounds of nitrate of potassa.

Plat two.— 5 pounds of nitrate of potash and 10 pounds of calcined kieserite (crude sulphate of magnesia).

Plat three.— 15 pounds of superphosphate of lime, 5 pounds of nitrate of potash, and 10 pounds of kieserite.

Plat four.— Received nothing.

Plat five.— 15 pounds of superphosphate of lime, 5 pounds soda saltpetre (Chili saltpetre), and 5 pounds of muriate of potash.

The fertilizers were partly applied in the fall, partly in the early portion of spring; the fruits were collected in the second year, after applying the first fertilizer. The following is the analysis of the ashes of the Downing strawberry raised upon the above-stated five plats:

	I.	II.	III.	IV.	V.
Potassium oxide..........	62.13	56.72	61.81	58.47	62.39
Calcium oxide...........	12.57	14.12	12.21	14.64	12.46
Magnesium oxide.........	5.96	3.29	6.00	6.12	6.33
Ferric oxide..............	2.32	5.77	3.64	3.37	2.50
Phosphoric acid..........	17.02	20.10	16.34	17.40	16.42
	100.00	100.00	100.00	100.00	100.00

The changes in the organic portions of the fruit raised upon the various plats will be studied the coming season, if time permits. As the mineral constituents of the berries show similar changes in relative proportion to those noticed in the previous experiments with grape vines, it is to be assumed that similar changes in the organic matter, and thus in the quality of the fruit, will be found.

The lime has decreased, and the potassa has increased, in plats one, three, and five, as compared with that in plat four.

The unfertilized plants in plat two form apparently an exception; yet the result may find a satisfactory explanation by the well known peculiar action of the sulphate of magnesia in sending the potassa rapidly to the subsoil, and thus beyond the reach of the roots of those plants which feed on the surface soil. Accepting this explanation, we have to assume that the presence of the superphosphate of lime (see No. 3) counteracts that tendency of the kieserite.

EXPERIMENTS WITH PEACH TREES.— The trees were planted by Professor S. T. Maynard, at different times, beginning with 1869. Those under special treatment for the disease called the "yellows" were planted in 1870. Of this planting, those on the top of the knoll, in light soil, have shown the greatest indication of the disease, whilst those within seventy-five yards, in lower and richer lands, appear to-day perfectly healthy. For five years after planting the trees received but little care, and little if any manuring except that applied to grow one or two crops of corn upon the land used. No special manures were applied until 1876; and since that time only one crop (squashes) has been taken from the land, except the fruit from the trees. The land has been kept light and mellow by means of a large cultivator, and by light ploughing once or twice.

Two rows of the trees received in 1876 a dressing with two different chemical fertilizers. The trees had been planted twelve feet apart in every direction. The fertilizers were applied in a radius of eight feet around the tree, taking care to keep off about one foot from their trunks.

Fertilizer No. 1 consisted of thirty pounds of rectified Peruvian guano, twenty-five pounds of dissolved bone-black, thirty pounds of sulphate of potassa (Stassfurt salt, containing from twenty-five to twenty-eight per cent. of potassium oxide), and twenty pounds of crude sulphate of magnesia, or kieserite.

Fertilizer No. 2 consisted of thirty pounds of rectified Peruvian guano, twenty five pounds of dissolved bone-black, and twenty pounds of muriate of potash. The amount specified in both instances applies to one-tenth of one acre. The trees which received either one of these fertilizers have made a better growth, and produced more and better fruit since, than the trees adjoining. There is no apparent difference between the trees upon the two experimental plats.

In the case of pear trees in different plats, which were treated in the same way and at the same time with both fertilizers, Fertilizer No. 1 has produced the best results in growth and in fruit. Both, however, surpass the unfertilized trees.

In 1880 a new series of experiments was inaugurated with ironsweepings and iron containing phosphates. The entire orchard has received since, annually, some potash containing phosphates, with good results. The special treatment of the diseased peach trees, pronounced by good authority to be suffering from the yellows, began in 1878, when my personal attention was first called to its appearance on the top of the knoll in the college orchard. The general appearance of the diseased trees suggested to my mind, at first, that an abnormal condition of the soil might be the cause. This condition might be ascribed either to a more or less general exhaustion, or to an absence of only some one or other *essential* element of plant food; or, finally, to the presence of some injurious substances which might have accumulated in the soil from some cause or other in the course of time. I felt inclined to consider, in either of these cases, the fungus which covers and disfigures the diseased parts of the trees a secondary feature of the disease. My observations of later years, with grape vines and currants in particular, have tended to strengthen in my mind that view in regard to many of our troubles with parasitic growth and diseases of plants. I have repeatedly noticed that plants suffered seriously from mildew and blight upon unfertilized and exhausted lands, when upon adjoining fertilized plats no sign could be noticed. On the other hand, the healthy condition of the roots, even to the last stage of the disease, and also the gradual disappearance of the green color, indicating insufficient production of chlorophyll, which causes the gradual change from a healthy appearance to a sickly one, beginning with the outer termination of the branches, which is the most active part for the formation of new vegetable matter, seemed to point towards a localized trouble, — a possible interference with the normal cellular functions,— an alteration of the osmotic action of the cellular tissues, and thus subsequent death of its affected part. This view of the case found support in the well known observations of Messrs. Nobbe, Schrœder, and Erdmann, regarding the action of sulphate of potassa and chloride of potassium on the growing of rye and of buckwheat. Sulphate of potassa had caused first a premature yellow color of the entire plant, which terminated with its gradual failing; whilst the chloride of potassium (muriate of potash) had caused a vigorous growth, a rich, dark green colored foliage, and a successful production of grains.

An examination of the cellular tissue of the diseased plants had shown an excessive accumulation of starch in the cellular tissue, indicating thereby a retention of that constituent, and but little chlorophyll was noticed. On the strength of these results I began, in 1878, to treat slightly affected trees with a phosphatic fertilizer in the usual proportion, adding at the same time from three to four pounds of chloride of potassium (muriate of potash) for every tree, and the diseased branches were cut back once or twice to the healthy wood. Soon after the new growth of the branches regained its green color. The details of this work were carried out by Professor Maynard, who to-day reports these trees in a vigorous condition. In connection with these analyses of healthy and diseased branches of these trees, I also made the analyses of the mineral constituents of the ripe and healthy (entire) early Crawford Peach, and that of the entire, prematurely ripened, diseased fruit. The following statement contains my results: I, fruit; Crawford's Early Peach, healthy; II, fruit; Crawford's Early Peach, diseased; III, branch; Crawford's Early Peach, restored; IV, branch; Crawford's Early Peach, diseased:

	I.	II.
Ferric oxide	.58 per cent.	.46 per cent.
Calcium oxide	2.64 "	4.68 "
Magnesium oxide	6.29 "	5.49 "
Phosphoric acid	16.02 "	18.07 "
Potassium oxide	74.46 "	71.30 "
	100.00 "	100.00 "

	III.	IV.
Ferric oxide	.52 per cent.	1.45 per cent.
Calcium oxide	54.52 "	64.23 "
Magnesium oxide	7.58 "	10.28 "
Phosphoric acid	11.37 "	8.37 "
Potassium oxide	26.01 "	15.67 "
	100.00 "	100.00 "

The above analytical results show a remarkable difference in the composition of the mineral constituents of the healthy and the diseased plant. The differences in both cases are most remarkable as far as potash and lime are concerned. The difference is more conspicuous in the branches than in the fruit. The diseased objects contain less potash and more lime than the healthy ones.

The subsequent statement contains a summary of result obtained by those investigations:

1. Healthy wood shows comparatively little stored starch; but fungous growth is present in the outer layers of the bark.

2. Diseased wood shows an abnormally small development of the cells, and the invariable presence of large quantities of starch; also an abundance of fungous growth.

3. Diseased leaves show the presence of fungous growth, discoloration, and cells filled with starch.

4. The fungus appears first on the surface of the trunk or branches, and thence enters the woody structure when the conditions are favorable.

5. There is little or no difference between the tissues and cell contents before and after the leaves fall.

6. While fungus is abundant on fully diseased trees, it is also to be found on trees which, *once diseased, had been restored to a condition of vigorous health.*

The previous statements seem to confirm some of the views entertained by me when planning the investigation. The results seem to point toward an interior disorder before the fungus enters the living tissue.

Whether some other internal or external influence, or both, inaugurates the disease, whether the various forms of the disease are merely a matter of degree, or whether they are of an entirely different character, must, of course, be left to future investigation. I consider my results of a general interest rather on account of what they suggest than of what they seem to me to prove.

BACTERIA.

In an address delivered in 1878, before the Massachusetts State Board of Agriculture, by Professor W. S. Farlow, of Massachusetts State Agricultural College, he says: "At the lowest limits of the vegetable kingdom, some would say, below the lowest limits, is a large group of very minute beings called 'Bacteria.' They are very small; they are found everywhere; their study taxes the *highest powers of the first scientific men.* It will be a long time before the scientific world will know much about them and longer still before the public do. Without being a prophet, it will be safe to predict that within the next ten years the agriculturist will have to listen to an immense amount of nonsense about the harm these small bodies do, and the diseases they cause." This prediction has been fully verified, and there is to-day hardly a disease, or misfortune even, which life is afflicted with, that is not attributed to some form of these minute organisms. Long, sensational articles, written by quacks, patent medicine venders, and even by so called scientific men, are continually seen in our periodical literature, designed and tending to alarm the public in regard to the evil they are doing and the dangers to be apprehended from their presence.

There is no doubt but that in certain forms and under certain conditions these apparently insignificant bodies do play an important part in the phenomena of life, and have a great power for good and for evil, but just what that part is, and the extent of this power, is far from being fully known. The most extravagant ideas have been advanced in regard to them, so extravagant, in fact, that it does not seem possible that they could have been seriously entertained. It has been claimed that they are not only the life principle, the origin of all life, but also the source of all matter; that from a single germ of these minute bodies, all nature, from the inanimate atom to the highest living organism, even man, endowed with reason and intelligence, has been evolved by development; that their agency is sufficient for all things, so that there is no necessity for a Divine intelligence to create or superintend. Some have also held that in them we see a practical illustration of the principle of spontaneous generation, and proof that conditions are the real cause of life in all its varied forms. But the investigations of scientific men have clearly demonstrated the fact that as far as it is possible to look into the hidden mysteries of nature, each form springs from and bears "seed of its kind," and that the further back we go, the simpler the forms and elements, the greater appears to be the necessity for an intelligent mind and an omnipotent power as a first cause, not only to design and create, but also to give to such feeble instruments such an inherent adaptation and power as to enable them to perform their mighty mission with the precision, regularity and force of law.

These extreme views are now generally rejected, and there is a strong tendency in the other direction, to regard these organisms as the prime agents of disease and death, rather than the source and promoters of life. The germ theory of disease has long been held by a few, but of late years the number of its adherents has greatly increased, and from being the cause of disease in a few cases, it is now claimed to be the source of nearly all diseases, both in the animal and vegetable world. Recently it has been declared that all the different forms of blight seen in our apple and pear trees, and the yellows in the peach, are the direct result of these germs. It is mainly on this account that the subject will be of interest to the horticulturist, and that some of the most important facts brought to light by the scientific investigation of these minute bodies are here given.

Much has been discovered in regard to their history, but there is still much that is unknown, and will doubtless long continue so, for it is a significant fact that those who have spent the most time and labor in these investigations seem to be the least inclined to make positive statements in regard to them. With the data at command, it will not be possible, perhaps, to reach definite results, but some benefit will be secured if a brief statement of a few points in their history and of the differences of opinion held in regard to them, and the difficulties encountered in their study, will serve to allay fears and check the disposition to form hasty conclusions.

The existence and active agency of those organisms in the phenomena of life is not of recent discovery. As far as we have any record of investigations made in the past, they seem to have been first discovered by Leenwenhock, of Amsterdam, in 1675. He was the inventor of the microscope, and while testing the power of his lenses in the examination of a drop of stagnant rainwater, he was greatly astonished to find that it contained a multitude of atoms of globular form, darting about in every direction. The following year he discovered them in fæces, and in the tar-

tar from the teeth, and gave such a description of their forms and movements, with drawings illustrating the descriptions, as to leave no doubt that they were the same objects known as the bacteria of to-day. Nearly a century later, O. F. Müller, of Denmark, gave twelve years to their investigation, and discovered three hundred and eighty different forms of these bodies in the fresh and salt water at Copenhagen. These he named and classified as *Monas* and *Vibrio* under the general group of *Infusoria*. Microscopists soon gave a good deal of attention to their investigation, but owing to the imperfect instruments in use, little progress was made. There was much conflict of opinion in regard to their place in life, whether they belonged to the animal or vegetable kingdom. Most of the old observers classed them as animals, mainly, because they appeared to have the power of voluntary, independent motion like animals, and were able to assimilate organized substances. In the following century there was a great increase in the number of observers and in the perfection of the instruments used, yet but little progress was made in settling the questions as to their nature, varieties and proper classification. In 1859, M. Devaine first clearly demonstrated that they belonged to the vegetable kingdom and were related to the Algæ. M. Ferdinand Cohn, who of all observers has given the most attention to this subject, and whose opinions are regarded as the most reliable, says that "they belong to the Algæ, but from the want of Chlorophyl resemble the fungi." Dr. Magnin, a French *savant*, in summing up the conclusions of M. Cohn, states that: "If there are still differences of opinions among naturalists as to the place of bacteria among the Cryptogams, there is but one opinion as to their vegetable nature." Some still dissent from these views, but they are generally indorsed by the majority of observers.

Though they are insignificant in size, in numbers and variety they are wonderful. They are to be found everywhere. "Of all beings, they are the most widely diffused. We find them in the air, in water, upon the surface of solid bodies, and in the interior of plants and animals." Some claim that normal blood and healthy tissues are full of the germs; others are inclined to doubt this, and are disposed to believe that the germs seen in these conditions come from the air, while undergoing examination. If a transparent liquid containing a small quantity of organic matter is exposed to the air it becomes clouded in a short time, and the microscope will show that it contains myriads of these bodies. Their presence in the atmosphere has been ascertained by forcing currents of air through tubes lined with sticky substances, or closed at one end with wads of cotton. After the air has been thus filtered the cotton is found to be filled with these germs. Water may be filtered in the same way and the germs collected. The following extract from an article in the London *Nature*, giving the results of experiments made in Paris, will give a better idea as to the numbers found in air and water: "It will astonish many persons, no doubt, to inform them that even the purest country air is peopled with a host of microscopic corpuscles, which enter into our lungs together with the air we breathe, and which come in time to take up their residence in our own bodies, as in a well-furnished house all prepared to receive them. The surprise would be greater and even more disagreeable should we add that the number of these germs, thus held by the air in suspension, enormously increase in places thickly or even constantly inhabited — that there is not a bedroom, a saloon, even an attic, in which they do not swarm; that in great cities they multiply to fantastic proportions. The most densely inhabited parts of the city are also the most populous with microbes. The air is ten times thicker with germs in the heart of Paris than in the neighborhood of the fortifications. The proportion also varies according to seasons; it is greatest in summer, lower in winter, diminishes in autumn. There are variations likewise corresponding to the state of dryness or dampness of the streets. The air is most infected during the periods of summer, when, by reason of the scarcity of water, the streets are not sprinkled, and the dust flies everywhere. At such times not less than 5,000 bacteria have been found to the cubic metre (39.33 inches) of air. But while at Paris, even in the rainy season, one must always reckon upon the germs in the interior of dwellings, and daily scattered to the winds every time that rooms are cleaned; in the country, upon the other hand, once the atmosphere is well swept by rain, it remains pure until the winds again come to lift from the soil the fine, light dust peopled with living microbes.

"Everybody knows how easily dust penetrates into rooms, and that in any city a few days' neglect is sufficiently shown by the appearance of a fine layer of impalpable dust on a marble table or other articles of furniture. Well, in one single gram (about 15.43 of our grains) of such dust 1,300,000 bacteria have been found. Another experiment made in the Rue Monge revealed the presence of bacteria in the still more fantastic figure of 2,100,000 in one gram of dust which had collected upon furniture.

"It is in the wards of hospitals that those germs are found in the greatest quantity. While the atmosphere of a house in the most thickly settled portions of Paris contains from 3,000 to 4,000 germs to the cubic metre of air, the atmosphere of hospital wards contains from 7,000 to 8,000 germs per metre. At the hospital of La Pitie the average is 11,000 bacteria per metre. In the confined air of one room of the same hospital, M. Miquet found the sadly eloquent number of 28,900 bacteria per cubic metre.

"Our water has been analyzed like our air. To every litre (four and a half litres are equal to our gallon) of rain-water M. Miquet found 64,000 microbes; in Seine water at Bercy, 4,800,000 per litre; in Seine water at Asmiers, 12,800,000 per litre; and in sewer water in Clincy, 80,000,000 per litre."

Professor Lister, the renowned English surgeon, has tried some very interesting experiments which well illustrate the great variety and number of these germs in the atmosphere and the difficulties encountered in the examination of the development of special varieties, their presence in and relation to certain tissues. The experiments made were to preserve milk from the organism always found in sour milk, which he designates as *Bacillus Lactis*. For this purpose he prepared twelve small glass "culture-tubes," taking the utmost pains that scientific skill could devise to destroy the germs that might be in the tubes and instruments used, and to prevent exposure to the air at any point. Each of these tubes were charged with milk fresh from the cow in the stable. No *bacillus lactis* were found in any of the tubes, but some other germs were discovered there, and nearly as many in kind as there were tubes. The same experiment was repeated in the open air, outside the cow-house, with the same result; every tube contained germs, most of them of different kinds, some of orange color, some pink, green, and different shades, varieties he had not seen before. Still another experiment was made with twelve more tubes. The cow was driven to the orchard in the morning, just after a shower had cleared the air, and the conditions were the most favorable possible; yet in ten of the twelve tubes the germs were developed within a day or two.

The germs found in the atmosphere are mainly spores, or the seeds of the perfect plant or organism, and they have a general resemblance both in form and size to each other; so much so, that if judged by this we should conclude that there were but very few varieties. But when placed in proper conditions for growth a great variety of form is seen. When full grown, some are round like a ball, others oval; some resemble rods of varied lengths and outline, rectangular, tapering and obtuse; others are long, fiber-like, straight or curved, wavy and spiral. In some, these peculiarities are quite marked and easily seen, in others very indistinct; so much so as to make it very difficult to determine to which variety they belong. When we take into consideration their minuteness in size, we shall more readily appreciate the difficulty of deciding what they are, so as to say definitely whether they belong to this or that class. The differences between a horse and a mule are discernible at a glance when they are of their natural size, but reduce them so that a magnifying power of two thousand diameters is required to make them visible and the differences would not be at all appreciable, though still there; so it is with these minute bodies. Professor Ferdinand Cohn says on this point, "so long as the makers of our microscopes do not place at our disposal much higher powers and as far a possible without immersion, we will find ourselves in the domain of bacteria, in the situation of a traveler who wanders in an unknown country, at the hour of twilight, at the moment when the light of day no longer suffices to enable him to clearly distinguish objects, and when he is conscious that notwithstanding all his precautions he is liable to lose his way."

The globular and oval forms are in a general way classified by themselves, under the general name of *Micrococcus;* the short rod-like kinds are called *Bacterium;* the straight, fiber-like are called *Bacillus;* the curved and wavy, *Vibrio;* and the spiral, *Spirillium.* For a long time many regarded these varied forms as but different stages of growth of one and the same organism, and that the little differences seen in what might be called the same stage were due to more or less favorable conditions for development, but the most careful investigation has demonstrated that each is but the characteristic form of a separate species; that while there is a general resemblance in the spore state of all kinds, and that the spores of all are similar to the mature form of the class called *Micrococcus*, each variety has its peculiar characteristics and workings, as permanent and distinct as is seen in the higher orders of plant life. This conclusion has been reached through experiments in the separate cultivation of the different varieties, planting the individual germ in a fluid containing the necessary nourishment, giving the proper temperature and watching it through all its stages of growth. Owing to the difficulty of destroying all germs in the nourishing fluid, and of excluding those in the air, great care is required, and uniform results have not always been reached in these experiments. Some claim that the deadly *Bacillus Anthrax* found in splenic fever can be changed by different treatment and a change of nourishment into the *Bacillus subtilis*, an innocuous germ, common in all infusions of hay, and also the reverse, but the general belief is that no change of nourishment, or other conditions will produce a change in the form of mature development; that like must come from, and must produce like.

There is perhaps as great a difference in their size, if such a thing can be conceived of in bodies the largest of which is microscopic, as in their form. Take the *Bacterium termo*, the germ found in most all forms of putrefaction, and which is said to be the active agent in all kinds of fruit tree blight, it is far from being the smallest. An adult germ of this variety has an average length of 18,000th of an inch and a diameter of 16,000th. To make this appreciable by figures, try to cover a surface of an inch square with them, placing them compactly, end to end and side by side in rows. It will require 8,000 rows with 16,000 in a row, or 128,000,000 in all. This is the full grown form. The spores are much smaller, if we can realize it. An estimate made by Dr. Thomas Taylor, Microscopist of the Department of Agriculture, may help us in this. He states that there are organisms so small that a globe which can pass easily through the eye of a cambric needle would contain 20,000,000 of them. Wonderful as these statements are, Professor Cohn has been led by his investigations to say "that it is by no means certain that there are not organized forms even beyond these, and that when the mathematician declares that matter is capable of infinite division, he is laying down an actual as well as a theoretical truth."

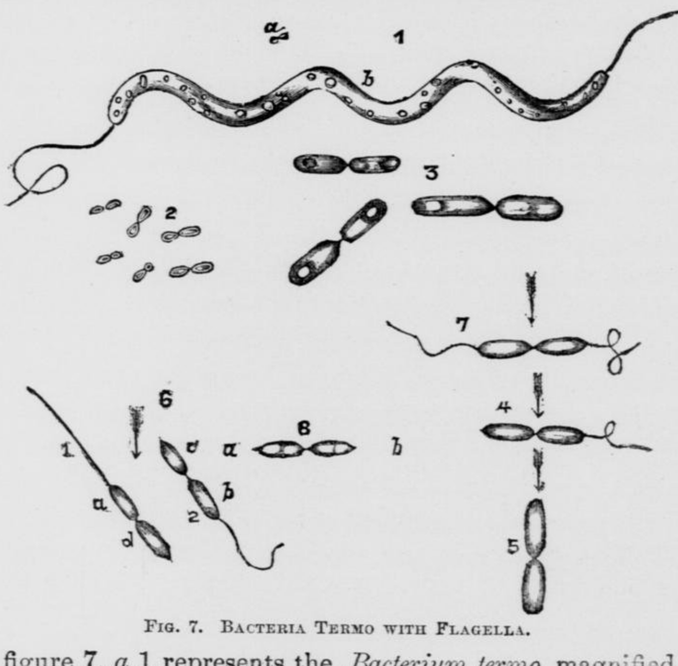

FIG. 7. BACTERIA TERMO WITH FLAGELLA.

In figure 7, *a* 1 represents the *Bacterium termo* magnified with 1,300 diameters, diminished one-half, while *b* 1 represents the *Spirillum volutans*, the largest of the bacteria, and one usually found in vegetable infusions and in all fresh and salt water, magnified with the same power as *a*. No. 2 is *B. termo*, seen with a power of six hundred diameters. No. 3, with one of 3,700 diameters. No. 4 represents the *B. termo*, with a cilia at one end, the light coming on the object in the direction of the arrow. No. 5, the same body moved at right angles, with cilia invisible. No. 6 represents a bacterium with one cilia moving; as the ends *a*, *b*, were in focus the cilia were visible but not with *c*, *d*. No. 7 gives their true form, and No. 8 shows the form before cilia were brought into view and gives the pointed termination of the bodies.

The spore form of development has been mentioned, but this is only one of the forms in which it multiplies, and that, too, much the least rapid. The most rapid increase in numbers in its local development is in the growth and division of the adult cell, or by fission as it is termed. "When the bacterium has grown to perhaps double its original size, then it constricts itself in the middle like a figure eight, and breaks into two new individuals; each of these in a short time divides again, and on account of the rapidity of this process we usually find them multiplying, either constricted in the middle, or hanging together in pairs. The warmer the air, up to nearly 100°, the faster proceeds the division, and the stronger the multiplication; in a lower temperature it becomes slower, and ceases entirely in the neighborhood of the freezing point. We know that bacteria divide themselves in the space of an hour into two parts, then again after another hour into four, after three hours into eight, etc. After twenty-four hours the number exceeds sixteen and a half millions (16,777,220); at the end of two days this bacterium will have multiplied to the incredible number of 281,500,000,000; at the end of three days it will have increased to forty-eight trillions; and after a week the number can only be expressed by figures of fifty-one places. In order to make this number comprehensible, we will reckon the mass which may result from the multiplication of a single bacterium. A single individual of the most common species of *Bacterium termo* has the appearance of a short cylinder of a thousandth of a millimetre in diameter, and perhaps one five-hundredth of a millimetre in length. Let us now think of a cube, the side measuring a millimetre (cubic millimetre), six hundred and thirty-three millions of rod bacteria will completely fill this cavity without leaving any empty space. The fortieth part of a cubic millimetre would perhaps contain the bacteria that proceed from one single little rod in twenty-four hours; but at the end of the following day the bacteria would fill a space equal to 442,570 such cubes. Take the space which is occupied by the seas of this world, about two-thirds of the terrestial surface, say with a mean depth of a mile, the collective contents of which would be nine hundred and twenty-nine millions of cubic miles; by continual progression of multiplication the bacteria which spring from one germ would in less than five days fill the whole world's seas completely full; the number can only be expressed by figures of thirty-seven places.

"Almost all bacteria," Professor Cohn states, "have two different modes of life, one characterized by repose, and one by motion. In certain conditions they are excessively mobile, and, when they swarm in a drop of water, they present an attractive spectacle, similar to that of a swarm of gnats, or an ant-hill. The bacteria advance, swimming, then retreat without turning about, or even describe circular lines. At one time they advance with the rapidity of an arrow, at another they turn upon themselves like a top; sometimes they remain motionless for a long time, and then dart off like a flash. The long rod-bacteria twist their bodies in swimming, sometimes slowly, sometimes with address and agility, as if they tried to force for themselves a passage through obstacles. It is thus that the fish seeks its way through aquatic plants. They remain sometimes quiet, as if to repose an instant; suddenly the little rod commences to oscillate, and then to swim briskly backward, to again throw itself forward some instants after. All of these movements are accompanied by a second movement analogous to that of a screw which moves in a nut. When the vibrios, in the shape of a gimlet, turn rapidly round their axis, they produce a singular illusion: one would believe that they twisted like an eel, although they are extremely rigid."

Efforts have been made to account for these movements in various ways. An explanation, given by some, is that they are the voluntary movements of real animal life; others reply that the same motions are seen in forms of life known to be vegetable. Another theory is that the motion is produced by arms or cilia attached to the germs, such as are seen in zoospores of fungoid origin. It is true that they have these cilia or flagella, as they are usually termed, but the bodies are sometimes seen in motion when the cilia are at rest, and sometimes they move rapidly while the body remains at rest. Another explanation given is that it is caused by the presence of oxygen, and the assimilation of food. How this process can lead to the movements seen is not clear. The probabilities are that when we can explain the movements seen in many forms of living protoplasm in the higher orders of life, we shall get at the cause here also.

Up to a comparatively recent date, many supposed that these bodies were composed of protoplasm in a solid form, but later researches have demonstrated that they are perfect cells, with a cellular membrane resembling the cellulose of larger vegetable cells, which are filled with a nitrogenous fluid or substance, usually transparent, and refractive, resembling protoplasm of plants of the higher orders. In the smaller species this protoplasm seems to be alike throughout, but in the larger ones and also in some of medium size, granules, vacucles and, sometimes, points highly refractive, and of different shades of color are seen. Where temperature and nourishment are favorable, these granules and shining points develop into spores or sporangia, and form the permanent germs and the most important means for the widespread dissemination and perpetuation of the organisms.

In most of the varieties the mature organism has two cilia or arms. This fact was for a long time called in question, but is now generally conceded. They are so fine and delicate as to test the highest power of the strongest instruments in use, and it is only by a careful adjustment of light and the focus that they can be seen at all.

Having the regular cellular structure, it is generally conceded that they obtain their nutrition in the same manner with other vegetable cells, by endosmotic absorption. They are known to take nitrogen from ammonia itself as well as from its compounds, and to assimilate carbon and other elements from the organized substances containing them, not by "nibbling the grains of starch like mice and rats," as has been stated in illustration of the movement seen in such grains, where blight was seen, but by endosmosis.

Mr. Grimn states that upon examining with the microscope some particles of a lemon containing bacteria and spores of algæ, he saw a certain number of bacteria gather around a spore, and fix themselves to it by one of their extremities. They did not penetrate it; but when they left it, the spore had diminished in volume, while the bacteria had taken a greenish color.

The most important question in relation to their history is, do they, by contagion, direct poison, or by their power to assimilate the organic substances in which they are found, cause disease and death, or are they but natural agents to hasten the resolution of living organisms into their original elements, when decay has already commenced? Can they cause disease, or are they only the result of it? On this point there is a great diversity of opinion among scientific men. A great many experiments have been tried to settle the question, but with such varied results as to cause those best acquainted with the subject to be very non-committal in expressing their opinions. Dr. Antoine Magnin, who has given to the public the most complete treatise on the subject yet published, in speaking of their effect in certain diseases, sums up by saying, "We do not feel justified in adopting any definite conclusions," and closes a volume of nearly two hundred pages in regard to these germs with the statement, "As to their *role* in fermentations, in putrefactions, in contagious diseases, and in surgical lesions, notwithstanding the considerable number of labors of which bacteria have been the object in these different points in view, it is not yet possible to define it in a certain manner." Others, of whom the most prominent are M. Louis Pasteur, the renowned French scientist, and Dr. Koch of Berlin, hold that they are the primary and special cause of disease; not claiming, perhaps, that there is not usually some previous adaptation of the tissues affected which aids their development, and that there may not be conditions of vitality in the animal exposed to the attack which will give perfect immunity, but their power is such as to enable them to produce disease and death in a majority of cases. The wonderful experiments of M. Pasteur, and Prof. Salmon of our own country, in the innoculation of cattle, sheep and chickens with the attenuated virus containing the germs found in splenic fever and chicken cholera, have led many to indorse these opinions; but the same experiments, and others in the same line with the germs found in other diseases, have not been attended with like satisfactory results. We give a few opinions on this point.

Prof. Roberts of Manchester, England, as the result of his investigation, says that septic bacteria are not parasitic on living healthy tissue. They constantly enter our bodies in the air we breathe, the food we eat; they come in contact with cuts, sores and scratches that are often found on our flesh, but without injurious effect unless the tissues are already dead. Could they breed the same in living tissue as where decay has commenced, animal life would be impossible.

The following is a condensed statement of the views of Prof. Lionel Beal, F. R. S., a distinguished English physician and microscopist: "The tongue is constantly covered by whole forests of bacteria. Millions pass into the stomach whenever we swallow. It is the same with all animals. Every vegetable and fruit and leaf also contain countless numbers. So does the air we breathe and the water we drink. All disintegration and decay facilitates the growth of this minute vegetation. It is certain now that bacteria in large quantities are constantly passing into the alimentary canal of men and animals without doing harm. There is probably not a part of the body of any one of us, one-quarter of an inch in diameter, where their germs are not present. So small are they that they pass freely into the substance of every organ. They exist within us, even in the blood, without disturbing us in any way."

In disease their numbers are vastly increased. "I have seen every part of the stomach, the small and large intestines, filled with curdled milk which, when placed under the microscope, seemed to be almost composed of bacteria. But this probably did not originate the disorder, but resulted from the prior diseased state of the secretions. It is still an open question whether infectious diseases originate from some special kind of death-carrying bacteria, or from practices wholly independent of all such organisms. Though some evidence has been adduced in favor of the first hypothesis, many new facts must be discovered before the problem is solved."

Dr. George M. Sternberg, surgeon of the United States army, and member of the National Board of Health, and translator of Dr. Magnin's work on Bacteria, says:

"There would be an end to all animal life, or rather there would never have been a beginning, if living animals had no greater resisting power to the attacks of these parasites, which by numbers and rapid development make up for their minute size, than has dead animal matter. Nature has placed in the living tissues of animals a resisting power against the encroachments of bacterial organisms invading and surrounding them, which is sufficient for ordinary emergencies. But when the vital resistance of the tissues is reduced, on the one hand by wasting sickness, profuse discharges, etc., or, on the other hand, the vital activity of the invading parasitic organism is increased, the balance of power rests with the infinitesimal but potent micrococcus. * * * Experiment has demonstrated that, by some unknown mechanism, the ordinary bacteria of putrefaction, and, under certain circumstances, even pathogenic organisms, may be introduced directly into the circulation without the production of evil consequences, and that after a short interval microscopical examination does not reveal their presence in the blood."

Many more opinions of the same character, and even stronger, could be given, but these will suffice to show that all scientific men do not regard this as a settled question. There are also other points which have a bearing on this subject, that may well be mentioned here, viz.: that innoculation with a certain kind of germ does not always produce the same disease. Where virus containing *Bacillus Anthrax* has been used, the result in some cases has been septicaemia instead of splenic fever, and in recent experiments in the innoculation of rabbits with the microbe found in the saliva of one who died of hydrophobia, part of the animals died of this disease, and part of purulent fever and septicaemia. An experiment of the same character in Berlin produced *bacillus tuberculosis*, the germ claimed to be the cause of consumption.

Drs. H. C. Wood and Henry Formad, in experiments made under the direction of the National Board of Health, with the form of *Micrococci* found in connection with diphtheria, came to the conclusion that these germs differ from those found in common sore-throat only in reproductive activity, and that diphtheria could be self-generated when the conditions in the body or those acting upon it from without were such as to stimulate the inert *Micrococci* in the mouth into activity. These germs are also to be found in the mouth and throat of healthy persons. *Bacillus tuberculosis* is found not only in connection with other diseases than consumption, but is said to have been found in healthy tissue of the lungs, and it is so announced by a medical society in Berlin. Pasteur himself, in recent investigations, discovered the *Microbe* of hydrophobia in the throat of healthy persons, indicating that it may be harmless under certain conditions. Mice and rabbits have eaten tissue filled with spores and fibers of *B. Anthrax* with impunity. Virus containing these germs and also that of germs found in hydrophobia, has been injected into the veins of arterial blood without conveying the contagion.

Dr. Rosenberger, of Wurzburg, after destroying the germs in virus by holding it at 300° of heat for two hours, then reproduced the disease by innoculation with it and found the tissues filled with the same germs again.

Dr. Rossbach caused death by the injection of a purely chemical poison and the body was soon filled with multitudes of bacteria where none were to be seen just before. Space will not permit a further extension of this subject, but surely enough has been presented to show that there are many difficulties in the way of arriving at definite conclusions in regard to the exact mission and power of these lower organisms, and to give sufficient reasons for doubting some of the positive statements made in regard to them, at least until we have more light on the subject. It is better to go slow, than to be compelled to retrace our steps; it is prudent to see where you are going to land before you jump, whether the object be to clear a physical obstruction or to support a theory. We had not intended at the outset to speak of this subject in connection with the recent claims made as to its relation to the question of blight in our fruit and ornamental trees, but will say, that, after a careful and candid investigation of what has been said both for and against, the difficulties seem fully as great, if not greater, if we accept the theory as true. The fact that these same germs are found in the cells of healthy growing plants, without any evil effect, not only on the vigor of the plants but not even on the infested and adjoining cells, as was stated by French observers in 1869 and even earlier, and as has been confirmed by more recent investigations, is proof positive that their presence in vegetable as in animal life is not always injurious, and gives at least fair ground for the inference that when seen in connection with disease it is the presence of the disease that makes their development possible, rather than that they are the direct cause of the disease. The fact that these organisms are found in nearly all forms of decaying plant tissue, and in some cases in which we know that they are not the direct cause of the incipient decay, also naturally leads to the conclusion that they are but an attendant result. The reasoning, that because these organisms are found in Fire Blight, Twig Blight, Sun Scald, Blight in the Quince, Blight in Lombardy Poplar following insect perforations, Sun Scald in the Butternut, and in the twigs of Aspen Poplar, these diseases are but varieties of one and the same malady and have one and the same cause, viz: bacteria, may be a little more ingenious, but certainly does not appear more logical or satisfactory than that of the boy who concluded that "it was the maggots in the dead body he saw that killed the calf." A "laugh" may be the most appropriate answer to both, but it would be fully as strong an argument on the boy's side. These organisms are doubtless found in all cases of the decomposition of organic matter at that stage of the process where they can find in an available form the elements necessary to their development, but this does not prove that they are the cause of the decay; it would rather tend to establish the opinion that they are one of nature's provisions for the return of the decaying elements to their original condition.

ROSES, AND HOW TO GROW THEM.

HENRY B. ELLWANGER. From Western New York Horticultural Report.

This is a query put by many interested devotees of rose culture, annually, and one in which all who love floriculture in any of its many forms have a never failing interest.

As we are each year adding new sorts to our list of varieties and are also making some occasional discoveries and improvements in propagation and cultivation, it follows that our selection of kinds and our treatment in culture will vary somewhat from year to year, as new varieties appear to take the places of old favorites, and we have knowledge of improved methods for the care of them. The first requisite is the selection and preparation of a suitable place for planting. This is very important, as all that follows depends upon the care used in this first step.

To begin with, then, choose the best place you have in the garden, a place where you can offer sufficient protection by means of hedges or board fences from bleak sweeping winds. When fences are used, their general ugliness can be most appropriately clothed by roses themselves. A warm, sunny position is also requisite; if so situated that there is an exposure to the morning sun and the hot rays during the afternoon are in part or wholly shaded, all the better, but a certain amount of sunlight is as essential to a rose's welfare as to our own, though many of us do not show our appreciation of the blessings of sunlight as gratefully as do our roses. Besides scattering them through our gardens, roses may be made very effective planted in borders about our lawns, either individually or in groups, and also planted in beds on the lawn. When the latter is done, we may with great advantage depart from the usual custom of growing the plants in bush form and resort to what is termed the pegging-down system.

In this case the mode of procedure is quite simple. Having planted our roses — for this purpose those on their own roots are preferable — we allow them to grow the first season in the usual way, the following autumn or spring the short and weak shoots are entirely cut away, and the long ones carefully bent down and fastened to the ground by means of pegs, or where more convenient or preferred, they may be tied to stakes. Occasionally it happens there is a hard stiff shoot which will crack or break near the ground; but if the bark on the under side continues whole, this is generally of no consequence, as flowers will be produced as well as though the shoot were uninjured.

Every year the pegging down must be repeated, the old shoots being cut away, and the new ones which have come up during the summer, laid down in their place. The great advantage of this system over the ordinary practice of growing in bush form, is the immense quantity of flowers produced, thus giving a magnificent appearance on the lawn, and affording all the cut flowers desired for household use.

Soil.— Roses will do well in any ordinary garden soil that is free from standing water and well drained. Where there is too much clay, the soil can easily be made sufficiently friable by the application of wood and coal ashes, lime, stable manure, etc. Where, on the other hand, a soil is sandy or two light, we need to bring clay, muck, leaf mold, etc., to obtain sufficient body.

Pruning is best done during November or March, though to secure a good second crop of flowers in the autumn, it is also necessary to prune immediately after the first flowering is over with.

Manures.— In regard to this important portion of cultural operations, we would say that there must be a generous application if we expect a generous yield of flowers. When roses are planted in the spring, if the soil is ordinarily rich, it will be better not to dig in much manure about the roots, but rather apply it as a surface dressing. This will at once be nourishing, keeping the roots cool, and prevent suffering from the drouths of summer. The following autumn, say in November, after the roses have been planted, there should again be applied as a mulching a free application of stable manure, which may be dug in the next March. We find cow manure the best fertilizer, on the whole, that we have tried, though all kinds of stable manure are excellent, as are also bone-dust, soot, guano, etc. For full directions regarding this and kindred objects, we refer to the several excellent works on roses.

* * * A perfect rose, for general cultivation, should excel in the following particulars, and in the order named:

First—Beauty of color—As that which first attracts us to a rose.

Second—Beauty of form—Without which our eye cannot rest long, but wanders on, seeking a combination of the two in one flower.

Third—Fragrance—Deprived of this no rose can be perfect. Whoever yet saw a beautiful rose without wishing to inhale its odors? Gratification in this matter is ofttimes far more pleasing to us than the mere sight of beauty.

Fourth—Profusion and continuity of bloom. We like our good things in abundance, poured out to us with generosity, that we may have to distribute and carry our pleasure to friends.

Fifth—Vigor and healthfulness of growth. That will produce strength of plant thriving with a moderate degree of care and attention, and that will endure the extremes of summer's heat and winter's cold.

Let us consider at some greater length these several qualities essential to a perfect rose.

First—As regards color we like something decided and pronounced, or else of great delicacy and softness, and, withal, as durable as possible. The varieties differ very greatly in this respect. For example, *Pius the IX*, a well-known old rose of splendid habit, very seldom is seen of a clear color; the sun fades it almost immediately after the flowers expand, and a dirty shade of rose is produced, anything but pleasing. *La Reine*, *Giant of Battles*, and others are likewise affected, though in less degree. Some, like *Abel Grand* and *General Jacqueminot*, are quite permanent, lasting ofttimes till the petals wilt and fall. Above all things, therefore, we want our colors pure and steadfast.

Form.—In form, the rose shows almost as much diversity as in color. We have globular, cup-shaped, imbricated, and quartered roses, besides may modifications of these forms. The globular rose, as shown in *Alfred Colomb*, is the finest of them all, but the others are very pleasing in their variety, and we should not wish to be confined to the one type. The quartered or flat form is the most objectionable, though there are very many lovely roses of quartered or flat shape, such as *Caroline de Sansal*, *Baronne Prevost*, etc., which are large, full, and even symmetrical. Shirley Hibberd, in his excellent work on roses, places form before color. This may be right in an exhibition box of roses, but not as judged from our standpoint; however, it shows the very great importance of excellence in form, without which a rose cannot stand very high in the scale.

Fragrance.— Did one ever think what we should lose were our roses deprived of their sweet odors? Why, there would at once be a vacant throne, with no rose to hold the queenly scepter, and the strife of Dahlia, Camella, Lily, Gladiolus and Rhododendron for supremacy would have no check, no limitation. Among all the delightful perfumes exhaled by the Lily, Heliotrope, Daphne, Jasminum, etc., none yield such delicate, sweet-scented odors as *La France* and *Louis Van Houtte* give us; they are alike supreme in beauty and fragrance.

Profusion and continuity of bloom.— This is also a very important feature, as is ably set forth by W. D. Prior in an article on "Autumn Roses," in which he says: "One of the most important points in which all roses of comparatively recent introduction should be carefully watched is that of the habit of free autumnal bloom. Until this has been well established, the title of even the finest varieties to rank as perpetuals is incomplete. There is the greater necessity for this vigilance because true perpetuity is the chief claim to superiority that our modern roses are able to advance over some of their summer predecessors, which in form, color, vigor of growth and hardiness are quite their equals, being surpassed only in the valuable property of having more than one season of bloom. Another reason for impartial examination as to this quality is, that so many novelties receiving certificates, or which attract the commendations of adepts at exhibitions, ultimately turn out lamentably shy in autumn, mere summer roses in fact, yielding, it may be, under peculiar circumstances, a flower or two in the latter part of the year. It unfortunately happens that not a few even of the established favorites are capricious and unreliable in the essential feature which gives a name to the class to which they are held to belong. Let any one walk through a large collection of roses from the end of August till the time for lifting arrives, and he will be struck at beholding row upon row of healthy looking trees utterly destitute of the vestige of a flower. In other cases a bloom here and there may be seen, but nothing in quantity to justify the title of perpetual, while others will be found yielding flowers till the frost cuts them off. These last are the kinds most valuable for the purposes of the general rose public, in contradistinction to the limited class concerned with exhibition; hence the necessity of ascertaining the trustworthy autumnal blooms every year.

There is no doubt we have altogether too many kinds of so-called Hybrid Perpetuals, which, though excelling in many other qualities, are lamentably deficient in this; they are perpetual in name only, and do not yield a sufficient number of flowers; they, therefore, should give place to true perpetual varieties.

Vigor and healthfulness of bloom.— Last, and scarcely least, we look for a strong constitution.

Varieties subject to mildew have our commiseration as well as our regard; while weak or slow growing varieties, like *General Washington*, *Giant of Battles*, *La France*, etc., we unfavorably contrast with the exuberant, healthful growths of such sorts as *John Hopper*, *General Jacqueminot*, *Baronne Prevost*, etc.

EXPERIENCE AMONG THE ROSES.— Canon Hole, in his charming book about Roses, says: "He who would have beautiful roses in his garden, must have beautiful roses *in his heart.* He must love them well and always. He must have not only the glowing admiration, the enthusiasm, and the passion, but the tenderness, the thoughtfulness, the reverence, the watchfulness of love." This is the sum and substance of what constitutes our success in rose culture; without this true love, failure, partial or complete, must surely attend our efforts. Because we are imbued with a love for the rose, it does not of necessity follow that we can grow roses well; experience teaches otherwise; the novice must be prepared to expect some disasters arising from the mistakes which he will certainly make.

A common error committed by beginners is, attempting to grow varieties that are of delicate habit; attracted by great beauty of flower or fragrance, they do not consider, or do not understand, that vigor of growth, perpetuity of bloom and perfect hardiness are very seldom combined with the qualities which have allured them. The most popular roses are the Hybrid Remontants; these are moderately hardy, and produce flowers of the highest finish. Among them none are more desirable for tyros than *Alfred Colomb*, *John Hopper* and *General Jacqueminot.* These three varieties probably absorb more of the desirable features that go towards making the perfect rose than do any others which could be named; they blend well, and are very effective planted in a bed together, or separately. A pleasing departure from the usual method of growing roses is found in the pegging-down system. In this way the long shoots are carefully bent down, and fastened to the ground by means of hooked sticks or pegs. As a result of this system, an immense quantity of bloom is produced. True, the individual flowers are not of equal finish to those grown in the ordinary way, but we get a mass of color, a striking effect, that is not otherwise to be had. I do not advocate this method to the exclusion of the other, but its occasional use will certainly be satisfactory. Besides planting roses in beds, we should scatter them through the borders of our gardens, giving the more favored positions to the delicate kinds. Among these we find *Eugenie Verdier*, the most beautiful of the Victor Verdier type, a rose of very delicate tint — deep silvery pink, tinged with salmon — lovely in the bud, and in the open flower attractive as maid or matron; not only the flower, but the foliage of this variety, is most pleasing. Another variety which is beautiful in both flower and leaf is *Charles Lefebvre.* This has the thick texture of petal, and something of the same form as *Eugenie Verdier*, but the color is that of *General Jacqueminot*, deepened by a shade of satiny purple. Amongst the somewhat neglected roses are *Marguerite de St. Amande*, a deep pink, beautiful in the bud state, and flowering through the summer and autumn months. *Baroness Rothschild*, a blush pink, with exquisite cup-shaped flowers; single blooms of this kind, during December and January, sell in New

York for one dollar, and even two dollars, each; it has always been a great favorite with exhibitors. *Francois Michelon* is a striking variety, intermediate in character between its parent, *La Reine*, and *General Jacqueminot;* it has large, deep, rose-colored flowers, veined with lilac; of splendid, globular form; a valuable feature is its late blooming, the flowers not developing until most others of the same class are past their prime. *Eliza Boelle* is perhaps the finest white rose that we have; it blooms profusely all through the summer; has full, globular flowers of the most perfect form; the center is generally tinged with blush. It is not possible to imagine a flower of greater beauty.

Moss Roses have long been favorites in our gardens, but it is wonderful how many inferior varieties are grown; sorts are disseminated that are not mossy, are not beautiful. None of the Moss Roses will compare favorably with those of other classes as regards the open flowers; it is the fine buds that make them so attractive, and if a Moss Rose has not a well-formed bud it is worthless. The best of the Mosses are *Gracilis*, *Crested* and *Common*, a triad whose crested loveliness has a common grace.

Not one of the least of the qualities we desire in a rose is fragrance; in this regard all classes must do homage to *La France*, the sweetest of all roses; compelled to choose one variety, this should be ours. To be sure it is rather tender, but it can easily be protected, and so winter safely. It does not always open well, but it is a simple matter to assist it; an operation not practicable with most varieties that do not open perfectly. If *La France* does not develop well, by pressing gently with the finger the point of the bloom, and then blowing into the center, the flower will almost invariably expand, the pent up fragrance escape and almost intoxicate with delight our sense of smell.

Not enough attention is given to the Tea Roses and Bourbons. The Hybrid Remontants justly claim our first attention when they are in their perfection, but after their first blossoming is over, throughout July, August and September, they are much less attractive than many monthly roses. Varieties like *Bougin*, *Gerard Desbois*, *Homer*, *Sombreuil*, *Madame de Vatry*, *Marie Van Houtte* and *Madame Caroline Kuster* will give a continuous supply of flowers throughout the summer and autumn. Has it ever occurred to any of my readers how faithfully the various varieties of Tea Roses portray the beautiful tints, often painted in the sky at sunset and at sunrise? The many shades of rose, pink, lilac, white, salmon, yellow, etc, are found in both alike, and it would often puzzle one to decide where the most beautiful combinations of these delicate shades are found — in the sky, or in the petals of these roses.

The fact of Tea Roses being tender should not debar us from their culture; the truth is, they have, in this matter, been abused. Those sorts I have named are, in reality, but little more tender than *La France*, the Hybrid Noisettes, and all the *Victor Verdier* race of Hybrid Remontants. If earth be hilled up above the plants, and then a slight covering of loose material, like branches of evergreen, be given, the hardier sorts of monthly roses will winter in safety. There is sometimes a loss of plants, but the percentage is slight, very little more than happens to the so-called hardy roses. In giving this protection, care must be observed not to smother the plants by entirely excluding the air. This never occurs from the use of evergreen branches, but when straw or litter is taken, sticks or boards should be used to prevent the material matting together. This is one of the causes where it is possible to kill by mistaken kindness. If it be objected that this covering of roses is troublesome, then we must reply to the objection, you are no true lover, you are but a false knight, you cannot have beautiful roses in your garden because you have not them in your heart.

INSECT KILLERS.

By WILLIAM SAUNDERS, London, Ontario. From Western New York Horticultural Report.

In addition to such manual operations as searching out wood borers with the knife and destroying them, the jarring for curculios and their subsequent capture and destruction, the catching of the larvæ of the codling moth under bands, traps, etc., there are various substances destructive to insect life which have been used with more or less success. Among those applications which have been recommended for the destruction of insects injurious to the roots of fruit trees and vines, hot water and bisulphide of carbon are deserving of notice. Applied to the root louse of the apple tree it is claimed that hot water has proved efficient, but a very little consideration will suffice to convince every nurseryman that there are great difficulties in the way of the successful use of this remedy. Were the operations of the insect confined to the collar of the tree, or the superficial roots only, one might hope that by removing the surface earth and applying the hot water freely, to exterminate the pest; but those of you who have suffered from it know too well that this insidious foe establishes itself as well on the small outlying rootlets, and also on those which penetrate the soil to a considerable depth. Hot water applied to the surface of the soil cools rapidly as it passes through, and the heat thus abstracted soon reduces the temperature below the killing point; it is difficult and laborious also to transport a sufficient quantity of hot water where this evil is wide spread.

Nature comes to man's aid in this extremity. We have a parasite known as the root louse, *Pipiza radicum* Riley, which feeds, in the larval state, on this insect with avidity. The parent fly, which is two-winged, and measures, when its wings are expanded, nearly half an inch across, lays its eggs among the colonies of lice nearer the surface, and from thence the footless maggots seek out and devour the lice wherever they can find them.

Bisulphide of carbon is used as a remedy for the phylloxera on the vine, and is also equally applicable to other insects feeding on roots. Its use was suggested by French experimenters, and it has been extensively tried. It is a very volatile substance of an intensely disagreeable odor, inflammable, and, under some circumstances, explosive. It is recommended to make one or more holes in the soil, near the affected vine, to the depth of from one to two feet, and into each hole pour one or two ounces of the liquid, then close the orifice with earth and tramp it lightly down. The volatile fluid gradually vaporizes, and the poisonous effluvia arising from it permeates the porous soil and destroys the insect foes lurking there. There is little doubt as to the efficiency of this remedy when used in sufficient quantities, but, for several reasons, it is not likely to come into general use. If applied too freely, it is said to injure the roots; its offensive odor would deter some from handling it, others would consider its inflammability and explosive character sufficient reason why its use should be avoided; while the still weightier reason of its expense stands in the way of its very general use.

Those insects which affect the trunk and branches of trees are either borers which burrow under the bark or bore into the solid wood, or bark lice of various species, which fasten on the growing twigs and suck the juices therefrom. For the former, when they have once found a lodgment in the tree, we can suggest no better remedy than that of searching them out and destroying them, but much may be done to prevent their attacks. In each case the parent insect deposits her eggs on the bark, usually in little crevices, formed by irregularities in the surface, and when hatched, the young larva at once commences to eat through the outer bark to the interior. Alkalies, such as potash and soda, also alkaline earths, such as lime, are very destructive to insect life, and, by coating the bark with a suitable alkaline solution, at the proper season, either the insects will be deterred from depositing their eggs thereon, or the eggs or young larvæ will be destroyed. A suitable solution for this purpose may be made by adding to a gallon of soft soap about half a gallon of a strong solution of washing soda, as much as the water will dissolve. This solution, which will be about the consistency of paint, should be applied sometime early in June, selecting a fine dry day for the work, when the solution, on drying, will form a sort of alkaline varnish not readily washed off by rain. If thought desirable, the application may be repeated a month later. The mixture of lime and sulphur, recommended as a preventive for fire blight in the pear, would probably serve an equally good purpose, and applied to pear trees might do a double service. The same applications would be efficacious in removing bark lice, but for this purpose should be applied to the affected branches earlier in the season, just as the buds are bursting, as that is the time when the young lice are hatched and most easily destroyed. In the case of bark lice it is well, also, during winter or early spring, to scrape the limbs, and thus remove and destroy a large proportion of the scales under which the eggs are lodged, or the same purpose may be effected by the use of a stiff scrubbing brush, dipped in strong lye, or a solution of washing soda.

Applications to destroy insects devouring the leaves may be poisonous or non-poisonous. Among the latter hot water has proved efficient, in many instances, and, since it is always available, it should, in the absence of more certain remedies, be promptly used. The leaves of most plants and trees will bear the free application of scalding water without injury, and when showered on the larvæ of insects it causes them to fall promptly to the ground, writhing with discomfort. Strong decoctions of Quassia, May apple root and smart weed have also been found serviceable; pepper in powder dusted on the foliage has also been recommended.

Of the poisonous compounds, Paris green, which is a compound of arsenic and copper, in the proportion of — parts of the former with — parts of the latter, is without doubt, the most generally useful. It differs from most arsenical compounds in that it is insoluble, and, hence, less likely to injure the plants to which it is applied, when properly diluted. If used in a more concentrated form it will, however, sometimes disfigure and scorch the foliage. I have seen this effect produced on potato vines when the application has been much stronger than necessary. The insolubility of this poison seems to adapt it specially to act as a poison to insects feeding on foliage. There are two points, mainly, which have militated against universal concurrence in the efficacy of Paris green. One is the fact that it is often largely adulterated. There is so much competition now in business, and such an eagerness among the public for cheap goods, that the temptation to pander to this feeeling is very strong, especially since there is money in it, and, hence, manufacturers are usually obliged to make two or three grades in quality in order to meet the demands of their customers. The higher grades are usually pure, while those lower in price are adulterated, containing, indeed, so much foreign matter that they afford both manufacturer and dealer much larger profits than the pure substance would, and, while the close buyer flatters himself that he has bought as much for twenty-five cents as his neighbor has for forty cents or fifty cents, if the two articles were properly tested it would usually be found that the purchaser of the higher priced article had received by far the most value for his money, as the difference in strength is sometimes two or three times in favor of the pure substance. The buyer of the cheap grades often finds that Paris green is a humbug, that the beetles eat it with impunity, and that while he has supplemented his twenty-five cent purchase with one or two dollars' worth of labor he has accomplished but little, while the less penurious man, having entirely cleaned his potato patch for the time being, is well satisfied with the results of his work. Further, the user of the lower grades of Paris green finds it necessary, in order to accomplish anything, to apply the substance freely, which leads to another evil, for when he gets a really good article he is likely, in mixing it, to use it two or three times as strong as there is any need for, and by so doing sometimes scorches his vines, and then condemns the Paris green on this account.

If a pure article of Paris green is procured it will bear a large amount of dilution. If mixed with any dry material, such as plaster, flour, or ashes, it should have from forty to fifty times its weight of the diluting material. But it is far better and more convenient to use it with water, and a tea-spoonful of the poison to a pailful of water is quite sufficient. With a pail in one hand and a broom corn whisk in the other a man can dip into the pail, keep the powder uniformly diffused in the water, by the frequent introduction of the whisk, and sprinkle the vines almost as fast as he can walk along the rows, and do this in any but wet weather, at any time in the day, and with far less material than it would require if used in any other manner; besides, all the risk which arises from inhailing the dust is avoided. Used in this way, or with a syringe, Paris green will be found effectual in destroying almost every form of caterpillar which devours the leaves of fruits, plants or flowers.

London purple is another substance which has been strongly recommended as an insect killer. This is an arsenical mixture, a waste product, being the refuse which remains after the manufacture of aniline dyes. Before its introduction as an insecticide it had no commercial value, indeed the dye-makers were at considerable expense and trouble in getting rid of it as it accumulated. The arsenic, which is the active ingredient in it, is present in the form of arsenious acid, and, as one might expect in a waste product, in very variable proportions; sometimes it forms less than twenty per cent. of the mixture, at others more than forty per cent. Prof. Riley gives, as the result of an analysis by the chemist in the department of agriculture, forty-three per cent. while specimens, examined lately by myself, have not yielded more than eighteen per cent. It is associated chiefly with lime and coloring matter. The arsenic in this mixture is in a very fine state of division, and intimately mixed with the lime and other materials, forming a very fine powder. It is much more soluble than the Paris green, and hence more liable to scorch the foliage, while its very variable strength makes it an uncertain compound to trust to. For these reasons London purple is certainly far inferior to Paris green for this purpose.

Arsenic or arsenious acid has also been tried diluted with various substances. An artificial mixture of arsenic and lime of known strength, colored, could be supplied just as cheaply, and would be more reliable than London purple, but, owing to its solubility and caustic character, unless used very carefully it is apt to destroy the tissues of the leaves, making them appear as if burnt or scorched.

Powdered hellebore, which is the powder of the root or rhizome of veratrum album, is a poisonous substance which, in most instances, destroys caterpillar life very promptly, but there are some insects much less sensitive to its effects than others, and for these Paris green is required. Wherever hellebore will accomplish the desired purpose it should be used in preference to stronger poisons. It is best applied mixed with water in the proportion of one or two table-spoonfuls to a pailful of water, and used with a whisk, as recommended for Paris green. Taken in any quantity into the human system this powder produces very violent symptoms — vomiting and spasms, followed by convulsions and insensibility.

The insect powders of commerce are the powdered flowers of different species of Pyrethrum. Those of P. carneum and roseum were introduced twenty or thirty years ago under the name of Persian insect powder, and, within a much more recent period, those of P. cinneriæfolium under the name of Dalmatian insect powder. Both of these powders are good insecticides, but the Dalmatian is much the more active, and, hence, commands the highest price. The pyrethrums are hardy plants, which bloom abundantly the second year from seed. The powder is prepared from the half opened flowers, gathered during dry weather, and dried in the shade under cover.

House flies are very sensitive to the influence of these powders, and a few puffs of the dust, blown into the air of a room, with closed doors, the discharges being directed towards those parts where flies congregate, will stupefy and paralyze them within a few moments so that they will all be found on their backs, struggling on the floor, and injured to such a degree that but very few ever recover the power of flight again. They are also extremely useful in destroying cockroaches and other household pests, and, used in the same manner in a green-house, but a little more freely, they have a similar effect on plant lice.

Prof. Riley, giving the result of some experiments with this California pyrethrum powder on the cotton worm, states that the slightest puff of the powder causes the worm to drop almost instantly from the plant, and insures its speedy death. Besides using the powder pure he used it mixed with a small quantity of rosin, and also tried it diluted with ten times its weight of flour, and says that when thus diluted "it produces equally good results as when pure." This is indeed a most unexpected result, and it seems difficult to understand how a powder of this sort can, when mixed with ten times its weight of insect powder, be equally efficient with the undiluted substance. It is also asserted that a strong decoction of the powder with water produced no appreciable effect, but that an alcoholic extract mixed with water in the proportion of one part to fifteen or twenty of water, and sprayed on the leaves, was very efficacious in killing the worms.

FRUIT STATISTICS.

COUNTIES.	APPLE ORCHARD.		BUSHELS, 1880.	ACRES.	BUSHELS, 1880.	ACRES.
	No. of acres.	No. of bearing trees.	Apples.	Cranberries.	Cranberries.	Growing timber.
Adams	218	8,030	9,594	47	57	41,000
Ashland	....	....	....	....	....	500,000
Barron	49	1,266	834	1	1	300,000
Bayfield	2	100	....	....	....	944,640
Brown	276	8,946	9,838	....	....	28,769
Buffalo	211	9,770	4,052	....	....	26,387
Burnett	6	46	....	1,216	2,522	260,000
Calumet	665	23,570	49,226	....	....	45,991
Chippewa	61	2,268	1,416	....	....	185,997
Clark	193	6,799	3,557	6	125	128,647
Columbia	2,157	72,343	208,022	12	40	81,082
Crawford	1,119	26,493	34,018	....	....	102,696
Dane	3,891	124,563	195,898	1	....	115,752
Dodge	3,057	100,336	197,482	....	....	48,154
Door	133	2,815	2,045	....	....	41,513
Douglas	5	100	....	....	....	200,000
Dunn	191	8,098	3,579	....	....	76,919
Eau Claire	300	7,702	4,630	....	....	19,170
Fond du Lac	2,982	113,052	197,365	6	3	49,416
Grant	3,853	130,054	160,697	1	....	129,033
Green	1,876	72,376	135,971	....	....	59,171
Green Lake	1,311	52,802	88,746	4	1	24,075
Iowa	1,211	51,999	89,909	....	....	59,528
Jackson	230	9,338	4,941	1,501	6,076	74,787
Jefferson	2,667	101,030	237,978	2	6	32,975
Juneau	603	14,991	20,855	1,495	9,565	28,968
Kenosha	1,638	53,108	72,577	....	....	14,806
Kewaunee	172	6,353	2,725	....	....	32,563
La Crosse	411	14,536	9,151	....	20	50,097
La Fayette	1,557	61,142	71,946	....	....	38,289
Langlade	....	....	....	600	....	96,286
Lincoln	....	....	....	....	....	1,890,000
Manitowoc	1,016	28,162	34,513	21	45	72,198
Marathon	58	1,619	1,004	....	....	506,547
Marinette	2	....	163	80	3,500	275,000
Marquette	683	17,854	19,857	56	85	61,572
Milwaukee	2,991	80,428	217,760	....	....	19,378
Monroe	[illegible]22	19,011	14,796	682	6,075	80,093
Oconto	116	2,362	3,435	....	4	95,001
Outagamie	769	21,443	19,[illegible]97	....	5	89,466
Ozaukee	1,122	26,113	68,321	....	....	21,489
Pepin	83	2,835	1,879	....	....	3,864
Pierce	363	9,922	6,593	....	....	88,627
Polk	29	1,8[illegible]1	232	16	352	80,421
Portage	568	4,544	4,832	560	15	19,761
Price	2	....	....	500	....	469,500
Racine	2,150	76,418	143,275	....	....	15,833
Richland	804	26,108	17,263	....	....	109,685
Rock	3,748	134,184	251,508	....	....	52,734
St. Croix	238	14,144	1,565	4	14	51,875
Sauk	1,696	54,164	71,058	....	25	85,362
Shawano	175	9,618	1,739	40	400	91,123
Sheboygan	2,458	76,468	221,503	5	20	54,652
Taylor	1	22	....	....	....	617,000
Trempealeau	265	10,320	4,822	....	2	27,584
Vernon	1,167	39,652	29,967	5	....	125,932
Walworth	3,662	119,991	250,230	5	39	41,585
Washington	2,531	74,894	130,006	1	....	50,756
Waukesha	3,520	128,623	283,190	21	54	44,956
Waupaca	357	13,551	11,005	57	215	138,326
Waushara	519	13,737	13,924	1,018	31,743	75,008
Winnebago	1,543	90,471	83,833	38	4	17,589
Wood	63	2,031	1,378	7,480	11,159	170,000
Total	64,466	2,189,596	3,743,374	15,481	72,154	9,379,728

WISCONSIN MEANS FOR A NUMBER OF YEARS FROM VARIOUS SOURCES.

PREPARED BY C. A. SHAW, SIGNAL OFFICER.

MEAN DAILY BAROMETER.	Mean temperature.	Highest temperature.	Lowest temperature.	Total rainfall.	Range of temperature.	Prevailing direction of wind.	Place of observation.
1822	49.5	92	—23	....	115	SW	Fort Howard.
1823	42.4	100	—38	....	138	SW	Fort Howard.
1824	44.4	100	—18	....	118	SW	Fort Howard.
1825	46.7	100	—25	....	125	SW	Fort Howard.
1826	45.1	100	—32	....	132	SW	Fort Howard.
1827	45.6	98	—16	....	114	W	Fort Howard.
1828	45.6	92	—20	....	112	S	Fort Howard.
1829	43.4	92	—32	....	129	SW	Fort Howard.
1830	46.7	100	—26	....	126	S	Fort Howard.
1831	46.7	96	—24	....	120	S	Ft. Winnebago (Portage City).
1832	50.4	93	—33	....	126	S	Ft. Winnebago (Portage City).
1833	51.8	98	—14	....	112	SW	Ft. Crawford.
1834	50.1	98	—28	....	126	SW	Ft. Crawford.
1835	41.7	91	—26	....	117	SW	Winnebago (Portage).
1836	41.2	90	—22	....	112	NW	Ft. Winnebago.
1837	41.8	99	—18	31.32	117	N	Ft. Winnebago.
1838	40.9	104	—29	27.88	133	NW	Ft. Winnebago.
1839	44.3	94	—26	28.95	120	N	Ft. Winnebago.
1840	42.7	98	—23	28.12	121	N	Ft. Winnebago.
1841	41.8	92	—29	28.45	121	N	Ft Winnebago.
1842	43.8	92	—21	24.51	113	N	Ft. Winnebago.
1843	41.7	94	—22	22.80	116	NW	Ft. Winnebago.
1844	47.6	91	— 6	39.06	97	NW	Ft. Winnebago.
1845	45.7	94	—12	25.34	106	W	Fort Snelling.
1846	55.9	94	— 6	26.10	100	SE	Fort Snelling.
1847	41.8	93	—24	21.80	117	W	Fort Snelling.
1848	42.5	90	—24	23.18	114	NW	Fort Snelling.
1849	42.3	93	—30	49.69	123	SE	Fort Snelling.
1850	43.5	98	—24	25.50	122	SW	Fort Snelling.
1851	46.6	94	—28	23.42	122	SW	Fort Snelling.
1852	47.4	93	—18	40.00	111	N	Beloit College.
1853	47.8	91	— 9	45.71	100	SW	Beloit College.
1854	49.4	97	—19	31.63	116	SW	Beloit College.
1855	45.9	98	—15	24.69	113	S	Beloit College.
1856	45.2	96	—26	27.44	112	S	Beloit College.
1857	44.4	93	—20	30.56	113	S	Beloit College.
1858	48.0	94	—15	39.76	109	S	Beloit College.
1859	46.2	98	—22	21.94	120	W	Beloit College.
1860	46.6	94	—26	22.35	120	S	Beloit College.
1861	47.6	98	—11	34.63	109	W	Beloit College.
1862	47.1	97	—18	35.30	115	NW	Beloit College.
1863	47.8	93	—10	29.29	103	NW	Beloit College.
1864	45.6	96	—29	31.12	125	NW	Beloit College.
1865	46.4	90	—20	24.40	110	S	Beloit College.
1866	45.4	94	—20	29.27	114	S	Beloit College.
1867	45.5	96	—19	24.04	115	SE	Beloit College.
1868	45.2	92	—23	34.74	115	NE	Beloit College.
1869	44.7	88	— 3	30.40	91	S	Beloit College.
1870	47.1	98	—15	27.83	113	NW	University, Madison, Wis.
1871	46.1	91	—15	29.45	106	W	University, Madison, Wis.
1872	43.5	92	—28	22.44	120	SW	University, Madison, Wis.
1873	43.8	91	—21	26.49	112	NW	University, Madison, Wis.
1874	45.8	96	—15	29.02	111	SW	University, Madison, Wis.
1875	42.4	86	—25	22.58	111	W	University, Madison, Wis.
1876	45.8	90	—22	36.04	112	SW	University, Madison, Wis.
1877	46.5	86	—16	27 67	102	SW	University, Madison, Wis.
1878	49.7	92	— 9	39.54	101	NW	University, Madison, Wis.
1879	47.9	91	—22	35.23	113	NW	Signal Service, Madison, Wis.
1880	47.8	93	—21	46.72	114	S	Signal Service, Madison, Wis.
1881	46.7	95	—20	52.93	115	NW	Signal Service, Madison Wis.

SUMMARY OF METEOROLOGICAL OBSERVATIONS TAKEN AT THE UNITED STATES SIGNAL SERVICE STATION, MADISON, WISCONSIN, FOR THE YEAR 1881, BY C. A. SHAW, SIGNAL OFFICER.

MONTH.	THERMOMETER EXPOSED IN OPEN AIR.				BAROMETER CORRECTED FOR TEMPERATURE.				Inches of rain and melted snow.	Miles of wind.	Percentage of saturation.	PERCENTAGE OF WIND.—Three telegraphic Observations, 6:10 A. M., 2:10 P. M., 10:10 P. M.								
	Max.	Min.	Mean.	Variation.	Max.	Min.	Mean.	Fluctuation.				S.	SW.	W.	NW.	N.	NE	E	SE.	C.
January	58	6	34.6	52	30.615	29.334	29.953	1.281	2.75	8,688	73	21	7	21	20	13	3	3	4	....
February	55	0	28.2	55	30.814	29.134	29.958	1.710	1.75	8,740	70	13	6	8	18	9	6	13	11	....
March	57	7	33.6	50	30.640	28.911	30.021	1.729	2.11	9,615	68	2	7	16	26	21	5	12	3	....
April	78	23	46.6	55	30.401	29.173	29.864	1.228	5.48	9,758	65	15	4	13	19	10	9	11	8	....
May	84	44	65.5	42	30.383	29.438	29.877	.945	4.45	7,344	62	24	3	6	10	8	10	30	7	...
June	87	50	69.6	37	30.251	28.986	29.862	1.265	9.31	6,077	71	9	11	2	16	7	7	28	10	....
July	93	53	71.9	40	30.193	29.698	29.916	.492	6.00	5,343	72	14	17	9	22	7	7	10	4	...
August	92	52	71.0	40	30 217	29 665	29.952	.552	5.90	5,691	74	13	12	11	7	13	5	24	8	...
September	85	40	60.6	45	36.374	29.584	29.974	.790	4.44	6,185	71	16	17	14	13	9	5	5	11	....
October	75	26	48.5	49	30.471	29.068	29.985	1.403	1.68	8,069	67	19	13	18	15	11	3	2	12	....
November	60	−7	26.8	67	30 741	29.264	30.124	1.477	1.68	7,915	72	20	15	25	10	5	1	5	9	....
December	40	−21	17 0	61	30.727	29.200	30.099	1.517	1.17	7,402	75	9	7	26	22	13	3	4	9	....
Sums	.....	.....	......	.....	......	....	....	......	46.72	90.857	......	......	..	...	......	......	....	....	......	....
Means	....	.....	47.8	..	....	....	29.980	....	....	7,571	70	15	10	14	16	10	5	12	8	....
Range	93	−21	......	114	30.844	28.911	....	1.933	....	......	.....	......	......	......	......	......	..	...	..	....

1881.

MONTH.	Max.	Min.	Mean.	Variation.	Max.	Min.	Mean.	Fluctuation.	Inches of rain and melted snow.	Miles of wind.	Percentage of saturation.	S.	SW.	W.	NW.	N.	NE	E	SE.	C.
January	35	−20	12.0	55	29.562	23.429	29.062	1.133	2.05	6,505	73.5	21	7	21	18	13	5	3	4	1
February	44	−4	18.8	48	29.478	28.437	29.017	1.010	5 42	8,128	76.9	13	6	8	18	9	6	13	11	0
March	49	−1	27.9	50	29.233	28 404	28.872	.834	4.36	8,511	74.4	2	7	17	26	21	5	12	3	0
April	73	11	40.2	62	29 257	28.646	28.985	.611	1.50	6,228	71.8	14	4	14	19	10	10	10	9	0
May	88	35	65.3	53	29.397	28.721	28.997	.676	4.25	5,750	68.8	24	3	6	10	3	10	30	7	0
June	90	49	65.7	41	29.146	28.625	28.912	.521	4 15	6,227	76.0	8	11	2	16	7	7	28	11	0
July	92	56	73.2	36	29.258	28.662	29.016	.596	9.47	5,321	74.0	9	15	13	21	10	6	12	6	1
August	95	52	73.2	43	29.223	28.703	29.009	.520	.56	5,499	69.7	17	10	5	5	13	14	11	18	0
September	92	46	64.8	46	29.204	28.396	28.908	.803	8.17	6,864	77.1	21	12	11	11	4	2	15	14	0
October	77	33	51.6	57	29.489	28.452	29.041	1.037	9.12	7,014	79.9	9	9	10	13	11	11	12	18	0
November	59	6	34.6	53	29.599	28.435	28.990	1.164	2.56	9,884	76 0	21	8	24	16	4	4	5	8	0
December	49	6	33.1	43	29.440	28.534	29.036	.906	1.32	8,330	74.4	29	11	10	20	9	5	1	7	1
Sums	. ..	.. ..	......	... .	....	....	....	... .	52.93	84,342	......	188	103	141	193	114	85	152	116	3
Means	......	.....	46.7	.....	....	....	28.990	... .	....	....	74.4	......	......	......	......	......	.....	......	......	....
Range	95	−20	....	115	29.599	28.396	....	1.203	....	....	....	......	......	......	......	......	......	.....	......	....

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