REPORT

OF THE

;it Growers' Association

OF THE

PROVINCE OF ONTARIO,

FOR THE YEAR

1877.

TO WHICH IS APPENDED THE

Annual Report of the Entomological Society

OF THE PROVINCE OF ONTARIO,

FOR THE YEAR 1877.

Printed by Order of the Legislative Assembly.

Toronto:
PRINTED BY HUNTER, ROSE & CO., 25 WELLINGTON STREET WEST.
1878.

Montreal Horticultural Society

AND

Fruit Growers Association of the Province of Quebec.

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REPORT

OF THE

FRUIT GROWERS' ASSOCIATION OF ONTARIO,

FOR 1877.

REPORT OF THE FRUIT GROWERS' ASSOCIATION OF THE PROVINCE OF ONTARIO FOR THE YEAR 1877.

To the Honourable the Commissioner of Agriculture.

SIR,—It is again my pleasant duty to hand you the Annual Report of the Fruit Growers' Association, which will be found to contain a full account of the transactions of this Society for the year 1877.

The past season has been very favourable to the fruit culturist in all the fruits of our climate, with the exception of our great staple fruit, the apple. Of this there was a fair supply of those varieties which ripen in the summer and fall; but we have not enough of winter apples to meet the wants of our own people. The plum crop was very abundant, and the grapes never were better in flavour or greater in quantity. Small fruits were plentiful and good, and the crop of peaches larger than usual.

The meetings of the Association have been well attended, and the discussions full of interest and information. The beneficial effect of these meetings in arousing attention and imparting information, is acknowledged with thanks on every hand; and the influence of the Society in stimulating the propagation of new seedling fruits of good quality, is beginning to be felt. Many thanks are due to our enthusiastic hybridists for their painstaking efforts to improve several of our fruits. The Association is actively scattering the results of their labours through all parts of the Province, so that all who wish can readily and cheaply enjoy the benefits thereof.

Hoping that you will find by the Reports that the Association is faithfully and successfully working out the ends it was designed to achieve,

I have the honour to remain,

Your most obedient servant,

D. W. BEADLE, *Secretary.*

PROCEEDINGS AT THE ANNUAL MEETING.

The Annual Meeting was held in the City Hall, in the City of London, on Tuesday evening, the 25th September, 1877.

The President called the Meeting to order at 8 o'clock.

The Secretary read the minutes of the last annual meeting.

The Directors submitted their Report, which was as follows : –

DIRECTORS' REPORT.

Another year of the history of our Association is closing, and your Directors appear before you with the brief summary of the proceedings of the year. There has been nothing in the management to bring specially before you. We have followed very closely in the usual course of our predecessors, holding our meetings in the manner and about the time observed in former years. These have been attended by the members residing in the vicinity, with a few from more distant points ; and the discussions have been animated and interesting. The winter meeting was held in the City of Hamilton, on the 7th of February ; the summer meeting at Stratford on the 18th of July ; and the autumn meeting is appointed to be held on the 30th of October, at Port Hope.

There was unusual delay in the printing of the Report of 1876, though the manuscript was in the hands of Government in good time, arising from causes over which we had no control, so that it was not mailed to the members until quite into the summer of 1877. It is very desirable that our Report should be distributed as soon after New Years' as possible ; and we hope that the efforts which the Department is making to have it printed earlier in future may prove successful. It has been decided to illustrate the next Report with a coloured lithograph of Arnold's new hybrid apple, the "Ontario," a tree of which it is intended to present to all the members in the spring of 1879.

Arrangements have been made to distribute a plant of the "Burnet" grape to each member next spring. We believe that this will prove one of the most valuable grapes ever sent out ; and that the hardiness of the vine, size, beauty, and quality of the fruit, and early period of ripening, will place it high in the estimation of our members,—as high as the greatly esteemed and worthy President himself, whose honoured name it bears.

No arrangements have been made for the distribution of any trees or plants beyond the spring of 1879, hence upon our successors will devolve the burden of selecting some promising fruits for dissemination in future years, in time to have them propagated in sufficient quantity for that purpose. Of late years the Directors have recognized the principle of giving preference to fruits of Canadian origin, where their qualities were such as gave promise of adaptation to our climate, and of their becoming a valuable addition to our list of fruits.

Our membership at present is smaller than it has been for several years past, being now but a very little over one thousand. The causes of this falling off have been various. While the hard times has not been without its share in bringing about this diminution, there have been other causes at work, and prominently among them have been disappointment in the trees and plants received through the Association. Some have been disappointed because the articles sent were not of larger size ; some because they were not in all respects what they expected ; and more because what they did get failed to grow. One great cause of the failure to grow, is to be found in the fact that the trees were often most sadly abused after they arrived at their place of destination. No care was taken to preserve them ; perhaps the person to whom the parcel was addressed, opened the bundle, took out his own tree, and left the others exposed to dry up and die, without any care for those belonging to his neighbours. Many instances have been reported to your Secretary of the trees being found in this condition, perhaps yet in the Express Office, sometimes in the corner of some store or grocery, or

under some tavern-keeper's shed, withered, dry, and dead. How to obviate these evils has been a question that has had the serious consideration of several of your Boards of Directors, and we commend the subject to the thoughtful attention of our successors. It may be that the best solution will yet prove to be that of sending out only trees and plants of such a size as may be transported in the mails, and addressing each member's tree to him direct through the post-office.

We have to call the attention of this meeting to a change that has been made by our Legislature, at its last session, in the number of the Board of Directors and their mode of election. By the provisions of the Act now in force, it is made the duty of this meeting to elect a President, Vice-President, and thirteen Directors,—one for each of the thirteen agricultural divisions, and within which division he shall be a resident; and the officers so elected shall elect from amongst themselves or otherwise, a secretary and a treasurer, or a secretary-treasurer. Hence it will be seen that this meeting has no longer to do with the election of the Secretary or Treasurer of the Association, but that officer is to be chosen by the officers whom you elect at this meeting. The President and Vice-President are not restricted as to their place of residence, but may reside in any part of the Province, while each Director must reside in the agricultural division which he represents.

In compliance with the resolutions passed at the last annual meeting, which instructed the Directors to require security satisfactory to the Board, from the Secretary-Treasurer, to the extent of $2,000, your Directors have accepted from that officer the guarantee of the Canada Guarantee Company to the amount of $2,000, in favour of this Association.

The financial condition of our Association is fully set forth in the Treasurer's Report, which is submitted herewith.

The Treasurer then submitted his Report, which was as follows :—

TREASURER'S REPORT.

Receipts.

Balance from last year	$123 44
Centennial Grant	2,000 00
From sale of Fruit	15 00
From Members' Fees	1,009 00
From Centennial Commissioners for transportation	114 60
Government Grant, 1877	1,000 00
	$4,262 04

Disbursements.

Prizes	$105 00
Plants	692 55
Coloured plates	320 00
Director's expenses	442 43
Commissions collecting fees	35 78
Mailing reports and postage	38 28
Stationery and printing	54 86
Advertising	7 76
Clerk	50 00
Auditors	20 00
Express and telegraph	16 77
Room for meetings	9 00
Guarantee premium	20 00
Secy-Treasurer salary	200 00
Centennial expenses, less $84.20 paid last year	1917 05
Balance in Treasury	332 56
	$4,262 04

Of the Centennial expenses the sum of $656.33 was expended in defraying the expenses of delegates to Philadelphia to take charge of the fruit, and see to the arrangement and display.

The President then delivered his Annual address:

ANNUAL ADDRESS.

The return of the Provincial Fair, and the annual meeting of the Fruit Growers' Association, bring with them the recurring duty of addressing you on some of the many subjects connected with fruit culture. Usually annual addresses are full of congratulations, and generally begin and end with these common themes. For years it has been my good fortune to be in a position to express not only my satisfaction, but the satisfactory expression of every member of our association, at the progress and development of the fruit interests connected with our Society. Similar expressions must be tempered this year, as the climatic changes have not been auspicious to fruit growing. A most abundant promise in spring has been followed by a very poor fruit crop, apples being almost a failure. The show of buds and blossoms were something wonderful. Two occasions of early frost, however, not only destroyed the buds, but even the branchlets to which they were attached. In some instances the latter frost destroyed the trees, and especially our pear trees. There can be little room left for doubt that the frost acted on the tree as if it had been blighted; a speedy application of the knife, however, in many cases preserving the limbs. A fond fancy leads to the indulgence of what may be a conceited notion, that similar causes account for the ordinary blight, viz: frosty and cold winds.

In some districts our fruit-growers had no cause to complain of the crop of small fruits. Strawberries were very abundant, and as a rule, very good. Seasonable rains helped them much. The same may be said of raspberries, currants, gooseberries and pears. They were very prolific, and made a fair return for outlay and labour. Peaches are abundant almost everywhere. Had the amount of peach-orchard corresponded in any adequate proportion to the demand for the fruit, the pecuniary advantages to be reaped would have been very great. The season's yield has given an impetus to the planting of peach trees, which was greatly needed—the ill success of peach-growing for years past, having damped the ardour of peach culturists. Grapes are an enormous crop, and early ripe. Plums are extra good, and most abundant, amply rewarding the toil of the husbandman. Apples are a failure. What of the crop the frost and caterpillars left has been sadly damaged by the ravages of the codlin moth. We may add, however, as often happen in years of scarcity, the samples are good. There is little to find fault with in the specimens of fruit at our Provincial Exhibition, and frequent remarks have been heard how agreeably disappointed many have been at the amount of good fruit at the show. Fruit matters have, as a rule, been quiet during the season. Our interests have suffered, less or more, with all civil and commercial interests during the continuance of the hard commercial times through which we have been passing. When one member of the body politic suffers all the members suffer with it. A lull, too, was to be expected after the strenuous efforts which, as an association, you put forth at the Centennial. Our members' attention cannot always be on the stretch.

You will allow me, perhaps, to express my regret, which may be considered as a reminder of our duty, that we did not put in appearance and make any representation of any fruits at the recent meeting of the American Pomological Society at Baltimore. I had invitation upon invitation from the venerable and hon. President of the Society, but felt myself unable to act as I would have liked, under our circumstances.

During the year a notable Act for the Encouragement of Agriculture, Horticulture, Arts and Manufactures passed the Legislature. The formation of Horticultural Societies in cities, towns and incorporated villages receives a large amount of encouragement, participating in all the privileges and grants accorded to Electoral District Societies.

We should have liked to have seen in the new Act that the grants to the cities of the Province had been equalized, and that St. Catharines and Brantford had been included in the beneficent arrangements of the Government. Both St. Catharines and Brantford are famous horticultural centres.

Our own association comes in for a share of the attention of our legislators.

The Hon. Mr. Wood was always ready to listen to the suggestions of your Direction, and although the whole of the amendments to the Act brought before his notice have not been inserted, there are changes introduced which in the long run will greatly benefit your society. At this annual meeting you shall elect thirteen Directors, one for each of the thirteen agricultural divisions, and within which division the Director elected shall be a resident.

In present circumstances this may seem a hardship, and even a difficulty, but in the future this arrangement will greatly advance our Provincial horticultural interests. The increased expense connected with the increased number of Directors may lead you to take steps to ask for an increased legislative grant.

The plans which your Direction have instituted for the well-being of the society meet with a fair share of success The tree and plant distribution has assumed large proportions, and is productive of good results. Favourable reports have been received of the plants and trees already distributed, and of the very general satisfaction they have given to our members. The Directors of the Association have taken a new departure, and now distribute trees and plants the creation of our own hybridists. They have been anxious that the proverb shall be no longer verified, that a prophet is not without honour save in his own country. They now send out, therefore, and give the preference to, the home productions of our own members. Glass' seedling plum is proving a good grower, and giving abundant promise. Next spring Dempsey's seedling grape, "the Burnet," will be distributed. The *savans* among us declare that this grapevine is the king of all seedling grapes. Time will tell. We hear of competitors of no mean quality looming up in the distance. We heartily wish all success to all present, and to all future hybridists.

We have continued the illustrations of our Annual Report to Government, and although the strain on the means at the disposal of your Board is great, yet the result encourages them to proceed in the good work. People learn almost as much by the eye as they do with the mind, and, in the end, these illustrations will form a valuable adjunct to the horticulturalist in serving to help him make a choice of excellent varieties for cultivation.

The discussions at our different meetings seem to gain in interest, and are gradually acquiring a wider scope. Our summer meeting at Stratford elicited a large amount of valuable information, and it will be long before the courtesy of Messrs. Jarvis, Woods, Hanson, and the other members of the Stratford Horticultural Society are forgotten.

The earnest and indefatigable labours of our hybridists for years past have been leading our efforts and discussions in the direction of new, hardy, and prolific varieties of fruit trees, but in vain do we discuss the production of suitable trees, if the circumstances, which surround us render their growth impossible or unproductive. Almost insuperable difficulties in fruit growing paralyse the efforts of the horticulturist. "Eternal vigilance is the price of good fruit;" say to the contrary who may. In a season during which these difficulties have singularly abounded, it perhaps will be befitting that I direct your attention to a few of these difficulties, and the mode and manner in which the best and most devoted of our horticulturists overcome them. What an alarming list they make. The caterpillar, curculio, pear slug, canker and currant worms, the aphis and red spider, the grasshopper and phylloxera, the codling moth and borer, and last, but not least, the blight, blackknot, bark louse, frost and mildew.

Well may the fruit-culturist stand aghast, and almost in despair give up his labours in hopeless prospect of success.

My object is not to treat our insect pests, and their depredations philosophically, or even entomologically; that is in abler hands among us; but briefly to enumerate in one paper, and shortly to state the most efficient means known for the sure accomplishment of their destruction.

SMALL FRUITS, AND THEIR INSECT DEPREDATIONS.

First in order come the currants, red, white, and black. None of these are worm proof They have all numerous and destructive enemies. The inveterate leader of these hordes is the currant borer, "a small whitish grub with brown head and legs, which lives in the stems of the bushes, burrowing up and down, making them so hollow and weak as to be liable to break with every wind," The eggs are deposited by the parent, which in general appearance is not unlike a wasp, from the 10th to the 15th of June, which in a few days are hatched,

when the small worms eat their way to the centre of the stem, where they burrow up and down until full grown. A most effectual remedy, and the only one claiming the attention of the fruit culturist, is to cut out the affected stems and consign them to the fire pile. Another potent enemy is the currant caterpillar, or measuring worm as it is called, which in its voracity strips the plants of every leaf, and only desists when the tree is under bare poles. The caterpillar is yellow, marked with rows of black, roundish spots along the back, and in its movements forms a bow, which it bends and unbends in its forward progress. The moth which is the parent of this caterpillar is of a dull yellow colour, with brownish spots dotted over the wings. This insect deposits its eggs late in the summer, fastening them to the stems of the bush, where they do not hatch till the following spring. Hellebore is an effectual cure. We have always been in the habit of applying the poison with a watering pot. Since Mr. Van Wagner's "duster" came into our possession, we have applied the hellebore dry, after watering the bushes, and have found this mode of application serve every practical purpose.

The gooseberry saw-fly is also an enemy to the currant. Its ravages begin in early spring. The leaves no sooner appear than this pest deposits its eggs in great profusion on the underside of the leaves. So speedy is the destruction of these voracious worms, that in a few days the leaves entirely disappear. When well gorged they are of a dull yellow colour, and when in that state begin to weave their cocoons, from which the flies emerge at the end of June or beginning of July. They appear less or more throughout the summer, and unceasing vigilance is necessary to counteract their ravages. The same remedy is effectual in their destruction, viz.: repeated doses of hellebore. In my garden they were singularly plentiful this spring. On a yellow flowering Ribes in the neighbourhood of a sheltering wall, they stripped every leaf off in an incredibly short time, and when disturbed actually covered the ground with a beautiful carpet of yellowish green colour. The pupæ of the later broods remain, as a general rule, in the ground till the following spring, when they emerge as eagerly bent as ever on the work of destruction, to the infinite detriment of the horticulturist.

INSECTS INJURIOUS TO THE RASPBERRY.

The roots, canes, leaves, flowers and fruit of the raspberry have all their peculiar enemies. We have never seen any enemy affect the root, but this arises from the difficulty we have had in making a proper approach to unearth this evil.

The Red-necked Agrilus attacks the canes of the raspberry and blackberry in early spring. Their depredations are marked by an ugly swelling, which indicates the presence of the larvæ of this pest. The cane has all the appearance of being slashed, and under the ridges between the slashings will be found a small borer. The body is slim, yellow, approaching to white, composed of a chain of bead-like sections, with the anterior ones considerably flattened, adapting it greatly to carry out its depredations. It bores through the cane into the sap, lives there, traversing up and down the cane to secure abundance of sap-food. The head is brown, jaws black, and the whole body is about three-fourths of an inch long. In May the larvæ reach the pith-core, there undergo their change, and early in summer the beetle appears. She deposits her eggs in July, and thus this circle of destruction is continually kept up.

One, and only one, effectual remedy is at the disposal of the fruit-culturist, and that is to cut out the affected canes and commit them to the flames. Too great care cannot be observed when trimming the vines in the spring to see that all the affected stems are eliminated.

The raspberry cane-borer is another potent enemy of this culture. The beetle is half an inch long, long-horned, slim black body, the thorax and breast pale yellow. They first appear in June, and after pairing, girdle the canes with a double circle about an inch and a half apart. Between the girdled circles the cane is punctured, an egg deposited, and hatched in a few days. The wound causes the cane to droop, and as they begin their destructive work and continue it throughout the most of July, the estimated damage is not easily realized. A free use of pruning shears is the only effectual remedy, topping the cane, so that the part operated on by the beetle is completely destroyed.

THE RASPBERRY SAW-FLY.

This is a four-winged fly, and appears in its winged state about the end or middle of May. This insect has dark metallic wings, the body is dark, and the abdomen dull red. She

deposits her eggs beneath the skin of the leaf by means of a saw-like apparatus, and in due time the young larvæ appear, and when full grown are three-quarters of an inch. They penetrate the ground, and construct little oval earthy cccoons, in which they remain until the following spring.

THE STRAWBERRY LEAF-ROLLER.

They are thus named from rolling up leaves with their web, to form a tent for protection. Ingeniously enough they provide for being disturbed by securing an opening at the open of the folded leaves, through which they descend to the ground by means of a self-made thread. Their larvæ attain their full size at the end of May or beginning of June, then line the twisted leaf in which they live with their web, and undergo their change. After the lapse of a few weeks they make their egress in the form of a perfect moth. The effectual remedy is to crush the leaf with clippers in the shape of butter prints from the middle to the end of June. There is no need to make examination of the death of the chrysalid, being satisfied that the chrysalids have not escaped in the moths ; a slight squeeze completely destroys the inhabitant.

THE RASPBERRY NEGRO BUG.

In eating raspberries we are sometimes disgusted with a disagreeable *buggy* odour. The insect that causes this uninviting flavour, is black, with a white stripe on each side. He is a compact, *dutchy* fellow, seldom seen till it is too late to give him a wide berth. A sucker of rather singular construction enables him to first pierce and then suck the juices from the fruit. June and July are the seasons favoured with the countless increase of these noxious pests. We have never heard of any effectual plan of lessening these pestilential fellows. They are not very fastidious in their likings attacking not only the valuable and cultivated varieties of raspberries, but also the wild sorts ; and they luxuriate on other plants of a less profitable nature, such as Purslane, Speedwell, and the like.

THE ENEMIES OF THE STRAWBERRY.

The strawberry false-worm has been very destructive to the strawberry-plants during the past summer. Mr. A. M. Smith, of Drummondville, sent me along on trial some new variety, and they completely riddled the leaves, and finally killed three-fourths of the plants. The average length of the larvæ when full grown is about six-tenths of an inch, pale white greenish skin, semi-transparent, and eight pairs of prolegs. These creatures also form cocoons by sticking together small fragments of earth, and in these make their change.

THE BLACK STRAWBERRY BEETLE

Is another pest of common occurrence, very active and destructive. The beetle is "about three-twentieths of an inch long, dark body, and wing covers spotted with black, and ornamented with regular rows of punctures which disappear towards the tip." We are not aware that any remedy has been found readily destructive of the insect.

A CUT WORM.

This enemy is a night-worker, and requires careful watching. A patch of Nicanor of mine, at Hamilton, once nearly disappeared, until I had a visit from the late Mr. Mesten, who unearthed the caterpillar, and taught me how to destroy him. In many respects he is not unlike in his habits to the cut-worm that attacks young cabbage-plants newly set out, and nips them off just on a level with the ground, and buries himself in the day-time. He is an inch and a half long, coiled up when at rest, and when jerked from his hiding-place rolls along like a perfect ring. The colour is dull-green, and semi-transparent. They enter the chrysalis state at the end of June, and the moths appear about the middle of August. The only remedy is to search and unearth them in their caterpillar state—a sure guide to the discovery being the leaves of the vine being either partially or wholly cut, and dropping on the ground.

THE INSECTS AFFECTING THE CHERRY.

The greatest enemy the cherry has is the white and black Aphis. They breed in vast numbers under the leaves, which curl, it seems, for their protection The insect is small, transparent, bright-eyed, and long-legged. Its eggs are deposited under the leaves at the end of June and the first of July. Their food is the juices of the leaves, and their ravages are often to such an extent that the trees are killed outright.

Having killed one of my cherry-trees, after its death they attached themselves to the places where I had severely pruned and grafted a yellow Bellflower. No remedy is known to me worthy of mention but that of destroying them by hand, whenever the clusters begin to appear.

THE CHERRY CURCULIO

Is most destructive to the fruit. It not unfrequently happens that the caterpillar is found by twos and threes in the same fruit. They render the cherry worthless, and, undestroyed, soon increase to such an extent as frustrates the whole labour of the cultivator.

INSECTS AFFECTING THE PLUM.

The greatest insect enemy of this fruit is the curculio, a "little Turk," as he has been termed from the crescent-like wounds on the fruit. This beetle is of a deep grey colour, approaching to black, about two-tenths of an inch in length. It is in its general contour as like the seed of some of the fine varieties of grapes as it can well be. The formidable instrument which renders him so destructive is his snout or proboscis. With this the beetle pierces the tender skin of the plum, and therein deposits the ova. I have, with the point of my penknife often removed the egg immediately after the operation, and thus saved the plum.

The insect "undergoes transformation in about fifteen or twenty days, in the month of June or beginning of July. The larvæ that go into the earth as late as the 20th of July, remain there in the pupa state until next spring.

The only successful fight that can be made against the enemy is "jarring." A curculio catcher is a simple but efficient instrument, consisting of a sheet stretched by a framework on a common hand-barrow without the sides, leaving a space in front at the wheel for the admission of the trunk of the tree. A ball of rubber or rags, and a wooden mallet complete the outfit, and the cultivator is ready to make his appearance. A sudden stroke with the mallet on the rubber laid on the trunk, brings down the curculio in an apparent dead state, during which he is readily captured.

Black knot of late years has become a serious evil to the plum-grower. Some years ago it was unknown in Western Canada; now it is everywhere common except in a few favoured localities, such as Owen Sound and Meaford. It is understood to be formed by a fungus, which appears as a vegetable *goitre*, and to save the tree requires immediate application of the knife. No particular plum-tree is proof against black knot. On the common blue plum it is singularly abundant. What a melancholy sight it is for one to see certain fruit-growers preparing a rod to pickle for themselves, by allowing the black-knotted trees to stand in their orchard year after year without the least attempt to rid themselves of the evil. Fungoid forms are produced from spores, these spores ripen every season just as regularly as other seed-bearing plants, and warmth, winds and rains disseminate the germs, which being deposited in convenient resting places, are ready next season to develop and run over again their destructive course. Cut out unsparingly black knot, whenever it appears, and burn with all convenient speed.

ROT

is another difficulty with which the plum grower has to contend. No truly philosophical or reasonable account has been presented of its origin. Conditions of rot have been amply described, but no certainty as regards its true origin has ever been presented. Speculations are rife. Horticulture is an ample field for speculation. The only remedy known to us is to thin out the affected specimens and destroy them. Leaving the injured fruit on the tree, or on the ground almost equals the folly of allowing blackknot to develop and spread its propagating spores.

INSECTS INJURIOUS TO THE PEACH.

Foremost is the peach borer. This insect is not unlike a wasp—the markings are similar. It is unnecessary, however, to be very particular in the description of the perfect insect, as I know of no means to entrap him for his destruction. The only effectual means of destroying this pest is to use the knife, when he is doing the damage under cover of the protecting bark. The eggs are deposited, generally between wind and water, just at the neck of the tree. These deposits are made at the end of July and beginning of August. The pupa state lasts in warm summer weather about three weeks. Their whereabouts is easily seen by their fæces, and the exudation of gum from the injured part. Having carefully removed the larvæ, if any, by means of the knife, wrap round the neck of the tree a piece of cotton cloth, covering the trunk to the extent of three or four inches, and reaching closely to the ground Better still would this appliance be if made from the period the tree is planted, and anterior to the deposition of the eggs in the tender bark.

For trial by our peach culturists, I may mention a plan successfully pursued by growers on the other side of the lines, viz :—The mounding system, in which a bank of earth is made around each tree, for three successive years to the height of about a foot each year, the mound averaging a width of about six.

INSECTS AFFECTING THE VINE.

The list of the many insect foes which attack the foliage and fruit of the vine, as given by Mr. Saunders, London, is most alarming. The green grape-vine sphinx, the beautiful wood nymph, the pearl wood nymph, the grape-vine leaf roller, the grape vine plume moth, the grape cidaria, the common yellow woolly bear, the spotted pelidnota, the grape vine flea beetle, the grape vine seed insect, the thrips, the grape leaf gall louse, the tree cricket, and last, not least the honey bee. We spare you, gentlemen, in not giving the jaw-breaking technical terms of these depredators—the vernacular is enough, and after giving them are ready to draw a long breath.

THE GREEN GRAPE-VINE SPHINX

caterpillar is a determined enemy of the vine, and is easily recognized by a horn on his hinder extremity. The moths of the grape vine sphinx appear about the 20th of May, and begin in a few days to deposit their eggs upon the leaves. They are developed in about a week. The caterpiller is most ravenous, and in an incredibly short time destroys the leaves. The remedy is to hand pick and destroy them. If allowed to remain and develop they descend the vine and bind a few leaves together with their filmy cords, and there remain in their chrysalid state till they change into a beautiful green moth, large and powerful on the wing. It enters on its destructive work like other evil workers, in the dark.

THE GRAPE-VINE LEAF ROLLER

is well known to all grape growers. This moth is double brooded, and first appear in June and August, and secondly in July and September. The eggs are deposited on the leaves, and whenever they develop they roll the leaf as one would a bit of paper into a match, and make it their hiding place. Is requires no little dexterity to catch them, being exceedingly active, they are apt to escape by end of the rolled leaf before the searcher is aware of it.

THE GRAPE VINE FLEA BEETLE.

has been very destructive of late years in Essex. They penetrate and suck the fruit buds and render the grape entirely barren. These beetles appear in April and continue their evil habits till May. Their orange coloured eggs are deposited under the leaves, which hatch in a few days, and pierce the leaves with innumerable small holes, in June they descend into the ground, burrow and there make their change into chrysalids. No definite plan has yet been discovered to get rid of these pests.

THE THRIPS

are the best known of the vine pests, The eggs are deposited on the leaves in June, and when hatched, the young insects puncture the leaves and suck the sap. The yellow spots on the leaves speedily testify to their diligence, and the destruction of the crop is the consequence. The remedy in and around Cincinnati, and at Stoney Creek, is to shake the vines in the stillness of a summer night, and walk up and down the rows with lighted torches. The complete removal of all leaves, or other roughness, in the neighborhood, either late in the fall or early spring, will also lesson their numbers, as the survivors are destroyed by exposure of the cold.

THE PHYLLOXERA OR ROOT LOUSE.

This creature attacks the roots of the vines. In France whole vineyards have been destroyed throughout large districts by these hostile pests, and much attention is now bestowed on its ravages, both in Europe and America.

The winged insects appear in July, August and September, but the work of destruction proceeds with unabated pace from early spring till late autumn. The root-louse, as the phylloxera is sometimes called, punctures the tips of the rootlets, and thus cuts off the regular supply of sap needed for the plant. No remedy has been yet propounded which meets the urgency of the case. Soot mixed with the soil has been thought of benefit, but vine growers have been more indebted to predacous parasites than to any particular artificial means of destruction yet discovered for the annihilation of these pests.

INSECTS INJURIOUS TO THE PEAR AND APPLE:

THE CODLING MOTH.

This is, perhaps, the most pernicious of all the injurious insects with which the fruit culturist has to contend. Its ravages have become so clamant that the united efforts of horticulturists everywhere should be put forth for its diminution.

It would tend greatly to enhance the law of compensation, if the small apple crop of the present season should amply repay apple growers for their present anxiety for the shortness of the apple crop, by its proving the ruin of the codling moth. It may prove a simple but natural way of stamping out its ravages. The loss of fruit buds ensures the loss of the eggs of the codling moth. Next season we may be comparatively free from this pest.

The codling moth appears as a winged insect just as the apple blossoms begin to open. She deposits her egg in the calyx of the apple, and the larvæ grow with its growth; their presence always prematurely ripens the apple, and the same may be said of the pear.

We are persuaded that the best and easiest way to overcome this evil is to turn the pigs into the orchard. Mr. Ritchie, of Bayfield, has done this for years, and has almost ceased to fear the ravages of the codling moth.

Mr. Springer, Wellington Square, employs bands of empty salt bags, tied around the trunks, and examines the bands once or twice a week for the pupæ and unchanged larvæ. He has almost got rid of this destructive pest.

CANKER WORMS.

We are not concerned about the different kinds of canker worms—it is enough for us that we and others have to lament their cruel ravages. Lately, at the New York State Fair at Rochester, in conversation with a veteran horticulturist, he declared that a fresh tar band around the apple tree trunks effectually checked the larvæ. The female is wingless, and if the tarry band is freshened with repeated applications, a stop is put to the depredation. These bands should be applied after the apple crop is secured in the fall, and kept up till the month of June.

THE "FOREST TENT CATEPILLAR" (*C. Sylvatica*).

The ravages of this caterpillar have been most destructive over a large portion of Ontario during the present season. Had a fire passed through our orchards it could not have

left our apple trees under more barren poles. The eggs of this pest are dexterously glued to the terminal branches of the trees in the month of July, and continue there till the 15th or 20th of May. At the first approach of genial weather they develop into perfect caterpillars, and commence the work of destruction. At night they congregate in a crotch or fork, and can easily be destroyed by an application of the spirits of ammonia. This may be done by means of a sponge or other convenient appliances.

THE PEAR TREE LEAF SLUG.

This offensive pest may be destroyed with a home made sand or dry earth pepper box. A thorough application once or twice in spring, and again in September, when the second brood appear, will effectually rid the orchard of this pest.

BLIGHT ON THE APPLE AND PEAR TREE.

For some years this disease has been very prevalent throughout Ontario, and in some of the Northern States of the Union. Its characteristics this season have been entirely different from those of former years. It has attacked the tips of the young apple trees, the fruit buds of the pear, and has generally ceased its ravages after penetrating the branches a few inches beyond the first affected parts. We may truthfully affirm that most people are in entire ignorance of the causes of this disease. We are inclined to lay the burden of the offence on Boreas. His cold winds injure the tender stems, disorganize the sap vessels, and leave the limbs a blighted mass. If proof were needed, it might be found in the double blightness of the past spring, accompanying two frosty nights. *Fungus* may be a philosophical word, and men may use it philosophically enough, but to me it would seem when the vital organisims of the apple and pear are injured by the cold, that the matter of which the branches are composed, assumes other shapes, develops other organisms, and appears to our inspection as *fungoid* excrescences, which, for want of better terms, we call *fungus*.

I have again greatly trespassed on your patience and forbearance by my lengthened address. My only apology is a desire to further the interests of horticulture, not so much among the members of the F. G. A. of Ontario now present, who are intimately acquainted with these matters, as among a large and increasing class in our Province, who are acquiring town and country lots, to whom the pleasures and profits of horticulture are little known and less appreciated. If any of you think it a queer way to do this by exhibiting the difficulties attaching to fruit culture, I merely answer, to be forewarned is to be forearmed. Difficulties overcome add to the zest of the pleasures realized. There are few valuable and pleasurable occupations without corresponding drawbacks.

Pursue, gentlemen, your laudable and successful efforts for the furtherance of fruit interests, and your self-denying labours will in the end be crowned with the plaudits of an enriched, happy, and contented people. Flag not, until you have diffused the civilizing influences of Pomona throughout the length and breadth of our land ; remit no effort to bring horticulture into favourable repute, until every farmer and possessor of land derives the advantages which you so fully estimate, and which are to be so successfully obtained from the cultivation of fruit and fruit trees. Many portions of our Province have as yet scarcely heard of your efforts. Cease not to agitate horticultural questions and interests until every township has its show, and at every Provincial Exhibition the tables groan with the rich and luscious products of Pomona.

ROBERT BURNET,
President.

The address was listened to most attentively. At its close,—

Mr. Wm. Saunders, of London, moved a hearty vote of thanks to the Chairman, and spoke very highly of its general excellence. He also added the request that the Report be furnished the Secretary, and published in the annual proceedings of the Association.

Mr. H. M. Switzer, of Palermo, seconded the motion, which was unanimously passed.

Mr. Legge, of St. Mary's, gave his experiences as to the eradication of caterpillars, saying in his district they were the greatest pests in July, and if overcome then they were easily got the better of.

ELECTION OF OFFICE-BEARERS.

Mr. Mackenzie-Bowell, M.P., proposed the re-election of Dr. Burnet, complimenting him highly on his abilities.

Mr. W. Mackenzie Ross, of Chatham, seconded the motion, which was carried unanimously.

Mr. Wm. Saunders moved, seconded by Wm. Roy, the election of Mr Wm. Haskins as Vice-President. Carried.

The following Directors were elected :—District No. 1, John Croyle, Aultsville ; No. 2 P. E. Bucke, Ottawa ; No. 3, F. H. Hora, Glen Lawrence ; No. 4, P. C. Dempsey, Albury ; No. 5, C. B. Salter, Port Hope ; No. 6, Geo. Leslie, jr., Toronto ; No. 7, Oliver Springer, Wellington Square ; No. 8, A. M. Smith, Drummondville ; No. 9, Chas. Arnold, Paris ; No. 10, Wm Roy, Owen Sound : No. 11, Wm. Saunders, London ; No. 12, W. Mackenzie Ross, Chatham ; No. 13, Henry Robertson, Collingwood.

The Directors subsequently met, and re-elected D. W. Beadle, of St. Catherines, as Secretary-Treasurer.

AUDITOR'S REPORT.

To the President and Directors of the Fruit Growers' Association of Ontario.

GENTLEMEN,—We, the undersigned Auditors, have carefully examined the account-book of your Secretary-Treasurer, aud compared each item with the voucher therefor, and have found the same correct. We find the balance in the treasury to be $332.56.

Respectfully submitted.

ROBERT ROY,
ANGUS SUTHERLAND, } *Auditors.*

REPORT OF COMMITTEE APPOINTED TO EXAMINE THE TREASURER'S DISBURSEMENTS.

To the President and Directors of the Fruit Growers' Association.

GENTLEMEN,—Your Committee has carefully examined the Treasurer's payments, and with much pleasure report that they have all been made in strict accordance with the instructions of the Board.

R. BURNET.
W. SAUNDERS.

REPORTS OF DISCUSSIONS.

WINTER MEETING.

The Winter Meeting was held at Hamilton, on the 7th of February, 1877. The President not being able to attend, the Vice-President, Judge Macpherson, took the Chair. The Secretary read the Report of the last meeting, and then gave an account of the part taken by

our Association in the Centennial Exhibition; setting forth the magnitude and excellence of our display, the praises bestowed upon it by the American press and people, and the number of medals awarded to our fruits.

The following subjects were proposed for discussion :—

1. What varieties of trees are best adapted for the shelter of orchards, and what is the best time to plant?

2. Which are the most profitable apples to ship to the European market?

3. Which are the best six varieties of out-door grapes suitable for amateur cultivation?

4. What is the best soil for the raspberry, and the best mode of cultivation?

Upon the discussion of the first subject, Mr. John Reed, of Hamilton, named the Arbor-Vitæ and Norway spruce.

James Taylor, St. Catharines, spoke of an orchard in that neighbourhood belonging to Mr. Pawling, which was protected by a willow hedge or screen.

Col. John McGill, Oshawa, had used for this purpose the yellow poplar. Had planted evergreens, and preferred to plant them in the spring, after they had made a little growth.

W. Saunders, London, had succeeded in growing a good shelter-belt, composed of Norway spruce and maple-trees, with Scotch and Austrian pine. The outer row is of maple, the middle row of Scotch pine mixed with Austrian pine, and the inner row of Norway spruce.

Dr. Watt, Niagara, suggested that such a belt required a large breadth of ground. He had found the roots of the common white pine to extend a distance of from thirty to forty feet. His neighbour, Mr. Ball, had used silver poplar mixed with white pine, but the poplar proved to be a nuisance, because of the numerous sprouts thrown up from the roots.

Chief Johnson, Tuscarora, had sheltered his orchard by leaving a belt of the natural forest.

P. E. Bucke, Ottawa, plants pine trees among the apple trees through the orchard.

L. Wolverton, would take the Norway spruce for a shelter belt in preference to any other one tree; this keeps thick and close to the very ground, while the balsam fir becomes thin and poor with age, gradually losing its lower limbs.

Mr. Arnold would plant evergreens just as the buds are beginning to burst.

Mr. Quinn, planted last spring a thousand Norway spruce and lost only four. Also removed some in the middle of September, and they all grew well.

The hour for recess having arrived, the meeting adjourned. After dinner, business was resumed, and the members listened to the following paper from Mr. Bucke :—

IRRIGATION.

A Paper on Irrigation read before the Winter Meeting of the Fruit Growers' Association of Ontario, at Hamilton, 7th February, 1877, by P. E. Bucke, Esq., of Ottawa.

Mr President and Gentlemen,—A great deal has been said of late with regard to the use of ardent spirits: I therefore propose to say a few words to-day on water. So confident am I that before many years will elapse we shall have a practical system of irrigation in this country, when the matter is properly brought before the cultivators of the soil and Government, that I offer no apology for bringing the subject before this meeting for its consideration.

The average rainfall of the last thirty-five years in Canada, has only been 28½ inches per annum; and the principal part of this falls in the months of May, September and October. It will thus be seen that in the greater part of the hot growing season, when water is most required to assist vegetation, it is in a great measure wanting. Everyone knows, who has practised farming in this country or the States, one of the greatest drawbacks is the lack of moisture, not the superabundance of it, that is so ruinous to our crops. How often do we hear men speaking reproachfully of the Author of the Universe because the required rain is not given; but how true is the maxim that "God helps those who help themselves." We are bountifully supplied with both lakes and rivers—in fact never was country so well watered—and yet we have not sufficient enterprise to apply it to our soil. The beneficial heat of June and July is quite thrown away—nay, it is rendered worse than useless by drying up the land, because there is no water to moisten the ground. Any one who has seen the luxuriance and

rank growth that is obtained by heat and moisture in southern or tropical swamps, may easily conceive what might be arrived at by our genial summer sun. If this country is ever to enter into the profitable trade of exporting cattle to the old world, irrigation must be the keynote to the enterprise. The animals already sent have been largely fed upon the offal of distilleries; but this is only a limited mode of raising fat beasts. Our pastures, with the aid of water, could put on a perpetual green from the 1st of May to the end of November, if a proper supply could be run over them. One crop of hay could be turned to three by the aid of water, and the cut of which would be considerably more than that now secured from one. By the same means our fruits, vegetables, and vines would be materially benefitted. The finest strawberries it is possible to grow, both in size and flavour, can be produced in the dryest season on land that can be flooded between the rows. The summer of 1874 was an unusually dry one. In the States it is reported that apples were in some places a third under the usual size through drought. Pears could be seen in almost every garden with their leaves flagging, and the fruit was correspondingly small and gritty. Plums were in the same sad plight where the crop was at all heavy. People would do well in selecting a spot for a garden to secure a place where an ample supply of water could be introduced. All that is required is to have good drainage, so that there may be no spots where the water will become stagnant in the subsoil. Convey it to the highest point and let it run under proper directions. The want of rain will then be rather an advantage than otherwise. It is doubtful, however, whether individual enterprise can ever inaugurate a proper system of irrigation otherwise than by raising water with windmillls; and unfortunately wells become dryest when the water is most needed, but wind-engines would be of much utility near lakes or large streams to raise water to a higher level. Thomas Meehan, in the *Gardeners' Monthly*, says: "To have water when nature does not favour us is one of the roads to fortune. It is surprising more people do not guard themselves from injury by contrivances to secure water when nature is in a wayward mood." Government aid is necessary to build canals and supply water, or at all events to enable parties to cross farms with irrigating ditches and aqueducts. Before, however, anything is done in this direction, it will probably be necessary to show, by actual experiment, that irrigation is necessary for the best interests of the country; or perhaps the Government could be induced to test the matter themselves at their Model Farm at Guelph. One would scarcely think it necessary to show that irrigation is required in a dry, hot country, with only twenty-eight inches of rainfall, when England, with a comparatively cool temperature, and with a rainfall of forty inches, can double her grass crop by an additional supply of water. The principal countries now using irrigation are British India, Spain, Holland, France, Italy, South America, California, Japan, China, Persia and Norway. I am satisfied, on examination of the subject, that the sediment derived from the use of the Ottawa River water would be quite sufficient, without any other fertilizer, to keep grass lands in perfect heart for any length of time, as it holds in solution a large quantity of vegetable matter —so much so that its current is noticeable by its dark shade for many miles after it enters the St. Lawrence at St. Ann's. The rainfall of Spain is thirty inches, being two inches more than Canada, without our heat, and yet an eminent writer says: "Irrigation in a country so exposed to droughts as Spain is of the greatest importance, and is carried on to a large extent.

In Mr. President Burnet's annual address to our Association in 1871, the following passage occurs :—"The severe drought had tested many of our choice varieties of fruits,"—and I heard many remarks at the Centennial at Philadelphia, that fruit would have been much finer, had Canada and the States been favoured with a larger rainfall. 760 years before the Christian era, in order to picture a state of desolation, Isaiah writes : "Ye shall be as an oak whose leaf fadeth, and as a garden that hath no water." The Jews, no doubt, derived their system of irrigation from the Egyptians, who we learn from history and other monuments, practised it 4,000 years ago, and are still practising it at the present day. The climate of this interesting country is remarkably equable; the atmosphere is dry and clear. At Cairo, there is generally but one heavy storm a year, which occurs in the winter, and there is a shower or two besides. At Thebes, in upper Egypt, they have a storm only every four years, and a light shower about as frequently; and yet with the crudest kind of means for raising water above those parts of the country not sufficiently low to catch the overflow of of the Nile, they raise abundant crops and generally *three* on the same piece of land each year. The

population of Egypt is now only about 3,000,000, but in days gone by it was many times that number.

The vineyard is the most valuable part of an Egyptian estate ; but other fruits are cultivated, especially the palm tree. The gardens were often exclusive and laid out with great formality ; they were intersected with numerous small channels, which were filled by one or more water wheels. By these channels the water is spread over the garden, which is divided by them into many square compartments ; these are edged with ridges of earth, and flooded as occasion requires.

Two methods seem to have been generally adopted for raising water. One was with a bucket attached to a stick, which was suspended to a long pole held up by a crotched stick set up in the ground, similar to those often seen at the present day in many parts of Canada for lifting water out of wells ; the other was by means of a horizontal wheel, turned by oxen or mules, and connected with a vertical wheel which is on the same axis as another, around which are earthen pots in which the water is raised and poured into a trough.

The canals of Egypt for irrigating purposes are very extensive, and on them has depended the life of the country, which has been in a state of more or less civilization for upwards of 4,000 years. In lower Egypt we find the Mahmoodee-yeh Canal 50 miles long and 160 feet broad, and the great canal called Bahr Yoosaf or river Joseph, 350 miles long. This work was probably executed under the Pharaohs, and some historians attribute it to the patriarch Joseph himself. This used to form an important highway for shipping, as well as being used for irrigating purposes. At the present day the grape is a common fruit, but no wine is made from it, owing to its being prohibited by the Mahommedan religion.

In no country in the world is agriculture carried on more thoroughly than in Japan. The British Isles cannot compare, in point of production, with that of the Island of Niphon, the largest and most central of this archipelago. We find the rainfall here, 75 inches per annum, nearly three times that of Canada. This, however, principally falls in the summer months ; but in the winter, when wheat and kindred products are grown, the average rainfall is only twenty-two inches per month, or nearly as much as is deposited in Canada in an average year. This amount of moisture, although they have the influence of the sea air, which adds considerably to the humidity of the climate, is considered totally inadequate to the wants of agriculture, and, consequently a vast net work of canals and artificial streams are made to intersect the whole of the country ; so that on the settled part of the Japanese Islands, which are not much larger than the New England States of America, they maintain without any imports, a population of 35,500,000. In Japan but two crops are grown in the year—in summer, rice, tobacco and the sugar-cane ; in winter, wheat and other kinds of grain. The fruits are semi-tropical—such as oranges, limes, grapes and blackberries. Former exclusiveness restricted the introduction of new sorts, but as this has been partially removed, a grand field is now open for the ubiquitous *tree pedlar !* It is estimated that as much is grown on one acre in Japan in one season as can be grown in Canada in four. The Japanese have a wonderful skill in dwarfing fruits, which they train to small bamboo poles which are tied to stakes forming a horizontal network at the height of from four to six feet. The agriculture of China is similar to Japan ; I will not, therefore prolong the paper in its discussion. The irrigation of India is one of the most magnificent monuments to science of the present day. One canal in that country is one thousand five hundred miles in length, and has probably been the means of preserving the lives of millions from starvation. The peaceful spirit of this continent appears to indicate that it will eventually become the granary of the old world. The vast standing armies kept up for defence, or protection, by which means agriculture there is deprived of her husbandmen, will call forth all our energies to provide food for these non-producers ; this will tax the ingenuity of our farming communities to the utmost, so as to produce fruits, meats and breadstuffs for exportation, and I see no way in which these productions can be more greatly augmented than by a carefully and well-devised system of irrigation.

After the reading of Mr. Bucke's paper, the consideration of the second question was proposed, namely :

" Which are the most profitable apples to ship to the European Market ? "

Dr. Watt, Niagara, named the Baldwin, Esopus Spitzenberg and Northern Spy. The Newton Pippin is a good variety to send to that market when it can be grown clean and free from blemishes. The Mann Apple also promises to be a good apple for that market. The

Wagner is not sufficiently spherical, it is too irregular in form. If the Ribston Pippin is got away early it sells well, the trouble seems to be to get enough of this sort to make a shipment. Any apple of good quality and high colour will sell.

P. E. Bucke, Ottawa, Coxe's Orange Pippin sells well in the English Market, but I cannot say whether it can be profitably grown here.

L. Woolverton, Grimsby, would name the Baldwin, Greening and Spy. Thinks the Spy during the first twenty years will yield as much or more than the Baldwin.

G. Barnes, Hamilton, in my experience, the Baldwin will yield two barrels to one of any other sort.

Mr. Osborne, Beamsville, the Baldwin sells well at 16s. Sterling. In a lot of five thousand barrels, a few barrels of Cranberry Pippin brought 18s. 6d. Sterling. Good selection of fruit, and good, careful packing are both very important in shipping to the European Market.

Chas. Arnold, Paris, remarked that Europe wants red apples.

W. T. Taylor said that at the meeting of the Western New York Society, the preference had been given to the Baldwin, Mann, Spitzenberg and Spy.

The third subject: "Which are the best six varieties of out door grapes suitable for amateur cultivation," being introduced:

James Taylor, St. Catharines, thought that the Rogers' Hybrids possess the most satisfactory qualities. He had found the No. One to be too late in ripening. No Three was early. No. Four not so fine in quality. To number nine he is very partial, esteeming it as the best light coloured grape. No. Fourteen is also a favourite, thinks it better than No. 15. Number Fifteen is good, but the vine is very subject to mildew. His opinion of No. Nineteen is not so favourable as of many other sorts. Number Thirty is a light grape of peculiar flavour. Salem is a good grape. Would select as the most desirable numbers, 9, 3, 14, 33, 41 and 22. The Diana is the best wine grape. He mulches his vines with stable manure.

Chief Johnson, Tuscarora, has found No. 3 to be the earliest. No. One ripened with me last season.

W. Saunders, London, has had his best success with No. Four. For eating prefers the Canada; to those named would add Concord and Clinton, especially the Clinton.

Col. McGill, Oshawa, prefers Salem to Delaware, yet, would plant both these and the Concord, and Rogers' No. 4. The Champion is a hardy and early sort, but not of first quality.

S. Woodley, Hamilton, names Delaware, Salem, Rogers' No. Four and Nine, Allen's Hybrid and Eumelan. I am aware that Allen's Hybrid does sometimes mildew, but not with me. I use sulphur freely in the Spring on the ground under the vines.

James Taylor, St. Catharines, uses sulphur, but applies it to the berries when small with a bellows.

H. M. Switzer, Palermo, likes Rogers No. 15 remarkably well, and thinks highly of the Chippewa, Delaware, Concord, Hartford-Prolific, Northern Muscadine, Rogers 15 and 14.

W. H. Mills, Hamilton, named Concord, Delaware, Creveling, Hartford Prolific, and Rogers Nos. 4 and 15.

Geo. Barnes, Hamilton, named Hartford Prolific, Delaware, Rogers Nos. 1 and 4 and Salem; also Diana, if grown on poor gravelly soil. The Eumelan did not do well on sandy soil.

Matthew Bell, Hamilton, suggested Delaware, Allens' Hybrid, Rebecca, Creveling, Eumelan, Concord, Hartford Prolific or Champion, and Rogers Nos. 4, 7, 9 and 15.

The fourth subject, What is the best soil for the raspberry, and the best mode of cultivation? was opened by A. M. Smith, Drummondville, who said he had found the Clarke to be more hardy than the Franconia. For a home market I consider the Clarke to be very valuable, nearly as hardy as the Philadelphia, not as productive, but larger in berry and of better quality and colour, selling at Drummondville and Niagara Falls for two and three cents per quart more. The Mammoth Cluster and Davison's Thornless are the best of the black caps. Elm City is small, but early. Herstine has impressed me favourably.

S. D. Willard, Geneva, N. Y., remarked that there was a gain pecuniarily when we could secure earliness and productiveness, even though it be at the expense of quality. The Highland Hardy bore shipment well, was very early, came next to the strawberries, was fine in appearance, was very productive, very hardy, and the quality fair to good, not the highest, not quite

so good as Franconia. The Brandywine comes next after it and will give the largest picking, and so far has proved hardy ; in size, style and quality it is like the Highland Hardy.

Chief Johnson, Tuscarora, raises the Philadelphia, and yellow Antwerp; mulches with wood ashes.

Mr. Osborne remarked that at Montreal they raised fine Brinckles' orange, that here is called too tender to endure the winters without protection.

S. D. Willard cuts in the young wood in the summer, thereby obtains numerous branches which shade the ground and bear fruit.

After the discussion on grapes, a vote was taken upon the different varieties with the following result :—

Delaware	received	37 votes.
Concord	"	33 "
Rogers No 15	"	22 "
Rogers No 4	"	19 "
Salem	"	17 "
Clinton	"	16 "

The Chairman having appointed a Committee to examine and report upon the seedling and other fruits on exhibition, they brought in the following report :

The committee on seedling and other fruits, beg to report as follows :—
There were on the table the following seedling apples :—
No. 1, Russet, exhibited by Mr. Bradt, of Glanford.
No. 2, Seedling, exhibited by Daniel Wismer, Jordan Station.
No. 3, Seedling, named "London Beauty," exhibited by William Russell, London, Ont.
No. 4, Seedling, exhibited by A. Moyer & Co., Jordan.

No. 1 is exhibited for the prize of $50, to be awarded by this Association. It is a russet of medium to large size ; of fine, smooth, nearly round shape, possessing evidently many good qualities, though the specimens have not been well kept, being somewhat "wilted." The prize is to be awarded to a "late winter" apple, and your Committee have no satisfactory evidence before them that this apple properly belongs to this season. Your Committee think it an exceedingly promising fruit, but cannot take it upon themselves to award the prize of $50 without being further satisfied as to its claims thereto. We would recommend that a Committee be appointed to visit the locality, examine the original tree, and report thereon at the next winter meeting ; and that the exhibitor be requested to place in the hands of this Committee next fall, a number of specimens to be tested personally by the Committee, as to the keeping and other qualities of this fruit.

No. 2. A large and handsome apple, flattish, with a red cheek. The specimens have been tainted in keeping in the cellar, so that your Committee cannot fairly judge of its flavour, but in this respect consider it to be of second quality ; but from its large size and handsome appearance we adjudge it a prize of $5.

No. 3 resembles the Gravenstein in colour and markings, and somewhat in shape. The specimens are past their prime, and your Committee cannot judge of the merits of the fruit when at its best.

No. 4 is a pretty striped apple of medium size, and evidently a good keeper ; quite tart, core large, hardly up to the necessary standard of excellence.

Of the other fruit on the table we would say that Mr. Jno. Freed, of Hamilton, exhibits the following, which were picked before they were ripe, and shown at the Provincial Exhibition, viz. : Grimes' Golden, Ortley, Ben Davis, Hubbardston Nonsuch, Ohio Nonpariel, Haas, Utter's Red, Mammoth Pippin, King of Tomkins County, Rymal's Favourite, and Oswego Beurre pear. This fruit was grown by Warren Holton, Esq

Wm. Calder, of the Reservoir Water Works, exhibits some fine specimens of Gravenstein, in a splendid state of preservation.

Moyer & Co., of Jordan Station, show some fair specimens of twelve varieties of apples of established sorts ; and A. M. Smith, of Drummondville, also contributes some specimens of established kinds of apples.

Samuel Woodley, of Hamilton, shows four kinds of grapes, viz. : Salem, Rogers' No. 4, Eumelan and Catawba. These are good bunches, and in a fine state of preservation.

Matthew Bell contributes specimens of Rogers' grapes, kept openly in baskets in a cool room with temperature somewhere about 50 degrees. The varieties are No. 4, No. 33, No. 15, No. 44, and Salem. The berries have almost become raisins, and are quite palatable, the best flavoured amongst them being the No. 33.

Committee { GEO. LESLIE, JR. / JOHN FREED. / A. M. SMITH. / S. D. WILLARD. / JOHN M. DENTON.

SUMMER MEETING.

This meeting was held at Stratford, on Wednesday, the 18th of July, 1877, at ten o'clock, A M.

The President called the meeting to order, and the Secretary read the minutes of the last meeting, which were approved.

The following questions were submitted for discussion :—

First.—Plum culture. Can it be made profitable in Western Ontario, and what are the most desirable market sorts ?

Second.—Twig blight in the pear, over what extent of country has it prevailed this season ?

Third.—Strawberries, what mode of culture, in hills or thick rows, is found most profitable, and what are the best varieties ?

Fourth.—Can the grape be profitably grown for market in Western Ontario ?

Fifth.—Injurious insects. How best to counteract the ravages of the codlin moth. Is the forest tent caterpillar likely to continue troublesome ?

Sixth.—Can any of the nut-bearing trees be grown with profit, and, if so, what varieties ?

The meeting proceeded to the consideration of the first question.

Mr. Stitt, Stratford, thinks the plum can be profitably grown in that section. Has grown very fine Washingtons and Smith's Orleans, but finds the Lombard to be the most profitable.

P. H. Jarvis, Stratford, has grown plums for twenty years, and has been very successful. The frosts have sometimes killed the blossoms, and during the last three or four years the curculio has thinned the fruit rather too much. I believe that jarring the trees and catching the insects is the only effectual mode of getting rid of the troublesome creatures The English Green Gage, Lombard, Smith's Orleans, and a large blue plum do well here.

Mr. Buchan remarked, when I lived in Fullerton, the Lombard did well, and was a great favourite on account of the certainty of the crop. I have only resided here about a year, and therefore have but just planted plum trees in Stratford.

Chief Johnson, Tuscarora, I think highly of Lombard, Victoria, and Washington. Am very careful to gather the plums as soon as they fall, and burn them in the fire. Have found fresh slacked lime mixed with ashes and scattered over the trees as soon as the blossoms fall to be very beneficial.

Mr. Mitchell, St. Marys, for some time I found plum culture the most profitable of all, but for the few last years the curculio has made the crop so light as to render it unprofitable. I tried hanging up corn-cobs, soaked in molasses, in my plum trees, but found it quite useless to prevent the plums from being stung. I have also tried jarring, but did not save enough to pay for the trouble. I grow the Washington, General Hand, Imperial Gage, Reine Claude de Bavay, and Lombard For size and good quality I mention Washington, but for flavour prefer the Reine Claude de Bavay when thoroughly ripened The curculio does not work so bad in the Orange Egg and Reine Claude de Bavay. For real downright profit the Lombard is the best variety. We want the heavy bearers so that the curculio can not destroy all. I have doubts whether jarring will pay, but favour hens and small pigs. My soil is a clay loam with gravel sub-soil. It does not pay to keep old trees when growing plums for profit, say beyond twelve years ; but we should put out young orchards. Have not suffered from

black knot, but have seen it on the common blue plum, and think that variety is rapidly spreading the black knot.

Mr. Legge, St. Marys, does not grow many, but thinks highly of Reine Claude de Bavay, McLaughlin, Lombard and Blue Plum,

Mr. Smith, Downie, the black knot is bad on the blue plum. Bleecker's Gage gives me a good crop and seems to be nearly curculio proof. I believe plum raising would pay well. My soil is clay. The curculio came within three or four years.

Mr. Lansburg, Clinton, the curculio is not yet so bad in Clinton as it is here. Prefer Smith's Orleans, Imperial Gage, and Lombard, especially the two last named. Soil a sandy loam.

Mr. Miller, the Lombard is a favourite variety, selling for a dollar and a half per bushel. My soil a heavy clay loam. Am also partial to the yellow gage. The curculio has become very troublesome.

Mr. Stitt stated that one of his neighbours thinks that the fowls have relieved his plum trees of curculio, for this year there are none where the fowls have the run.

Mr. Roy, Owen Sound, the plum crop this year has been very heavy in the neighbourhood of Owen Sound; we have no curculio, but we have the black knot, and it seems to be increasing. Plum trees need to be renewed after a few years, for they bear themselves to death. I grow quite a number of varieties, but almost all sorts are grown in the vicinity. The black knot is mostly confined to the old trees.

Col. McGill, Oshawa, grows some twenty-five varieties. The Lombard is the most profitable, followed by Yellow Egg, Duane's Purple, and Bradshaw. The Washington is a fine dessert sort. I always have plenty of plums in spite of the curculio, though I do nothing to prevent them stinging the fruit, but just let them have their way. I prefer the blue plum for preserving. Soil is a sandy loam. The most money can be made from the Lombard. Have not had any black knot for twenty years, except on Duane's Purple.

Mr. Grey, Woodstock.—I have quite a variety of plums, and am pretty successful with them all. I find that the black knot affects the dark plums the most. Prefer the Green Gage and Imperial Gage, and of these I have usually a good crop, despite the curculio. The top soil is loamy, the sub-soil very heavy clay.

Mr. Parker, Woodstock, succeeds best with the Lombard; has plenty of black knot and curculio. He jarrs the trees, and catches and kills the curculio, else he would not have any plums. The Blue Damson is excellent for preserving,—indeed the best for this purpose.

Rev. Chas. Campbell, Niagara.—My neighbours have been planting plums largely. The small blue damson is the favourite. The black-knot was formerly very bad, but has now nearly disappeared from us. The Blue Damson and Lombard are immense croppers.

Mr. Kettlewell, London.—The plum can be made profitable: some labour is necessary, but it pays. It is necessary to shake the trees and kill the curculio as they fall; we Canadians can catch and kill the Turk if the Russians cannot. I cultivate the Washington, Bradshaw, Imperial Gage, Coe's Golden Drop, McLaughlin, and Green Gage. For quality I prefer the McLaughlin, Imperial Gage, and Green Gage. It will not pay to let the curculio alone. I caught 846 curculios this year, and saved my crop—indeed had to thin out the fruit. My little boy said to me, "Papa, you curculioed them too much." However, I don't want the little turks about. For quality the McLaughlin is the best, but the Bradshaw will sell for more money than the McLaughlin on account of its size. The Lombard is the greatest cropper of all.

Mr. Mitchell.—I have caught over a thousand curculio a day, day after day, and after all I did not save my crop.

Rev. W. F. Clarke, Guelph.—I believe plums can be grown profitably, and that the Lombard stands at the head for profit. Next to the Lombard I find the Bleecker's Yellow Gage to rank as a cropper, and it is hardy. Thinks the blue plum to be the source of the black knot, for he has done away with his blue plum trees, and with them abolished the black knot.

P. E. Bucke, Ottawa.—I have tried the Lombard, Washington, Yellow Egg, etc., etc., but none of them would fruit. Only the wild plums will bear fruit, and of these we have some very good varieties.

C. Arnold, Paris.—I have often caught the curculio by the thousand, and yet did not get enough fruit to pay for the labour. However, this year I have a good crop of plums, and

hope to get fruit enough to pay. Think Pond's Seedling will pay me the best,—get from three to four dollars per bushel. Prince's Yellow Gage is early, and sells well. The reason why it will not pay me to catch the curculio is that I have so many neighbours who take no pains to destroy them, so that before I can secure a crop I have to catch my own and theirs too. The Washington is a fine plum, but a very uncertain cropper, and the fruit is very subject to rot. The English damson is the best preserving plum, and it sells well; the Wild Goose plum is worthless. I have grown and fruited it for a number of years; its only value is as a stock for grafting good plums upon. Cannot see much value in the Italian prune; all prunes with me are too much skin and bone and too little pulp.

W. Saunders, London.—We want size and colour in a fruit for market; the light varieties are not as good for marketing as the dark. The Bradshaw sells very well; Pond's Seedling also commands a good price. Guthrie's Apricot Plum is my favourite dessert plum, but it is a poor cropper, and insects are very fond of it. I believe the curculio can be fought successfully, and in the end profitably.

By request the Committee took up the consideration of the fifth subject: Injurious Insects—How best to counteract the ravages of the Codlin Moth? Is the Forest Tent Caterpillar likely to continue troublesome?

Mr. Stitt has not found it very difficult to keep the caterpillar in subjection.

Judge Scott, Brampton—searches for the eggs of the caterpillar in the winter, and takes them off. If any escape then, he finds the young caterpillars in the spring when they have hatched out and begun to make their web.

Chief Johnson said he killed the caterpillars in their web while young.

Mr. Mitchell would get rid of the codlin moths by burning lights in the orchard in summer, so that they can fly into them and perish. The codlin moth worm often crawls under the scales of rough bark, so that I frequently find them there. I would clean off this bark in the early spring, and let the pigs run in the orchard during the summer to devour the fallen apples.

John Feed, Hamilton, knows of no way of getting rid of either of these insect pests but by catching and killing them.

Mr. Honsberger—In order to kill the codlin moth, I gather and feed to my hogs all the fallen apples. Have had very little experience of the tent caterpillar until this year. I have an orchard of 350 young trees, from which I shook the worms off and trampled them to death, and so saved my trees.

Mr. Stephenson—There are a great many tent caterpillars this year; the best way to get rid of them is to begin early in the spring and gather the eggs or kill the worms as soon as they are hatched.

Col. McGill, Oshawa, scrapes the rough bark off his trees, and ties a rag around the trunk of the tree, and catches the worms of the codlin moth in the folds of the rag. He was troubled with worms on his currant and gooseberry bushes; to get rid of them his man coal-oiled them, and succeeded in killing the bushes if he did not the worms.

Mr. Kettlewell, London, advises to pick up all the fallen fruit frequently, and feed it to the pigs, or burn it, or in some way destroy the worms that are in it. He would turn in the pigs among the trees, if there were no other things that they could get at and injure. The forest tent caterpillars come down on to the body of the tree during the heat of the day, and then is a good time to catch and kill them. But the best way is to get the eggs.

Rev. W. F. Clarke, Guelph, thinks the tent caterpillars are likely to continue troublesome, because they breed on the wild cherry and other trees in the forest. We are much indebted to the students of Entomology for the information they have given us of the habits of these insects. Many think that the studies of the entomologist are of a very trifling nature, but they are by no means so, he is really the orchardists best friend.

W. Saunders, London.—This forest caterpillar does not make a tent like the one with which we are most familiar, but the worms collect on the trunk or large limbs in the middle of the day. They are destroyed in various ways. A military man shoots them with a charge of powder, but the best way is to gather the eggs in winter, and failing to get them in that way, search for them as soon as hatched. Fires in the orchard will destroy the moth of this insect, but they are not likely to catch many of the codlin moth. The codlin moth has two broods in the year. It is the first brood that causes the apples to fall in midsummer. The second brood is found in the apples in the fall and winter. It is very serviceable to put ban-

dages around the trunks of the apple trees in June, for as most of the worms leave the apples before they fall, they will creep under these bandages to make their cocoons and pass into the chrysalis state. These bandages should be examined as often as once in every ten days, and all the worms found under them or in the folds of the cloth destroyed.

Mr. Baker, London.—I find that the codlin moth is getting worse every year. Believe the pigs are very serviceable when allowed to run in the orchard and eat the fallen fruit.

D. Shoff, McGillivray.—The tent caterpillars are stripping the trees completely. Trees denuded of their foliage do not always die, but it injures them for some time. Coal-oil will kill them.

Mr. Legge, St. Mary's, succeeded in saving his orchard by sweeping down the cater pillars and killing them, and then tarred the trunk of the trees to prevent any new comers from going up.

Mr. Searle, Clinton, exhibited a simple contrivance for cutting off the twigs and small branches with the eggs of the caterpillars on them.

Mr. Saunders, London, gave a minute description of the difference between C. Americana, the common tent caterpillar of our orchards, and C. Sylvatica, the forest tent caterpillar, which was this season unusually abundant in that section. Members who have the report for 1875 will find in the entomological part at page 20 and 21, very good drawings of both of those caterpillars, with full descriptions. Mr. Saunders thought that they would not long continue to be troublesome, that from some cause not yet fully understood, they seldom appeared in such great numbers for two consecutive seasons.

Mr. Mitchell has destroyed them in his orchard by sending the boys into the trees who jarred the limbs, which caused the worms to let themselves down, when he caught them in a pan and killed them. He remarked that usually when they begin to travel they have nearly done eating, and are then searching for a convenient place to build their cocoons.

Rev. President Burnet, London, I found them on my trees from the 7th to the 10th of May ; by the 24th of May they had made a net over the leaves. Afterwards they went into a fork of the branches, where they wove a web and cast their skins.

P. E. Bucke, Ottawa, remarked that last year they were very abundant in that vicinity, but that this year there were none.

The sixth subject was then considered, viz : Can any of the nut-bearing trees be grown with profit, and if so, what varieties?

John Freed said that in Hamilton the English Cob-nut or Filbert, fruits well.

W. Saunders, London,—I have not much experience with nut trees. Some seven years ago I bought a few Hickory-nut trees, and now they are only about twelve feet high. There is a row of Filberts in the grounds of the Lunatic Asylum but not much fruit as yet, though they have been growing there for six or seven years. Butternut trees that I planted at the same time with the Hickorynut trees are bearing.

P. E. Bucke,—Filberts kill down every year at Ottawa.

Judge Scott remarked that the Butternut grew much faster than the Hickorynut, that the Hickory made a very handsome tree.

Mr. Stitt remarked that the Canadian Hazelnut growing in a shady place fruited well.

P. Jarvis, Stratford,—Butternuts gathered at the proper time make a very fine pickle, and in that state might be made an article of commerce.

President Burnet thought that the winter killed the catkins of the European Filbert, and that hence they fruit seldom and sparsely.

Col. McGill stated that the Native Canadian Hazelnut and Butternut grew well at Oshawa.

Mr. Baker said both Walnuts and Butternuts grow well about London, and thought that the Chestnut should be profitable for the nuts sold at four to five dollars per bushel.

John Symmonds, London, thought that the English Filberts would fruit well if they were only properly pruned. Each tree should be pruned with a clear stem of twelve inches, which must be kept free from all shoots as well as suckers from the root. The head should be kept in an open cup-like form, and the centre preserved open and free from branches. All the short spurs which are produced on the branches should be preserved, but if the laterals exceed six inches in length they should be cut back so as to form spurs. The great object is to have the branches thickly covered with fruit bearing spurs.

The thanks of the meeting were tendered through the President to the kind friends in Stratford, and especially to Mr Jarvis for his kind attentions which had made our meeting so pleasant.

Mr. Jarvis and Mr. Hanson replied, thanking the members from a distance for taking the trouble to come to Stratford and contribute so much to the interest of the meeting.

Thanks were also most cordially tendered to Mr. O'Loane for the use of his office in which the meeting was held, and thereupon the meeting broke up.

FALL MEETING.

Held in the Town Hall, Port Hope, on Wednesday, 31st October, 1877.

President Burnet called the meeting to order, and the Secretary read the minutes of the Summer Meeting.

The President appointed Messrs. Leslie, Arnold and A. M. Smith, a committee to examine and report upon the seedling fruits on Exhibition, and Messrs. Hora, Bucke, Salter and Dempsey a committee to examine and report upon all other fruits exhibited.

The meeting then proceeded to the consideration of the following subject, viz: Varieties of apple, which of them are proving most worthy of cultivation ?

Wm. Roy, Owen Sound.—The Ribston Pippin is fine for home use and for export, Golden Russet is very valuable, Red Astracan is early and very desirable. The Snow Apple is a first class fruit, the Pomme Grise is hardy and very fine, one of the best for market, Scarlet Pearmain is a very valuable, early autumn fruit, Baldwin does well and bears good crops. The apple crop this year is about one third of the usual quantity and of very fine quality.

Mr. Salter, Port Hope, has just been planting, mostly old standard winter sorts. The Baldwin is preferred by the fruit dealers. There is considerable fruit raised about this section, which finds a market at Montreal, Ottawa and Lindsay.

Mr. Coleman, Bowmanville.—There are thousands of barrels of fruit sold from about Bowmanville. The orchards extend to lake Scugog, about eighteen miles distant, and they are splendid. There are from eight to ten thousand barrels sent from Bowmanville alone. We begin with the early sorts, the Early harvest, Golden Sweet, &c., and for winter sorts the Northern Spy, Baldwin, Russets and R. I. Greening. The Greening does not do as well as it used to. I have a Baldwin tree that is twenty years old, it is vigorous and healthy. Early apples bring $1.25, late apples, $1.50 per barrel for the fruit, the buyer picks the fruit and supplies the barrels.

Mr. Roberts, Cobourg, remarked that the Talman Sweet brought only 80 cents per barrel, while other sorts brought $1.25, that is for the fruit alone, the buyer picking and packing. The barrel used is the ordinary flour barrel. Mr. E. C. Beman, of Newcastle, has a large fruit orchard, comprising pears, apples, plums, &c. I have planted three hundred pear trees. My best apples are the Golden Russet, Yellow Belleflower and Northern Spy. The Belleflower is not shipped to Europe because of its want of colour. In that market only high coloured fruit is in demand. The Snow apple does not spot much in my orchard.

Mr. Edwards, Peterboro.—The kinds best suited to that locality are the Snow, St. Lawrence, Yellow Belleflower, Red Astracan, Duchess of Oldenburg, Golden Russet and Northern Spy. There is not much fruit shipped from Peterboro'.

James Clark, of Canifton, grows chiefly seedlings, some of them are very fine. He resides in Thurlow, six miles north of Belleville. I have over twenty varieties of seedlings, four or five of these are more fruitful, more hardy, and on that account more profitable than the kinds usually grown. Some of them keep until February and March. He exhibited to the meeting one of his seedlings, it was a conical striped apple, sub-acid and keeps well until the first of February. It sells well. It was suggested that he name it the Clarke apple.

Mr. Trenbeth, Port Hope, shewed to the meeting a sample of the Grimes Golden Pippin which he plucked from the tree sent to him by the association. The Northern Spy is one of the apples most highly esteemed, it is sought for by the fruit dealers. The Yellow Belle Flower is also very much thought of. I sold this year about forty barrels of apples, for which I received $2.10 per barrel, packed in common flour barrels. The barrels cost me 30cts each. I picked and packed myself. He shewed to the meeting very fine samples of Blenheim Orange, Yellow Belleflower, R. I. Greening, Cabashea, and Golden Russet.

Geo. Smith, Port Hope, remarked that fruit growing is increasing about Port Hope.

A. Hood, Guelph, called attention to a seedling dessert apple not unlike a crab in appearance, sweet and pleasant.

After dinner the subject of pear culture was taken up and the varieties which had proved most successful.

Mr. Roberts has not fruited any new varieties yet, but has imported a number of pear trees from France, some nineteen new sorts of pear, besides plum, cherry and apple. Has fruited the plum, Belle de September, and found it large and fine.

Mr. Coleman.—Our soil is strong, rich and dry, trees do well in it, yea, splendidly; it is a clay soil but not stiff. I plant my dwarf pears with the place of union a little below the surface. After they have been growing a few years, I remove the earth from the trunk in the latter part of July, cut the bark of the pear and return the earth to its place. I do this in order to make roots grow out from the pear above its junction with the quince. The best variety of all is the Flemish Beauty. I like the Summer Bon Chretien; do not think much of Napoleon. The Bartlett is rather tender, particularly if exposed to the north-west wind. Clapp's Favourite does remarkably well, fruits evenly and abundantly, but the fruit will not keep. The White Doyenne is good, the fruit does not crack and the tree bears every year. Duchess of Angouleme is not the most profitable. Winter Nelis is a fine variety. Louise Bonne is an enormous cropper, and does splendidly.

Mr. Clark, Canifton, grows good apples and grapes, but cannot do anything with the pear.

Mr. Edwards, Peterboro'.—The Flemish Beauty is the best pear we have in our section.

Mr. Roy, of Owen Sound, named Bartlett, Summer Franc Real, Beurre Diel, Duchess of Angouleme, Flemish Beauty, Lawrence, Louise Bonne, Seckel, Sheldon, Beurre Clairgeau, Beurre Superfin, Glout Morceau, and Winter Nelis. His favourite of them all is the Flemish Beauty; it is healthy and productive. The pear trees have not shewn any blight this season. He uses wood ashes liberally about his pear trees.

Wm. Saunders, London.—I used to fancy that the Flemish Beauty was free from blight, but now I must say that I have lost nearly all of my trees of this variety by the blight. My Clapp's Favourite are also badly mutilated. Beurre d'Anjou has suffered the least; the fruit of this variety is large and good. My trees of the Lawrence have been blighting during the last two years. I have failed with dwarf pear trees, owing to the killing of the quince roots by the frosts of winter. The Duchess d'Angouleme has succeeded the best of any of the dwarfs. Dana's Hovey is a very nice fruit, and as yet has not suffered in my grounds from the blight. I am very partial to the Tyson. The Jalousie de Fontenay is sweet and of fine flavour.

Mr. Simpson, grows Clapp's Favourite, Flemish Beauty and Bartlett; gives the preference to Clapp's Favourite. As yet has not been troubled with the blight.

E. A. Powers, grows pears; thinks highly of the Flemish beauty and Winter Nelis. Has been troubled with the blight, but thinks he has prevented it by driving rusty nails into the roots, for since then he has not been troubled with blight.

Charles Arnold, Paris, is very favourably impressed with the Goodale; the tree is a good grower; the fruit is of good flavor, though not equal to the Seckel or Tyson in quality. I am satisfied there is more money to be gained by growing the Goodale than by raising pears of the Flemish Beauty. The fruit is large. General Negley is a fine showy fruit. Duchess de Bordeaux is a splendid keeper.

Mr. Rose.—My soil is a medium heavy soil, and deep. Would name Flemish Beauty, Bartlett, Clapp's Favourite, Vicar Winkfield, White Doyenne and Duchess d'Angouleme.

A. M. Smith, Drummondville.—Have fruited the Mount Vernon; it is a fruit of fine quality.

Rev. R. Burnet.—The Brockworth Park is a splendid pear, and well worthy of cultivation. It is much like a large Louise Bonne.

The meeting then proceeded to the consideration of the subject of plum culture, and the best varieties.

M. Coleman said that he grew the Washington, Smith's Orleans, Lombard, Yellow Egg, Prince's Yellow Gage, and many more. I like the Smith's Orleans. Lombard is an enormous cropper, and pays immensely. Reine Claude de Bavay and Coe's Golden Drop both require a sheltered situation. Guthrie's Apricot bears well. Smith's Orleans is a capital

plum. Local buyers take my crop and ship the plums to Montreal, paying me a dollar per box, holding three pecks!

J. D. Roberts, Cobourg, grows early Prolific, Victoria, Belle de Septembre, Diamond, Yellow Egg, Goliath, Mitchelson, &c. Lombard is one of the best, a great cropper, sure bearer, and of good flavor. Diamond is a very large black plum, not best quality. Am pleased with Belle de Septembre; it is large and of good quality; a first-class market plum, in colour a beautiful bright red. My ground is all made soil, a black loam.

Mr. Bull, Weston.—The Lombard is the principal one I grow, but I think there is more money in the Columbia. The Washington is a fine plum. The Green Gage grows well and fruits well. The Bradshaw kills back. My soil is a heavy clay.

Mr. Rose said, my plums have nearly all died out.

W. Roy, Owen Sound.—I have had an enormous crop of plums this year. I grow Coe's Golden Drop, which I esteem very highly; also the Imperial Gage, the Lombard, and, by the way, more money can be made out of this than out of any other sort. Pond's Seedling is very large, showy, and sells well; Fellemberg is very sweet and luscious, and fine for drying; Victoria is a very showy fruit, of medium quality; the Diamond is large, fine for exporting. I find on inquiry that those dealing in plums have exported this season upwards of four thousand five hundred bushels of this fruit, of which three fourths were Lombard. Probably two-thirds of the shipment went to Chicago. The price ranged from 75 cents to $1.50 per bushel. With us, plum-trees do not last more than seven or eight years after they come into bearing,—they literally bear themselves to death; hence it is necessary to plant a new orchard as soon as the old one begins to fail. We have no curculio; there is some appearance of black knot, but we are all trying to keep that down.

P. C. Dempsey, Albury.—I had no fruit this year to speak of, just a few specimens of the Lombard, Prune, Victoria, and Pond's Seedling. I value the Prune and Victoria. Plums vary very much in price, ranging from two to five dollars per bushel.

J. Clarke named Washington, Yellow Egg, and a large blue plum, probably the Purple Egg.

Mr. P. C. Dempsey remarked that in his section the country is full of blue damsons, growing in almost every fence corner. The fruit was sweet, of very fine flavour, and the tree is hardy and reliable.

Mr. Beadle remarked that through the kindness of Mr. Dempsey he had received a bushel of these damsons, which came to him in excellent order, and proved to be the best plum when cooked of any he had seen canned.

Mr. Powers grew the Lombard, Washington, Imperial Gage, and Yellow Gage. For the market he had found the Lombard the most reliable.

P. E. Bucke, Ottawa.—We cannot grow your cultivated plums, the trees do not fruit in our climate. We have some very fine wild sorts which are hardy and productive.

Rev. Mr. Bethune, Port Hope.—I have a few plum-trees in my garden, but do not know the names of them. The trees are healthy, and bore some fruit this year.

Wm. Saunders, London.—I had a good crop of plums this year, and they paid well—better than any other fruit I have grown.

The Committee on Seedling Fruits brought in their Report, which is as follows:—

REPORT OF SEEDLING COMMITTEE.

PORT HOPE, October 31st, 1877.

Mr. J. C. Wilson, of Whitby, exhibits two varieties of seedling apples, and one of crabs. No. 1, a medium-sized striped reddish apple, ripening in fall; fair quality, but not equal to many cultivated varieties of same season.

No. 2. A seedling, in size, appearance, and all its qualities, much resembling the Maiden's Blush, but probably earlier.

The crab is a seedling from the Red Siberian but later, being now in season Might be valuable upon further trial for its lateness.

Mr. J. Burrows, of Drummondville, shows a seedling apple, season winter, medium size, greenish-yellow, with a slightly reddish cheek, mild sub-acid flavour. We would be glad to see it at the Winter Meeting, when its merits can be more fully tested.

Mr. Roy, of Owen Sound, has a handsome seedling of medium to large size, splashed and mottled with red on a yellow ground, the flesh now coarse, but as it would seem to be a good keeper we would like to see it at the Winter Meeting, when it will be more nearly ripe.

Mr. Wm. Brown, Sydenham, Co. Grey, one specimen of seedling winter apple of large size, not sufficiently ripe to judge of its qualities.

Mr. John E. Bull, of Weston, exhibits five varieties of apples, two of them of considerable excellence. No. 1, a large, light-yellow fruit, slightly striped, strongly resembling the Colvert in appearance and season, but of much better quality; flesh white, flavour good to very good, sub-acid.

No. 2, a handsome, oblong apple, season fall, beautifully striped and splashed with carmine red on a light-yellow ground; quality, first-rate, flesh very white, fine grain, flavour a sprightly sub-acid resembling the Fameuse, but richer. We award it a prize of $5.

Jas. M. Anderson, of Guelph, shows an apple in size, colour, and qualities strongly resembling the Benoni, if not identical.

Mr. Jas. Clarke, of Canifton, submits a showy, striped, red and yellow apple, sweet, and of fair quality. Might be prized by those who desire a sweet fall apple. Also a large oblong striped apple, of fair sub-acid quality, season early winter. Recommended for trial, especially in the colder parts of our Province. And a pretty, medium-sized crab, red, and of good, nearly sweet, flavour. We are unable to say if it will prove useful for cooking purposes.

Messrs. Leslie & Son exhibited a fair seedling pear, much resembling in appearance a medium-sized Beurre Bosc, of fine quality, buttery, free from grittiness, and worthy of extensive trial.

Mr. S. Greenfield, of Ottawa, sends a grape, said to be a seedling from the Concord, resembling the Hartford Prolific and of the same season, but not equal to these standard sorts.

P. C. Dempsey, of Albury, places on the table his No. 25 Seedling White Grape, a hybrid which has formerly been before the Association and received a first prize. It is superior in size of both bunch and berry to most of the white grapes heretofore introduced, of good flavour, and entirely free from foxiness. We would express the hope that the Society may some time be able to distribute it to the members of the Association.

A. M. Smith.
Charles Arnold.
Geo. Leslie, Jr.

REPORT OF THE COMMITTEE APPOINTED TO EXAMINE THE OTHER FRUITS ON EXHIBITION

Mr. Geo. Leslie, showed pears—Flemish Beauty, fine sample; Jaminette, Beurre Haines, good specimens; White Doyenne, fine specimens; Beurre Langlier, well-grown; Beurre Superfin, Mount Vernon, a good new winter pear, likely to succeed in Canada, and a profitable one to grow; Beurre Gris, Easter Beurre, a good keeper; Sheldon, a magnificent specimen; Beurre de Waterloo, Beurre Hardy, Winter Nelis, Doyenne Sieulle, Bergamot Cadette, a new variety; Brown Beurre, good; Buerre Diel, Beurre Clairgeau, Vicar of Winkfield, fine; Duchess d'Angouleme, a very superior collection in every respect. Apples—Stotts Russet a fine russet apple, seedling not yet ripe, but has been proved to be a good keeper, heavy cropper, and a fine strong grower, has received a prize from the Fruit Growers' Association. Jeffries, a new apple of much excellence; Kentish Filbasket, king of Tomkins county; St. Lawrence, Cornish Gilliflower, a very handsome apple without much flavour, Hertfordshire pear-main, light-coloured, medium-sized fruit, of very good flavour, well worthy of a more extended cultivation :—a fine display.

William Roy.—Flemish Beauty, very superior specimens; Winter Nelis, fair size; Glout Merceau, handsome specimens; Sheldon, good; Beurre Diel, Lawrence, Duchess d'Angouleme, Beurre Superfin, excellent specimen; Graslin, Beurre Clairgeau, Easter Beurre—This collection is of great excellence, proving the Owen Sound district is specially suited to the growth of this fruit.

A. M. Smith displays a magnificent specimen of King of Tompkins, and a fair sample of Maryland Red Streak.

Peter Coleman, of Bowmanville, showed some exceedingly fine Duchess d'Angouleme pears of extraordinary size, one weighing 18 oz., also a fair specimen of Beurre d'Anjou.

William Simpson, Port Hope, had some Flemish Beauty well coloured, of extra fine size and flavour.

William Roy, Owen Sound.—Apples—Ribstone Pippins, Fameuse, Baldwin, Yellow, Belleflower, Golden Russet, Fall Pippin, good specimens, free from codlin moth, the Snows being unusually fine.

H. M. Rose, Port Hope, showed pears—Buffam, White Doyenne, Napoleon, and apples —Fameuse, Yellow Belleflower.

Charles Arnold, Paris, shewed again two varieties of his Hybridized Grapes, Canada and Othello. Of the latter it is perhaps again necessary to say that it requires a good touch of the frost, as some may not have taken this precaution and so have been disappointed at its flavour. Of Canada the same may be said, as this alone brings it to its proper excellence.

George Smith, Port Hope, Iona grapes, well-coloured and ripened.

Richard Trenbeth, Port Hope.—Apples. A superior lot of Blenheim Orange would sell well in the English market. Golden Russet, Greening, Cabashea, extra fine specimen ; Yellow Belleflower, Northern Spy, Ribstone Pippin, Rambo, Grimes Golden, a good display.

P. E. Bucke,
F. H. Hora,
P. C. Dempsey,
G. B. Salter,

REPORT OF THE COMMITTEE APPOINTED TO EXAMINE THE SEEDLING PEACHES AND OTHER FRUITS GROWN BY MR. B. GOTT, ARKONA, ONTARIO.

To the Directors of the Fruit Growers' Association.

Gentlemen,—Your Committee appointed to visit the grounds of Mr. B. Gott, of Arkona, and to examine his seedling peaches and other fruits, beg to submit the following report :—

We left London by the early morning train of the 14th of September, and reached Watford Station on the Great Western Railway about 9 a. m. Arkona is situate in the midst of a belt of fertile country, midway between Watford and Parkhill, the latter being on the line of the Grand Trunk Railway ; Arkona is about 12 miles from either place, and about 7 or 8 from Lake Huron. Having secured a conveyance at Watford, and the day being fine, we had a very pleasant drive, reaching Mr. Gott's farm and nurseries about a mile and a half beyond the village in a little more than two hours.

As our visit was somewhat unexpected, we found that Mr. Gott was absent from home. He had gone to Parkhill, one of his market outlets, with a load of peaches. We found, however, no difficulty in getting all the information we needed, and were shown every attention by his good wife who seemed to take an equal interest with her husband in all that was grown on the place, knew the history of almost every tree and was quite familiar with all the different varieties of fruit.

We were soon among the peach trees which were so heavily laden as to threaten their destruction, indeed some of the more weakly branches had given way, broken down with the weight of fruit. The orchard of seedling peaches first claimed our attention. In this there were about 240 trees in all ; the great bulk of them with an abundance of fruit of fair size, ruddy in appearance, of good average quality and remarkably uniform in character. But there were among them several of superior excellence, the characteristics of which we shall give in detail indicating the fruits by numbers.

No. 1.—Large ; seven and three-quarter inches in circumference ; colour, whitish yellow, with a brilliant red cheek ; flesh white ; very juicy ; melting, and of a rich flavour ; stone

free, with the flesh surrounding it of a deep red colour. The foliage of the tree is large and vigorous, the young wood deep red. The fruit ripens about a week after Hale's early.

No. 2.—Large ; nearly eight inches in circumference ; color, pale yellow, almost covered with splashes and dots of deep red ; flesh rich and juicy ; white with reddish dots and red flesh about the stone ; stone medium sized, free ; foliage vigorous and glossy.

No. 3.—Is an excellent seedling peach, very closely resembling No. 2.

No. 4.—Large ; yellowish white, mottled almost entirely over with bright red. Flesh juicy, melting, and of good flavour ; white, much stained with red ; stone free. The origin of these seedlings is unknown.

Adjoining the seedling orchard there were a goodly number of trees of some of the standard varieties. There were 50 Crawfords Early with a fine crop of very handsome and high-coloured fruit, specimens of which measured eight and a half inches in circumference. These peaches were now ripe and being marketed.

There were also, besides other varieties, 10 Mountain Rose, an excellent and high-flavoured white peach, some of which measured eight inches in circumference, and bore some resemblance to the seedlings Nos. 1 and 2. The suture on the Mountain Rose is visible entirely around the fruit, although more prominent on the one side than the other. Mr. Gott's crop of peaches this season was over two hundred bushels, for which he realized from $1.75 to $4 a bushel.

His soil is a rich, deep sandy loam, with a subsoil of white sand. It was formerly a favourite Indian camping ground, evidence of which is furnished by the number of arrow heads and pieces of Indian pottery found by Mr. Gott on the premises ; indeed we picked up several pieces of this pottery ourselves while walking over the grounds.

Grapes, we found, were very forward here ; even as early as this the greater part of the crop had been marketed. The vines were planted eight feet apart and ten feet between the rows ; in one vineyard they were planted from east to west, in the other from north to south. The excellent character of the soil, and the sunny situation of the vineyards on a gentle slope facing south, resulted here in the fruit being unusually high coloured with a remarkable development of saccharine matter. Among other varieties we observed the following :—

Iona, good crop, not quite ripe.
Concord, heavy crop, scarcely ripe ; bunch and berry unusually large.
Hartford Prolific, quite ripe, nearly all the crop had been gathered.
Delaware, quite ripe, highly coloured, fine bunch and berry.
Rogers 4, scarcely ripe.
Rogers 3, quite ripe ; most of this variety had been marketed.
Eumelan, ripe and gone ; the crop had been good.
Rogers 19, ripe ; a heavy bearer, with large berry and fine bunch.
Rogers 43 (Barry), nearly ripe.
Rogers 44, almost ripe ; large bunch and berry.
Rogers 9, ripe, and deeper in colour than usual.
Salem, ripe ; fruiting well.
Rebecca, nearly ripe ; fair bunches, fruiting moderately well.

His pear trees are young and not many of them fruiting yet. We saw some good Bartletts fine fair fruit. Flemish Beauties very large and handsome ; also fine examples of Beurre d'Anjou and Seckel. The cherry trees, both on mazzard and mahaleb stocks had made remarkably healthy and vigorous growth, but had not fruited yet. The apple trees were also young but healthy, and making good growth.

Mr. Gott is also successful with small fruits. His raspberry canes had made strong growth, and yielded good fruit in their season. He cultivates Philadelphia, Clarke, Yellow Antwerp and Brandywine ; also gooseberries, currants, and strawberries, finding a ready market for all his fruit in his own district.

By the time we had made a careful tour of the orchards and partaken of a lunch, kindly provided for us, Mr. Gott had returned from market, and with him during the afternoon we visited again the different points of interest on his place, and returning to Watford in time

for the evening train, we reached London about ten P.M., much pleased with the experiences of the day.

WM. SAUNDERS,
ROBERT BURNET,
CHARLES ARNOLD,

OUR FRUITS FOR 1877.

By B. Gott, Arkona.

Being shut out from the pale of competition for your annual prize essays by inexperience and a want of skill in the subject to be treated, I shall content myself, and deem it a privilege and a pleasure to report as briefly as possible upon some of our common fruits for the very encouraging season just passed; and this I shall hasten to do before the exquisite and delightful flavour of our excellent grapes and aromatic peaches has wholly passed from the delicate and sensitive touch of our palate; or before the sweeping, blustering, pinching and merciless winds of approaching winter have driven the pervading and pleasant fragrance of them far away from our gardens and orchards. Allow me to note firstly—

OUR GRAPES,

By which term I should like to be understood to mean to designate Canadian grapes, those grown, fostered, and matured on the soil and within the boundary of British Canada,—or, if you please, Ontario. And further I should like to be understood to mean not grapes that are the product of vines carefully nursed and protected within walls of brick and mortar, and covered with transparent glass, and tended with the hand of matured experience and skill, but those grapes that are the products, the spontaneous fruitfulness of vines firmly rooted in the open fertile soils of our hills; wafted and fanned by the pure and invigorating breezes of our delightful atmosphere, and warmed and invigorated by that energetic and life giving principle derived directly from our brilliant Canadian sun. (I hope to be excused for the use of this seemingly selfish and ridiculous expression, as I am led to believe that the intense brightness, the extreme purity, and the vigour of our sunshine, is a peculiarity of Canada.) By our grapes I may be understood to mean further, not the wild, austere, and uninviting products of our native indigenous species of grape vines, found clambering in our native forests and on the banks of our beautiful streams (although some of these are not altogether bad to take), but grapes that are the abundant products of vines that were originated and nursed by the industrious, careful, skilled, and experienced Canadian and American hybridists and cultivators. Among those vines we have the highest, the best, and the latest improved types of the species viz., Arnold's Hybrids, Dempsey's Hybrids, Mills, and others of Canadian origin; also Roger's Hybrids, Ricket's, Campbell's, and many others of great excellence of American origin. These valuable fruits of highest and purest excellence, are found growing and thriving as luxuriantly and satisfactorily on our open borders as the most enthusiastic grape-lover could well desire. It is very pleasing and instructive to carefully note the growing importance to the masses of this branch of horticultural industry in this country. A few years ago, people among us of some considerable intelligence, would startle us in the most abrupt manner on grapes being presented to their notice, with the inquiry, "Yes, very nice; but what are they good for? How shall we use them? What are they used for?" and many other such questions of like ridiculous import. How changed are the inquiries of the present time, and all through the late grape season, instead of the foregoing, people would curiously and interestedly ask what is the name of this or the other variety when presented to their notice. Have you any vines of this or the other varieties to dispose of? etc., etc., thus showing the deepest intelligent concernment, and evincing at once a desire to possess the fruitful vine that would only promise to produce for them like precious fruits. Again, a short time ago it was not safe to offer a hundred-weight of grapes upon some of our country markets for fear of a stagnation, and an utter failure to dispose of the stock in anything like a reasonable and satisfactory, mannner. To-day, in those same markets, thousands of pounds can be safely offered, and can be easily and satisfactorily disposed of, and with very encouraging results. The grapes

both of Canadian and American origin, consumed in this country during the past season among all classes of our people, must have amounted to an enormous aggregate; and so the demand is multiplied and extended in this remarkable manner from year to year. It would not be very unsafe to one's reputation for veracity, or require any superhuman intellect to predict that in this country this remarkable consumption of this valuable fruit will go on increasing, and its popularity extending; and if the demand is not amply met at home, and by the industries of home growers, it must come from abroad, and foreign growers in other lands will be called upon to supply our people with a fruit they will not do without; and which we can safely, abundantly, and profitably produce at home. We have sunshine and showers as sublimely and as plentifully as any people; we have hill and dale as picturesque and as fertile as any land can boast, where we can produce bunches that will gladden the heart and elevate our native pride of country and home. The original wild grape-vine, and its near relative the Clinton, being only one remove from it, are fast disappearing, and are being rapidly and successfully supplanted by the far more valuable and excellent Othello, Agawam, Concord, Delaware, and many other valuable sorts of undoubted and established superiority. As for sorts and varieties and their characteristic points of difference and excellence, it appears to me that we are, as a people, merely experimenting, and our work at present accomplished and accomplishing is trial and testing. Although we have many varieties of grapes of the best of quality, and of established repute in their favourite localities, but as yet we have not a perfect, untarnished grape, resolutely coming up to all demands and fulfilling all requirements. We have not a grape that we can safely and confidently recommend to all classes of growers, and under all the various circumstances of their tastes and soils. This, however, I never expect to see; and it seems to me to be preposterous to ask for such a grape. It is not obtained in any other fruit of which we have any knowledge, and why should it be presistently asked for or so perseveringly studied and laboured for in our grapes. Each variety has its individual and characteristic peculiarities of nature and constitution; and he who originates a variety of grape of even an established local merit, is a benefactor to his country. Those varieties now existing and propagated freely among us, are, very fortunately, almost endless in their diversities, and are individually suited and well adapted to every man in his various tastes and requirements, to his circumstances and his relationships; and all he has to do is to find out, to test, to observe, and thus come to the knowledge of the variety or varieties best adapted to his individual peculiarities. All are good and useful in their proper places, and under proper and congenial conditions; and all are excellent and serviceable to men in their proper time and season. To say unqualifiedly that one variety is better than all others is a task not easily defined. It is very true, notwithstanding, that at the present time and under present existing circumstances of climate, soil, and season on this continent—I mean, of course, the grape-growing regions of it,—grape-growers, through the utmost extent of the regions, unhesitatingly confer an overshadowing and a proud pre-eminence upon the prevailing and unconquerable excellencies of one variety, and that variety is the *Concord*. On every list, north and south, east and west, it stands pre-eminently and emphatically as *The Grape for the Million*. But how long this high and sweeping verdict may continue to hold good, it is at present impossible for any ordinary intellect to predict. It is quite possible, and not at all improbable, that some new and aspiring grape of better inherent qualities shall be originated and produced among us that will take the dignified and coveted position, and leading the van shall leave its favoured rival far in the distant past. Just think of the extent and grandeur of the work that is here open for investigation and competition. How our hybridists and originators may ponder and work, and what fond and aspiring hopes may well animate their exertions with this grand conception and this cherished object before their vision. Remember, friend, that you aim at nothing less than to beat the Concord. Work away Arnold, and Saunders, and Dempsey; work away Rogers and Rommel, Campbell and Rickets of American renown. Your already heavy and justly celebrated work is yet unfinished; though you have bestowed trophies upon us your highest ambition is not attained. To beat the Concord in its glorious perfections, will require your utmost and concentrated abilities; your best and continued exertions, and your highest and best possible ripened experience. This popular and national variety originated with one E. W. Bull, of Concord, Mass., about some thirty years ago. The vine is very hardy, a good grower, and very healthy and productive. The wood is strong and rather long-jointed, and the leaves are large and deeply lobed. The fruit is large, globular, black, and thickly covered with a beautiful blue bloom; skin thin, and very easily cracks;

fruit sweet, pulpy, tender ; colours about two weeks before the Catawba, but should be allowed to hang long to develop all its excellencies ; bunches large-shouldered and compact. The hardiness, productiveness, and popularity of the Concord have induced many attempts to raise seedlings therefrom, some of which have attained considerable note, but none surpassing the renowned parent. During the past favourable and encouraging season for grape-growing in this section, we have been enabled to fruit and properly mature some thirty distinctive and representative varieties of noted Canadian and American grapes on our grounds. All these have uniformly done well, and given the best of satisfaction, excepting perhaps Agawam Roger's No. 15, which suffered much in wood, leaf, and berry from sunscald and mildew ; but whether this was caused by, or is the result of, internal weakness of nature and constitution, and thus an inability to withstand the trying vicissitudes of our peculiarly trying Canadian climate, or whether it was merely from the improper acclimatizing, that may be better affected or removed entirely after a few years residence among us, I am at present unable to state, but from some cause it failed to ripen its fruit. Wilder, Rogers' No. 4, and Herbert Rogers' No. 44, are either and each of them most certainly remarkable and highly valuable varieties, and may be justly estimated as boons to the people. Where they do well they may be very safely encouraged and liberally planted. The vines are so vigorous, such strong, free, and rampant growers ; make such fine, heavy, and healthy wood, and are clothed with such large, fine and handsome leaves, that they are at once captivating in their very appearance. But when the large compact bunches of rich, black, and deliciously-flavoured fruit is seen and tasted, the argument is conclusive : it is more than the most exacting and the most critical can withstand.

As for Delaware, we most sincerely think that the high and proud position so long and so extensively gained by this favourite variety is very much shaken by competition with the newer and very promising variety of Dr. G. W. Grant's on the Iona Islands, near Peekskill, N. Y., and hence called *Iona* from the place of its nativity. With the single exception of earliness of maturity this is a *peer*, a successful competitor for the national laurels so long held by the old standard variety, Delaware. Its vine, on gaining some root force is a remarkably heavy and strong grower, stout jointed and thickly covered with a large healthy and beautiful foliage. The fruit is large, oblong or oval, and of a beautiful, captivating, redish colour marked with deep, red veins longitudinally, and hangs pendant from a large, long and loosely clustered, heavily shouldered bunch. The capabilities of the vine for endurance in our climate is good, and for production and fruitfulness, wonderful. For excellence, pure and simple excellence in internal value, Mr. Rogers' No. 9, Lindley, stands at the present, among out-door and tested grapes without a successful rival. The vine is hardy and enduring in our colds, but not so unflinching in our heats, and on some soils, and in some locations a little liable to mildew. It makes a good growth in favourable circumstances and an abundance of strong healthy wood. The fruit is large, round, of a brick-red colour, pulp, soft, sweet, sprightly and of a peculiarly aromatic flavour, and of very high excellencies, the bunch is large, compact and heavily shouldered. The leaf is large and fine and the properties of the vine for early and abundant bearing are very satisfactory. This season we have had the extreme and unexpected satisfaction of fruiting the much talked of Early Champion or Talman as it is differently denominated in various localities ; it has one predominating point of merit viz : that of earliest maturity, the first grape of the season, (and we all have an extremely keen relish for that) and is not otherwise an inferior grape, the wood and leaf much, very much, resemble those of Perkin's or Hartford Prolific (but rather closer jointed than the latter) and the growth is strong and very healthy, and endures our climate well. The fruit is medium, round and of a bright, deep black colour, and without bloom, and is thickly set on a simple bunch, and of a rich, mild, sugary flavour. The vine is very hardy and prolific, and from the fact of the very early maturity of its fruit would be very acceptable and profitable ; and should be largely planted and encouraged among us. The Hartford Prolific, it seems to me, is striving hard, very hard for a place and name among the early varieties, it is really a very valuable and serviceable variety and well adapted to the popular want for an early, good grape. The vine is hardy and an excellent grower, and an early and abundant fruiter, the wood is heavy and healthy, and long jointed, and covered with a foliage at once fine, healthy and abundant, and I think, the finest and most spreading leaves found on any of our out-door grapes. The fruit is medium, round and of a dark, black colour with slight bloom, the flesh is semipulpy and of a sweet, sprightly flavour. The bunch

is large, loose and heavily shouldered ; and the vine (true to name) is very prolific, and commences to show fruit very young. Our highest hopes and expectations were, from a very early time raised to their utmost capacity by the reports of the good qualities we everywhere got from the Eumelan, one of Dr. G. W. Grant's new valuables, but rather two highly praised varieties. Well, we had it heavily fruiting on our grounds this very season, and are somewhat at rest as to its real place and intrinsic merits. That it is a valuable, and in some localities and respects an excellent variety, cannot be denied, but that it will attain a popularity or an eminence equal to some that are already in the market is very questionable.

The vine is a good grower and very hardy, and the bluish-coloured wood is covered with a beautiful bloom, and a fine large showy foliage and is very close jointed. The fruit is medium, round, and of a bluish black colour, covered with a showy bloom and is of a mild, soft sweetness, somewhat resembling the elder berry, and without good grape character. The berries with us this season were much and seriously affected by a sort of dry rot that appeared on them in spots like a red scab or blotch, and eventually resulted in the berry shrivelling and totally drying up to the skin ; and this singular disease spread rapidly from berry to berry through the entire bunch, and in some cases to every bunch on the vine. Whether this manifestation is a peculiarity of our soil and climate, or whether it is an internal weakness of the vine I am not at present able to say, but if it should continue it will terminate in the condemnation of this promising and largely expectant variety. What bunches were perfect and well matured, however, were excellent, and extremely admirable. Last, but not least, of our newly acquired and promising varieties of grapes this year was the Rebecca. Well, now, I cannot say that Rebecca has, after all, so very much real sterling merit in it ; but like many of her fair and famed namesakes has much, if not most, of her goodness in the name. But still it has some good qualities, and I believe if it were properly grown, and well matured (which might not have been the case with us this season), it would be a very fair grape, and then it is a *white* grape. The vine is a delicate slow grower, especially when young, but very hardy and close jointed. The leaf is small, delicate, and very deeply lobed, but very healthy ; the fruit is small to medium, oblong, and of a sweetish sprightly flavour ; and of a clear greenish whiteness ; the bunch is small, simple and very compact. For amateur culture this variety would make a very nice addition where a man can afford time and expense to gratify a fine taste.

Of the other varieties we have fruited upon our ground and of whose merits or demerits, as far as our soil, location, and climate are concerned, we are at least capable of offering an opinion, I shall at the present content myself by simply giving a short and plain description.

Massasoit, Roger's No. 3.—Vine healthy, strong grower, and early and abundant bearer. Wood very hardy, strong, and close jointed ; leaves large, fine and healthy, and deeply lobed. Fruit medium to large, round, and of a reddish brown colour with a bluish bloom ; flavour excellent, and of a very inviting and pleasant aroma ; bunch large and shouldered. This is a very profitable and promising variety.

Merrimac, Rogers No. 19.—Although it much resembles Wilder in its habits and general characteristics, yet it is scarcely so good or so valuable a variety. It is, however, well worthy of our best attention for amateur culture

Barry, Rogers, No. 43.—Vine very strong and rampant grower ; hardy, healthy, and a good and early bearer ; leaves abundant, large and healthy. Fruit large round, and of a bright black colour ; flesh sweet, tender and good, and about two weeks later than Wilder in maturing. Bunches medium to large, compact and shouldered. This is a very showy and very promising grape.

Delaware.—Of this famed variety so much has been said and written of late, that most growers perfectly understand its good and excellent qualities ; and I need scarcely detain the patient reader with a description of either it or its fruit. Sufficient to say, however, that with us during the past season it has well retained its everywhere excellent qualities.

Salem, Rogers No. 53.—Some authorities, however, have this numbered 22, but I have very good reason to believe the first number to be correct. (The Bushberg's catalogue, page 72.) The vine after reaching some age is a strong and vigorous grower, healthy and hardy, and promising to be an early kind ; good flavour ; the wood is heavy and close jointed ; foliage healthy and beautiful, and deeply lobed. The fruit is large to very large, round, and of a mild red colour, covered with bloom. The flesh is tender semipulpy, sprightly, aromatic and

very agreeable ; bunches medium to large, shouldered, and is a very valuable acquisition and wherever tried appears to be quite a popular favourite.

Of the late ripening varieties that we were enabled to fruit, and very nicely to mature by the 5th of October, were the following, viz :

Goethe, Roger's No. 1.—The vine is a strong and very good grower, heavy wood and close jointed, and has a disposition to show fruit quite early ; it is hardy, healthy, and abundantly covered with a showy foliage. Fruit large, oblong, and adheres firmly to the bunch, and of a whitish red colour ; flesh tender, sweet and rich, and possessing many of the characteristics of the celebrated Originator's Grapes. Bunches are large, long and loose, and simple. Where this grape can be properly grown and matured it would doubtless be very valuable.

Clinton.—This old sort is so well and generally known that a description of it seems needless, it is esteemed lightly, and of little internal value.

Catawba. –This old and popular variety seems to well retain its much renowned and valuable characteristics, and they have been partially brought out by us the past favourable season. Where it can be properly grown and matured, it is, without doubt, a number one grape, Ohio to the contrary notwithstanding. Vine a moderate grower at least while young, but very hardy, vigorous and healthy, and a good and early bearer. Fruit medium to large, round, red, with a soft lilac bloom ; flesh tender, somewhat pulpy, with a very rich vinous and spicy flavour of the best and most pleasant quality; bunches large, long, loose and shouldered. If we can raise and mature Catawbas we ought to be proud, and much more deeply patriotic.

Perkins.—Vine very much resembling Hartford, but rather more woolly and leaves far more deeply lobed ; a healthy and good grower, and early bearer. Fruit medium oblong, and of a soft whitish red colour ; flesh pulpy, not highly flavoured but pleasant ; no definite character claiming attention. Bunches small to medium, very compact, but does not hold the berry well, and slightly shouldered. I see no very good points to recommend Perkins to our friendly consideration.

Alvey or Hagar.—Vine very rapid and strong grower ; wood heavy and long jointed, hardy and healthy. Fruit excessively small, round, and of a bright black colour ; flesh no pulp, juicy mild and of a dark blood red, seeds large. Bunch small, shouldered, loose, and uninviting. This variety with us this season is of no value excepting merely as a curiosity, and to swell the list.

Isabella.—This old and well-tried variety has still some good points, but it is not always certain that they are going to be realized. The character is so well known that a description is useless. One of the best qualities of the fruit, if it is matured well, is its keeping qualities ; nicely and securely put away the fruit can be made to retain its plumpness and character long after most others are done, and so materially prolong the pleasant grape season, a point of no small value.

Israella.—This is one of Dr. Grant's puffs, and brought extensively into notice some few years ago, by that over-sanguine and enthusiastic gentleman. With us this season it is a great sell, and a great disappointment. The vine, however, is a strong grower, and pretty hardy, wood heavy and short jointed ; foliage healthy and good. Fruit small, round, and of a bright black colour ; flesh tender, and of no decided character. Bunch small and loosely scattered. Its excellencies are yet to appear.

Of those varieties growing and doing well with us, but which have not as yet presented us a sample of their fruit for inspection.

Othello, Arnold's No. 1—A good grower and hardy, with a deeply lobed, healthy and delicate leaf.

Autuchon, Arnold's No. 5.—Quite promising.

Martha.—Very slow and delicate grower while young, but possessing a good name from abroad, we hope great things from it.

Adirondac.—This is also a remarkably slow and delicate sort, while young. Hardy, but difficult to start ; it may, however redeem itself.

Crevelling, also hardy, but delicate while young.

Croton.—On account of the preciousness and extensive popularity of this promising variety, I have tried hard to get it started and fairly under way ; but as yet have made but very slow progress. Ive's seedling good grower, hardy.

Walter.—Good grower, hardy, and very satisfactory so far. We hope much from this variety.

Lady.—Aye this is the variety inestimably precious. It is Mr. Campbell's speciality from Delaware, Ohio. It may do well with us, unsympathizing, incredulous Canadians, but it has not done much as yet with me. I hope, however, as for the times of ripening, the following notes taken on the grounds may be of service. And be it distinctly understood, that these times refer exclusively to this location on our own grounds, and that this season and open exposed culture are meant.

August 9th, 1877.—Examined grapes to-day; found Agawam Roger's 15, badly affected with mildew in wood, in leaf and in fruit, much of the latter making no advancement towards ripening. Found Eumelan extensively and badly affected with red scab, a disease affecting the berry in spots, and causing it to shrivel and entirely dry up to the skin, no seed in these matured. The fruit that was healthy, and not thus affected, was fine, and maturing very nicely, bunch very large. Talman and Israella appear slightly affected also with the red scab, but not very largely. Talman quite ripe and of good flavour; all others look healthy and promising but not ripe.

August 29th, 1877.—Entered to-day into an extended and more thorough inspection of our grapes.

Agawam.—Those bunches and berries that are matured and healthy, are of most excellent flavour, about $\frac{2}{3}$ of the crop is lost. Massasoit, Roger's No. 3, ripening very nicely; promise to be excellent. Merrimack, Roger's 19, just turning, fine. Wilder, Roger's No. 4, ripening nicely.

Lindley, Roger's No. 9, just ripening; very fine.

Barry, Roger's No. 44, not yet changed.

Herbert, Roger's No. 44, well advanced in ripening.

Eumelan, ripe and all harvested.

Delaware, just commencing to turn for ripening.

Rebecca, well advanced in maturity, fine flavour.

Salem, Roger's No. 53, not yet changed.

Perkins, not ripe; yet unchanged.

Goethe, Roger's No. 1, no signs of ripening.

Cawtaba, not changed.

Champion, quite ripe, mostly gathered.

Israella, yet unchanged.

Hartford Prolific, changing for ripening.

Iona, just colouring.

Isabella, no signs of maturity.

Clinton, just changing.

Concord colouring very rapidly, these are very healthy and exceedingly promising.

October 5th, 1877.—Of the late ripening varieties still on the trellises, the following are now well ripened, viz.: Cawtaba, Goethe, Roger's No. 1, Perkins, Alvey, Isabella, Clinton, Israella, &c.

October 13th.—To-day we clipped the last of our grapes from the trellises, for this season. It is with feelings of eagerness we linger about the trellises, anxious to spy the last missed berry, and the idea of their being all gone is repugnant and unwelcome; we have cultivated a familiarity for them that is hard abruptly to break off. Of the last in good condition, were Cawtaba, Isabella, Perkins, Goethe, and Iona. Concord also is still good, and in the highest condition of excellence, but the over ripe and extended berries will burst their skin on the slightest pressure. Iona keep best.

October 23rd.—The foliage of our grapes are yet untouched by frost, and they still present an appearance almost as brilliant as summer; and scarcely an indication of approaching winter is upon them.

November 1st.—Although considerably scored and yellowed, there is yet an abundance of fine natural foliage upon the Grape trellises.

This circumstance has not before been noticed here for many years in the past.

Thus I have attempted to give as briefly as possible, what I know about our grapes, and although this has been very hurriedly, imperfectly and incompletely done, I must dedicate it to the fruit growers of this country, hoping at least that it may be of some humble service

to them in their arduous work and in their honest and persistent attempts to supply this needy country with good and perfect home grown grapes. May their laudable efforts abundantly succeed.

Having drawn so largely on my space in my observations on our grapes, I must of necessity condense my remarks on the other fruits of this very fruitful season. (Note in this last reference to the season, I wish to be understood that it is applicable only and truthfully to the cultivation of varied crops; that the man who relies on one crop, and that crop apples, cannot readily endorse this description of the season.) This brings me secondly to

Our Peaches.

The day when Canada would become able to grow and be noted for her fine peaches, at one time seemed very far in the future; and it seemed to those essaying it, that the realization of them would necessitate some radical and essential changes in the physical laws, by which our seasons and climate are governed. Notwithstanding those great discouragements and obstacles, however, we have been enabled this season to grow, mature, and harvest as fine and as lucious peaches as are the boasted product of any clime. Peach-growing this season received an impetus, a decided demonstration that will influence our growers and very sensibly affect the future destiny of this crop in this country. Cousin Sam! boast not of your exalted and exclusive control of American peach growing; for we in Icy Canada, may yet become recognized as an ally of no mean pretensions in this matter. The extraordinary and regular size, the beauty and completeness of outline and the exquisitely tinted and beautiful colours of our peaches this season were truly wonderful; and the surprisingly astonishing manner in which the trees were laden, and their slender and elastic branches weighed to the ground, was something to be talked about, and something worthy of a long journey to behold.

But the flavour, the delicate tender richness of juice and flesh, and the exhaling and delightful aroma of the ripened fruit, are recollections not quickly or easily forgotten. Could the man with disparaging notions of Canadian peach-growing have witnessed and inspected the demonstrations this season, we feel satisfied that the result would have been enough, and more than enough to have forever banished his scepticism to the winds, and firmly established him in the belief of this country's future greatness, and in her ample ability to supply her inhabitants with the best and richest of fruits.

Peach-growing seems to be no longer an experiment among us, but it has arrived to the standing and position of a permanent and remunerative industry; and our people can now plant and cultivate their peach orchard with as much confidence and assurance of satisfaction and success, as they have been long taught to exercise towards their apple orchards. Furthermore, we are reminded by this season to provide for emergencies, by planting fruits in variety, in large varieties, for it is an established law of nature to compensate, to preserve an equilibrium in this as in other matters and interests. When one of our precious fruits fails us, it is with feelings of no small satisfaction and delight that we look at the bending loads of another sort of fruit to compensate the loss. The idea of total failure in any of our staple industries, is very painful, but a partial failure is endurable. Such was our position this season. Apples, nil; peaches, very plentiful; plums scarce, and in great request; pears and cherries tolerably plentiful. This arrangement Providential.

Again, certain insects prey upon a sort of fruit to its almost total devastation, but others were left untouched for the use of depending man. Thus, by planting out liberally and plentifully of various sorts and kinds of fruits, we every year have some to cheer us, and in some years we have the greatest profusion and richest abundance of nutritious fruit products to feast our longing appetites, As for the differences of varieties of peaches now claiming our attention, we have not, as yet, experimented very largely, but have contented ourselves mostly, with a few of the most prominent; and of these we feel abundantly satisfied with the superexcellence of Early Crawford or Crawford Early. This is a truly remarkable variety of fruit destined for national honours and supreme domain; and standing in the same relation to all other peaches as the grape Concord holds to all other grapes; and on every catalogue, north or south, through the entire length and breadth of this extensive country it stands pre-eminent as a standard and popular variety. It was originated some few years ago

by one William Crawford Esq., of Middletown N.Y., U.S. The late A. J. Downing in his excellent and valuable work on the fruits and fruit trees of America, page 490, 1847, makes the following careful and judicious remarks on this sterling fruit. "This" says he, "is the most splendid and excellent of all early yellow fleshed peaches, and is scarcely surpassed by any other variety in size and beauty of appearance. As a market fruit it is perhaps the most popular of the day; and it is deserving of the high favour in which it is held by all growers of the peach." This enconium upon Crawford's peach we must decidedly endorse. The tree is very vigorous, very fruitful and tolerably healthy and hardy, and makes a fine orchard tree. The leaves are large and abundant. The fruit is large too, very large, oblong, swollen point at the top, very prominent, and the suture shallow. Skin, a deep yellow with a fine deep, red, cheek and is very enticing. Flesh, deep yellow, melting, sweet, rich and very excellent, accompanied by a marked and very pleasant aroma, and ripens about the first week in September. Flowers small. In last season's notes on this excellent variety I was induced to make statements derogatory to the bearing qualities of the tree; but after this season's experience, and by further acquaintance with our American friend, I beg leave, most decidedly, to revise that verdict. The crop was everything that could well be desired, and the bearing qualities of the trees all that the most exacting and unscrupulous could conscientiously wish. To develop the best results, however, with this as well as all other varieties of peaches, the tree must attain some maturity and stand on soil and in locations somewhat favourable to its urgent demands and necessity. Smock's Free we have also found to be very excellent and not inferior to Melocoton. Crawford's Late is also fast growing in popular favour, and bids fair to be one of our standard, and most valuable and profitable sorts. Mountain Rose has good and excellent qualities both in tree and in fruit, and in this section its excellence and its beautiful appearance has won it much respect. As usual our seedling peaches this year have been very abundant, very excellent and very profitable; many of them attaining equal size and beauty of appearance as well, also as excellent internal qualities as has the Mountain Rose and other renowned American varieties.

The Committee appointed by the President of the Ontario Fruit Growers' Association to visit our grounds and examine those seedling peaches this season, have reported, I believe upon four of them as having valuable qualities worthy of recommendation. And thus we are encouraged to raise peach trees from selected seed that are perfectly hardy and adapted to our climate and our necessities, and having excellent qualities of tree and fruit that may be worthy of dissemination, and that can be confidently recommended to our people. We have also several highly praised named sorts that we have not as yet fruited, all of which are promising, and so far, very encouraging, and shortly we hope to be able to report upon their several good qualities and estimable fruits. The most prominent of these names are Early York, Early Beatrice, Alexander, Foster, Stump the World, Hales Early, Lemon Cling, Old Mixon Free, and others; but we must notice

OUR APPLES.

This staple fruit crop was exceedingly scarce this season, and not alone with us, but the complaint was very general, not only in this country but throughout the whole Western States as well, as also, the North West country. In the East, I believe, there was a medium crop and in some sections a good yield; but taking the country as a whole, and the crop as an industry and a dependence, it was this year a general failure. The causes of this singular and wide-spread scarcity of apples have given rise to many speculations, and are doubtless varied and not overly well defined. Insect depredations and an over-abundant and general crop last year may have exerted an influence in this result; but it is more than likely that the last was the true and potent cause of injury, as it was noticed that the trees in the Spring failed to show their blossoms. There were, however, in this section and neighborhood some happy and cheering exceptions to this general and lamentable scarcity of apples on our trees. Some of our neighbours had a hundred and some two hundred bushels; and in the case of Mr. James Johnson on the lake shore, in the Township of Bosanquet, whose orchard of 200 trees is 29 years old and had, this season, 700 bushels of very superior apples. Others in this section also have had good crops which were readily disposed of at remunerative and encouraging prices. Let us hope, however, that this severe failure in this staple crop of fruit and which we so deeply feel, may bring us

instead, good and profitable results which we may keep after many days; as first a better and higher estimate of the real intrinsic value of this fruit and its true place in our economy, and second, a better and more general immunity from the devastations and depredations of the Codling Moth and other apple eating insects. Surely we may reasonably expect an equivalent.

OUR PEARS, PLUMS, AND CHERRIES.

The crops of these valuable fruits are improving in interest from year to year and this season these fruits have been tolerably plentiful throughout the country, and in certain favoured sections they have even been abundant. It is very clear, however, that considering our very favourable conditions for raising them, and the constant and increasing demand for them; that the half that should be provided are not produced among us.

OUR SMALL FRUITS.

These, without any exception, as far as I am aware, have been most abundant and very encouraging to their cultivators and admirers. Much interest is being annually developed in these fruits, and many are heard enquiring for plants of Strawberries, Raspberries, etc. from which to grow those welcome and delicious summer fruits so easily and abundantly produced. I have thus attempted to sketch the history of the fruit products of this encouraging and bountiful season, conscious of our dependence upon the "Giver of all Good" for those and all other mercies. I have done this for the double purpose of review, and to increase the interest in fruit growing among those who are less highly favoured; how far I have or am likely to succeed in those purposes I leave you, patient and attentive reader, to determine, assuring you at the same time that my wish and earnest desire is for the best interest of fruit culture in this country. And further, allow me to say, I firmly believe the day is not far in the distant future when we may become noted as a people for the beauty, the abundance and value of *our fruits.*

DAVID BRADT'S SEEDLING RUSSET.

To the President and Board of Directors of the
Fruit Growers' Association of Ontario.

GENTLEMEN.—I hand to you Specimens of my Seedling Apple.

The Tree is about forty years old, a Chance Seedling, and stands well exposed, growing in a line fence and at the present time very healthy, and has borne good crops, the best crops are produced in alternate years, but a light crop other years, the soil is a strong loam, the tree growing in sod without any cultivation. The tree is pruned regularly every year. In 1876 the crop was about 12 bushels picked apples, and many fell without counting. Their keeping qualities are quite equal to any other apple with which I am acquainted, some of them I had in good condition as late as June.

It is also a capital desert fruit, and for cooking I think is quite equal to the very best.

DAVID BRADT.

North Glandford, 7th February, 1877.

REPORT FROM J. J. GREGORY.

ST. THOMAS, ONT.,
February 17th, 1877.

D. W. BEADLE, ESQ.,
Secretary of the Fruit Growers' Association.

SIR —As the season is now apparently opening with its anxieties respecting the fruit

crop of 1877, we naturally turn to matters of interest in connexion with fruit growing in Ontario.

The Glass's Seedling Plum, Flemish Beauty Pear and Swayzie Pomegrise Apple, are all growing well, and bid very fair at present, to stand our Canadian weather, although in a very poor dried up condition when received from the agent of the Association.

We have a new raspberry, a chance seedling taken from an uncultivated field, so nearly resembling Mr. Saunders' Hybid Raspberry (which is to be distributed to members of the Fruit Grower's Association this year) in description, that we would like you to see the two plants growing together, and will send you one in the spring, if you will accept it, to be shewn by you to a Committee of the Association, if you think it is worthy after seeing the fruit. We have fifteen bearing bushes of this variety, propagated from one plant. Habit robust, perfectly hardy, fruit, deep purplish red, nearly a black ; flavour much like the wild native red raspberry ; plant nearly thornless, and prolific, does not sucker, but roots from the tips of the cane, like Mammoth Cluster ; fruit larger and a few days later ; a good market fruit.

Very respectfully yours,

JOHN J. GREGORY.

P. S.—Those native and seemingly Hybrid plants are plenty, with but little variation in colour of fruit, but generally not very prolific through this Township of Yarmouth and Southwold, in the County of Elgin.

J. J. G.

NOTE.—The Secretary received from Mr. Gregory a couple of these raspberry plants. One of them is growing, and may show fruit this year, 1878.

DANIEL WISMER'S SEEDLING APPLE.

JORDAN STATION, Feb. 6th, 1877.

To the Members of the Fruit Growers' Association now assembled in the City of Hamilton.

I again present you with my seedling apples. I again give you a description of them. The tree came up alongside of a pig-pen, where I fed my pigs apple cores. It in the first place was a very ordinary-looking tree, but I trimmed it up nicely and it became a fine thrifty tree. The soil is a sandy soil, not very light. The apple is a fine cooking apple, and a very good keeper, and a good eating apple ; also a splendid apple for frying. The tree is a hardy one and bears every year, which makes it very good where a person cannot have many trees. I trust you will examine them, and if they are worthy of anything I know you will do them justice.

Respectfully yours,

DANIEL WISMER.

CULTIVATION OF NUTS.

Visit to Chief Johnson's, in Onondaga.

WALNUTS, BUTTERNUTS AND HICKORY NUTS IN ABUNDANCE.

FRUIT GROWERS' ASSOCIATION ADVOCATE THEIR CULTURE.

From the Weekly Spectator, Hamilton, Nov. 8th, 1877.

At the summer meeting of the Fruit Growers' Association of Ontario, held at Stratford in July last, one of the subjects for discussion was "The nut-bearing trees of the Province ; and their adaptability for ornamental purposes, as well as a source of financia

profit to the farmer." The discussion which then took place was animated and interesting, and resulted in the appointing of a committee to visit the groves of Chief Johnson, of the Six Nation Indians, situated on the river between the villages of Middleport and Onondaga, in the Township of Onondaga. The Committee consisted of Mr. Charles Arnold, of Paris, and Mr. John Freed, of Hamilton, who with a representative from the *Spectator* paid the visit on Wednesday.

The gentlemen named took the 8 o'clock train of the H. & N. W. Railway, arriving in Caledonia in due time. Here one of Leith's spanking teams was hired for the drive, a delightful one along the banks of the Grand River—and although some of the farms presented a sterile appearance, without exception the late sown wheat looked well. In fact, it was more than once remarked that in some instances there were fears of the growth being too forward.

The company was augmented at Caledonia by Mr. W. T. Sawle, of the Caledonia *Sachem*, and on arriving at the residence of Chief Johnson, the party were received in the most courteous manner possible, and offered the hospitality of his household.

The worthy chief has many curiosities which it gives him pride to exhibit to visitors, and his guests were shown without parley a magnificent silver calumet (or pipe of peace) which was, prior to the revolutionary war, presented to the Mohawk Indians by the nine European patentees of the tract near Schoharie, granted in 1769, as a testimony of their sincere esteem. The bowl of the pipe is beautifully carved, there being a representation of an English army officer and an Indian chief linked together by a chain. Directly above is the sun, and beneath a fire, the former carrying out the idea that no dark misunderstanding should come between them, and the latter that their friendship should ever be warm. On the stem was engraved "E. Milne fecit." This valuable relic was given the chief by his father, who is still alive, rejoicing in the ripe old age of 84. Chief Johnson says that this mark of appreciation on the part of the settlers towards the Mohawks had a decided influence upon their actions in the American revolution.

After the rebellion of 1837, Chief Johnson opposed vigorously the passage of a bill to indemnify those who took the part of Mackenzie against the Canadian Government, and his course was met with such favour among his fellow-Indians that the Cayugas presented him with a magnificently-finished tomahawk, and an old British officer made him the recipient of a sword, properly engraved. Both of these momentoes of the stormy times of '37 were shown the guests. An hour or so was most pleasantly spent in the interior of the residence, in examining these and other Indian relics, after which the committee had an opportunity of visiting the groves.

The farm, two hundred acres in extent, and of the richest sandy loam, is delightfully situated on the banks of the Grand River. Twelve or fourteen acres are comprised in the nut groves, which are without exception the most extensive in the Dominion. On his grounds, standing singly, are most magnificent specimens of the black walnut trees, and the yield this year is said to be immense. Wagon load after wagon load have been driven off by friends of the chief from Brantford, Caledonia, Ancaster and elsewhere, and still there are thousands upon the ground.

There are also a great variety of hickory and butternut trees. These have borne immensely this season, and the quality of the fruit is fine.

Little doubt exists but the committee were impressed with the desirability of encouraging nut-planting, and from what one can see at chief Johnson's groves it could certainly be made a profitable investment for the farmer.

A great many homesteads throughout the country would be much improved in appearance by the planting out of walnut, butternut or hickory trees, and besides the shade afforded, a rich profit could be made in a few years from the products therefrom.

The committee purpose preparing a report which will be submitted at the next meeting of the Association, and it will be looked forward to with interest.

The Association are deserving well of the country, and our only wonder is that there is not a much larger membership, as the society sends out annually one or more new or choice plants to the subscribers. Next year a grapevine will be sent out—"The Burnet"—a hybrid between the black Hamburg and Hartford prolific, said to be the best grape in the country. The subscription to the society is only $1. Mr. D. W. Beadle, St. Catharines, is the Secretary, and when the annual report is published, the observations taken

by the Committee yesterday at chief Johnson's, will appear therein, together with a large amount of other interesting matter.

REPORT ON THE MUSKOKA DISTRICT.

BY WM. SAUNDERS, LONDON, ONT.

During the latter part of September it was my privilege to visit this interesting section of our province where free grants of land have of late attracted many settlers. Leaving Toronto by the early morning train, Gravenhurst, the terminus of the Northern Railway is reached about one P. M. The station is situated nearly a mile from the town in a small bay at the southern extremity of Lake Muskoka. Here taking the Steamboat Nipissing, the traveller is taken across Muskoka Lake to Muskoka River, up the river six miles to Bracebridge, down the river again to the lake and up Lake Muskoka to its head, where, passing through the lock at Port Carling, the higher waters of Lake Rosseau are entered. From thence the boat touches at several settlements or post offices on the borders of the Lake reaching the head of Lake Rosseau about nine P. M. I do not know of a more delightful day's travel during the summer season than this. The air of the lakes is very bracing and the scenery is perfectly charming as the boat threads its way among the numerous prettily wooded islands of every conceivable size and form.

During the two or three days spent at the head of Lake Rosseau, I took occasion to visit several of the farms in the neighbourhood, and more especially those of two of the members of our Association, Mr. W. L. Laurason and Mr. Coate, both of whom reside on the shores of Lake Rosseau about three or four miles from its head. At Mr. Laurason's place was found Glass' Seedling, the plum sent out by the Association two years ago, thriving tolerably well, also several other varieties of plums which gave more or less promise of success, some of them had stood the winter's cold fairly well, while others had suffered. We found wild plums abundant, fully ripe and of very fair quality. There were no signs of curculio marks on any of them, and no traces of this pest were observed anywhere in the district.

Mr. Laurason had been less successful with a small apple orchard. The St. Lawrence, Gravenstein, Red Astrachan, Fameuse and some other varieties, the names of which were not obtainable, had all suffered from the extreme cold of winter as was evidenced in the killing back of the wood and in the stunted appearance of the trees. I could not learn that there were any wild crab apples in this district.

Of pear trees only one Bartlett and one Flemish Beauty were seen, both young trees, the Bartlett had been killed nearly to the ground last winter, and the top of the Flemish Beauty partly killed, but in each instance they were making fresh shoots.

Houghton's Seedling Gooseberry does well here and is perfectly hardy. The green worm of the saw-fly which attacks the leaves has found its way this far and become troublesome, but the fruit worm is as yet unknown.

Tomatos ripen well; there were also fine nutmeg melons ripe at this date, September 10th.

On Mr. Coate's farm an excellent spot had been selected for an orchard, elevated and sheltered by a rocky ledge covered with wood on three sides. In this spot 100 apple trees had been planted two years previous including many varieties, the names of which in Mr. Coate's absence, could not be obtained. About one third of the number had lived and of these some had made but little headway, while others had made fair growth. The only fruit seen was a few examples of the large Red Siberian Crab, which were of good size, on a tree making very thrifty growth. We learnt here, that the Transcendant and Soulard Crabs also do well and fruit nicely.

Mr. Coate has succeeded remarkably well with strawberries, Wilson's Albany and Triomph de Gand, the uninterrupted snow during the winter forms so perfect a protection for the plants that they come out in fine condition in spring and produce very large crops. He was carefully nursing Arnold's new seedling strawberries distributed this year by the Association, and had succeeded in raising quite a number of young plants from the two he received.

Wild gooseberries were reported as very abundant, and wild blackberries and raspberries

so plentiful and fine that no efforts have been made to introduce the cultivated sorts. Huckleberries are extremely abundant in season, the bushes were to be seen anywhere in the woods.

REPORT ON W. H. MILLS' HYBRID GRAPES.

To the President of the Fruit Growers' Association of Ontario.

The Committee appointed by you to visit and report upon the hybrid grapes of Wm. H. Mills, of Hamilton, beg leave to submit the following :

We met in Hamilton according to your instructions, on September 15th, and at once proceeded to the grounds of Mr. Mills where we found doubtless, the largest and finest collection of hybrid grapes in Canada. First in order was the Augusta, a large, black grape, a cross between the Bowwood, Muscat and Rodgers No. 4. This grape shows unmistakably its foreign element, the foliage and clusters strongly resembling the Muscat, and though hardy and vigorous, it is unfortunately too late for this climate, but we believe it would prove valuable under glass or in more southern localities.

Ella is a dark coloured grape, a little larger than the Delaware, and perhaps a little earlier, it has a fine vinous flavour though not very sweet.

Excelsior.—Very much in every respect like the Delaware, though perhaps, a little earlier, as it was sweeter than that variety grown by the side of it.

La Vegä.—A cross between the Diana and Rose Chaselas. This, we think, is one of the sweetest and best flavoured out door grapes we have ever tasted, colour, red ; berries, medium size; bunches, compact and shouldered ; fully as large or larger than the Diana ; foliage healthy, vine apparently hardy, ripens with the Delaware. We consider it a great acquisition.

Muscatel.—A fine looking white grape, but too late for this climate.

Pomona.—Another fine looking grape of decided foreign character, Diana flavour, is rather late, but we doubt not would succeed further South.

Otonell.—Very similar to the Catawba, but, perhaps a week earlier.

The "Sultana" is a cross between the Muscat Hamburg and the Concord, and we think as a market grape, this will prove the most valuable of the whole collection. Berries size of Concord ; bunches, large, compact and shouldered, the berry adhering remarkably to the stem, so much so, that a large cluster can be lifted by a single berry ; skin, remarkably tough which makes it a long keeper. It has a rich aromatic flavour and is free from pulp, ripens with the Delaware ; the vines seem very vigorous and hardy.

We saw several other promising varieties, but Mr. Mills prefers not to bring them into notice till he has tested them farther. We congratulate him on his great success in hybridizing and believe his fruit only needs to be seen by the public to have his labours amply rewarded.

A. M. Smith.
Peter Murray.

REPORT OF THE COMMITTEE ON ESSAYS.

To the secretary of the Fruit Growers' Association of Ontario.

Dear Sir.—The Committee appointed by the Directors to read the essays received by you and to award the prizes report that they have made their awards as follows :—

"On the results accruing from the trees and plants distributed by the Association : "

First Prize to the Essay bearing the motto, "For the Public Good."

Second Prize to the Essay with the motto, "Alere Flammam."

"On the best methods of acquiring statistics with regard to the quantity of orcharding in Ontario, and the annual average product : "

First Prize to the Essay having for its motto, "Experto, Crede."

Second Prize to the Essay indorsed with the motto, "Order is Heaven's first Law "

"On the most profitable fertilizer for fruit growing."

First Prize to the Essay accompanied with the motto, "I can call spirits from the vasty deep."

Second Prize to the Essay with the motto, "Ce n'est que le premier pas qui coûte."

"On Hybridization and its Canadian results."

First Prize to the Essay bearing the motto, "Yielding fruit after its kind."

Second Prize to the Essay having the motto, "Male and Female created he them."

Yours truly,

Wm. Roy,
Wm. Saunders,
Geo. Leslie, Jr.,
Committee.

REPORT OF THE SECRETARY ON PRIZE ESSAYS.

To the President and Directors.

Gentlemen,—Having received the Report of the Committee appointed to read the Essays which were received in competition for the prizes offered by this Association, which is herewith submitted, I have the pleasure of stating that the Essay having for its motto, "For the public good" was written by John M. McAinsh, St. Mary's. Ont., and the one with the motto, "Alere Flammam" was written by the Rev'd. R. Burnet, London, Ont., as were also the Essays bearing respectively the mottoes, "Experto, Crede" and "Ce n'est que le premier pas qui coûte."

The Essay with the motto, "Order is Heaven's first Law," is from the pen of George Mill, Warwick, Ont., that inscribed with the motto, "I can call spirits from the vasty Deep" was written by A. Hood, Fergus, Ont.

The Essay bearing the motto "Yielding fruit after its kind" is from D. W. Beadle, St. Catharines, and the one having the motto "Male and Female created he them" was written by Mr. P. E. Bucke, Ottawa, Ont.

Respectfully submitted,

D. W. Beadle,
Secretary.

St. Catharines, 1st December, 1877.

FIRST PRIZE ESSAY ON THE RESULTS ACCRUING FROM THE TREES AND PLANTS DISTRIBUTED BY THE O. F. G. ASSOCIATION.

Motto.—"For the public good."

By John M. McAinsh, St. Mary's.

The benefits accruing to the interests of Canadian horticulture from the annual distribution of trees and plants by the O. F. G. Association, is greater than what, perhaps, at first sight appears. To a great extent, the very existence of the Society depends upon it. For, while there are a few zealous fruit growers who would be willing to support the Society for the sake of the information to be derived from it, it must be confessed, that the large majority of those who are interested in fruit growing would be unwilling to contribute their dollar unless they received some more tangible equivalent in return; therefore, we must consider the increased membership as one of the results accruing from the distribution of trees and plants. We will briefly notice the object sought to be attained by the Society.

The object of the O. F. G. Association is to collect and disseminate information on fruit culture, "By holding meetings every year in different localities, of which all members receive notice by circular; by reporting and preserving discussions; by procuring and publishing valuable essays by skilled fruit-growers; by appointing committees to make personal examinations of different sections of the Province, and report upon the peculiar characteristics

of the soil, climate, and special conditions of fruit culture therein." These discussions and reports are carefully arranged and published in the "Annual Report," a copy of which is distributed to every member. As the Association is composed of the leading and most intelligent fruit-growers of the Province, its "Reports" will be found to contain a large amount of valuable information on fruit growing, which it would be difficult, if not impossible, to obtain from any other source. The "Horticultural Annuals," published in the United States, although written by men of ability, are not always adapted to Canada, from the fact that the modes of culture, and especially the varieties of fruit suitable for cultivation in some parts of the States, are not always adapted to the peculiarities of our Canadian climate. But although the information derived from the discussions and reports of the Society, and embodied in the "Annual Report," is acknowledged to be very valuable to the Canadian fruit-grower, yet the probability is that if the Society presented no other inducement, it would not receive a very general support. But when, in addition, every member receives some valuable tree or plant, it must be generally admitted to be a sufficient equivalent in return for the member's fee. In some instances the trees and plants distributed in former years could not be obtained for less than that sum. I notice that some of our leading nurseries are now selling the Goodale pear and Eumelan grape at one dollar each. But perhaps the greatest benefit resulting from the distribution of trees and plants is, that it is calculated to awaken and foster an interest in fruit-growing. Over large sections of the country the interest in fruit-growing may be said to be yet in its infancy. To a very large extent, farmers and owners of gardens are satisfied with raising a few apples, and, perhaps, some of the more common small fruits, when, in addition, they might be liberally supplied with the rich and melting pear, the lucious grape, and other fine fruits. An idea prevails in some parts of the United States and elsewhere, that Canada is a bleak and inhospitable country, where only more common and hardy varieties of fruit can be grown. But stubborn facts prove that this is not the case. The splendid exhibit of fruit made by the Ontario Fruit-Growers' Association last year at the Centennial, which caused so much surprise and admiration, was well calculated to dispel this idea. And the large and varied display of fine fruit annually made at our provincial and local fairs, proves the adaptibility of the country for fruit-growing. For while good fruit can be grown over a large extent of Canada, the milder parts of Ontario especially, will ever hold a foremost place as a fruit-producing country. And yet, judging from the scarcity of fine fruit in some localities, we might be led to conclude that the country was poorly adapted for fruit-growing. In years gone by I remember gathering wild grapes from the woods, which were then considered a luxury, but now, after partaking of such grapes as the Salem, Delaware, Concord, or even the Clinton, they appear to be poor sour things. And yet there are many who have plenty of land on which to grow them, who seldom or never taste a fine grape. Again, in many parts of the country, where many of our fine cheries, especially the hardier varieties, such as the Elton, Mayduke, Belle Magnifique, Plumstone, Marrello, and Early Richmond, can be successfully grown, we find the common sour red cherry the only kind grown to any great extent. And, again, while excellent varieties of nearly all the small fruits can be grown in abundance, they are very much neglected. During their season, a plate of delicious, tempting strawberries, on the tables of people generally, is the exception, not the rule. If a lively interest in fruit-growing existed, the country at large could be liberally supplied with good fruit in abundance. In the efforts of the F. G. Association to help to develop this interest in fruit-growing, probably no other means can be found more efficient than the distribution of choice trees and plants.

There is yet another benefit accruing from the distribution of trees and plants, which must not be overlooked. By distributing some choice promising variety of fruit to every member, scattered as they are all over the Province, its merits, and especially its hardiness and adaptation to the various parts of the country, can be pretty thoroughly tested. A good deal of valuable information in this way has already been obtained. The Directors have need, however, to be very careful not to send out anything until they are pretty certain that it will succeed well throughout the country. For, however instructive it might be, it would not be very encouraging to a member to pay his annual fee, and, after planting and cultivating the tree or plant, to find out that it was worthless.

But, perhaps the most important point in connection with this subject is, whether any improvement could be made on the present system of distribution. The practice has been to give to every member one or more trees or plants, all receiving the same variety. Now,

while there are some good reasons for this course there are also some weighty reasons against it. Sometimes members get something with which they are already supplied. And again, although they have not got it, it is, perhaps, what they do not want. For instance, a member remarked to me this year that he did not care anything about the strawberry and raspberry plants which he got, but that he would have liked to have got a grapevine of some good variety. If arrangements were made with some reliable nursery, so that the members could have a choice of, say, a dozen different articles, it would probably give better satisfaction. A good assortment could be made of grape-vines, small fruits, and ornamental shrubs and plants, which could be sent by mail. An assortment of this kind, composed of approved varieties which are known to succeed well throughout the country, would probably be better calculated to further the interests of horticulture than sending out any one new variety for trial. But it would not be well to discard these new, promising varieties, but rather, give them a place in the assortment so that any member who choosed could have them for trial. Each member could give notice of what he wanted to the Secretary at the time he paid his annual fee. If this plan of distribution were adopted the Directors would, doubtless, devise the best way of carrying it out.

In the distribution of trees and plants it would be well to give some attention to ornamental planting. If it is not included in its objects, I think the time has fully come when the society ought to take a "new departure" in this respect. The love of ornamental planting is one of the few earthly pleasures which tend to elevate and purify the mind, and ought to be encouraged by every person of pure and refined taste. It ought ever to go hand in hand with fruit growing to which it is closely allied. If it were generally carried out through the country it would tend very much, to dispel the idea that rural life is a dull routine of slavish toil, unrelieved by any pleasant enjoyment. The choice of a few fine flowering shrubs or plants would be hailed with delight by many, especially the wives and daughters of members, who are generally far more interested in those things than men. And it would, doubtless, tend to strengthen the influence of the society in carrying out its objects.

I have thrown out these few hints and suggestions, not with the design of casting any reflections on the managers of the Society, who, so far as I am aware are faithfully trying to advance its interests. But rather, while acknowledging the good work which has been done so far, I have tried to aid them in making the Ontario Fruit Growers' Association yet far more prosperous and effective than it ever yet has been.

FIRST PRIZE ESSAY, ON THE BEST METHOD OF ACQUIRING STATISTICS WITH REGARD TO THE QUANTITY OF ORCHARDING IN ONTARIO, AND THE AVERAGE ANNUAL PRODUCT.

Motto.—"Experto, Crede."

By Rev. R. Burnet, London.

Statistics, in our day, form a most important item in political economy. Calculations on the advancement of a people largely depend on the accuracy of the collection of facts and figures regarding their state or condition. So valuable have these ascertained facts become, that few politicians speculate with regard to the future without calling to their aid these generalized facts obtained from the experience and development of the past. This is true of almost all the arts and sciences. We have naval statistics, military statistics, commercial statistics and vital statistics, each, and all of them have attained to marvellous perfection in there several spheres. It is strange that the agricultural and horticultural statistics of our Dominion should lag so far behind any other interest in our country. Somewhat has, indeed been done for Agricultural Statistics, though it be very imperfect and superficial, but absolutely little or nothing has been done for Horticulture. Fruit growers begin to feel the want of some basis on which to build their claims for attention, and aid. To the question, what has been done, or what is doing? no definite answer can be given. Horticulturalists are entirely in the dark about past, present or future efforts. In a rough way, the amount of the report of apples has been partially ascertained, but with little accuracy and precision

A recent and greater interest in Horticulture has given a new direction and impetus to the acquirement of Horticultural Statistics, and hence, the F. G. A. of Ontario are laudably endeavouring to collect every available account of the amount of Horticultural produce raised and sold in the Province. This question has often arisen during the various discussions on fruit interests: The want of sufficient data has often been deplored, but up to the present moment no active measures have been taken to remedy the defect. We have little doubt that the subject matter of this Essay will engage the earnest attention of many fruit growers throughout Ontario, and from their united efforts and practical suggestions, great results of a beneficial nature may be expected to follow.

THE IMPORTANCE OF THE SUBJECT.

This can scarcely be over-estimated. It is essential to the welfare of the country. As a guide to a farmer about to purchase land, few things can be more important. Indeed few people are aware of the immense value of the annual fruit crop of our Province—fewer still there are, who are aware of how much greater might be the amount of pecuniary benefit if means were only used to develope the industries. Fruit growers are few and far between in Ontario, who make fruit growing a means of livelihood. This partly arises from the uncertainty of the results and rewards of fruit growing. The Association, therefore, is assuming its due place and proper sphere, when, by every legitimate effort it attempts to remove the obstacles that lie in the path of successful fruit cultivation. A small beginning may have a very prosperous ending. Few things are more important to the producer than to know from time to time the amount of marketable fruit that is produced. It would facilitate equally his fruit production as well as his fruit sales, and give a sure indication where the best market was to be had for his produce. The Government itself, has a deep stake in the securing of accurate Horticultural Statistics. These statistics serve as an admirable guide to the number of hands permanently engaged in this industry, and the amount both of the funds invested in carrying it on, and the amount pecuniarily returned from this outlay. In every way in which it can be viewed the statistical information sought is valuable, and highly desirable.

DIFFICULTIES IN THE ACQUIREMENT.

These must not be underrated. From the very nature of the industry there is difficulty. Some fruit-growers do not dispose of their crop to buyers. They dry and preserve their fruits, or give them gratuitously to their neighbours, nay, sometimes they even feed their cattle with their overflows of apples. No account can be received, and little reliance can be placed, of the amount they used. That there is a large amount, no one acquainted with large districts of our Province can doubt. There are others again who are not desirous that their neighbours should know what they are doing, or how engaged in disposposing of their fruits. We are persuaded that this is largely peculiar to Canadians. Others again keep no account of outlay and income, as regards their fruit expenditure, and fruit proceeds. They are satisfied to remember that they sold to one buyer two hundred and fifty barrels, and to another one hundred. How are these difficulties to be fairly overcome?

MANNER OF OVERCOMING THE DIFFICULTY.

Some have thought that the necessary information might be had from the buyers. An effort has been made in this direction, but with no very profitable results. Indeed, it is a roundabout manner to attempt to secure information in this way.

There are so many middle men in the business, that there can be no satisfactory reply received from them. Nor is it to their interest to make known to others the amount of their transactions. Efforts have been made to collect the information from the sellers at the prominent depots. This has also failed, from the fact that there is no particular party appointed to do the work. What is everybody's, or anybody's, business, is not very thoroughly executed. These abortive efforts, however, indicate pretty clearly the necessity for some plan to obviate all these difficulties. Of course, the easiest and simplest is the best and surest plan. The individual who can bring forward a scheme at once easy and reliable ought, other things being equal, to carry off the palm for his suggestion.

THE ONLY MODE.

The terms of the Essay afford a clew to the mode in which this is to be accomplished. The subject asks for suggestions for the best mode of acquiring statistics with regard to the quantity of orcharding in Ontario. This question can only be satisfactorily answered from one source, *i. e.*, from the men engaged in orcharding. There is a large amount of orcharding in the Province; more, perhaps, than even fruit-growers are aware of. In older settlements there are very few farms on which there is not planted five or six acres of apple trees. We are persuaded that in old settlements, as well as in newer districts of Ontario, there is an average of five acres planted on every farm. If this estimate is anything near the mark, then one-twentieth of all the farming land in the Upper Province is orchard. We anticipate, however; this information is yet to be secured. We say it must be got, if got at all, from those who possess orchards. The information must come from the farmers, amateur fruit-growers, and professional men of Ontario.

The query is, how is such information to be got?

Another answer sought is, what is the best mode in acquiring statistics in regard to "the average annual product?"

Here again we are shut up to one source for information on this head. Such information must come from the producers. Guesses have been, and may be, made on the average product of years, but without definite statistics, these guesses are all in vain. A broken reed on which no stable platform can be erected. Having thus narrowed our grounds to the point, that statistical information can only be satisfactorily sought and secured from the orchardist and producer, we are in a position further to inquire:

How is this to be done? Who is to do it?

We hold, first, that both the extent and importance of the subject take it out of private hands. Nor do we think that it can be, or ought to be, undertaken by our Association. A private individual has almost no inducement to undertake such inquiries—there is no personal benefit to accrue to himself from the labour, and we know how little is patriotically done in these days in which we live. It is beyond the duties claimed from our Association, inasmuch as, though intimately connected with horticulture, it is a distinct branch of economy altogether independent of our exertions. Besides, we question if the Society with which we stand connected, had the will to carry out such a gigantic scheme, the money would be forthcoming. Indeed, we know of no one so public-spirited, no Association so self-denying as would forego their other duties, and give attention and diligence in the accomplishment of a statistical record of our horticultural interests.

We again narrow our field from which we may expect this work to be done. A responsible body alone can be supposed to undertake such a work. And this body is the Bureau of Statistics. Perhaps, for clearness sake, I ought to say that the Government of the country alone can ask, as they alone can make it legal to demand the desired information.

HOW TO ACQUIRE HORTICULTURAL STATISTICS.

Statistical information being for the public benefit, the Government should collect horticultural facts connected with orchards, and the average annual product, at the public expense. This can be done without increasing the public burden of the Province, by instructing the Census Commissioners to include all the necessary queries in their Schedules for the accomplishment of the decennial census. We fail to see any easier mode than this, or any one so inexpensive. To the queries already on the Schedules, it would be necessary to add:

1st. What average have you under apple-tree cultivation?

2nd. How many acres under pear cultivation?

3rd. What acreage under vine culture?

4th. Are there any peach orchards in your neighbourhood, and what is their extent?

5th. Has the average of the past ten years in productiveness, been good, bad, or indifferent?

6th. What is the average product of the present year?

7th. Are fruit interests advancing in your section of the country?

A summary of the replies to the questions would afford ample scope for all the generalizations desired by the F. G. A., as well as by the Agricultural Department of the Dominion. A decennial inquiry would be sufficiently frequent, as progress in fruit-growing could scarcely have its limits well defined by embracing a shorter period. What a stimulus would such codified information give to fruit-growing. The success attending one particular district would soon find an echo in another, until, in honest rivalry, we may look forward to our Province becoming one of the most favoured horticultural districts in the world. Our farmers and fruit-growers require to know what is being done elsewhere. It is not to our credit that some of the most important fruit marts in our country is supplied by the producers of the United States. Why should Montreal be supplied with grapes and peaches from Lockport and Rochester? We have in the West as favoured districts as New York can boast of. All we want is enthusiastic fruit-growers, and means taken to secure railway facilities to market our fruits. On the shores of Lake Erie, there is an inexhaustible fruit district. We have now and again attempted to guage the capabilities of this extensive stretch. We are persuaded that there is more fruit allowed to go to waste in this district than would supply the rest of Ontario. It would surprise any one, were we to speculate on the amount of the future supply from this locality, when the people are awakened to a due sense of their geographical advantages for fruit-growing. The average of fruit-culture would be increased tenfold, if people only knew, and saw how to best market and dispose of their fruits. Systematic effort must be introduced and acted on. Knowledge must be increased. The people must be led. No way can sooner accomplish this than that all should know what is being done elsewhere. A comparison between neighbour and neighbour, between district and district, township and township, county and county, and to know fully and correctly what, as a whole, we are doing, can alone come up to the purposes and plans of the Fruit Growers' Association of Ontario. If in any faint degree the Association can stir up an interest in fruit-growing in every corner and favoured spot in our large and extensive country, they will confer a boon which future generations will not be slow to appreciate. Some might entertain the fear that when the knowledge is obtained of the amount of orcharding in Ontario, that the cultivation of fruit would diminish. There need be entertained by any one no such fear as this. People require to be educated to the taste for good fruit, and the more good fruit is produced, the more will be the consumption of the better classes of fruit. Practically, we believe there is no limit to the production of good fruit, and, practically, there is no fear of too much being grown to glut the market. When every artizan and mechanic in the Dominion, and in the United States, partakes daily throughout the year of the rich and lucious treasures of Pomona, then, and not till then, may there be an outcry against the production of too much fruit. There is nothing healthier, and nothing better, than a sufficient supply of fruit for the millions. There are multitudes who seldom or ever taste fruit as a necessary of life. There are plenty who taste it only as a luxury. In summer, with our climate, it would be well for our teeming thousands to eat less of butcher's meat, and more of our fruit products.

Every effort to accomplish an end so desirable must eventuate in good. The time must speedily come when our farming class with their luxuriant and fruitful orchards, must club together and have skilled workmen to attend to their fruit interests. Five or six orchardists might employ one man between them to care for their orchards when their agricultural interests demanded all their attention. A small increase in the average under cultivation would go far to equalize the expense and profit. Let this become general, and a bright day will yet dawn on Western Ontario in respect to fruit interests.

As another suggestion worthy the consideration of the F. G. A. of Ontario, we would remark that the acquirement of statistics on Horticulture might be secured through the Warden of Counties and the Reeves of Townships. Let the Horticultural queries suggested in this paper for submission to the Census Commissioners, be embodied by the County Councils in their schedules for the acquirement of general statistics, and as regards Ontario, the matter would be speedily and cheaply done, for no new staff of officials would be needed. The organization at present in existence would accomplish the object.

Our suggestions on this fertile and important theme must be brought to a close.

In conclusion, we further remind the Executive of our Association that they are not to rest contented with merely acquiring suggestions on the best method or methods of

acquiring statistics with regard to the quantity of orcharding in Ontario, and the average annual product. Correspondence should be had with the Governments both of Ontario and the Dominion. They are both ready to lend an attentive ear to all practical suggestions of the F. G. A. Urgent solicitation should be made to them to embody the above, or other suitable queries in the Govermental Census Schedules. Constant application and renewed reminders can alone accomplish your purpose. If the mode of acquirement of Horticultural Statistics has been struck as the key-note of this paper, then some such course must be followed up and a practical issue given to our Associational efforts. Some one has said and written that, "eternal vigilance is the price of good fruit," then a similar vigilance is needed to carry out to a successful issue the good work we have in hand. In vain we collect statistics of our loved culture unless we actually co-operate in carrying out the fruits of our knowledge and plans. Mutual encouragement is needed,—unflagging application in discharging the duties of the Society,—shoulder to shoulder must be our motto, and then there will be no fear of our Association or of her interests. Let us pursue an undeviating course, having regard to the advancement of horticulture and her interests, and there need be no fear but that all the wise and good will fully appreciate the unselfish and patriotic ends of far-seeing and judicious men.

FIRST PRIZE ESSAY, THE MOST PROFITABLE FERTILIZER FOR FRUIT GROWING.

Motto.—"I can call spirits from the vasty deep."

By A. Hood, Fergus,

In regard to fertilizers applied in the shape of manures it is difficult, perhaps impossible, to say which, among all the kinds used for that purpose may be considered the most profitable, because as much, perhaps more, depends on the requirements of the particular soil to which it is to be applied than on the virtues of the manure itself; and this again, is greatly modified by the particular kinds of fruit for which it is required, because, although there may be a general uniformity in the wants of fruit bearing plants and trees, there are certainly particular differences; differences not only in different kinds but in different varieties of the same kind; a manure, therefore, that might be the most profitable for one particular fruit would not necessarily be so for another. There are some manures, it is true, from the use of which benefit is derived in almost all cases, such as ashes and barnyard manure but it would depend greatly on other conditions which of the two was most profitable; this kind may be more easily obtained in some localities, and that, perhaps, is more abundant in others. But here again, the one most easily obtained, and therefore the cheapest, may not be the most suitable and consequently not the most profitable.

The general practice among fruit growers as may be learned from the reports of discussions at meetings of Fruit Growers' Associations is to use barnyard manure, and a great many of them use that alone; it must, of course, be admitted that they know better than any other body of men can do, what applications are most beneficial, and the fact that so many of them use barnyard manure is next to a proof that it is the most profitable fertilizer they can apply. The testimony, however, in favour of ashes is almost universal, but ashes do not contain all the elements of plant food which barnyard manure does, it may therefore be concluded that barnyard manure is the most profitable in the greatest number of cases.

There is, however, another fertilizer not sufficiently resorted to, but which must, when duly appreciated, be considered the most profitable, and that fertilizer is—cultivation, the hoe, the plough, the cultivator and draining tools are the implements necessary to secure the full benefit of this universal renovator, and the air we breathe, the rainfall, the dews and the minerals that are contained in the soil are the only elements from which these implements are instrumental in enabling the roots of plants to extract all that is necessary for their growth and sustenance.

It is found by analysis that the greater part say ninety per cent of all vegetable substances is composed of the four organic elements, oxygen, hydrogen, nitrogen and Carbon, and these four elements are found in abundance in atmospheric air and in water, the former containing seventy-nine per cent of nitrogen and a small proportion of Carbon while the latter is composed of oxygen and hydrogen, here then, we have air and water two substances which contain far the greater part of the elements which compose the leaves, wood and fruit of all plants, substances that are everywhere present, and that are brought constantly into contact more or less, with both leaves and roots of all vegetable growth, but these elements are not supposed to enter into the organism of plants without first having formed some other chemical combination to fit them for being taken up by the roots, for instance: Hydrogen and nitrogen are both required as plant food but they must first be produced from the decomposition of other substances, animal or vegetable, to form ammonia which is simply a chemical combination of the above elements in the proportion of three or four parts of nitrogen to one of hydrogen. The ammonia thus constituted being a product of decomposition and forming one of the constituent portions of most manures and is considered so beneficial to vegetation that such manures are valued in proportion to the quantity of ammonia they contain.

This ammonia is only obtained by decomposition and not by a mixture of the two elements of which it is composed although those elements are constantly in contact with each other wherever air and water are found because, the nitrogen of the atmosphere and the hydrogen of the water have a greater affinity for the elements with which they are united than for each other. Agricultural chemists therefore, tell us, though they are not unanimous on that point that plants cannot take their nitrogen as such from earth or air. The correctness of this theory may, however, be doubted, although supported by the opinions of many able men for the following reasons:

If the nitrogen of plants could only be taken up in the form of ammonia, and ammonia is only produced by the decomposition of animals or plants, it would follow of course, that the amount of vegetable and animal life on the face of the globe could never be increased, because neither can grow or live without the nitrogen, and this nitrogen can only be fitted for the food of plants by the decomposition of animal or vegetable substances producing ammonia. This would form a sort of circle which could never be enlarged for the decaying vegetation could not produce more ammonia than would supply the same bulk of living vegetation, but this is contrary to our experience.

On the same principle, if nitrogen was only taken up in the form of ammonia, how would it be possible for a farmer who uses no manure, but what is made on his own land to increase the productiveness of his farm? and yet we know that such is possible.

When analytical chemists understand all the chemical changes and combinations that take place during the growth of plants, they may be in a position to say that such and such substances can or cannot be taken up by plants in this or that form, and that plants are not able to extract certain gasses from one or two elements known to contain them but, until they can do all this they would be wise not to endeavour to set bounds to nature's recourses, or say what can or what cannot be done in nature's laboratory.

An able agricultural writer says that "peas and beans contain three times as much nitrogen as wheat, and yet it has been demonstrated that beans and peas require for their maximum growth far less nitrogen than wheat," of course this means that they require less nitrogen in the soil, but it certainly follows that the peas and beans must extract nitrogen from the atmosphere. The same writer says "that peas, beans, turnips, &c., organize a greater quantity of nitrogen from rain-water and the atmosphere than wheat, we know to demonstration." This would show that there must be ammonia in rain-water and the atmosphere, and that the leaves of plants have the power of organizing such ammonia; this is, no doubt, correct, but the leaves of some plants possess this power to a much greater extent than others, and in these last, as in the case of wheat, which has but little power to absorb nitrogen through its leaves, and yet requires a large supply for its maximum growth, this office must be performed by the roots, and when the requisite supply is not present in the soil (as shown in the experiments of Mr. Lawes, referred to further on) they must extract them from the air, and moisture; but to enable them to do this, air and moisture must have free access to them, which is the one important condition on which this theory of cultivation being the most profitable fertilizer depends.

Every farmer knows that when heavy rains are followed by a hot sun and the ground becomes baked, the growing crop will almost certainly be a poor one ; but there are every few of such farmers that know why such is the case ; the reason is, that the baking of the ground excludes the atmospheric air and the dews, and thus prevents the roots from procuring those elements of plant food that under other circumstances they are capable of obtaining and organizing for the support of the plant. Then, again every practical cultivator of the soil must have observed how very rapidly potatoes, corn, cabbages, &c. grow when they are frequently hoed, this hoeing breaks up the baked surface and allows the air and dews to penetrate and a healthy growth follows as a matter of course ; certain experiments have been made which show this more fully, for instance :—a committee was appointed by a Scottish agricultural society for the purpose of ascertaining what advantage, if any, was obtained by drilling grain over broadcast sowing, and it was found that when the drilled crop was hoed, it had a decided advantage over broadcast ; but where the drilled crop was not hoed, the advantage was slightly in favour of broadcast sowing—very conclusive evidence in favour of hoeing.

A celebrated English agriculturalist, Mr. Lawes (it is believed) has made a practice of sowing wheat annually, as an experiment, on the same piece of land for a number of years in succession, without applying any manure whatever, the report for the 19th year was that the average product was 16¼ bushels per acre per annum for the whole of that period, and it was found that the annual yield was not decreasing. Those crops were always drilled in and hoed once, thus showing that the nitrogen and other organic elements extracted from the air and water were equal to a produce of 16¼ bushels annually ; for the organic elements in the soil when those experiments commenced, must have been long since exhausted. Had these crops been hoed more frequently, the success of the experiment from this point of view might have been more decisive.

Mr. J. J. Mechi, of Tiptree Hall, England, annually sows one acre of land to wheat or rather dibbles it in, for that is the way it is done, at the rate of one peck to the acre, the rows are far apart, say 10 to 14 inches and the crop is regularly hoed, and the yield is invariably greater than that from the same kind of land manured in the same way, and sowed or drilled with 6 pecks to the acre. Can anything be more conclusive in favour of hoeing ?

Let any individual try for himself the virtue of hoeing on a small patch of wheat, planted or dibbled in rows 10 or 12 inches apart, and 4 inches apart in the rows and hoed regularly every week, and he will soon become convinced that there is more virtue in hoeing than in any manure he could apply, and he will at the same time be very much surprised at the result.

We have raised fruit trees on poor soil without manure, and the trees were healthy and the growth vigorous ; the soil being generally dug with a fork, and planted with potatoes or other hoed crops.

A soil that lies loose, and is frequently stirred, never becomes dry much below the surface in the dryest summers ; while soil that is not so stirred frequently beeomes dry to a greater depth than the roots of most plants extend ; it may also be noticed that a light sandy soil is always moist a few inches below the surface, while a clay soil, under the same circumstances, will be as dry as dust, the reason being, that a very light soil cannot bake or form a crust on the surface, consequently it is always porous, and pervious to both air and moisture.

It is not intended to argue for one moment, that other fertilizers are useless, for it must be self-evident that hoeing on an enriched soil will be attended with better results than on a poor one ; but cultivation will be found both cheaper and more efficatious than any other application in the shape of manure. The cheapness might, of course, be reasonably doubted, since the labour of frequent hoeing will cost more than a dressing of manure ; this may be so, but if manure is used, hoeing cannot be altogether dispensed with, and is worth all it costs in keeping down weeds.

It should be remembered that hoeing may be well done, and it may be ill done ; it may be done with a view of simply cutting down the weeds, and it may be done with the view, at the same time, of letting in the air and moisture ; and here it may be observed, that some workmen have a slipshod method of hoeing or scratching the surface of the ground, and just cutting off the tops of the weeds ; this sort of hoeing does not break the

crust of the ground, and is therefore, of no benefit as a fertilizer; and it only checks the weeds for a short time, for they will be growing again from the same roots in less than a week; what is wanted is intelligent hoeing, deep enough in all cases to cut up weeds by the roots, and in all annual crops, such as potatoes, corn, and garden vegetables, it should be gradually deeper, as the roots penetrate further down; but cultivation by the hoe in this manner is not sufficient for full-grown or large rooted trees; these should have the soil loosened round them once a year, at least, to a greater depth, with frequent surface hoeings afterwards with the hand hoe or cultivator; the best implement for this purpose is the digging fork, but the plough may be used without material injury to the roots, because it will be found that when the soil is continually kept loosened, the roots will descend deeper, and generally below the reach of the plough; indeed, it is found that the spade, or the digging fork, which go deeper than the plough, seldom come in contact with the roots of trees in properly-cultivated ground.

The roots of trees require air as well as moisture, hence it comes that they will not flourish in land so wet that their roots are immersed in water, or water-soaked ground, for any length of time, because in such situations the air is excluded. It may be observed in the case of those hardy trees that will grow in wet situations, that the roots never penetrate into the subsoil; the nearer the water is to the surface of the land, the nearer will the roots be to the surface also. This may be observed in roots upturned by the wind in any swampy situation, where it will be found that there is a perfect net-work of roots interlaced in all directions on the surface, but not one penetrating to the subsoil; that the whole root, in fact, presents an appearance as flat as though it had grown on the surface of a rock, or flat stone, that was only covered with a few inches of soil; thus it would appear that roots will not penetrate into a wet subsoil; that they will only go just so deep as to be able to reach the moisture sufficiently without being deprived of air, and this fact seems to show that they require air as well as moisture, which, when immersed in a water-soaked soil, they cannot get. Obviously, therefore, the way to assist nature in producing a healthy growth, is to maintain the conditions which surround them, so as to favour the admission of air and moisture into the soil, so that they can at all times have access to the roots, and that moisture should never be so abundant as to exclude the air. This last condition must be obtained by natural or artificial drainage; the first by keeping the soil so loose, and the crust so frequently broken, that atmospheric air, dew, and rainfall can have easy access.

Another important function performed by the atmosphere when acting on vegetable mould is the production of Carbonic Acid which is taken up by the roots to form carbon the largest constituent part of all vegetable substances, composing as it does, more than one half of the dry matter of all plants. The atmosphere contains a small proportion of carbon which is decomposed by the leaves when acted upon by the rays of the sun, but the greater portion is extracted from the vegetable mould by the action of atmospheric air, showing again how important it is that the soil should be loosened for the purpose of admitting the air and thus favouring the production of carbonic acid which is so important an element in the growth of all vegetation.

There is yet another view of the case, which is, that ammonia is attracted and absorbed by the soil from rain-water, the air and the dews, when the soil is so open and porous that those substances can freely penetrate; Hoskyns says: "This same gas (ammonia) has one remarkable property among others—it loves those, and falls on those, and blesses those who prepare for it and receive it kindly, so if you wish to attract its sweet and sovereign influence, stir the surface—nay, keep it continually stirred, for on any hard impervious, sunbaked surface, it absolutely refuses to settle." One of Shakespeare's heroes says, "I can call spirits from the vasty deep," to which the reply was—"But will they come when you do call for them?" This might be questionable, but you certainly may, with better hopes of success call this gas from the dry land, from every dung-hill and from every particle of decaying animal or vegetable matter for miles around you, and it *will come* if only you will do one thing—keep your soil in a condition to attract, receive and retain it."

The value of cultivation of the surface is exemplified in a discussion which took place at a meeting of the W. N. Y. F. G. A. where the name of a gentleman was mentioned who was said to be justly celebrated for his success in raising grapes, and his method was to

trench and manure his vineyard, but the speaker said that a brother of this celebrated grape grower had just as good success, and he neither trenches or manures, but *he cultivates the surface of the ground some fifteen times during the summer.*

It is contended then, that cultivation of the soil enables the roots of plants to obtain from air and moisture, and from the vegetable mould acted on by those elements, all the substances that are required to perfect their growth, that they obtain nitrogen from the the air, oxygen and hydrogen from water, carbon from the atmosphere and from vegetable mould acted on by the atmosphere, and that all these processes are aided and assisted by cultivation,—nay, that cultivation is absolutely necessary, in fact, the one important condition that can alone enable growing plants to avail themselves of the benefits to be derived from this food, they may, it is true, without cultivation, consume such supplies as are stored up in the soil, but, as these supplies are not supplemented by the inexhaustible treasures contained in the surrounding elements, their growth can never be so vigorous as it might be, and the stores they are consuming must soon be exhausted. And not only does cultivation accomplish all this, but it enables the soil to attract and absorb ammonia and other organic elements necessary for the growth of vegetation and is, therefore, the most universal and most economical as well as the most profitable fertilizer.

FIRST PRIZE ESSAY ON "HYBRIDIZATION, AND ITS CANADIAN RESULTS.

Motto—"Yielding fruit after its kind."

By D. W. Beadle, St. Catharines,

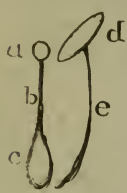
The law of reproduction impressed by the Creator on all living things is tersely expressed by the translators of our English Bible "Yielding fruit after its kind." This law has remained unchanged since that morning of creation, when the sons of God shouted for joy, and as then, so now, "like produces like." Men observing this law and trusting to it as a rule of life, early availed themselves of it to perpetuate certain physical peculiarities in the animal creation, and to bring these into a high state of development. Hence we have to-day our various strains of blood in our domestic animals, the fleet hunter and runner, the heavy draught horse and the lighter roadster; the fine-wooled and the coarse-wooled sheep; the gazelled-eyed dairy cow and the more rotund producer of beef. We have been slower to avail ourselves of the same rule in the production of vegetables and fruits, but nevertheless we find the rule to exist, and some progress has been made in the direction of combining in our fruits and flowers and vegetables those peculiarities which we wish to perpetuate and develope.

The processes of vegetable reproduction have been carefully studied by but few persons, and it is only within a comparatively recent period that much attention has been given to the art of hybridization, with the view of combining in one fruit the excellencies of several varieties. Those who have ventured into the field of inquiry and experiment, have found it to be exceedingly fascinating. Comparatively new and untrodden, it affords wide scope for the exercise of human ingenuity and skill, while at the same time the uncertainty of the limits which will bound our operations and say to the manipulator "thus far shalt thou go and no further," gives to the pursuit a zest like that of discovery in an unknown land.

The requirements of our climate and country are offering every inducement to the Canadian Hybridist to press his investigations and experiments until he shall have supplied our people with fruits of good quality and hardy constitution. Apples are wanted that will thrive in the hard climate of our colder sections and yield fruit of fair size and good flavour. Pears, too, have yet to be produced having sufficient hardiness to grow and bear fruit over a much larger part of our Dominion than now. Even now grapes may be found growing wild ar beyond the limits of the successful culture of our garden varieties, but these hardy sons of the soil needs to have their austerity tempered by the infusion of some gentle blood that shall sweeten the uices of the fruit, without impairing the hardiness of the stem. The blackberry, raspberry, whortleberry, and all the host of small fruits are waiting for the skilfu

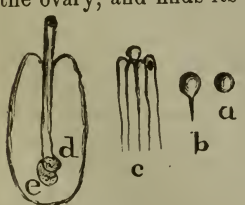
touch of the hybridist to appear in new combinations of form and flavour, adding thereby new charms to the attractions of our rural homes.

In order to the better understanding of the operations performed in hybridization, it will be necessary to consider the processes of vegetable reproduction. That organ in the flower which we call the anther, yields a fine powder, usually of a golden yellow colour, which is called pollen. These grains of pollen fall upon the stigma, penetrate the ovary, and, coming in contact with the ovule, impart to it a new vitality, enabling it to develop into a perfect seed. It is taken for granted that the reader is sufficiently acquainted with structural botany to understand what is meant by the stamens and pistil of a flower. Stamens usually consist of a filament or stalk, upon the top of which the anther is placed, though in some flowers the filament is wanting. The pistil usually consists of the ovary, style, and stigma, but the style in some flowers is absent, and the stigma rests directly upon the ovary.



In the figure, *a* represents the stigma, *b* the style, and *c* the ovary, *d* the anther, and *e* the filament. Within the ovary, and connected with its inner surface by a delicate cord attached to each, lie arranged in definite order the little ovules. These ovules are rudimentary bodies, which, under certain conditions, will develop into seeds, having the power of germination and growth. Before these ovules can develop into seeds, they must be quickened by contact with the life-imparting pollen. Every gardener knows that unless the pollen of the cucumber is taken from those flowers that yield the stamens to those that bear the pistil, he will look in vain for fruit; and hence, if he is growing cucumbers in a close frame, he will apply the pollen by hand to the stigma, for in this plant the flowers that contain the stamens with their pollen-producing anthers, do not contain the pistil with its ovary. In nature we find various arrangements and contrivances designed to secure the contact of the pollen with the stigma, and thence to the ovule. Were this contact to fail, were the pollen from any cause to be prevented from reaching the stigma in our grains, and fruit-producing trees and plants for a single summer, vain would be the toil of the husbandman, the care of the vine dresser would come to naught, and the orchardist would look in vain for the luscious fruits.

When the ovule has become formed in the ovary, the pollen grains burst out from the anthers through little openings that are formed at the proper time for their escape. These grains are very small and light; they float on the most gentle current of air, they adhere to the limbs and bodies of insects that visit the flowers; they are projected, as shot from a gun, by the sudden bursting of the anthers, so that in one way or another some of them find their way to the stigma, whose surface is usually coated with a glutinous fluid, thus causing the little pollen-grains to adhere, when once they come in contact with it. And now the pollen-grain undergoes a change. Like a seed in congenial soil, it throws out a little rootlet which pierces through the substance of the stigma, traverses the entire length of the style, penetrates the ovary, and finds its way to the little ovule.



In the sketch *a* represents a magnified pollen grain, *b*, the same pollen grain with its rootlet or pollen-tube; *c* shews the pollen-tube descending the stile towards the ovary, *d* the end of the pollen-tube after it has entered the ovary, reached the ovule and is pressing against the embryo sac *e*.

By this contact between the pollen grain and the ovule, a new life and development are imparted to the latter, it begins to take on new forms; the germ of a new plant is developed, and the ovule becomes a seed.

The art of hybridization, or to speak accurately, the art of sub-hybridization—for the horticulturist usually seeks to blend varieties of the same species, not to cross different species of the same genus—consists in applying the pollen of one variety to the stigma of another, and preventing pollen from any other source coming in contact with the ovule. To accomplish this he selects the flower upon which he intends to operate, with delicate sharp-pointed scissors he clips away all the anthers before the pollen in them has escaped, and having gathered pollen from flowers of the variety he wishes to blend with it, applies that pollen to the stigma of the flower which he has deprived of its anthers, and then carefully encloses it in a small issue-paper bag, to prevent any other pollen falling upon that stigma and interfering with his

work. If the work has been successfully performed, the pollen grain will throw out its little pollen-tube, which will grow in the manner already described and impart life and development to the seed germ, and at the same time impart to it also some of the characters and qualities of the plant, tree or vine from which it was taken. After this seed, thus fertilized, has ripened, it must be planted, and when it has grown, and the plant therefrom bears fruit, it will be found that the fruit will partake to some extent, in a more or less marked degree, of the qualities of both the parents.

Hitherto the grape has been a favourite subject for experiment in this direction, for while we possessed grape vines that were hardy and vigorous and ripened their fruit sufficiently early, yet the quality of the fruit was much inferior to that of the European grape vines, whose constitution did not seem to be at all suited to our climate, and whose fruit did not generally mature perfectly in our short seasons. Among the first—if not the first—of our Canadian Hybridists who turned his attention in this direction is Mr. Charles Arnold, of Paris, Ont. Taking one of our wild vines that was growing on his place, and which on account of the austere quality of the fruit was known as the "good-for-nothing" for the female parent, he sought to turn its hardy constitution and vigorous habit to some good account, by fertilizing some of its flowers with pollen of several of the European varieties. In this he was remarkably successful, and from these crosses has produced several very interesting varieties. The vines raised in this way retained much of the hardiness, vigour and productiveness of the wild parent, while the fruit was increased in size, both in berry and bunch, and vastly improved in flavour. These hybrid vines have been disseminated, and some of them are highly esteemed in Southern Missouri as wine grapes. Since Mr. Arnold's success has become known others of our hybridists have made the vine the subject of their attention. Mr. Wm. Saunders, of London, has raised a considerable number of crosses of various parentage which are now just beginning to show fruit. It is greatly to be hoped that in another year he will be able to give the results of his labours in a special report to the members of our Association.

Mr. W. H. Mills, of Hamilton, has also raised a number of very interesting crosses. Several of these were exhibited at some of the fairs during the present autumn. Probably the most promising of them is the one which he has named Lavega, a cross between the Diana and the Rose Chasselas, the fruit is large both in bunch and berry, sweet and rich, ripening with the Delaware. Another which he has named Sultana possess many points of great interest. It is a cross between the Creveling and one of the Muscats, large bunch and berry. The berry is very fleshy, and firm and adheres to the stem with wonderful tenacity. Should its qualities in other respects prove desirable, it will beyond doubt prove the best shipping grape we have yet seen.

Mr. Wm. Haskins, also of Hamilton, has been very successful in his hybridizations, and among other sorts has a white variety that gives promise of far excelling any of the white grapes now in cultivation. Mr. P. C. Dempsey, of Albury, has also raised a number of varieties in the same way. One of these has been selected by our Association for distribution among the members next Spring, to which he has given the name of our honoured President, so that henceforth it will be known as the "Burnet" Grape. This is a cross between the Hartford Prolific and Black Hamburg, and is beyond question a most promising variety for cultivation in Ontario. Hardy of constitution, vigorous in habit, and prolific in bearing, at the same time ripening its fruit even earlier than the Hartford Prolific, were the quality of the fruit no better, it would be still an acquisition ; but when to these is added a berry with the fleshy character of the Black Hamburg, and possessing all its sweetness and even more than its richness of flavor, we have a grape that promises to be the most desirable of any variety known.

But our Hybridists have not confined their attention to the grape alone. Mr. Arnold's hybrid wheat has made his name well known far beyond this Canada of ours, and his new hybrid dwarf peas, combining the excellence of the champion of England, with the dwarf habit of the little Tom Thumb, will entitle him to the everlasting gratitude of every cottage gardener. What he has done for us in our Diadem raspberry, the members of the Association for 1877 will soon be able to tell, and, if he has linked the flavour of Brinckle's orange to the hardy constitution of the Philadelphia, he has done that for which he well deserves a rich reward. Of his hybrid apples our members will also shortly be able to judge, for the Ontario apple, one of his hybrids, will be given to the members in the spring of 1879.

But what shall be thought of the daring hybridist who conceived the idea of blending the apple with the pear. Mr. Dempsey has undertaken to do this, and believes that he has succeeded. We hope no misfortune will befal the little tree, but that it may grow to maturity and yield fruit If this can be done, what new flavours await the palates of future generations. But our witty Colonel says that Dempsey is mistaken, that the pear and apple cannot be thus united, that the antagonism between them is too great, for, says he, did not the apple drive the first pear (pair) out of paradise?

The labours of our hybridists have achieved already some valuable results both for science and for human comfort, showing that cross fertilization can be effected under heretofore unexpected circumstances, and yielding to us a few valuable grains, fruits, and vegetables. These results are just sufficient to encourage still further attempts, and stimulate to repeated experiment. New fruits are needed for our new country, and the careful and persistent explorer into this part of nature's domain will surely be rewarded by some grand and useful discoveries, grand because useful, enlarging the list of home comforts and contributing to the happiness of our people. Of what has thus far been accomplished one can speak, not dogmatically but hopefully; believing that the Burnet and La Vega grapes, the Diadem raspberry, Ontario apple, and Champion of Canada pea, will prove to be very valuable acquisitions won for us by the labour of our Canadian Hybridists. Of the future it may not be wise to boast, but these results, to any one who has thought on these things, are but the earnest of an inheritance yet to be won, more rich and varied, and full of delights, than eye hath yet seen or heart yet conceived.

SECOND PRIZE ESSAY ON THE MOST PROFITABLE FERTILIZER FOR FRUIT-GROWING.

Motto.—" Ce n'est que le premier pas qui coûte."

By Rev. R. Burnet, London.

A friend from the country came on one occasion to see and learn how I grew such fine pears. At every fresh examination of the beautiful and luscious fruit, his exclamation, ever and anon, was, " But how do you grow these?" My reply was, as invariably, by attention to " first principles." The same exclamation and the same reply were of frequent occurrence before the object of the visit was finally attained. On going away, he inquiringly implored me to tell him what I meant by " first principles." I significantly pointed to the " dung heap," which, in passing, I may say, I had stolen, and that breach of the commandment was on this wise. Happening one day to be in company with a member of my church, returning from the discharge of some duty, we were passing across the Common. Oh! said I, at the sight of a manure heap, containing at least a thousand loads, who does that belong to? Nobody, was the reply, it was laid there when the Grey Battery were stabled in the Crystal Palace. The people in the neighbourhood, continued he, complained to the authorities of the smell and odour arising from the mass, and caused Colonel Peacock to cart quantities of lime and ashes to cover it. This to all appearance had been most effectually done, as the nut-brown colour of the manure gave unmistakable signs of the decaying matter. I had carts engaged for several days, conveying to my premises this truly valuable and rich deposit. Weeks after, I learned accidentally that the whole belonged to my fellow-citizen, Mr. William Henrie, who was preparing it for transport across the ice to his farm at Wellington Square. On that occasion I broke the Eighth Commandment, and often since I have, in thought, violated the tenth, when I have seen a large grand pile in the barn-yards of our yeomenry. The colour of that pile of manure is worthy of the greatest attention. It was saturated with ammonia, and this element gave it its richest value—ammonia, in some form or other, being one of the most important ingredients of plant-growth. Whatever most bountifully supplies this for plant food is the best fertilizer.

The subject matter of this Essay, therefore, will lead us naturally to the treatment of manures, and how to use them in their application to fruit trees. In fact, the operations

both of the horticulturist and agriculturist depend much upon the kinds and amount of manure at their disposal.

In anticipating the production of fruit crops, we must of necessity make some reference to the use of fertilizing substances. We shall, therefore, in this essay, as succinctly as we can, enumerate the fertilizers most used by horticulturists—give their sources—remark on their qualities, and dwell on the modes of using them.

The foremost— because the most accessible of all manures—is dung from the barn yard. This source of profit, fully understood and husbanded, is of immense importance to the fruit-culturist. Indeed, without some such source of fertilization he might despair in the prosecution of his labours. This dung is composed of the droppings of the cattle—litter wherewith they are bedded—the remnants of broken food—the collected urine of the various kinds of cattle. These all gathered together, rotted, or compounded, as it is called, form the most valuable fertilizer. It is a simply returning to the earth what has been taken from it, with the exception of the grain and fruit sold, the meat, and the farm products that have been disposed of. This succession of supply and demand verifies the old adage, that supply and demand are equal and opposite. The preparation of fertilizers becomes, therefore, a subject of paramount importance both to husbandry and horticulture.

In my reading, and as far as my practice goes, I have been led to regard this preparation as best accomplished under covered sheds. Such a plan prevents incalculable waste, and especially of the most important of the fertilizing elements which the dung contains —oxygen, nitrogen, ammonia and carbonic acid gas. In Holland and Belgium great success has attended the careful preparation of manures. No expense is thought too great to carry out the enlightened views of these foreign cultivators. Every farm-yard should possess its liquid tank, and means should be employed to distribute the contents over the firmer material under the shedding, to aid in the decomposition, and to enrich the mass. Tanks of liquid manure are now in general use for all garden purposes, and only the fruit-culturist can adequately enumerate the benefits to be derived from the application of liquid manures.

An old acquaintance of mine in the old country was noted for the number of prizes which he took at the local exhibitions for his fruit. On my asking him the secret of his success, he took me to a neglected but most important part of the premises, behind the hot-houses, and directed my attention to a large tank filled with a greenish matter, and plentifully supplied with a covering of round black bullets. There, said he, is the secret of my successful competition. I found that certain persons were employed to gather the droppings of the sheep over the lawn and the home fields, and from this liquid compound, he found a perfect stimulant to every variety of fruit and flower which he grew.

The scientific application of manures has undergone great changes of late years. It is now understood that it is unnecessacy to allow the manure heap to decompose its elements and thus have large portions dissipated. Approved application of manures is to cart green manures to the fields, speedily plough them in, and depend upon the further application of guano, superphosphate of lime, and other prepared manures, for stimulating the growth of plants during their early stage, and thus put them in the best condition for making gradual use of the slowly dissolving manure. In the neighbourhood of towns, fruit-growers possess singular advantages in the preparation of fertilizers. The raw materials, as a general rule, can be obtained cheap. Due preparation in the winter months would suffice for every demand for fertilizers in the Spring and Fall. The late Mr. George Barnes, of Hamilton, collected offal from the pork factories, blood from the slaughter houses, bones from every quarter, dead horses and cattle, and made a compost of the whole. With the wind from a certain quarter, and travelling down King Street, one can infallibly tell from the offence of the olfactory nerves, when they come near his thriving and productive farm. The manure used by Mr. Barnes comes nearest of anything I know to a mixture between barnyard dung and the best of all manures that has lately come into extensive use, I mean guano. While barnyard manure must always remain the great staple for maintaining the fertility of the orchard, guano claims our next notice.

Guano is the solid excrements of carniverous sea-birds, which is accumulated in great quantities on the coasts of South America, and other tropical countries. As a manure it has become world-renowned. It has been used as a manure in Peru from time immemorial, but the accounts given by the older travellers of its marvellous effects were considered to

be fabulous, until Humboldt, from personal observation, confirmed all their statements. It was first imported into Great Britain within my memory, in the year 1840; in which year a few barrels of it were imported, and from that time its importation has rapidly increased. Although an excellent fertilizer, it should not cause us to lose sight of those valuable materials which exist on almost every piece of cultivated land. Every ton of guano imported into any country is an addition to the national wealth, but every ton of stable manure, or poultry dung, or night-soil evaporated, or carried away in streams or rivers, is equally a *deduction* from our riches. If the imported fertilizer is to really benefit us, we must not allow it to occasion the neglect, and consequent loss, of our home fertilizers.

The Peruvian guano, which is considered the best, is obtained from Islands off the coast of Peru. The value of guano differs greatly according to the location from which it is obtained. That from the rainless districts of Peru contains the ingredients of the dung comparatively little changed, a considerable portion of the uric acid and ammonia of the urine existing in some instances in its natural state, and a small quantity only having undergone decomposition. But that from other districts has suffered a more or less complete decomposition, according to the moisture of the climate, which reduces the quantity of organic matters and ammonia, until in some varieties they are so small as to be of little importance. This arises from the loss of uric acid, or rather the urate of ammonia, which exists in the fresh dung to the extent sometimes of even 90 per cent.

As with farmyard manure, the value of guano is estimated by the quantity of nitrogen and phosphates which it is capable of yielding to the crop.

Guanos, therefore, naturally divide themselves into two classes, the one, characterised by the abundance of ammonia, and the other by that of phosphates. Peruvian is characteristic of the former, and Bolivian of the latter—of course, the value of these varieties is very different. They are bought, however, for different purpores—the ammonical guanos for their ammonia principally, and the phosphatic for their phosphates. Peruvian, however, is generally the best, although there are certain soils on which the phosphate guanos nearly or altogether equal it; but this is only the case in particular instances, and taken as a whole, it may be said that Peruvian, notwithstanding its high price, is the cheapest of all guanos.

The value and use of guano are now so well understood that it will scarcely be necessary to enlarge on the mode of its application. Although owing its chief value to ammonia and phosphates, it contains also all the other ingredients of the plant, and everything required in a manure except the large quantity of organic matters capable of producing carbonic acid. It is capable of replacing barnyard manure, and excellent crops of turnips and potatoes have been raised by it alone, and at less cost than by farmyard manure.

Guano has also been most advantageously employed as a top-dressing to grass land, to young corn, and to orchards.

In selecting the variety to be employed, several circumstances must be attended to. It will be found, as a general rule, that on strong soils, under good cultivation, the best effects are obtained from the ammoniacal guanos, but on light soils these guanos are less applicable, as the soluble ammoniacal compounds they contain are rapidly washed out, and much of their effects lost. On such soils the phosphate guanos come up to, or even surpass, the others. No definite rules can be given for determining the soils on which these different varieties are most applicable, but each individual must determine by experiment that which best suits his own land. A very excellent practice is for horticulturists to employ a mixture of equal parts of the two sorts of guano.

The best fertilizer within easy reach is *night soil*, or human excrement. The manure of man consists of those parts of his food which are not retained in the increase of his body. His food is usually of a varied character, and is rich in nitrogen—in phosphates—and other inorganic constituents; consequently, his manure is made valuable by containing large quantities of these matters. As is the case with the ox and horse, the dung contains the indigested food, the secretions of the digestive organs, and insoluble parts of the digested food. The *urine*, in like manner, contains a large proportion of the nitrogen and the soluble inorganic parts of the digested food. When we consider how much richer the food of man is than of the horned cattle, we shall understand the superior value of the *excrement*. Night soil has been used as a fertilizer for ages, in Japan and China;

and herein lies, undoubtedly, the great secret of their success in supporting a dense population, for almost countless ages, without impoverishing the soil.

I use much night soil in my gardening operations, using it after rather a novel fashion. I dig a hole two feet deep, and a foot and a half across, and deposit there weekly the contents of a large crock kept for the reception of the *excrements* of the household, and this with every possible advantage to the trees and crop. It is rather approaching the comical for me to affirm that my pears are all the better for the application. This is evident from the fact that plants have it for their direct object to remake, and put together the refuse organic matter, and the gases and minerals found in nature, for the use of animals. If there were no natural means of rendering the excrement of animals available to plants, the earth would soon be shorn of its fertility, as the elements of growth, when once consumed, would be essentially destroyed, and no soil could survive the exhaustion.

There is no reason why the manure of the human being should be rejected by vegetation more than that of any other animal; and, indeed, it is not, ample experience has proved that there is no better manure in existence.

In Belgium and Holland, the importance of human excrement for the growth of plants is singularly verified. Every morning parties call at the residences of the citizens, and contribute largely for the privilege of removing all night soil from their dwellings.

Night soil may be so kept that there shall be no loss of its valuable gases, and consequently no offensive odour arising from it, while it may be removed, and applied to the orchard, without unpleasantness. All that is required to effect this wonderful change in night soil, and to turn it from its disagreeable character to one entirely inoffensive, is to mix with it a little charcoal dust, prepared muck, dry earth, or any other good absorbent, thus making what the French call *poudrette*. The mode of doing this must depend on circumstances. Several plans have recently been devised, which have for their object the improvement of privy accommodations in detached houses. One of these, the "Earth Closet," is at once so cheap, so simple, and so perfect in its operation, that it should receive general attention. Its action is based on the power of soils which contain clay or organic matter to absorb all offensive effluvia. This power is so great that not only will a pint of sifted and air-dried earth completely deodorize the matters of a single evacuation, but if dried in the air after each use, the same pint of earth may be used over and over again —losing, apparently, none of its power of absorbtion—until it finally becomes as powerful a fertilizer as Peruvian guano, although entirely inoffensive to the sight or smell. The manure thus made is of the most valuable character, and may be used under any circumstances, with a certainty of a good crop.

The dung of all birds, which more or less closely resembles guano, may be employed with much advantage as a fertilizer. Poultry dung is nearly equal in value to Peruvian guano, and it deserves to be carefully preserved and judiciously used. It is as well worth a dollar per bushel as guano is worth seventy-five dollars a ton. Poultry manure is liable to as much deterioration from evaporation and leaching as is any other manure, and care should be taken to prevent such loss. The principle on which the "earth closet" is based may be very effectively applied to the poultry house. All that is necessary is to sprinkle their droppings with dry earth. In this manner the floor of the poultry-house, for a depth of eight or ten inches, may be made to absorb the droppings of a whole summer so as to entirely prevent offensive smells or disease, while the earth for that depth will be worth many times the trouble it has cost. My friend, Mr. W. H. Mills, and myself pursue this plan, with great benefit to our fruits and fruit trees.

The value of this manure should be taken into consideration in calculating the profit of poultry-keeping. I have a high fancy for the different breeds, and I think every farmer and horticulturist should indulge a similar taste. A gentleman of much experience, says in regard to raising poultry, that the yearly manure of a hundred fowls applied to previously unmanured land would produce extra corn enough to keep them for a year. This is probably a large estimate, but it serves to show that this fertilizer is very valuable, and also that poultry may be kept with great profit if their excrements are carefully utilized. Pigeon dung has long been held in the highest repute. Liquid manure made from pigeon droppings has a most powerful effect on flowering shrubs and fruit trees. In fact, intending exhibitors at horticultural shows, can scarcely compete unless they are acquainted with some of these "tricks of the trade." We have had occasion to mention the uses of sheep-

manure, when converted into a liquid application for fruit trees. So much for animal, and now a brief sentence on vegetable manure.

In a highly civilized state of any society, many plans are adopted to improve the arts and sciences, which are almost unknown in new and advancing states. This is singularly the case in Canada with regard to the employment of vegetable fertilizers as manures, either for the farm or garden. In such countries as France and England no expense is spared, no means unemployed, no available manure untried, to advance the interests of agriculture, and horticulture. Many such manures are employed as fertilizers ; their value is variable, and must be estimated in the same way as farm-yard manure, in proportion to the abundance of nitrogen and phosphoric acid. Although like farm-yard manure they may be made to undergo fermentation so as to convert their nitrogen into ammonia ; they are generally, indeed, almost invariably, conjoined with farm-yard manure.

Rape-dust has long been employed as a fertilizer, and the success which has attended its use has led to the introduction of the refuse cake of other oil-seeds, such as that of the castor oil seed, which cannot be employed for feeding. Like the seeds of all plants, these substances are rich in nitrogen, and their ash, containing of course, all the constituents of the plant, supplies the necessary inorganic elements. Indeed all these substances contain as much of nitrogen as is found in about ten times their weight of farm-yard manure, and a somewhat similar proportion exists in the amount of phosphates, and probably of their other constituents. Rape-dust makes a splendid top-dressing, both for fruit trees and cereals. Its effects are most marked on exhausted land. It requires moisture, and hence it often proves a failure in very dry seasons, and on dry soils.

Malt-dust, bran, and chaff have been applied as fertilizers, and their value depends on the quantity of nitrogen which they contain. Straw has occasionally been employed for the same purpose and even as a top dressing on land. It is, however, unsuitable for the latter application, as it decomposes very slowly, and it is always desirable to ferment it in the manure heap, so as to facilitate the production of ammonia from its nitrogen. One of our horticulturists at Drummondville has used it thus with good effect. It will generally prove beneficial on heavy soils, which it serves to keep open, and so promote the access of air, and enable it to act on the soil.

Saw-dust.—I have tried saw-dust and have succeeded and failed. Some kinds of saw-dust ferment, and thus prove detrimental to fruit trees. It is a good *mechanical* addition to heavy soils, and diminishes their tenacity. It is a useful absorbent of liquid manure, and may be advantageously applied to farm-yard manure for that purpose. In towns and cities saw-dust is sometimes used instead of straw as bedding for horses and cows. It then becomes a useful addition to the farm-yard pile of manure.

MANURING WITH FRESH VEGETABLE MATTER.

The term green manuring is applied to the ploughing in of green vegetable matter, which has been grown on the soil for that purpose. The success which attends it, especially on soils poor in organic matter, is very marked. Its utility is manifestly dependent upon its affording to the soil a supply of matter, which by its decomposition may yield carbonic acid to act on the soil as well as nitrogen, and inorganic matters. The action is not, however, confined to this, for it serves also as a means of bringing up from the lower parts of the soil the valuable matters which it contains, and of mixing them again with the surface part. Many of the plants found most useful for green manuring send down their roots to a considerable depth ; and when they are ploughed in all the substances which they have brought up are, of course, deposited in the upper few inches of soil.

Plants, when ploughed in the fresh state, also decompose rapidly, and are therefore able immediately to improve the subsequent crop ; and as this decomposition in the soil takes place without the loss of ammonia and other valuable matters, which infallibly occurs when they are fermented on the dung heap, it will be obvious that in no other mode can equally good results, by the use of these plants, be accomplished.

Many plants have been employed as green manure, and different opinions have been expressed as to their relative values. In the selection of any one for the purpose, that should of course be taken which grows most rapidly, and produces, within a given time, the largest quantity of valuable matters. No general rule can be given for the selection,

as the plant which fulfils these conditions best will differ in different soils and climates. The plants most commonly employed in this country are, rye, clover, buckwheat, rape, and some others. Clover is perhaps the favourite of these with our horticulturists, more especially with those who desire to fertilize old orchards. Indeed for young as well as for old orchards a crop of clover ploughed under will amply reward the horticulturist. Buckwheat is also another green fertilizer, which, for several obvious reasons, is much employed by our farmers and gardeners. Its cleaning qualities are not to be overlooked—its close and thick growth smothers all kinds of weeds—and its own succulent nature singularly adapts it for immediate use as food for the plant. I have known of turnips sown broadcast at the end of harvest, and ploughed in after two months. The effect of this treatment is such, that the most exhausted land may be made to bear a renumerative crop.

OTHER ORGANIC FERTILIZERS.

Animal substances generally contain a much large quantity of nitrogen than vegetables, and as they undergo decomposition and yield it in the form of ammonia more rapidly, their value is much higher. *Flesh* is an important fertilizer. If the decomposition of animal bodies takes place in exposed situations, and without proper precautions, the ammonia escapes into the atmosphere and much of the mineral portion is leached out by rains. The use of absorbents, such as charcoal-dust, prepared muck, &c., &c., will entirely prevent the evaporation, and will in a great measure serve as a protection against leaching. If a dead horse be cut in pieces and mixed with ten loads of muck, the whole mass will, in a single season, become a valuable compost.

Blood is a most valuable fertilizer, but it is not much employed in this country, at least in the neighbourhood of large towns, as there is a demand for it for other purposes, and it can rarely be obtained by the farmer and horticulturist in any large quantity. It is best used in the form of a compost with peat or mould, and forms an excellent fertilizer for turnips, and is also advantageously applied in atop-dressing for wheat. It is a capital fertilizer for vines.

HAIR, SKIN, AND HORN.

The refuse of manufactories, in which these substances are employed, are frequently used as fertilizers. They are all highly nitrogeneous substances, and owe their entire value to the nitrogen they contain. Refuse horsehair generally contains eleven or twelve per cent. of nitrogen. Woollen rags contain over twelve per cent. of nitrogen, and woollen cuttings about fourteen. Horn shavings are extremely variable in their amount of nitrogen, when pure they contain an amount of over twelve per cent.

All these substances are highly valuable as fertilizers, but as they undergo decomposition more slowly than flesh or blood, they are more applicable to the horticulturist than to the farmer, and more especially applicable to heavy soils. Woollen rags have been largely employed as a fertilizer for hops, and are believed to surpass every other substance for that crop. As a manure applicable to the ordinary purposes of the farm, they have scarcely met with that attention which they deserve, because their first action is slow, and the farmer is more accustomed to look to immediate, than to future results. Horticulturists know that they possess the important qualification of adding permanently to the fertility of the soil.

BONES.

Bones consist, when dried, of about one-third organic matter, and two-thirds earthy matter. The organic matter consists chiefly of gelatine—a compound containing nitrogen. The earthy matter is chiefly *phosphate of lime;* hence bones are excellent, both as organic and as mineral manure. The organic part, containing nitrogen, forms *ammonia*, and the inorganic part supplies the much needed phosphoric acid to the soil.

Bones are applied in every conceivable form. *Whole bones* are often used in very large quantities, this is one of the forms in which I apply it to my fruit trees—their action, however, is extremely slow—and almost fills the place of a permanent manure.

Ground bones are best for all fertilizing purposes. They ferment readily, and produce ammonia, while the ashy parts are exposed to the action of the roots. The finer the bones are ground the more valuable do they become. Not only do they, in this state, expose much more surface to the feeding action of the roots, but from their fine division they can be much more evenly distributed through the soil. Even Peruvian guano, soluble as it is in water, is made much more effective when ground fine before being spread upon the land.

Composting bones with ashes is a very good way of securing their decomposition They should be placed in a water-tight cask: first, make a layer four inches of bones, then the same quantity of unleached wood-ashes, continuing these alternate layers until the cask is full, and keeping them *always wet*. The ashes are in themselves valuable, and this compost is excellent for almost all crops, agricultural and horticultural, particularly for Indian corn. A little dilute sulphuric acid, occasionally sprinkled on the upper matter in the cask, will prevent the escape of the ammonia. The bone dust which I use is prepared at the pork slaughter houses in our city, and the preparation is rapidly becoming a most important item in reducing the expense connected with pork-packing.

I may notice here that guano is believed to encourage a great expanse of foliage, and to be especially suited for early sowings— and superphosphate to influence the development of bulb, and to deserve the preference for a late seed time. The obvious inference is, that for the turnip crop, at least, these valuable fertilizers should be used in combination; and actual experiment has verified its soundness. The use of them is universal and ever on the increase.

In regard to superphosphate of lime, the prudent and economical plan is for the farmer and horticulturist to purchase bone-dust and sulphuric acid, and prepare it himself.

Recently, a new source of supply of superphosphates has been discovered, the extent of which is becoming more apparent as investigation proceeds. We allude to those phosphoric deposits found in such abundance in the crag, and upper and lower greensand in the South-east of England. These deposits consist of animal fossil, remains of Sharks, gigantic Sea-Lizards, and Whales. These fossil-bones are found in enormous quantities in Suffolk, Norfolk, and Essex, and are ground by powerful machinery, and dissolved in sulphuric acid, to render the phosphate of lime available as manure.

Bone-dust is used by horticulturists and farmers as a top-dressing, both for trees and grass crops. Two falls ago I gave my garden a thorough top-tressing, with prepared bone-dust and leached ashes. Sometimes I have covered my garden-patch to the depth of three inches with leached ashes and bones, in every case with uniform success.

LEACHED ASHES.

Among the earth fertilizers that have not yet been mentioned—not coming strictly under any of the preceding heads—is the one known as *leached ashes*. These, of course, are much less valuable than ashes from which the potash has been leached out; still, as potash is generally made, the leaching is not very complete, and a considerable quantity of this substance, available for plants, is left in them. In addition to this, they contain phosphoric acid, and silicic acid, which adds to their value. Practically they are held in high esteem in all localities where they can be obtained at a moderate cost of transportation. Boston horticulturists purchase leached ashes in Hamilton, at ten cents per bushel, carry them to Boston, and make them pay. I have sometimes thought that Canadian fruit-growers repurchase their own ashes under some of the names of fertilizers so common among ourselves, as phosphates and superphosphates.

The most important and extensively used mineral substance employed for fertilizing is *lime*. Lime readily decomposes muck or dung, and is most efficient in accomplishing this purpose, when mixed with salt. As food for plants, lime is of considerable importance. All plants contain it, some in large quantities. It is an important constituent of straw, meadow hay, leaves of fruit-trees, peas, beans, and turnips. It constitutes more than one-third of the ash of red clover. Most soils contain lime enough for the use of plants; in others, it is deficient, and must be supplied artificially. It is almost indispensable to choose a limy formation for the planting of an orchard.

Its effects upon the soil are very marked. It corrects sourness, and is especially valuable in the reclaiming of moory and boggy lands.

It hastens the decomposition of the organic matter in the soil—it causes the mineral parts of the soil to crumble; and, by producing these effects, it prepares the constituents of the soil for assimilation by plants.

It is said to exhaust the soil. You may laugh at such assertions, for the exhaustion represents its beneficial action in producing large crops, and is therefore no argument against its use. Thus we see that it is hardly fair to accuse the *lime* of exhausting the soil, when it only improves its character, and increases the yield. It is the *crop* that takes away the fertility of the soil, and in all judicious cultivation this loss will be fully compensated by the application of fertilizers, thereby preventing the exhaustion of the soil.

I may add that shell lime is the best of all, for it contains no magnesia, and it does contain a small quantity of phosphate of *lime*. Lime should never be mixed with animal manures, unless in composite with muck, or some other good absorbent, as it causes the escape of their ammonia.

PLASTER OF PARIS.

Plaster of Paris or gypsum (sulphate of lime), is composed of sulphuric acid and lime in combination. It is a constituent of many plants. It also furnishes them with sulphuric acid, and with the sulphur, of which a small quantity is contained in seeds. It is an excellent absorbent of ammonia, and is very useful to sprinkle in stables, poultry houses, pig-styes, and privies, where it absorbs the escaping gases, saving them for the use of plants, and purifying the air, rendering stables and outhouses more healthy than when not so supplied.

ACIDS.

I have scarcely left myself space to say one word or two on the acids which are beneficial as fertilizers. Sulphuric acid is a very important constituent of vegetable ashes. It is sometimes known under the name of *oil of vitriol*, and may be purchased for horticultural and agricultural purposes at a low price. It may be added in a very dilute form to the compost heap, when it will change the ammonia to a sulphate as soon as formed, and thus prevent its loss, as the sulphate of ammonia is not volatile, and being soluble in water is useful to plants.

PHOSPHORIC ACID.

We come now to the consideration of one of the most important of all subjects connected with agriculture and horticulture. Phosphoric acid, which forms about one half of the ashes of wheat, rye, corn, buckwheat, and oats; nearly the same proportion of those of barley, peas, beans, and linseed; an important part of the ash of milk and turnips; one quarter of the ash of milk, and a very large proportion of the bones of animals, often exists in the soil in the proportion of only about one or two pounds in a thousand. The cultivation of our whole country has been such as to take away the phosphoric acid from the soil, without returning it, except in very small quantities. Every hundred bushels of wheat sold contains, and removes permanently from the soil about sixty pounds of phosphoric acid. Other grains, as well as the root crops and grasses, remove likewise, a large quantity of it. This removal of one the most valuable constituents of the soil has been the cause of the exhaustion of farms. Why is it that our wheat lands are diminishing in their yield per acre? For no other cause than the removal of the phosphoric acid from the soil.

The enormous waste of the most valuable fertilizers, taking place not only in every city, but about every residence in the land, can only be arrested when the importance of restoring to the soil a full equivalent for what is taken from it, is universally realized. Many suppose that soils which produce good crops, year after year, are inexhaustible, but time invariably proves the contrary. They may possess a sufficiently large stock of phosphoric acid, and other plant constituents, to last for a long time, but when the stock becomes so reduced that there is not enough left for the use of full crops, the productive power of the soil will yearly decrease, until it becomes worthless. It may last a long time,—a century or even more,—but as long as the system is *to remove everything* and *return nothing*, the fate of the most

fertile soil is certain—a fate, which, with equal certainty, diminishes the dollars in the pocket of the farmer and gardener.

One principal source from which this phosphoric acid can be obtained, is found in the bones of animals. These contain a large proportion of the *phosphate of lime*. They are the receptacles, which collect nearly all the phosphates in crops, which are fed to animals, and are not returned in their excrements. For the grain, &c., sent out of the country, there is no way to be repaid except by the importation of this material; but nearly all that is fed to animals, if a proper use be made of their excrement, and of their bones after death, will be returned to the soil.

Atmospheric fertilizers consist af ammonia, carbonic acid, oxygen and water.

Their greatest usefulness requires the soil to allow the rains to pass through it—to admit of a free circulation of air among its particles, and to contain a sufficient amount of absorbent matter to arrest and retain all ammonia, and carbonic acid presented to it.

Fertilizers, of whatever sort, should be supplied with regard to its requirements. Atmospheric fertilizers cost nothing, and are of great value when properly applied. In consequence of this, the soil which is enabled to make the largest appropriation of the atmospheric fertilizers, is worth many times as much as that which allows them to escape. In fact it may be considered to be the object of all cultivation, to use the advantages which the soil and fertilizers offer for the purpose of consolidating and giving a useful form to the carbonic acid ammonia and water, which are freely offered to all seekers.

In conclusion, I would say, like a parson, who brings his discourse to a close, much to the delight of his sleepy audience, "that no fertilizing can be strictly economical that is not based on a knowledge of the requirements of the soil, and of the crops,—and of the best means of supplying them—together with the most scrupulous care of every ounce of evaporating or soluable manure, made on the farm, and a return of the earthy matters sold off in produce."

SECOND PRIZE ESSAY ON "HYBRIDIZATION, AND ITS CANADIAN RESULTS."

Motto.—"Male and female created He them."

By P. E. Bucke, Ottawa.

Part First.—Hybridization.

Hybridization or domestication may, as a general rule, be regarded as synonymous terms when used in connection with animals and plants, because these in their wild state were kept apart by climatic and other influences, and it was only when different species of the same variety were brought together by commerce, or by roving tribes that, they mixed by interbreeding, and the wild type became, in many instances, utterly lost in a cultivated one. It is a very remarkable fact, however, whatever may be the cause, that with regard to plants this modification of the wild form by crossing, resulting from propinquity, causes such plants to yield far more abundantly under cultivation than they did in the wild state. Any one may see this for himself by examining the plant of the wild smooth gooseberry growing about any of our creek banks, in almost any part of Canada, the wild currant, both black and red, the wild strawberry, the wild crab, and in fact the list might be continued *ad infinitum*. The sparcity of production in the wild plants is accounted for by those who have given this subject considerable attention to the in-and-in breeding of the same variety, without the mixture of foreign pollen; the consequence is that when Hybridization takes place, whether artificially or naturally, the fruit is increased in size and the fertility and vigour of the plant are greatly stimulated. Sometimes, however, this gain is compensated for by the new plants produced losing hardiness of constitution. When once plants have been crossed, their reproduction by seeds is a matter of great uncertainty; thus it will be seen that the new varieties produced, which can be multiplied by cuttings, runners, layers, or by grafts, can easily be maintained,

but to originate any new kind of animal, grain, fruit or flower which reproduces itself by seeds only is a matter of no small difficulty; the fixing of the variety in this case can only be performed by selecting the seeds from approved specimens for several years in succession, rejecting any of them from plants showing any variation, and in this way the new plant may be kept fixed in its character for all time to come. When two wild varieties—the seeds of which will produce like plants—are crossed by artificial means for the first time, there is almost a certainty that the offspring will partake considerably of both parents in the colour and flavour of the fruit, and in the habit and manner of growth of the plant, but when two plants that have long been under domestication, not propagated by seeds, are artificially fertilized it is impossible to predict before hand what the result of such cross will be. In the improvement of plants or fruits selection plays a very important part in the production of better varieties, but cross fertilization must first take place to alter the original stock, and then there must be a judicious selection from the seedling produced; further hybridizing may then be practised to develop those parts of the plant most valued by man. The whole operation of improvement is much assisted by extra cultivation, which is a third factor in the production of new and useful plants. It will be found by any one who attempts the propagation of plants from seeds, such as the apple, gooseberry or raspberry, that, for some reason or law of nature, there is a perpetual tendency of plants so raised to revert to the original wild type. The seedling whose fruit or vigour of growth is in advance on the parent is comparatively speaking rare when matters are left to entire chance, but by the artificial hybridizing of two first-class fruits of the same species much more success is likely to attend the labours of the propagator. There are, however, so many causes which induce variation that no positive rules can be laid down for success. Among these causes are the surroundings of climate and its influences, either as a whole or on certain parts; other variations are caused through the reproductive system which is affected by being removed from its natural conditions. Sometimes, variability is occasioned on the mature organisms, on the embryo, and on the sexual elements before ever impregnation has been effected. Whether the mind of man will ever be sufficiently advanced to grapel with these subjects is at present quite uncertain, but the general advancement of the human understanding leads one to imagine that even these at present hidden mysteries may not be withheld at some future distant day, in the same way that it has been reserved to quite recent times for man to understand the laws which govern steam, the art of photography, and although it is admitted only a limited knowledge of electricity has yet been discovered, it is clearly demonstrated that this wonderful agent, which pervades all nature, and space, may some day be so easily handled that it will become one of the noblest handmaids of civilization: the main difficulty at present being to bridle and direct its power; as a source of light and heat it has but one rival, and that is the sun itself. The telephone is also as yet in his infancy, and there are hundreds of other things which might be pointed out to shew the powers of the human intellect are being developed under advanced culture.

From experiments made by practical scientists it is found that more than one spermatozoon is necessary to fertilise the ovule of the female in some animals. When a small number of spermatozoa is applied, the ova is only partially impregnated, and the embryo is never fully developed. With regard to plants it is found that results of nearly a similar nature occur. Pollen grains of more and more number up to thirty were applied to the stigma of a certain plant,[1] but did not fertilize a single seed, but when forty were applied, a few seeds of small size were formed. The pollen grain of another plant,[2] which are of extraordinary size, and of which the ovarium contains only a single ovule, was acted upon with the following interesting results:—A flower was fertilized with three grains of pollen with perfect succedss twelve flowers were fertilized by two grains, and several flowers by a single grain, an of; these, one flower only of each lot perfected its seeds; and what is more extraordinary still, the plants produced by these seeds never attained their proper dimensions, and bore flowers of a remarkably small size. It will thus be seen that the quantity of the peculiar formative matter which is contained in the pollen grains, or the spermatozoon, is an important element in the act of fertilization, not only in the development of the seed, but also in the plants they produce.

Mr. Charles Arnold, of Paris, Ontario, who has probably been one of the most active men on this continent in the science of Hybridizing, gives it as his opinion that the age of the pollen grains, or the state of the maturity of the ovule, materially affects the habit and

1 Malva—The common Mallow. 2 Mirabilis—Marvel of Peru.

structure of the future plants, and the fruit and flowers formed on them. Special notes should therefore be made of the period of the application of the pollen to the female organ after the flower has been artificially opened, so as to discover, if possible, what effect is exercised on the fruit of the seedling by applying the pollen at various stages of the flower's age. Of course this would do away with the recommendation given to Hybridists to make several applications of pollen at different periods to the same flowers. In working with the grape these observations should be especially made, as the forms and colours of the fruit are not so varied as in the apple, but are more marked than in the gooseberry or currant. Mr. Arnold attributes the colour and flavour of the fruits to the state of the sexual organs at the time impregnation takes place, and there may be, and no doubt is, considerable reason to suppose that the seedling is effected by the age at which the ovule is impregnated; and this will more readily be seen if we look at the new life imparted as a metamorphosis from a previous existence. From this point of view it will be seen that the stage of the previous existence when this metamorphosis takes place might readily affect the new existence. No one can doubt that some kind of life exists in the spermatozoon, and in the pollen grains of plants, for if no life were there, how could life be imparted? It may exist in a dormant and unconscious state, or in an entirely new form. No fire is obtained from flint until it is struck with a steel, and it has been pretty well proved that in no instance has it yet been ascertained that something has been made out of nothing. After the contact has been effected and the change or new life has commenced, the seed is formed. This is the second metamorphosis in plants, and the third and last is when the seeds are sprouted and the plant takes shape in its beautiful form which puts on foliage, flowers, and fruits. In this third stage, age again has its effects on the fruits produced. It is well known that old trees do not perfect as fine fruit as they did in their younger periods of existence; we will take as an instance the black currant,—when the wood of this shrub becomes four or even three years old, the fruit is not so large or so plentiful as if borne on one and two year old branches. The pruning of this plant should therefore be so conducted as to remove the old wood and allow the new to take its place. Upon examination it will be found that age affects all male and female forms of life, both in the reproductive organs and in the offspring produced. Old men, do not, as a rule, beget as healthy children as those of a man who has attained to full development; and the last child of a female, before she arrives at that age when child-bearing ceases, is often the smallest and most delicate of the family. It will therefore be well for Hybridists, from the above considerations, first, to use healthy plants to work on, securing their pollen from the most robust and hearty stocks; and in the next place, to see that the female organ is properly matured, yet not too old to work upon, if the best results are desired. In a state of nature these things to a certain extent accommodate themselves, and it is probably the forcing of nature that makes the seed of hybridized plants produce offspring of a dissimilar character to the parent stock, or, in other words, when impregnation takes place between two plants dissimilar in variety, the ovule is in some way disarranged when receiving the life-germ from a plant which nature has not accommodated to it; this derangement probably takes place at the time of the primal growth or swelling of the ova—though no difference may be recognized in the seeds produced—the formative matter being as it were chemically changed by the union of the two organisms which are not complementary in nature. Whatever may be the cause of the change produced it is clear that different gemules are attracted to build up the plants produced by seeds affected by hybridization.

The derangement which takes place at the first cross may become inoperative or entirely disappears by reversion to the original type if not specially preserved, but a cross having several times been made, the sports or variations become so wide apart that not only is the original utterly lost or become quite unrecognizable (see page 17), but the plants themselves will not produce like children, by sowing their own seed; this, however, is not invariably the case, as some of the new varieties may be made to come true from seed by careful selection of these from selected plants for several years in succession, whilst others again quite refuse to re-produce themselves in this way, fortunately the first class of plants are chiefly amongst the annuals, whilst the latter are principally those which can be propagated in other ways, such as the apple, &c.

Practical directions for Hybridizing the Grape have been given in previous numbers of the Report of the "Fruit Growers' Association," but as the members are continually changing, and as many may not have preserved their old reports, it may be as well to give a short de-

scription of the mode of operating. Enlarged figures of the grape flower may be found at page 49 of the Report for 1872. These instructions relate to the grape only, but as the structure of all blossoms are somewhat similar it will also give a key to others as well. A good-sized bunch of flower-buds should be selected and carefully watched, any of these found to be prematurely bursting should be cut off so as to secure as many as possible which would open at the same time to operate upon, and any that are not sufficiently matured may also be removed. Having selected those upon which it is proposed to work, and being provided with a pair of fine pointed forceps, a few camel-hair pencils, and some paper bags sufficiently large to enclose the bunches, everything is ready to begin. With the forceps the calyax and carolla must be carefully remoued so as not to bruise the internal organs, the stamen and pistil will then be exposed, the stamen or mail organ must then be nipped off, leaving the female organ or pistil in the centre of the flower, all by itself. When all the buds are thus arranged the paper bag must be put over the bunch and closely secured to prevent the possibility of contact by other pollen in the air or by visits from insects. The next step is to secure the pollen or male fertilizing matter, which in the grape is very abundant, and may be collected by holding a piece of blue paper under a branch of the kind required, and by a sharp jar with the hand a sufficient quantity may be readily secured. The caps of the flowers will also fall upon the paper, but these should be removed. The yellow pollen will be readily recognized on the blue paper. When sufficient is secured, transfer it to a small phial to be carefully labeled and kept for future use. Care should be taken to keep the pollen from the light by the bottle in dark-colored paper. Where there is a difficulty of jarring to collect pollen, wrapping up as in the apple, strawberry, &c., it may be obtained by damping the camel hair brush slightly, the pollen will then readily adhere to the pencil, and this must be used at once, as the moisture will soon dry on the brush and the pollen will then fall off and be lost. The time for the application of the pollen depends on the maturity of the flowers ; if these are nearly opened at the time they were operated upon the pollen may be applied the same day or the following, and a second application should be made two or three days afterwards, which materially increases the chances of success. In no case should the flowers remain a moment uncovered longer than absolutely necessary. After the pollen grains have been applied to the stigma they adhere to the necta and the process of germination begins, the pollen sending down a minute fibre which penetrates to the ovarian cavity which it enters and fertilizes.

Part Second.—"Its Canadian Results."

The Hybridists of Canada though enthusiastic are not numerous. The foremost amongst them are Charles Arnold, of Paris, W. Saunders, of London, W. H. Mills, Hamilton, P. C. Dempsey, Albany, and William Haskins, Hamilton. Mr. Arnold is celebrated for his hybrid apples, grapes, wheat, peas, raspberries and strawberries, besides some interesting experiments on the Indian corn or maize plant. Mr. Saunders for his grapes, raspberries, gooseberries, and the crossing of wild and native flowers. Mr. Mills chiefly for his hybrid grapes, which, though not yet sent out, are calculated to take an advanced place amongst our new varieties Mr. Dempsey in a few years time will probably be placed somewhere near the head of the list, by his splendid hybrid grape, named after our illustrious President, the Burnett. It is a black grape, and is a cross between the Hartford Prolific and Black Hamburg. Should this magnificent fruit on dissemination to the members of the Fruit Growers' Association in 1878, prove as successful in other localities as it has in its native County of Prince Edward, it will indeed be a step in advance for northern grape culture. With the same pollen applied to the female parent which produced the Burnett, Mr. Dempsey has also originated a white grape of great promise, at present known under the name of "No. 25." Not much is yet learned of Mr. Mills' hybrids, except that the grapes produced have been seen at some of the Provincial Exhibitions, and promise well, but their originator is anxious they should not be submitted for trial until thoroughly tested. At London, this season, they made a fine and interesting display, though not shown with a view to competition, but merely that their merits might be discussed by parties who are interested in such matters. His "Sultana" is a grape of very high promise, is fleshy and sugary, and it is claimed to be the only Canadian grape that will make raisins. The bunch is medium to large size, and the berry a little above the average. Mr. Haskins also runs in the grape groove with his hybrids, but more for wine purposes than the table. He has succeeded in producing a grape

which ripens in August, it is small, black, and of an acid flavour. The wine made from this berry has been tested by experienced English and Canadian judges, and is pronounced one of the richest and best flavoured produced on this continent, and closely resembles the best European port. Amongst Mr. Saunders' fruit Hybrids—he has also been succeseful in the floral line—is a most interesting and intimate cross between the Philadelphia native red raspberry, and Doolittle native black cap, both of which will produce themselves true from seed, the former, however, is propagated by suckers, the latter by rooting at the tips of the canes. At first a difficulty was found to exist in regard to propagating the new hybrids, as it roots very sparingly at the tips and does not sucker more than sufficient to prolong its own existence. From experiments made, however, by Charles Arnold, of Paris, and the writer it is found that plants may be obtained by laying down last year's canes early in spring in a small trench four inches deep, pegging them down securely to the ground, either with a hooked stick, small pieces of wood, or bent wire, and as they begin to force shoots at the eyes cover up the trenches. After a time it will be found they will throw out the fruit-bearing branches, and also a cane for next year's plant at most of the eyes. The leaves, canes and berries, as well as the habit of growth, all show the cross. The fruit is a sort of purple in colour, of a softer and more juicy nature than the Black Cap, the cane is long and trailing, and the leaves deeply serrated. Should any one be at all sceptical as to the possibility of crossing two species of the same genus, it would be impossible to doubt his senses on examination of this new plant. Some of these new varieties are most abundant bearers, and the berries, though perhaps a little acid, will be highly prized for cooking and preserves. Mr. Saunders' Hybrids in grapes and small fruits may be counted almost by the hundreds, but sufficient time has not yet elapsed to fruit anything like all his specimens.

The writer has a most interesting family of seeds taken from the Saunders Raspberry in 1876 ; these seeds were sown so soon as the berries ripened, and germinated very freely this spring—1877. Many of the plants are over two feet high, and represent the red and black varieties in all their forms of growth, with one exception, and that is, though several are exceedingly hairy, none are thorny.

Mr. Arnold's experiments in Hybridizing have extended over a large range of fruits and vegetables, and many valuable results have been obtained. In field grains he has two varieties of wheat, for one of which he obtained a gold medal some few years ago, and its cultivation has been extended over a large area of Canada and the United States. Quite a number of samples of this grain in glass jars and in the sheaf were on exhibition at the Centennial at Philadelphia last Autumn, being the growth of both Canadians and Americans. He has also succeeded in crossing the Champion of England pea with the little gem, the former being a rampant grower with large pod containing a pea of much excellence, the latter is remarkable for the dwarfness of the plant. The Hybrid produced is an immense bearer, as many as twenty-six pods having been counted on one plant. These are of good size containing peas of superior flavor whilst the plant is nearly as short as that of the Little Gem, in fact, it is scarcely too much to say that the Champion pod has been placed on the Gem plant. Mr. Arnold's five new varieties of apples are widely known and appreciated. In the Annual Report of the Pomological Society of Michigan U. S., for 1876, page 25, in noticing the Dominion display of fruit at the Centennial, the following remark occurs: "Three of Arnold's Hybrid apples, small in size, but fine in flavour, appeared from the grounds of that noted and successful Experimenter." I may state that the smallness of size was occasioned chiefly by the draught as those apples are what is known as "medium."

Mr. Arnold's Hybrid grapes have a Continental reputation and are quoted in the Catalogues of nursery men both in Canada and the United States as desirable varieties for cultivation, one of these, the Othelo was distributed by the Fruit Growers' Association of Ontario in the Spring of 1872 and has been fruited over a very considerable part of this Province and, I believe, has given much satisfaction.

Some new varieties of the raspberry family have also been raised by cross fertilization at the Paris Nurseries which give evidence of much promise.

Anything like a detailed description of new varieties raised by our Native Hybridists would fill a large volume. Enough has been said to show that the results of Hybridizing in Canada have been of marked value, many of the new plants named having had sufficient native elements infused into them to secure a greater degree of hardiness suitable to our rigorous climate, and it may safely be said that, for the short time this art has been practised the

results have been exceedingly satisfactory, and a stand point has been gained from which future results may be largely advanced. Let not the unlearned in this matter look for too great results, gooseberries cannot be made to grow as large as pumpkins, nor currants as big as oranges, there is a limit beyond which no human power can extend, but that limit can only be discovered by actual experiment. The number of forms, however, within a certain radius are both numerous and valuable. Take for instance, the grape, the different forms in fruit will be sweet, sour, musky, pulpy, juicy, fleshy, thick skin, thin skin, colour of berry, early, late, large, medium and small in size. The plant will vary in hardiness, tenderness, vigorous and slow in growth, size of bunch, downy leaves and stem, smooth, long jointed and short jointed canes, leaves of great and endless variety, and many other peculiarities. Besides these variations there is the co-mingling of them in the same plant or fruit which in the aggregate already amounts to several hundred different kinds, and as new varieties arise these will still further be multiplied.

Let no man tire in well doing; there is very much to be accomplished. The production of a free-bearing gooseberry exempt from mildew, of a size equal to those grown in England, is one of the things yet to be obtained, and that such will be raised in a very few years we have every reason to expect. Another desideratum is a little more earliness in the ripening of our cultivated grapes, the wild one turns black by the middle of August, why should we not have cultivated ones on our tables at the same date? It is my belief the reason is because those already in cultivation have too much of the foreign blood in them, these have been accustomed to a longer season, and yet the original parents were probably not much better than our own wild native grapes, of which there are three or four kinds on this continent, the collection and hybridizing of which would probably, under high cultivation, produce the most satisfactory results,—though it would take the best part of a century to obtain varieties equal to foreign grapes which have been under cultivation for several thousands of years.

In Europe there are cultivated one hundred and fifty-seven eatable plants useful to man, the origin of thirty-two of which are quite unknown, owing to their having been so often crossed and so highly cultivated, that they have become quite dissimilar to the wild type, and therefore cannot be recognized.

In Australia one hundred and seven plants are used for food, but none of these have been improved by cultivation by the aborigines.

In New Zealand no plants have been improved by man.

In Mexico, Peru, and Chili, thirty-three have been improved, cultivation having been carried to a very high state by the Incas, who used irrigation to a large extent.

In Brazil only a few plants are used for food.

On this North American Continent the following plants were cultivated before it was settled by Europeans: maize, pumpkins, peas, beans, and tobacco.

The spread of cultivated plants and domestic animals, and the gradual extinction of those which preceded them, is destined to make a marked change on the face of the cultivated globe, and to render its food-producing capabilities so much greater that a larger population will be more easily clothed and fed than at present. These again in their turn will give place to higher and better varieties, and, as man advances in number and intelligence, so will those products most useful to him be improved and made more productive, and it is in this matter the hybridist is playing, and will play, a very important part in future civilization.

It may possibly be asked by some, why are not fruits when found in the wild state, equally as rich in flavour, and as large in size as those cultivated? Why should they not have been ready made, as it were for use? The answer is, that originally, these fruits were required to be spread over a vast area for food for man, animals and birds, and it requires a hardy constituted plant to endure the climatic changes and different temperatures under which they have to exist. By cultivation, what is lost in the hardiness of the plant is gained in the quality of the fruit. Any of our cultivated fruits left to take care of themselves would either be destroyed by insect pests, killed by frosts, or revert back to their former conditions. The care of man alone supports them in fruitfulness, and guards them against their enemies.

In Canada, the hybridist has a wide field before him, his usefulness lies in two directions, on the one hand he has to adapt imported fruits to our tropical summer sun, our northern

winter cold, and such plants as come from a humid climate like Britain, to our dry, bright, atmosphere. On the other hand to raise our native fruits to as high a standard as those imported, and fit them for the enjoyment of our race.

To the Canadian hybridist in fruits, in cereals, and in the beautiful flowers, our grand Dominion already owes much, though there are still many leaves of nature's book to be turned by future aspirants to fame.

SECOND PRIZE ESSAY ON THE RESULTS ACCRUING FROM THE TREES AND PLANTS DISTRIBUTED BY THE ASSOCIATION.

By Rev. R. Burnet, London.

Motto—"Alere Flammam."

The Fruit Growers' Association have been fertile in devising, and in putting into effect, various schemes for the advancement of Horticulture throughout the province. A large amount of good has accompanied these methods, not only to the members of the Society, but to fruit-growers at large all over the country. Indeed it may be well said that these benefits have not been confined to our own province, but have extended to Quebec, New Brunswick, and Nova Scotia. Among the most efficient of these means for the development of Horticultural interests, employed by the Fruit Growers' Association, may be mentioned the public discussions on Fruit interests which have characterized the proceedings of the Society during its past existence. Few can calculate the good that has arisen from these means, to the members attending the meeting, and still greater good has accompanied the publication of the discussions both in the Press of the Province and in the annual report issued by the Honourable the Commissioner of Agriculture. We are satisfied that very great stress will be put upon these publications in all future discussions on the Horticulture of Ontario. Prizes for seedling fruits have been the means of calling into notice a fair share of the best seedling fruits grown in the Province. Two or three apples of surprising excellence have been brought to the knowledge of the Society, and means are in contemplation to fully reward the producers and owners of such fruits. There has not been any great result in pear-growing through the introduction of new pears. Perhaps the only new pear worthy of mention is the one from Oshawa, which cannot be said to be of superior excellence; indeed it scarcely comes up to the excellence of its parent, the Flemish Beauty. A seedling peach of rare excellence was exhibited by Mrs. Colbeck, of Hamilton, which gave great promise, but this variety from some cause or other has not been prominently brought forward of late.

It is among vines that the greatest success has marked the efforts of the Association. Here we have a large field of operation, and several distinguished operators, all claiming the ear of the public. Facile princeps among these is the veteran hybridist, P. C. Dempsey, County of Prince Edward. The "Burnet" grape will long remain a trophy of his ingenuity, perseverance, and patience. Nor are the efforts of Mr. C. Arnold, W. H. Mills, and Mr. Wm. Saunders, to be overlooked in their hybridizations of strawberries, vines, and raspberries respectively. Mr. Arnold's efforts embrace cereals as well as fruits.

Of all these efforts for the dissemination of a taste for horticulture, we question if any can compare in beneficial effects to the distribution of suitable plants and trees throughout the length and breadth of Ontario. It was a happy thought that originated this method for the advancement of fruit culture. It has wrought wonders among our fruit growers. The increased vitality among our members was not the least benefit. The roll of membership suddenly rose from hundreds to thousands, and men who had been chary or indifferent in having anything to do with the Association, felt it at once to be their duty to join its ranks. Varying success may have attended the advance of the Society since, but it never has altogether lost the impetus for good which it then received. It brought our Association into more prominent notice than it had heretofore received. The remotest counties and districts furnished names to the membership, and increased interest and benefit were the result. But this

was not all. Increased interest in fruit-growing was a consequence. At first, the Society was perhaps, singularly fortunate in their choice of trees for dissemination. There was an out cry that people knew nothing of the merits of the Eumelan. In fact, there arose what has ever characterised society at the introduction of anything partially unknown and undescribed, that the Direction had erred in issuing wholly unknown varieties. The proof of the pudding is the eating of it, however, and soon these fears and out cries were proved ephemeral as the gnats on our summer breezes. The Eumelan has come into general cultivation, and few new varieties of grapes are now considered more valuable. In Hamilton the cultivation of the Eumelan has received a mighty impulse. It is successfully grown by everal of our members who knew nothing of its merits till their attention was called to it by its distribution by our Society.

Mr. S. Woodley, may be mentioned as a fruit-grower, who has been singularly fortunate in its cultivation. The samples of this variety exhibited at Guelph, London, and Hamilton last year went far to disabuse minds partially prejudiced against its introduction to the public, by our society. It is no longer doubtful that the dissemination of the Eumelan has proved a wonderful success. It has opened the minds of our farming community to the knowledge of good fruit—fruit of high flavour, a plant marked by hardihood, and capable of being cultivated over a large area. As a good accruing to the community at large in the dissemination of our trees and plants, I may mention it as a fact, that since our distribution commenced, there has been a greater and wider enquiry, and purchase of new varieties than there was ever before in the history of fruit culture in the Province. People have not been satisfied in resting contented with one new variety of excellence, they wish to poesess all the market varieties now being issued from the nursery of our professionals. The Isabella, which was by far the best known variety over the length and breadth of the land, has given place to earlier and richer varieties. Few people are now found planting this variety. They desire Rogers' sorts, Rickett's Grants, &c., &c. We maintain as a fair, sure and unmistakable result of our plants and trees distribution, notable new varieties have been introduced, which it is not too much to say, will yet bear fruit a thousand fold as a testimony to the far seeing policy of the Fruit Growers' Association of the Province in their thoughtful dissemination of superior varieties of fruit-berring plants. No little good has been accomplished in bringing multitudes of people into personal contact with good fruit. It is very well to read about good fruit, to see the exaggerated figures of various sorts of fruit in interested catalogues issued, or in the extravagant cuts in books and directories on fruit and fruit culture. To grow, handle, superintend and taste is a very different thing. We almost require to see to believe. It is true that there among us, those who believe anything,—they put nothing to the test but their own folly. If an individual comes along promising great result from a certain purchase which he is ready to guarantee, they at once close with the bargain, showing an immense amount of credulity, and how easily an individual, blinded by a false zeal, may part with his usual common sense and his money. The common motto is not a bad one, in reference to fruit growing, seeing is believing. Farmers as a rule, want experimentally to see the fruit before they invest. Some, indeed unfortunately are satisfied with a showy plate. Give us the man, who desires to grow good fruit for himself. It is a means to get him to bestir himself to make enquiry after good fruit, before he invests.

What glowing eulogiums we have heard on the fruit produced by the trees sent out by the Association? It has often done us good to hear the well merited meed of praise. The Society deserves no little or niggard acknowledgement for this bringing our farming community into the very presence of excellent samples of good fruit. This good fruit is just as easily grown as inferior sorts. In reality, easier. It requires attention, it is true, but what worth having does not require attention, care, and painstaking? In this respect too, in introducing; and serving to cultivate a better species of horticulture, the efforts of the Society are not without their beneficial result. To make more careful cultivators than they were formerly, is not without its reward. It is a curious as well as an instructive sight to see the old horticultural manner of pursuit, and the new, as developed under the fostering hand of our Association. Who has not seen the half dead outside row of Kentish cherry trees, the broken and decayed apple trees, the suckers hiding the base of the original trunk, grass, and disorder everywhere dominant? Who has not seen all this changed? The owner has been recently cultivating the Society's trees, a new view, as well as a new taste, has been infused, and all

old things have become new. His interest, too, is seen in certain enquiries of our officers, as to his future planting and cultivation. The horticultural world has been turned upside down to him.

Provincially, our tree distribution has had a good result. It has constituted the length and breadth of our fair Province an experimental garden or farm. Instead of a limitation to the good in a small, and perhaps uncentral locality in the trial of a plant's adaptation to our soil and climate, here is a provincial test—in everyway worthy of the broad and enlightened views of our fruit growers. It is most remarkable that good reports reach us from every quarter of the most unvaring success of our plants. This, although the limits be most divergent—here we have reports from Elgin and Kent, as well as from Simcoe and Ottawa, each giving no uncertain sound, that where the plants grew from the first planting, there they have succeeded beyond all expectation. The future of this initial success, it would be hard to pourtray, when every farmer throughout the land only cultivates the best and choicest fruits, when every orchard shall be a sample orchard, when only good fruits shall be sold in our markets, when a general taste for good fruit is diffused—who will be able to make a correct estimate of the benefits accruing from our dissemination of the best fruits?

It is not to be expected that all the trees sent out will succeed equally well in every part of our lengthened country. A beginning, however, has thus been made, to give a general appreciation of the benefits to be derived pecuniary, as a matter of taste, and socially, from this dissemination. Great results lurk in the future for our fruit-growing interests. When the farmer learns what variety of apple is best for his soil and climate, what good is to accrue from growing winter varieties, what ready sale for homogeneous sorts, there will, doubtless, be a great *bouleversement* in fruit-growing, and a mighty advance on present modes of culture. The pioneers who are labouring to introduce these good times must not faint by the way, nor flag in their efforts. It may be up-hill work, but the issue is certain; we may not see it. but it is not far off. The ameliorating influences are at work; it may be that their onward march is silent, but it is none the less certain; there is a good time coming—it is looming up the depths of time.

Let us take courage, the success that has attended, and is now attending, present efforts, will not fail of ultimate success. Every fruit-grower has to be informed on the results of all fruit discussions; the best mode of cultivation; the best variety of both large and small fruits; the best time and method of planting, and then we need not fear the fruitful and successful issue.

Nor does the good of these efforts seem likely to simply benefit our own Province of Ontario. Nothing has been more marked by us in our intercourse with our American neighbours than to find that they are impressed with the benefits arising from our tree distribution. We have had frequent remittances from the United States to secure, not so much membership, as to make certain of receiving *our* Report and trees. Our Report is valued in Florida and Nebraska alike, and it even reaches, in its distribution, the Pacific Slope, the Empire State of the West—California. In all notices of our Report and progress, unfailing attention is given to the distribution of trees, as practised by our Association. It might not be amiss for a winter discussion on the methods of making this dissemination more beneficial.

The testing of the qualities of fruit-trees could not possibly be more perfect; if indeed the reporters are faithful in the discharge of their work. The future fruit-growers of our country have only to peruse the past issues of the publications of our Society to find out what varieties of fruits are best suited for their locality. What is more heart-breaking to a fruit-grower than to find that, after cultivating, tending, and watching a fruit-tree for ten or twelve years, it turns out to be a worthless variety?

Our test is infallible. The fruitfulness of the variety, its hardihood, its adaptation to the soil, climate, and locality, the amount of winter-kill, its liability to blight, the ravages of insects, the standard of excellence as shown by its market value, each and all of these requisites are fully exhibited in our provincial fruit-testing. Of course, these reported testings are not uniform—they differ as much as the individual faces of the reporters, as much as their dispositions and powers of observation. But, on the whole, there is almost uniform agreement on the essentials. It is just like the issue of any one of our meetings for fruit discussions—which is the best apple, pear, peach, plum, grape, small fruits, for cultivation? One or two varieties of each sort, are sure to well up. Snow, Seckle, Crawford's Early, Lombard, Concord, Black Cap, are sure tob e among the

favoured varieties. So it is with our society varieties—there is pretty uniform agreement ; hardihood, prolificness, market value, are sure to be much alike in all the reports.

Who would underrate this test and resulting good to the country ? Just in proportion as our association exercises diligence in the selection, and care in the mode of issuing these trees, will the benefit accrue to the community. Our present success, as well as our past failures, must alike make the Society careful in the dissemination of varieties of known excellence. We have scarcely known any scheme of any society that has been so exempt from cavilling and fault-finding, as has been this scheme and effort of our Association. Where so many interests are at stake, where there are so many loopholes for failure, it is remarkable that so little fault-finding has reached the officers of the So ciety. In some instances the trees have not taken root, this in one case, at least, has been o wing to the purchase of stript trees. It is almost impossible at all times to guard against this fraud. The new arrangements, however, of the Society have diminished this difficulty infinitesimally ; of late there has been little to desiderate in this mode of dissemination. It is a matter of fact, that our distribution of small fruits has sometimes acted injuriously on our members' list. This has been a matter of surprise to those of us, who well know the importance of the cultivation of small fruits in a community. We question if any kind of fruit cultivation pays the producer better than the production of small fruits. This culture is but in its infancy. The Association has done well, therefore, to mingle in their issues, specimens of small fruit plants. The gooseberry dissemination was, from some cause, a failure, but the same remark is not applicable to that of any of the other small fruit plants. The Mammoth Cluster and vines have done well, and this may even be said of the gooseberry in some localities. The profits of small fruit culture are something enormous ; we know of one case, and it is but a sample of many others, in which a patch of strawberries, *i. e.*, Wilson's Albany, little over a quarter of an acre, yielded in one season the enormous sum of over $750. Surely such recitals of matters of fact ought to encourage a wider acreage of small fruit culture. This cultivation, however, is quietly but surely progressing. In the neighbourhood of large towns, at Drummondville, at Windsor, Hamilton, London, and elsewhere, the cultivation has received such an impetus from various successful growers, that there is no fear but the taste for small fruit culture will grow, and be developed into somewhat of its just proportions. Of late nut growing has received the favourable attention of a few fruit growers, whose tastes are based on the remembrance of the early days of their nutting rambles in the old land ; we fear that the precariousness of the crop will always deter the general fruit growing public from largely embarking in this cultivation. In some of our favoured districts, you may find nut growers for a succession of hundreds of miles in extent. Take as an illustration the lake shore road from Amherstburgh to Welland, and you will find a continuous stretch of country of hundreds of miles in extent, more or less fruitful in nut bearing trees. We have to deplore as we have often done, that few people cultivate, or ever think of cultivating, the different varieties of the cranberry. Might it not be fairly within the province of the efforts of the F. G. A. of Ontario to disseminate among their members samples of one of the best varieties of the swamp cranberry, and one of the upland variety ?

The members of our Society have shown themselves singularly interested in the distribution of the apple. This will always be, in Canada, the king of fruits. Hitherto the planting of innumerable varieties has been the common rage. Farmers have not planted so much for profit as for fancy. The consequence is, when the buyer comes along, he is puzzled at the number of varieties, and the seller receives only a small sum for his outlay. One-sort orchards ought to become the order of the day. Where foresight in this respect has been shown, it has met with ample reward. Mr. Springer, of Wellington Square, has an orchard of a thousand Northern Spy, for which he never has any difficulty in commanding the highest prices going, because THEY ARE ALL OF ONE VARIETY ! What splendid profits would accrue to our fruit-growers from orchards wholly of Swayzie Pomme Grise, or of Grimes' Golden. We are bold to say that these two varieties have few or no compeers. They are both A. 1. apples. Shippers like apples all of one variety. They carry better than mixed sorts, and bring better prices.

Pear culture, for the present, has received some rude shakes. The terrible blight and pests have sickened the few enthusiasts who were all soul in the cultivation, and have driven others to the cultivation of the more profitable business of grape-growing and wine-making.

The Flemish Beauty and Beurre Clairgeau are, however, the king of pears. Wherever they have been disseminated, they have done well. The Flemish Beauty is adapted for almost every district in our land. It does well at Hull, opposite Ottawa, and flourishes at Meaford, Collingwood, and Owen Sound. The Beurre Clairgeau is a noble fruit. It requires only to be known to be appreciated. We have never known a tree of the Beurre Clairgeau blight. This, however, may not be the experience of the larger growers.

In speaking of the almost uniform success that has attended the distribution of trees by the Association, and the happy results to fruit-growers and others, it would be unpardonable not to notice the real source and strength of our efforts in this direction. It is the governmental aid that enables us to make such efforts as we are doing for the good of the fruit interests of our country. Surely it is a wise provision of our Legislative Assembly. It has often occurred to us, that seeing the wonderful amount of good being accomplished by the Fruit Growers' Association of Ontario, that the grant is not increased. Surely double the amount would not be considered too large a sum by the politicians at the helm of affairs, for the advancement of such an important interest as that of the Association clearly is. What is the Society doing for an increase of the grant?

It may be possible that our Society is languishing for the want of a vehicle to convey its doings and its efforts to an appreciative public. In these days of reading and publishing, the society that overlooks the assistance to be obtained from the use of the fourth estate, will soon fall in public favour however benificent its aims may be.

Let the members of the Association plead with their representatives in the Legislative Assembly to urge the claims of our Society, and as the great lever to accomplish their purpose, let them point to the profitable and truly admirable individual and provincial results that have accrued from the distribution of plants and trees by the Society. Success demands consideration. Means are wanted to render the Society a still greater and greater success. Economically administered, the funds are fairly spent for the advantage of the whole constituency of our Province. Greater means, and thereby increasing responsibility, would meet with greater consideration and more marked success.

As an omen of good, we notice the reconstruction of the Dominion Board of Agriculture, under the leadership of the Hon. Mons. Pelletier. Great results may be expected to flow from his patriotic purposes and plans. We trust that an effort will be made by the Dominion Board for the introduction of foreign, but to us new, fruit trees of all fruitful varieties. We rest satisfied that the Fruit Growers' Association of Ontario has set a fair example of a course that has been productive of abundant good in the past, and more than likely to be productive of increasing good in the time to come.

SECOND PRIZE ESSAY ON THE BEST MODE OF ACQUIRING STATISTICS WITH REGARD TO THE QUANTITY OF ORCHARDING IN ONTARIO, AND THE AVERAGE ANNUAL PRODUCT.

Motto:—"Order is Heaven's first Law."

By Geo. Mill, Warwick.

In modern times, the science of statistics is applied to almost every kind of business with beneficial results. The increase or decrease of population, the progress and effects of education, epidemics, commerce, agriculture, etc., are all subjects of statistical investigation. Statistics are the account books of a country, the storehouse from which politicians, historians, correct thinkers and reasoners draw some of their principal conclusions.

Notwithstanding the obvious advantages of this science, it must be admitted that it has its difficulties, and in nothing are these more perceptible than in the statistics of fruit growing. Although there are certain leading principles recognised by intelligent fruit growers yet it is not uncommon to find them holding opinions "wide as the poles asunder," on the culture and general management of orchards. For instance, one fruit grower will insist on the necessity of having the ground where apple trees are planted thoroughly underdrained, while another will assert with any amount of confidence that trees planted on the surface with the ground well ridged up will do equally as well, if not better, than where the ground is

underdrained. In order to support his opinions he will, perhaps, bring forward the stubborn facts that his own orchard, where the trees are planted on the surface of the ground, is more thrifty and bears larger and better flavoured fruit than the orchard of Mr. So and So, where the ground is underdrained eighteen or twenty feet apart.

Now, this may be perfectly true, but, when we examine all the facts of the case we may still have good reason to believe that underdraining is a most essential requisite for an orchard. After due investigation we will likely find that although in the one case the orchard is well drained, yet the trees have been planted too deep and neglected, the bark has not been kept clean, the trees have not been properly pruned, nor the fruit thinned out. In the other case there may be a gravelly subsoil, and the trees well attended, with manure, careful pruning, fruit thinned out, etc.

Again, at a meeting of fruit growers, Mr. A. will scientifically point out the benefits of a liberal supply of manure to fruit trees, how it stimulates their vital forces, supplies them with nitrogen and carbonic acid, and all these positions supported by clear, cogent reasoning. Mr. B. will then state that the principal thing for an orchard is to keep the ground loose and the trees free of grass round the roots, and that where this is done no manure is required. In proof of his theory, the orchard of Mr. C, who uses manure freely, will possibly be contrasted with the orchard of Mr. D. who depends altogether on keeping the ground loose and the trees clean, and who raises fruit fully equal to Mr. C. both in quantity and quality.

When all the facts connected with those orchards are brought to light it will probably be found that the trees of Mr. C. are large and have been bearing quite a number of years, while the trees of Mr. D. are young and vigorous and growing in rich soil. Such diversities of opinion, and tracing of the same effect to different causes, are some of the difficulties of imperfect statistics. Every reflecting person will see the necessity of having all the details of the management of orchards included in the account of the annual product. No doubt the Directors of the F. G. A. had this object in view.

In order to have sufficient fulness of details it is necessary to have the following particulars, to wit: The name of the owner of each of the principal orchards in the Province of Ontario, also the name of the Township, County and Post Office. Number of trees, age and varieties, also the quantity of summer, fall and winter fruit. The nature of the soil, manures, when and in what quantity applied. Miscellaneous observations on pruning, peculiarities of culture, etc.

In giving returns of the average quantity of fruit grown in this Province, and particulars connected therewith, it is highly important that all the statements should be strictly accurate. Large crops of first-class fruit do not depend on one or two causes, but on a number of causes put together, hence it is self-evident that inaccurate returns may be an evil instead of a benefit.

The success or non-success of experiments in fruit growing not unfrequently requires several years of a testing process before one can speak with certainty either one way or the other. Moreover, the quantity and quality of fruit is largely influenced by the seasons. The injurious effects of a low, moist temperature when fruit trees are in blossom, and, also, the high-flavoured fruit which generally follows a warm summer, have been frequently observed. Still there are some things connected with the influence of peculiar seasons that will require a considerable amount of investigation before they are properly understood. For example, a slight frost when fruit trees are in blossom, will sometimes injure the crop to a large extent in certain orchards, while others in the immediate vicinity suffer no perceptible damage. Taking all these facts into account, it is obvious that statistics of fruit growing must have fulness of details, accuracy, and also be extended over a large number of years before they can be of real value to the fruit-grower.

To take statistics in this manner, over such a wide field as the Province of Ontario will, of course, necessitate a large amount of labour. To attempt to pay for all this labour is almost, if not altogether, impracticable. Consequently, the following method of obtaining full and accurate statistics of the quantity of orcharding in Ontario, and the average annual product, is respectfully submitted.

Let members of the Fruit Growers' Association throughout the Province, take the statistics of the townships in which they reside. Supposing there are on an average four members of the Fruit Growers' Association in each township, it would be an easy matter ror them to divide the townships into four parts, and each one to take a part. One whole day of

faithful, systematic labour would in this manner take in the principal orchards of each township in Ontario. By taking a few sheets of common note paper, and ruling off each page in three columns, with appropriate headings over each column, there would be no waste of time, as all the entries could be put down under the proper heading in tabular form. The following tables may serve for examples. Apples only are taken, but tables on the same plan will answer for all kinds of fruit.

STATISTICS OF APPLES IN THE TOWNSHIP OF C——, COUNTY OF E——, SEPTEMBER 20TH, 1877.

I.

OWNER'S NAME.	LOCALITY.	POST OFFICE.
1. A—— B——	Township of C—— ..... County of E——	D—— P.O.
2. F—— G——	Township of H—— ..... County of I——	J—— P.O.
3. K—— L——	Township of M—— ..... County of O——	N—— P. O.

II.

NO. OF TREES.	AGE.	SORTS.
1. 200 Trees	10 years	*Summer Apples.* Early Harvest, 25. *Fall Apples.* Fall Pippin, 10. Snow Apple 15. Ribston Pippin, 12. *Winter Apples.* R. I Greening, 68. Golden Russet, 50. Baldwin, 20.
2. 160 Trees	22 years	*Summer Apples.* Sweeet Bough, 8. Red Astracan, 17 *Fall Apples.* Strawberry, 9. St. Lawrence, 11. Fall Jenetting, 7. Snow Apple, 14. *Winter Apples.* Spitzenburgh, 46. Gravenstein, 30. Baldwin, 24.
3. 384 Trees	18 years	*Summer Apples.* Hawley, 6. Red Astracan, 13. Early Harvest, 16. *Fall Apples.* Barclay's Seedling, 22. Hawthornden, 5. Tart Bough, 4. Nonesuch, 19. Belmont, 23. Rambo, 3. *Winter Apples.* King of Tomkins, 26.

Roxbury Russet, 34.
Gravenstein, 55.
Northern Spy, 80.
Golden Russet, 18.

III.

QUANTITY OF FRUIT

	SUMMER APPLES.	FALL APPLES.	WINTER APPLES.
1.	105 Bushels.	112 Bushels.	414 Bushels.
2.	72 "	164 "	376 "
3.	84 "	225 "	709 "

IV.

SOILS.

1.	Calcareous.	Dry.	Poor.
2.	Peaty.	Moist.	Rich.
3.	Heavy Clay	Naturally Wet.	Sterile.

V.

	MANURES.	QUANTITY APPLIED.	CROPS BETWEEN TREES.
1.	Stable Manure.....	Wagon-load to every 2 trees....	Turnips.
2.	Lime.....	1 Barrel unslack to every 4 trees.	Buck Wheat.
3.	Chips and Sawdust.....	Wagon-load to every tree.	Clover.

VI. MISCELLANEOUS.

1.	Manure applied every year.	Half-dwarfs on apple stocks.	Underdrained.
2.	Lime applied every second year	Roots of 10 Gravensteins pruned in the fall of '76 to make them produce fruit buds.	Underdrained ; drains 3 feet deep and 40 feet apart.
3.	Chips and saw-dust applied every third year. Sheltered on the north-side by a double row of Norway spruce.	Trees planted on the surface of the ground, with their heads inclined to the south-west at an angle of 70 degrees. Trees washed with lye every spring.	Underdrained ; drains $2\frac{1}{2}$ feet deep, and 25 feet apart.

The plan of these tables is so simple that explanation is altogether unnecessary. It may perhaps be well to mention that the first entry on No. I. corresponds to the first entry on all the other tables, and in like manner the second and third entries on No. I. correspond to the second and third entries on the other tables.

Now, although taking statistics in this manner will occasion some labour, yet when it is divided among all the members of the Association it will be comparatively light. In making a beginning the only thing that is required is for the Directors to make a formal requisition to all the members of the Association to send in the statistics of the townships where they reside, at a given time, either to the Secretary of the Fruit Growers' Association, or some person appointed to receive them. In order that the statistics may be sent in at the right time and in proper form it would be well for members of the Association in each township to appoint one of themselves to look over all the papers before they are sent in, and correct errors if necessary.

Full and reliable statistics would be a great advantage in various ways to members of the F. G. A. It has been said that it is a difficult matter for fruit buyers to obtain information about orchards and the proper localities to find fruit. Now if statistical tables were sent in from all parts of the Province by the 20th September each year, fruit buyers could see at a glance where apples were to be found, and also the sorts and quantity. Of course returns of peaches, strawberries, &c., would have to be sent in earlier, but this could in all

cases be done by the owners themselves as those fruits are not so extensively grown as apples. Again, if the returns of fruit were published every year, either in the Annual Report or in pamphlet form, parties intending to plant out fruit trees would be able to obtain correct information of the comparative value of the different sorts of summer, fall and winter apples, and all other kinds of fruit. Further, those gentlemen who endeavour to solve pomological problems by trying experiments would no doubt receive useful suggestions, and sometimes be spared the vexation of spending time in going over the same ground that others have gone over already.

The Association has done much to call the attention of the public to a pleasant and profitable industry. From the large amount of valuable matter which appears in the annual reports, it is evident that its members are men of intelligence, and that they have a mind to work. Judging from the perseverance and enthusiasm which have been shewn during the past year, there is not the least doubt of the members being quite willing to send in annually a full statement of the leading facts connected with the principal orchards in Ontario.

As far as fruit culture has been tried in this Province, the results have been quite satisfactory. It is evident that Canada is well adapted for growing almost all the fruits of the temperate latitudes to a high degree of perfection. Still it must be borne in mind that our work is only commencing. Much may be learned from the observations and writings of fruit growers in other countries, but it is a fact that every country has its own peculiarities of soil and climate. Consequently the fruit growers of this Province if they would fully develop the capabilities and resources of their country, must think and act for themselves. This would be one of the advantages of taking full statistics of fruit growing annually. The opinions, observations, experiments, effects of different methods of culture, &c., would be all brought together, and we would thus have a large collection of authenticated facts from which various deductions might be drawn. It is possible that some crotchets and pet theories would have to be set aside, but no matter, every right thinking man is willing to have his work and opinions thoroughly tested.

REPORT ON THE NUT BEARING GROVE OF G. H. M. JOHNSON, ESQ.

The Committee appointed by the Association for the purpose of examining the various nut-bearing trees found growing on the property G. H. M. Johnson, Esq., Chief of Six Nation Indians, beg to report:—

That this lovely native park is situate on the east bank of the Grand River, in the Township of Onondaga. That the land rises from the river to the commodious dwelling of the Chief in three broad and beautiful natural terraces of some seventy feet or more in height. That the various kinds of nut-bearing trees, enumerated below, were found growing and bearing in equal luxuriance on each of the terraces.

Your Committee were informed, by the Chief and his very intelligent and communicative son, that there were growing on their estate some 800 walnut, 300 butternut, and about 200 hickory trees of various kinds. Many of these trees were noble specimens—especially the walnuts. One upon the terrace below, and almost in front of the house, was really a majestic tree, with a large massive globular head of some 120 feet in circumference. The lower branches nearly touching the ground, and the head rising to at least (40) forty feet in height, and every branch drooping with its load of large fruit, some specimens measuring eight inches in circumference.

Your Committee were informed by the worthy Chief that he sold—or we might say, gave away—the walnuts at $2 for a waggon-box full, and the butternuts at 50c. per bag.

There are thousands of persons, doubtless, in our large cities and towns who would be glad to purchase these nuts at a much higher price if it were known where they could be got. Still there are various opinions as to the market value of these nuts as we now see them in their purely wild indigenous state. But when we consider that all of these nuts, viz.: walnuts, butternuts, and hickory nuts, show a disposition to vary, so much so that scarcely two trees bore fruit exactly like its fellow of the same species. And when we remember also that the English Walnut (Juglans regia) grows and bears fruit in a few favourite localities in Ontario, surely no one will doubt the value of a walnut that

should be equal in size and in thinness of shell to the English walnut, and as hardy and productive as our native black walnut. With such materials to work upon, who can doubt, that in the hands of our skilful hybridist this desideratum being achieved.

Let us hope that the above remarks of your committee may induce some young enthusiastic hybridist to undertake this work, and we will venture to predict that abundant success will crown their labours, and an intelligent and appreciative posterity bless their memory.

It is said, that in some parts of Germany there used to be a law, that no young farmer was permitted to marry a wife till he prove that he had planted and was the father of a certain number of walnut trees.

When your Committee consider the rapidly increasing value of the timber of these trees (if for nothing else), they have no doubt but that it would be a good investment for many a young man to plant walnut trees on their sloping river banks, that are too steep for cultivation. That in time the timber alone would lend much to increase the glory and wealth of the Dominion, and well reward the planter. There are tens of thousands of farms in Ontario that would be very much improved, both in real value and in appearance, by the planting of the various kinds of nut-bearing trees we have mentioned. The size and situation of the house and other buildings. The position of the land and various tastes of the proprietors will easily decide as to where to plant.

The butternut and the walnut will perhaps be the most prized, but the following named hickory were growing here and fine healthy trees.

CARYA, HICKORY.

Carya alba, shellbark or shagbark hickory, leaflets five ; fruit depressed globulous : nut somewhat flattened, nearly pointless, with a rather whitish shell and a large kernel, the principal nuts of the market, of this species we found some very good varieties.

CARYA SULCATA.

Thick shellbark hickory ; leaflets 7–9, nut strongly pointed, slightly flattened, with, I think, a yellowish shell, nuts nearly as sweet as carya alba.

CARYA TOMENTOSA.

Mocker nut, white heart hickory : leaflets 7–9 ; a tall tree with resinous scented foliage, the wood celebrated for its excellence as fuel, nut somewhat six angled, the shell very thick and hard, light brown, the small kernel is difficult of extraction from the thick and bony nut

CARYA GLABRA.

Pig-nut or broom hickory, leaflets 5–7 ; fruit pear-shaped or roundish obovate, skin splitting about half way down into four coriacious valves, nut hard and tough, with a sweetish or bitterish kernel, exceedingly tough sprouts used as hickory withes, the nuts of variable form.

After partaking of a bountiful repast provided by the good lady and daughters of our host, and had examined numerous valuable presents to his forefathers, various implements of a savage warfare—relics of a bygone age, and smoked a valuable silver pipe of peace ; your committee returned home, much gratified with their visit to the Chief of Six-nations of Indians, who two hundred years ago owned a large portion of this continent.

Respectfully submitted.

(Signed) CHARLES ARNOLD,
JOHN FREED.

MEETINGS FOR 1878.

The Winter Meeting will be held in Hamilton, on Wednesday, the 6th day of February, 1878, at Ten o'clock A.M.

The Summer Meeting will be held in St. Catharines, on Wednesday, the 10th day of July, 1878, at Ten o'clock A.M.

The Fall Meeting will be held in Sarnia, on Wednesday, the 11th day of September, 1878, at Ten o'clock, A.M.

DISTRIBUTION OF FRUIT TREES, VINES, &c.

There will be sent to all who may be then members of this Association in the spring of 1878

THE CELEBRATED BURNET GRAPE.

This grape was raised by Mr. Peter Dempsey, in Prince Edward County, Ontario, by hybridizing the Hartford Prolific with the pollen of the Black Hamburg. The vine is vigorous, productive, and hardy. The fruit is large in both bunch and berry, purplish black, sweet and rich, ripening earlier than the Concord. Any one can secure *two vines* of this grape by sending to the Secretary the names of nine persons as members, with his own name and $10.

1879.

The new Canadian Hybrid Apple "ONTARIO," raised by Mr. Charles Arnold, of Paris, a picture of which fronts the title page of this Report.

PRIZE LIST.

PERMANENT PRIZES.

First.—AN HONORARY MEDAL to the originator of any new fruit, which, having been thoroughly tested for a number of years, is found to be worthy of being placed among the fruits of its class for cultivation in Ontario.

Second.—FIFTY DOLLARS for the best Canadian Seedling Late Winter Apple, to be at least equal to the old popular varieties now in cultivation.

Third.—THIRTY DOLLARS for the best Canadian Seedling Harvest Apple of like merit.

Fourth.—TWENTY DOLLARS for the best Canadian Seedling Autumn Apple of same excellence.

ANNUAL PRIZES.

PRIZES FOR 1878.

First.—Awards may be made by the Committee on Seedling Fruits of sums *not exceeding Ten Dollars* for any seedling fruit that may be submitted to them during the year, which they may deem worthy, although they may not yet be prepared to advise the Directors to bestow either of the permanent prizes. Such award shall not in any measure disqualify the exhibitor from eventually receiving, for the same fruit, one of the permanent prizes.

Second.—FIVE DOLLARS for the best Winter Seedling Apple, fruit to be grown in 1878, and exhibited at the succeeding winter meeting of the Association.

Third.—FIVE DOLLARS for the best Autumn Seedling Apple, to be shown at the next Provincial Exhibition.

Fourth.—FIVE DOLLARS for the best Summer Seedling Apple, to be sent when in condition for examination, to the President, Rev. R. Burnet, London, all charges prepaid, and to be by him submitted to the Committee on Seedling fruits.

Fifth.—FIVE DOLLARS for the best Seedling Winter Pear, fruit grown in 1878, and exhibited at the succeeding Winter Meeting of the Association.

Sixth.—FIVE DOLLARS for the best Seedling Autumn Pear, to be shown at the Provincial Exhibition, or sent to the President.

Seventh.—FIVE DOLLARS for the best Seedling Summer Pear, to be sent, when in condition to be examined, to the President, Rev. R. Burnet, London, carriage prepaid, for submission to the Committee on seedling fruits.

Eighth.—FIVE DOLLARS for the best Seedling Plum, to be sent to the President when in season.

Ninth.—FIVE DOLLARS for the best Seedling Peach, to be sent to the President when in season.

Tenth.—FIVE DOLLARS for the best Seedling Grape, of any colour, to be sent to the President when ripe.

Eleventh.—FIVE DOLLARS for the best Seedling Strawberry, to be sent, if possible, to the Summer Meeting; if not possible, then to the President.

Twelfth.—FIVE DOLLARS for the best Seedling Raspberry, to be sent, if possible, to the Summer Meeting; but if that be impracticable, then to the President, when in season.

Thirteenth.—FIVE DOLLARS for the best Seedling Gooseberry that is not subject to mildew, whether of European or American parentage, or a cross between them; to be sent to the Summer Meeting, if possible, otherwise to the President.

Fourteenth.—FIVE DOLLARS for the best Seedling Blackberry sufficiently hardy to endure the climate of Ontario. Fruit to be sent to the President, when ripe.

Should two or more Seedlings of equal merit be shown, the prize shall be awarded to each. The Committee shall in all cases withhold the prize altogether, if they do not deem the fruit worthy.

A Seedling to which one of these annual prizes has been awarded cannot compete a second time in this class, but may compete in the class of Permanent Prizes.

A Seedling Apple which has received one of the money prizes in the class of Permanent Prizes cannot again receive a money reward, but may be offered in competition for the Honorary Medal.

CERTIFICATES OF MERIT.

Seedling fruits which have received any of the foregoing money prizes may be offered in competition for certificates of merit.

The Committee on Seedling Fruits will report to the Directors those fruits which they think to be worthy of a Certificate of Merit. The Directors will then make full enquiry and examination concerning the character of the fruit, including size, appearance and quality, the habit, vigour, health, hardihood and productiveness of the tree or plant, and its general adaptation to the climate of Ontario; and bestow such Certificate, if any, as they may think it worthy to receive.

A fruit which has received a Certificate of Merit may be offered in competition for the Honorary Medal.

The Honorary Medal may be given any number of times to the same person for different fruits, but only once for any one fruit.

CONDITIONS OF COMPETITION.

Seedling fruits offered in competition for these prizes must be shown in quantities of not less than *half a dozen specimens* of each sort, if they be Apples, Pears, Plums or Peaches; if Grapes, not less than *three bunches;* if Berries, not less than *one pint.* Each sort or variety must be accompanied by a statement, signed by the person sending the fruit, setting forth the origin of the tree or plant, if known; if the origin be unknown, then so much of the history of the tree or plant yielding the fruit sent, as may be ascertained—its vigour, hardihood and productiveness, the character of the soil in which it is growing, and what, in the estimation of the sender, are the peculiar excellencies of the fruit. This rule *must be observed in all cases,* whether the fruit be shown at the meetings of the Association or sent to the President for the examination of the Committee.

CONDITIONS OF MEMBERSHIP.

The annual fee is ONE DOLLAR, payable on the first day of January in each year, and may be sent to the Secretary-Treasurer, D. W. Beadle, Esq., St. Catharines.

Any person remitting the fees of old or new members, with their names and post-office address, may retain ten per cent. of the amount for his trouble. This arrangement is in lieu of the extra allowance in trees formerly given for each club of five members.

OBJECTS AND BENEFITS.

This Association seeks to collect, arrange, and disseminate information on the subject of Fruit Culture.

These objects are secured in the following manner :—

By holding meetings every year in different localities, of which all members receive notice by circular ; by reporting and preserving the discussions ; by procuring and publishing valuable essays by skilled fruit-growers ; by appointing committees to make personal examination of different sections of the Province, and report upon the peculiar characteristics of the soil, climate, and special conditions of fruit culture therein, by illustrating the Annual Report with coloured lithographs, drawn from nature, of the new fruits raised by our Canadian hybridists ; by disseminating among the members trees or plants of some new fruit that promises to be valuable throughout the Province, only exacting that the members will make a report for a few years to the Secretary, as to the manner these succeed with them ; by rewarding essayists, and, as far as practicable, the efforts of our hybridists.

In calling the attention of your neighbours to the advantages and benefits derived from becoming a member of this Association, you will confer a favour on your friends, and receive ten per cent. of the amount you may collect as a recognition of your services.

ROBERT BURNET,
President.

REPORT OF THE COMMITTEE APPOINTED TO EXAMINE THE HYBRID SEEDLING GRAPES OF WILLIAM H. MILLS, ESQ., HAMILTON.

Your Committee, agreeably to appointment, visited the grounds of Mr. Mills on the 15th September last. The grounds are well adapted to fruit-culture, being well sheltered and the soil a warm sandy loam, with good drainage. Some of the vines however were standing in positions not altogether favourable to early ripening. The system of training pursued for the most part is an adaptation of pole-culture, the vines being trained around 4 poles about 2 feet apart in form of a square, thus leaving a hollow space in the centre for the circulation of the air. A considerable number of the standard varieties of grapes are in cultivation on Mr. Mills' grounds, giving your Committee a good opportunity to make comparisons with the Hybrids raised by Mr. Mills. The vines were growing luxuriantly, with very little attempt to restrain their growth in any way.

Mr. Mills' Hybrids as shown to the Committee are the "Lavega," "Ella," "Sultana," "Augusta," "Excelsior," "Otonel," "Pomona" and "Muscatel." In a note received from Mr. Mills after the visit, he expressed the desire that the report be made only upon the 3 first named sorts (Lavega, Ella and Sultan) leaving his other varieties, in the mean time, for further testing, and we accordingly defered to his wishes.

The "Lavega,"—parents Rose Chasselas and Diana—dead ripe at this time and in comparison with Delaware, in same position, evidently a week to ten days earlier—every berry ripe, and unlike Diana, one of its parents, in this respect ; unusually sweet and on this account, said by its originator to be eatable 1st of September ; thin in skin and without pulp ; delicate, without coloring matter—hence should make a white wine without the addition of sugar—not likely to carry a long distance.—color, red, even in size of berry

and larger than Diana. Size of clusters, good medium, shouldered, compact, *thinning*, we would suppose a *necessity*. The vine is a free luxuriant grower and short jointed ; foliage, a deep-green and rather hardier in appearance than Delaware.

Mr. Mills states that the vine has been exposed to winter severities in some seasons and in others protected, but when exposed came out in spring as sound as any variety on his ground under similar circumstances.

Subsequent to the Committee's visit they learned that this variety was awarded a Diploma by the Judges at the Central Fair, at Hamilton.

The "Ella,"—parents Rose Chasselas and Delaware—a dark wine-colored grape, medium in size of berry and bunch ; appearance of vine and foliage much resembling Delaware but stronger, prolific ; good flavour without pulp, ripens with Delaware. A good grape but not equal to the Lavega or Sultana, though, it may possess qualities which upon further testing will show it to be a desirable sort for cultivation.

The "Sultana,"—parents Muscat, Hamburg and Creveling—this is in many respects a really extraordinary, grape and is quite a surprise even amongst the Hybrids of late years.

This vine is evidently very productive ; a strong grower with short jointed wood and dark green foliage, deeply lobed, the whole plant having a hardy healthy look that is very promising. The clusters are large, heavily shouldered as a rule and exceedingly compact; berries black, with a thick bloom, even and a little above medium in size, evenly ripened throughout the cluster ; skin very thick, containing a raisin pulp but not a stringy one ; flavour good, without any offensive taste in pulp or skin, ripens with Concord. One distinctive character of this grape is the wonderful tenacity with which the berry adheres to the peduncle. With this and its thick skin it should be a good shiping grape and a long keeper.

Mr. Mills states that he had clusters of this variety in good order in the middle of February after laying on an open shelf after gathering, and that the vine has gone through several winters unprotected.

These Hybrids of Mr. Mills we consider valuable additions to the onward march of improvement of our hardy grapes by Hybridization, and are worthy of dissemination and trial.

All of which is respectfully submitted,

GEO. LESLIE, Jun.
A. M. SMITH.

ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY

OF

ONTARIO,

FOR THE YEAR 1877.

INCLUDING REPORTS ON SOME OF THE NOXIOUS, BENEFICIAL AND OTHER INSECTS OF THE PROVINCE OF ONTARIO.

PREPARED FOR THE HONOURABLE THE COMMISSIONER OF AGRICULTURE, ON BEHALF OF THE SOCIETY,

BY

WILLIAM SAUNDERS,

President of the Entomological Society of Ontario; Editor of Canadian Entomologist.

REV. C. J. S. BETHUNE, M, A.,

Head Master of Trinity College School, Port Hope.

B. GOTT,

Arkona, Ontario,

AND

JOSEPH WILLIAMS,

London, Ontario.

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1877.

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AND

JOSEPH WILLIAMS,

London, Ontario.

REPORT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO, FOR THE YEAR 1877.

To the Honourable the Commissioner of Agriculture:

SIR,—In accordance with the provisions of our statute of incorporation, I have the honour to submit for your consideration the Report of the Entomological Society of Ontario, for the year 1877, in which you will find a detailed statement of the receipts and disbursements of the year, all of which are duly audited.

The annual meeting of the Society was held at the City of London, during the time of the exhibition of the Agriculture and Arts Association, when the various reports were read and the officers elected for the ensuing year.

The *Canadian Entomologist*, our monthly organ, appears regularly, and fully maintains its high standing. Its pages during the past year, have been enriched by many articles of the highest practical importance from leading entomologists. The numerous learned and original investigations and discoveries in Entomological science, which have been announced in the pages of the *Canadian Entomologist* have gained for it a high reputation in foreign countries, as is shown by the largely increased list of exchanges.

I have also the pleasure in submitting a Report on some of the noxious, beneficial and other insects of this Province, prepared on behalf of the Society by Mr. William Saunders, Rev. C. J. S. Bethune, M.A., B. Gott, and myself. This Report is well supplied with illustrations of the insects described, and will, we believe, prove valuable and interesting.

I have the honour to remain, sir,

Your obedient servant,

JOSEPH WILLIAMS,

Secretary-Treasurer of the Entomological Society of Ontario.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The seventh annual meeting of the Entomological Society of Ontario, was held in London, at the rooms of the Society, on Wednesday evening, September 26th.

The President, W. Saunders, in the chair.

Present :—D. W. Beadle, St. Catharines ; Professor Buckland, Toronto ; P. C. Dempsey Albury, B. Gott, Arkona ; Rev. R. Burnet, London ; Chas. Arnold, Paris ; David Boyle, Elora ; Colonel McGill, Oshawa ; E. B. Reed, London ; J. M. Denton. London ; Charles Chapman, London ; A. Puddicombe, London, and others.

After calling the meeting to order, the President expressed his regret that the Society had during the year lost the valued services of one of its officers. Owing to pressing business engagements, the Secretary-Treasurer, Mr. J. H. McMechan, had found it necesary to resign. Pending the appointment of a successor, Mr. J. Williams had kindly consented to act as Secretary *pro tem.*, and in this capacity had rendered most valuable and timely assistance.

The report of the Treasurer showed a very satisfactory state of the finances, there being a balance to the credit of the Society at the close of the financial year of two hundred and thirty-six dollars.

FINANCIAL STATEMENT OF THE SECRETARY TREASURER.

Receipts.

To Balance from 1876	$185 60
" Members' fees	194 55
" Sales of cork, pins, labels, &c	101 17
" Government Grant	750 00
	$1,231 32

Disbursements.

By CANADIAN ENTOMOLOGIST, printing, &c	347 75
" Paper for	102 76
" Printing labels	11 75
" Mail list and stamping	13 50
" Travelling expenses to Annual Meeting	6 00
" Sundry small expenses	50 70
" Postage, express and duties	46 82
" Library	77 52
" Engravings	20 04
" Merchandise, pins and cork	89 00
" Insurance	10 63
" Editor's salary	100 00
" Secretary-Treasurer's salary	50 00
" Expenses of Annual Report	68 00
" Balance	236 85
	1,231 32

We certify the above as a correct statement of accounts for the year ending September 26th 1877, as shown by the Treasurer's books, and with vouchers for the same.

JOHN M. DENTON, CHARLES CHAPMAN. } *Auditors.*

REPORT OF THE COUNCIL, 1877.

In presenting the seventh annual report, the Council feel highly gratified at the success that has attended the labours of the Society during the past year.

We are happy to note the return of the Society's Centennial collection of insects, which reached London in good condition shortly after the close of the International Exhibition. This collection, which was noticed in your last annual report, is now placed in the Rooms, where it will in future be available for reference. As this beautiful collection was made up largely from the cabinets of individual members of the Society, who generously loaned the insects for the purpose of exhibition, it was thought that if the immediate return of the loaned specimens was insisted on, the value of the series would be greatly impaired; but we are happy to state that the parties concerned have in most cases given their consent to allow the specimens to remain on deposit in the Society's Rooms, so that we still retain the Centennial Collection of Canadian Insects almost intact, a monument to the zeal and industry of those members of the Society who were actively engaged in this work.

We may add that this collection was placed on exhibition at the Rooms on several occasions after its return, when some of the members were present to assist visitors, and from the interest manifested then by the public in the matter, we would recommend that the Rooms be thrown open occasionally to all who may desire to visit them, and that public notice be given of the same

The CANADIAN ENTOMOLOGIST has almost completed its ninth volume, and fully maintains its reputation as a record of the latest investigations and discoveries in scientific and practical Entomology. We would return our heartiest thanks to all those who have so kindly contributed to the pages of the ENTOMOLOGIST, and request that they will continue to favour the Editor with the results of their observations and experiments. Although we have reason to feel gratified at the efforts of the Society to excite in the general public an interest in Entomology, yet we would respectfully suggest that our successors may be able in some measure to improve on the means adopted in the past to render the ENTOMOLOGIST even more useful to beginners in this interesting science, either by more frequent descriptions and illustrations of our common insects, and perhaps by referring to the insects that are likely to appear in each month of the summer, and the manner of their capture and preservation, or in any other method that may appear suitable.

We are happy to note a steady increase in the number of members. The Branch Societies, especially in London and Montreal, are progressing favourably.

The funds of the Society are in a gratifying state ; by economical management we have been enabled to sustain and successfully carry out all the operations we have undertaken ; for details we refer to the report of the Secretary-Treasurer.

The Library has been enriched by a number of valuable scientific works, and others of more general interest, but which bear on Entomological subjects. Among the additions we may mention the *Encyclopedia Britannica*, as far as at present published, which will prove invaluable as a means of reference. Our stock o engravings and electrotypes has been slightly increased, but in this line we are greatly restricted by want of means, and are obliged generally to content ourselves with electrotypes of other illustrations. We believe that a much larger sum than is annually given for this purpose might be profitably expended in procuring original illustrations.

Submitted on behalf of the Council by

JOSEPH WILLIAMS,
Secretary-Treasurer.

The President read his annual address, which received a vote of thanks. Rev. R. Burnet, in seconding the motion of vote of thanks, took occasion to speak highly of the value of the labours of Mr. Saunders, and suggested that his address appear in the daily papers as well as in the Annual Report, which was approved of.

ANNUAL ADDRESS OF PRESIDENT.

GENTLEMEN,—At the close of another year it is my duty and privilege to offer you a few remarks relating to our progress as a Society, and also to the general advancement of that department of natural science in which we all feel so deep an interest.

The progress of the Entomological Society of Ontario during the past year has been steady and continuous. Every season witnesses an infusion of new blood into our ranks, mainly from among the young, who, when entering on the pursuit of this charming study, bring with them all the enthusiasm and ardour of youth. Our membership is thus gradually increasing, and our influence and sphere of usefulness yearly extending. The importance of the study of Entomology is gradually becoming more deeply impressed upon the public mind. The Entomologist needs no longer to apologize for the trivial character of his pursuits, for small and apparently insignificant as the operations of the individual destructive insect may appear, yet when multiplied, as they usually are, by millions, their work is so disastrous and so desolating that the study of their life and history, with the view of combatting more effectually their enormous increase, becomes of the most vital importance.

We have to note the prevalence during the past year of several insect pests. Early in June our gardens, orchards, and even our forests in the western portion of Ontario were frightfully devastated with the Forest Tent Caterpillar, *Clisiocampa sylvatica.* There were millions upon millions of them, and so enormous were their numbers, and so persistent their attacks, that after fighting them bravely for a week or two, many gave up the contest in despair, weary of the slaughter. Many an orchard was rendered bare and leafless, and in some instances the woods were so void of foliage as to remind one of winter. This was particularly the case about London, and our orchards and gardens here were saved from destruction only by the most persistent effort. For several weeks caterpillars were swarming everywhere, so that the timid scarcely dared venture out under the shade of trees for fear of bringing them home on their clothing or persons. By the end of June they had nearly all become chrysalids, and it was interesting to observe the strange looking deformities they occasioned among ornamental shrubs and flowers by twisting the leaves into suitable forms in which to enclose their cocoons. On the trees the few fragments of leaves remaining were put to a similar purpose, and thus sewed up and hanging pendant with the weight of sometimes two or three cocoons huddled together, they looked very odd.

On examining a number of these chrysalids, a large proportion of them were found to be infested with parasites, which materially lessens the chances of their being so very numerous again next year ; still we fear that enough of them passed safely through all their preparatory stages to give us some trouble another season.

The Cabbage Butterfly, *Pieris rapæ*, is still progressing westward. This year it has extended its domain as far as Chicago, where a few of the advance guard have been captured. In the neighbourhood of London their larvæ have been very destructive this summer, so disfiguring and destroying the cabbages in many instances as to render them entirely worthless. The history of the introduction of this pretty little pest forms an interesting chapter in our Entomological annals. During the time of the Trent difficulty in 1861, a quantity of fresh vegetables were sent along with other stores to Quebec for the sustenance of the gallant little army which was despatched to our shores. As the Cabbage Butterfly is said to have made its appearance shortly after this period, it is presumed that it was accidentally introduced with the stores for the troops. In 1863 specimens were sent to us from this district for determination, which was the first intimation we had of their existence in this country. By 1866 the butterfly had spread further west than Montreal, and east as far as the Saguenay River. In 1869 it was reported as common in New Jersey, and by 1871 it had travelled east as far as Halifax, Nova Scotia, and west to the middle of the State of New York. It now embraces an area bounded by the shores of the Atlantic from the River St. Lawrence to Virginia, and has overrun the whole country westward as far as Chicago. A few days since, while on a visit to the Muskoka District, I was surprised to find them plentiful, in company with the Colorado Potato Beetle, as far north as the head of Lake Rosseau.

The wonderful manner in which this insect has adapted itself to the varying climatic characteristics embraced within this wide area, is a matter of astonishment. It seems to thrive alike in the cold north and sunny south, and in every place where it established itself it has multiplied so rapidly as to become in a very short time the commonest of all butterflies. The little parasite, *Pteromalus puparum*, which has also fortunately been introduced from Europe, and which is finally destined to keep this pest within reasonable bounds, is on the increase here, but is not yet sufficiently numerous to fulfil its mission as successfully as we could wish.

The Colorado Potato Beetle, as predicted, has at last found its way across the Atlantic, and founded colonies on the Continent and in the British Isles. Their arrival and settlement has caused a commotion almost as great as would the approach of a hostile army. According to newspaper accounts, large patches of ground where the enemy has been seen lurking have been saturated with benzine and fired, while in the search, the whole surface has been turned over with the spade and shovel as carefully as if each specimen were a nugget of gold or a diamond. Cargoes of all sorts in which it was suspected the intruders could find a hiding place have been submitted to the most rigid examination by government officials, and various edicts were promulgated, with a view to strangle this evil in its infancy ; but the beetle is heedless of enactments, however prohibitory, and we fear that no vigilance, no matter how persistent, will prevail in preventing the spread of this little intruder, and that before long the potato grower in Europe will be obliged to regularly adopt measures for poisoning this pest similar to those so successfully carried out by our own people.

Since I was last privileged to address you, the Congress of the United States, in view of the enormous losses yearly inflicted on agriculture by destructive insects, have appointed an Entomological Commission composed of eminent Entomologists, who shall devote their whole time for several years to a study of the habits of the various insect pests, and the thorough testing of the efficiency of such remedies as have been or may be devised for their destruction, and to report progress from time to time. A liberal appropriation to defray the expense of this work has been made, and the labourers are now actively engaged in the field.

Early in the year, your President was requested by the Chief of this Commission, Prof. C. V. Riley, to bring this important matter before our Government and ask their influence towards furthering the objects in view. Accordingly, at a meeting of the Council of Agriculture, held in June last, the writer introduced a resolution urging the co-operation of our Government with that of the United States in this undertaking, which was unanimously adopted by the Board and transmitted to the proper authorities. I am pleased to be able to state that the Minister of Agriculture, in his reply, assured us that this subject had already

engaged their serious attention, and that every effort would be made to aid the Commission in its work. This season is being spent by these savans in especially studying the habits and breeding places of the destructive Locusts of the West, and already they have made extended observations, not only in the western territories of the United States, but also in some of the adjoining portions of our Dominion.

The Entomological Club of the American Association for the Advancement of Science held its annual meeting in Nashville, Tenn., commencing on the 30th of August, when many interesting subjects were discussed. An important paper was read by A. R. Grote, Esq., of Buffalo, N. Y., on a new insect, destructive to the red and white pine trees, the sources of our valuable lumber trade. From the details given of the work of this insect we fear it may prove a formidable foe to the future growth of our pine forests. Our Society has usually been represented at these annual gatherings, but on this occasion, owing to other pressing and unavoidable engagements, those of us who have usually attended were prevented from being present.

We cannot better illustrate the recent progress made in Entomological science than by referring to one department, namely, that of the study of our night-flying moths. This has been greatly stimulated by the general practice of sugaring, by which immense numbers of these insects have been attracted, and their capture in good condition made an easy matter. This practice in America was but little followed until 1874, when an English Entomologist, Mr. George Norman, visited Canada, and, after having faithfully carried out the process of sugaring for a season, he published the result of his labours and his mode of operating, in our journal. His success was so unprecedented, and so many rare, or hitherto unknown species captured, that collectors everywhere were induced to imitate his example, and in the short time that has since elapsed an immense number has been added to the list of known species, and our collections have been enriched by this means with an extensive series of hitherto rare specimens.

Our monthly journal, the CANADIAN ENTOMOLOGIST, is still well sustained, its pages being regularly filled with interesting and original contributions. Did time permit, I might have occupied your attention at considerable length by referring to the many valuable points brought out in these papers. I cannot, however, refrain from adverting to the contributions of Mr. W. H. Edwards, of West Virginia, on the life history of some of our butterflies, in which it has been shown that not a few of our so-called species are merely dimorphic forms of other species, and attention drawn to the important influence of cold in modifying these forms. By exposing the chrysalids to the influence of this agency by laying them for varying periods on ice, or placing them in an ice house, some of these dimorphic forms have been produced at will, thus throwing much light on the causes of variation in species.

I would also call your attention to the many recent valuable additions to Entomological literature in America, especially to the beautifully illustrated work of Dr. A. S. Parkard, on the Geometrids of North America; to the continuation of Edwards' magnificent work on North American Butterflies; to the learned and elaborate treatise on the Rhyncophora of America north of Mexico, by Drs. LeConte and Horn; to the excellent works of Prof. Townend Glover, of Washington, on American Diptera, Orthoptera, and Hemiptera; to the valuable reports of the State Entomologist of Missouri, and many other excellent works. But I must not trespass longer on your patience. Thanking you for your kind partiality in honouring me as you have done,

I have the honour to be,
Yours very sincerely,
WM. SAUNDERS.

London, Ontario, September 25th, 1877.

The election of officers then took place, with the following results:—

President.—W. Saunders, London.
Vice-President.—E. Baynes Reed, London.
Secretary-Treasurer.—J. Williams, London.
Council.—Wm. Couper, Montreal; Rev. C. J. S. Bethune, Port Hope; J. Pettit,

Grimsby ; J. M. Denton, London ; Rev. R. Burnet, London ; R. V. Rogers, Kingston ; Ja. Fletcher, Ottawa.

Editor of Canadian Entomologist.—W. Saunders, London.

Editing Committee.—Rev. C. J. S. Bethune, Port Hope ; E. B. Reed, London ; and G. J. Bowles, Montreal.

Library Committee.—The President, Vice-President, Secretary-Treasurer, and J. M. Denton.

Auditors.—Chas. Chapman and A. Puddicombe, of London.

During the time allotted for miscellaneous business, Mr. D. W. Beadle, of St. Catharines, spoke of the ravages of the Cabbage Butterfly, *Pieris rapœ*, and of the great benefit that would be conferred on gardeners by the discovery of some remedy which might be safely used for this pest. He also referred at length to the great success which had attended the labours of the Entomological Society, and of the high reputation it had acquired in America and foreign countries.

The President, in reply, referred to the rapid increase of the small parasite Pteromalus puparum, which preys on this species, and the gratifying prospect of a speedy diminution n numbers of the cabbage butterfly from this cause.

Mr. P. C. Dempsey, of Albury, stated that hot water had been successfully used in his neighbourhood to destroy the *Pieris* larva ; that experiment had shown that the cabbage would bear the application of water heated to 200° Fahrenheit, without injury, while water at a somewhat lower temperature than this would effectually destroy the larva. The hot water may be applied through a rose sprinkler, or by the use of a dipper. He also stated that a cold infusion of Quassia, in the proportion of two or three pounds to a barrel of water, had been found effectual in destroying the worm, and more convenient in its application than hot water. This solution may give a slightly bitter taste to the vegetable, unless thoroughly washed, but it is perfectly harmless to the human system.

Mr. Chas. Arnold, of Paris, referred to the increasing ravages of the Codling worm (*Carpocapsa pomonella*), and stated that he had scarcely a sound apple in his orchard this year. This was, doubtless, partially due to the small crop, and he hoped that the scarcity of apples this season would so far starve out this insect that we might enjoy some immunity from its attacks for a year or two.

Rev. Dr. Burnet, President of the Fruit Growers' Association, expressed his pleasure at being present, and his high appreciation of the labours of the active members of the Society, and referred to the great benefits which fruit growers had derived from the publication of the results of their investigations on noxious insects injurious to fruits.

Prof. Buckland, of the Department of Agriculture, Toronto, spoke of the great utility of the work carried on by the Society in diffusing information in reference to the various insect pests which afflict the farmer and fruit grower, and of the flattering notices he had seen in foreign journals concerning the CANADIAN ENTOMOLOGIST. He believed the Society well deserved the cordial support of all those interested in agriculture.

The President, in confirmation of these remarks, alluded to the fact that the CANADIAN ENTOMOLOGIST numbers on its exchange list many periodicals of the highest standing, English, American, French and German.

ANNUAL MEETING OF THE LONDON BRANCH

The Annual Meeting of the London Branch of the Entomological Society of Ontario, was held on January 23rd, 1877, at the rooms of the Society.

The following officers were elected for the year 1877 :—

President.—Chas. Chapman.

Vice-President.—J. M. Denton.

Secretary-Treasurer.—J. Williams.

Curator.—A. Puddicombe.

Council. —Messrs. H. P. Bock, W. Saunders, and J. Williams.

The Annual Report of the Secretary-Treasurer was read and adopted ; it showed that a small balance remained after all expenses had been met.

REPORT OF THE COUNCIL.

The Council of the London Branch of the Entomological Society of Ontario, beg to submit the following :—

The prospects of the Branch are very good ; the meetings have been well attended, excepting during the heat of the summer, and many valuable additions have been made to our collections.

The experiment of placing the Centennial Collection on exhibition at the rooms was so favourably received by the public, that it has been decided to take steps to the more frequent admittance of non-members, and in this way it is hoped and believed something may be done to create a wider and deeper interest in our favourite branch of science. This is a matter of great importance, and we have no doubt our members will acquit themselves creditably in it.

Submitted on behalf of the Council, by

JOSEPH WILLIAMS,
Secretary-Treasurer.

MONTREAL BRANCH OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Fourth Annual General Meeting of this Branch was held on Tuesday, 1st of May at 8 o'clock p.m., at the residence of H. H. Lyman, Esq., the President, in the chair.

The following report was read and adopted :

REPORT.

Your Council beg to present the Fourth Annual Report of the Society's operations.

They would refer with pleasure to the satisfactory progress of the Society in the study of our science, evinced by the steadiness with which the monthly meetings have been kept up, and the interesting and valuable papers read at these meetings. Solid progress has been made in the identification and classification of the insects of Montreal, and much preliminary work has been accomplished, the value of which will appear hereafter. The only cause for regret is that our number continues so small, but the zeal and perseverence of the present members go far to compensate for their paucity in number. Your Council entertain the hope that at no distant day our membership will be augmented by the addition of at least a few more students of our useful and interesting branch of natural history.

Twelve meetings were held during this year, at which the following papers were read and presented to the Society :

G. J. Bowles—"List of Eggs and Larvæ Described in the Seven Volumes of the CANADIAN ENTOMOLOGIST."

H. H. Lyman—"Notes on the Occurrence of *Argynnis idalia.*"

F. B. Caulfield—"List of the Geometridæ of Montreal."

W. Couper—"On *Phyciodes tharos.*"

H. H. Lyman—"List of some of the Geometridæ of Montreal."

F. B. Caulfield—"Notes on some Species of *Chrysomelidæ* Occurring on the Island of Montreal."

F. B. Caulfield—"Notes on the Species of *Meloe* in Canada."

H. H. Lyman—"Entomological Rambles, Including Notes on Entomology at the Centennial Exhibition."

G. J. Bowles—"The Noctuidæ of Quebec."

G. J. Bowles—"Notes on D'Urban's Paper in the *Canadian Naturalist*, Vol. v., with Identifications of the Species."

Some progress has been made during the year in the compilation of the "Montreal Catalogue," and the names of 790 identified species are now entered on the list, comprising 385 Lepidoptera, 367 Coleoptera, 4 Diptera, 15 Orthoptera, 16 Hymenoptera and 3 Hemiptera. The earnest co-operation of the members is requested by your Council in this work. There is no doubt but that it will be of immense value to future students and will form a lasting memorial of our labours.

The finances of the Society have engaged the earnest attention of your Council. They

would recommend that the cash on hand be expended in books for our Library, under the direction of the new Council.

The whole respectfully submitted.

GEO. JNO. BOWLES,
President.

Montreal, 1st May, 1877.

The following were then elected to office for the ensuing year:

G. J. Bowles, President, (re-elected); H. H. Lyman, Vice-President; G. B. Pearson, jr., Secretary and Treasurer (re-elected); C. W. Pearson Curator (re-elected); Council—F. B. Caulfield, Robert Jack, W. Hibbins, jr.

After a pleasant conversation on Entomological subjects, and the examination of numerous specimens, the meeting adjourned.

G. B. PEARSON, Jun.,
Secretary.

EXPERIMENTS ON THE COLORADO POTATO BEETLE.

By W. Brodie, Toronto.

The following interesting paper giving details of experiments on the Potato Beetle was read at a recent meeting of the Toronto Entomological Society:—

GENTLEMEN,—I herewith submit for your consideration a synopsis of a series of experiments, conducted by myself, intended to determine certain facts in the life-history of *Doryphora* 10 *lineata*, about which there is a good deal of popular misconception.

The experiments were made in cages, where the natural conditions of temperature, light, and moisture were maintained as nearly as possible; the same cages in which I had successfully reared larvæ of *Papilio trolius* and other delicate lepidoptera.

To secure greater accuracy nearly every experiment was repeated, or two or more conducted simultaneously, and the results carefully compared and recorded.

The more important propositions supported by these experiments are:

First.—The potato is the only plant in Ontario on which the beetle can feed so as to become very numerous.

Second.—Food is necessary to the imago, in order to develope the reproductive functions.

Third.—If not supplied with food the imago will die in a short time—perhaps never exceeding two weeks.

Fourth.—The advent in Toronto of *Lydella doryphora*, by far the most reliable and valuable of all the enemies of *D.* 10 *lineata*.

It is so generally conceded that *D.* 10 *lineata* will not feed on the leaves of any of our forest trees neither on any of our grasses, nor cyperaceous plants; that proofs of this need not be submitted nor discussed. The plants experimented upon, you will see, are mainly those which have been named as food plants by newspaper men, farmers and others.

Experiment 1.—Thirty mature beetles, after being kept without food for twenty-four hours, were supplied with leaves of carrot, parsnip, beet, pumpkin, lettuce, sunflower, sage, *Panicum crus galli*, and cabbage, for eight hours; none eaten; when supplied with potato leaves, all ate freely.

Experiment 2.—Thirty mature beetles, after being kept without food for thirty-two hours, were supplied for sixteen hours,—in addition to the plants named in experiment 1.—with red root, (*Amarantus hybridus*), sheepbur, (*Cynoglossum officinale*), burdock, (*Lappa officinalis*), small bur, (*Echinospermum lappula*), sour dock, (*Rumex crispus*), *Lobelia syphilitica* and *L. inflata*, lambs quarter, (*Chenopodium album*), mullein, (*Verbascum thapsus*); none eaten; when supplied with potato leaves all ate freely. This experiment was also repeated three times, with uniform result.

Experiment 3.—Thirty mature beetles, after being kept eleven days without food, were, in addition to the plants used in the second experiment, supplied with leaves of milk weed (*Asclepias cornuti*), arrow head (*Saggittaria variabilis*), Canada thistle (*Cirsium avvense*)

water parsnip (*Sium lineare*), golden rod (*Solidago nemoralis*), fleabane (*Erigeron Canadense*), cat mint (*Nepeta Cataria*), common plantain, (*Ptantago major*), *Apocynum androsœmifolium.* None were eaten. When supplied with potato leaves, all ate freely.. This experiment was repeated three times with unvarying results.

The solanceous plants found in Ontario, outside of cultivation, on which it is generally admitted Doryphora will feed are the *Hyoscyamus niger*, *Physalis viscosa*, *Nicandra physaloides*, *Solanum nigrum*, *Solanum dulcamara*, *Datura stramonium.* It is very doubtful if Doryphora, either in the lavræ or imago state, will feed on the last two named. They are, however, all late plants, and would afford no food in the spring season, and so scarce that they would not feed the July brood for one hour.

Experiment 4.—Aug. 8. Took in fifty mature D. 10 lineata larvæ, forty-five of which had changed to beetles on Aug. 26, while five had died in the pupating stage. These forty-five beetles were kept without food; four died on the fourth day, thirty-seven were dead on the fifth day, thirty-nine on the eighth day, forty-two on the tenth day, forty-five on the eleventh day. Over 75 per cent. died within five days, the males dying first. No pairing took place, no ova were deposited, and no disposition to hybernate was evinced.. This is the average of three cases conducted simultaneously, and which varied but little.

Experiment 5.—Aug. 8. Took in thirty mature beetles all of which had partaken of food, and kept them without food. Two were dead in fourteen days; eight in nineteen days; thirteen in twenty-three days; sixteen in twenty-seven days; twenty-four in forty-seven days. Twenty per cent. survived forty-seven days' fasting; pairing occurred, and ova were deposited to a small extent during the first ten days. This is the average of three cases conducted simultaneously.

There is a very marked difference between this result and that of Experiment 4, where the beetles had never partaken of food.

Experiment 6.—Aug. 15. Twenty pairs *Doryphora*, after being well fed were kept in a dry situation; thirty two were dead in twelve days; all dead in twenty-two days; the males died first; a few ova were deposited during the first week. This experiment was repeated three times.

Experiment 7.—As to the rate of feeding, five experiments were tried. The beetles numbered fourteen to twenty-one, and the times from $3\frac{1}{2}$ to 168 hours; the average of the five trials was, one beetle will eat one square inch of potato leaves in thirty hours; the maximum rate was ten hours, minimum was thirty-seven hours. It may be stated that one beetle during its imago life will defoliate one plant of potatoes.

Experiment 8.—Aug. 20. Took in fifty beetles which had been well fed; eleven immediately buried themselves in the sand. September 6. All dead above ground; turned out the sand and found the eleven alive; replaced sand, also beetles; eight at once buried themselves. September 15. Three remaining on surface dead. September 20. Found all on surface of sand, which I found quite dry; on wetting sand all went down, are now alive October 16.

Experiment 9.—September 1. Took 100 *Doryphora* larvæ, some immature, fed them on potato. Sept. 10, all pupating. Sept. 20, 15 beetles out. Oct. 1, beetles all dead. On turning out the sand found that none had hybernated. This agrees with the results of seven experiments, and shows that there was no disposition to hybernate until after the middle of August, and then only by beetles which had fed.

The date of hybernation will vary according as the season is warm or cold, but I think it pretty certain that beetles which have not fed will not survive the winter.

A result of experiment 4 was the finding of a pupa case of *Lydella doryphora* under conditions which were fully narrated to you at our September meeting, and which you all agreed were conclusive as to the advent of this farmers's friend in Toronto.

It is hoped the publication of this will elicit evidence of its occurrence in other counties in Ontario, but it must be borne in mind that the very general use of Paris green by potato growers, has hitherto prevented the increase of this as well as other natural enemies of D. 10 lineata; has, in fact, rendered their existence almost impossible.

PROCEEDINGS OF THE ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Room 56, Maxwell House, NASHVILLE, TENN., Aug. 31, 1877.

Mr. Grote was called to the chair, and congratulated the meeting that there were found members from the South interested in the science of Entomology, and regretted the absence of the President of the Club and other officers. A letter was read from President LeConte as follows:

PHILADELPHIA, AUG. 24TH, 1877.

Secretary of the Entom. Club Am. Assoc. Adv. Sci. Nashville, Tenn.:

DEAR SIR,—I beg that you will express to the Entomological Club of the Association my great regret that I am not able to attend the meeting at Nashville. It was my intention to be present, but I find now at the last moment that it will be extremely inconvenient for me to leave this city. I greatly wished to take part in the discussion on nomenclature, but I have already expressed myself so strongly as against such changes as are produced by the rehabilitation of forgotten or disused names, that I think my opinions are fully understood by my colleagues.

Very truly yours,
JOHN L. LECONTE.

The Secretary's report of last year's meeting was received and adopted.

The chair drew the attention of the Club to the report of Capt. Dall on the subject of Zoological Nomenclature made at this meeting, and deprecated any separate action on the part of the Club.

The following resolutions were then passed:

Resolved—That since the Association has under consideration the subject of Nomenclature, the present Committee of the Club on that subject, consisting of LeConte, Riley, Saunders, Scudder and Grote, be continued to report at next meeting.

Resolved—That a request be made on the part of the Club to the Standing Committee of the Association, that copies of Capt. Dall's report on Zoological Nomenclature be printed and distributed to all active members of the Club before the issuance of the Nashville volume, so that the matter may be duly considered before the next meeting of the Club.

The meeting then entered into an election for officers for the next meeting, with the following result:

President: James A. Linter, of Albany, N. Y.
Vice-President: Wm. Saunders, of London, Ontario.
Secretary: B. Pickman Mann, of Cambridge, Mass.

Mr. Grote exhibited specimens in all stages of the New Pine Moth, *Nephopteryx Zimmermani*. He referred to Mr. Meehan's remarks after the reading of the paper before the Association on Thursday last, that this was probably the insect so destructive to the Scotch Pine about Philadelphia.

Prof. Nicholson stated that he thought from Mr. Grote's description and specimens that this insect was the one noticed as attacking the Scotch Pine near Knoxville. The trees had been introduced from the north.

Mr. Grote alluded to the migratory habits of the Cotton Worm, and stated that in his original paper (Hartford Meeting) he had shown that the moth hybernated, but died before it could find cotton on which it could oviposit the ensuing year. Where the moth state was not reached the chrysalis perished in cold winters over the cotton belt. The broods were irregular, occurring in the same locality some years as early as June, some years as late as September.

Prof. Stubbs stated that in the main Mr. Grote's theory of a progression from south to north was, he was satisfied, correct. At the same time he called attention to occasions

where the moth appeared in small areas, and thought it possible that in some cases the insect might succeed in holding over.

Mr. Grote stated that he thought that in localities where the circumstances were favourable, Southern Florida and along the coast of Georgia, that this might occur. He had in his original paper alluded to this, and he thought it more likely that the irregular patches on the cotton belt were partial colonizations from the southward or from the sea coast of Florida or Georgia. The first brood was more irregular in distribution. He further said that Prof. Tutwiler, of Ala., had told him that the observations made in his locality were to the effect that the south wind brought the worm ; in the present year the prevailing winds were from the north and they had been free rom the worm in Northern Alabama. Mr. Grote concluded by urging the creation of a scientific commission to look into the facts of the case. It was one that was most important to the agricultural interests of the South.

Prof. Nicholson stated that he had observed a few specimens of the Colorado Beetle near Knoxville ; the seed had been brought from the north.

Judge Bell stated that this year he had seen the Potato Beetle at Exeter, New Hampshire.

Mr. Grote exhibited some rare Celeoptera collected at Buffalo, N. Y., by Mr. Ottomar Reinecke. Adjourned.

(Signed) A. G. WETHERBY,
Secretary, pro. tem.

A NEW LEPIDOPTEROUS INSECT

INJURIOUS TO VEGETATION.

BY A. R. GROTE, BUFFALO, N. Y.

(*Read before the Am. Asso. Adv. Sci., August* 30, 1877.)

In the months of June and July the Red Pine (*Pinus resinosa*) and the White Pine (*Pinus Strobus*), show by the exuding pitch that they are suffering from the attacks of an insect. The wounds occur on the main stem below the insertion of the branch. On cutting into the bark the injury is found to be caused by a small larva, which, when full grown, measures 16 to 18 millimetres. The head is shining chestnut brown with black mandibles. The body is livid or blackish green, naked, with series of black dots, each dot giving rise to a single, rather stout, bristle, The prothoracic shield is blackish. The larva has three pair of thoracic or true jointed feet, and four abdominal or false feet, besides anal claspers. This larva, eating on the inner side of the bark, and making furrows in the wood, causes the bleeding which, when the depletion is excessive or continuous, and especially in the case of young trees, has proved fatal.

In July the worm spins a whitish, thin, papery cocoon in the mass of exuding pitch, which seems to act as a protection to both the larva and the chrysalis. The chrysalis contained in the cocoon is cylindrical, smooth, narrow, blackish-brown, about 16 millimetres in length. The head is pointed, there being a pronounced clypeal protuberance ; the segments are unarmed ; the anal plate is provided with a row of four spines, and two others, more slender, on either side of the mesial line, below the first. It gives the moth in ten to fourteen days. The perfect insect expands on an average 30 millimetres. An examination of the veins of the wing show that vein 7 of the primaries is wanting, while vein 1 is simple. On the hind wing the cell is closed or very nearly so. It belongs thus to the *Phycidæ*, a subfamily of the *Pyralidae*. The male antennæ are bent a little at the base, the joints inconspicuous ; the maxillary palpi in the same sex are not brush-like, and the hind wings are 8 and not 7 veined. We may refer the moth, then, to the genus *Nephopteryx*. Veins 3, 4 and 5 spring nearly together from the outer extremity of cell of the hind wings (though 5 seems to be nearly independent while running close to 4) ; vein 2 is not far removed from 3. On the primaries veins 4 and 5 spring from a common stalk, so that we must refer the moth to the sub-genus *Dioryctria* of Zeller. In colour the moth is blackish gray, shaded with reddish on the basal and terminal fields of the fore wings, There are patches or lines of *raised* scales on the basal field and on the anterior and darker portion of the medium space. The median lines are prominent, consisting of double black lines enclosing pale bands. The inner line at basal third is perpendicular, W-shaped or dentate. The outer line at apical fourth is once more strongly indented below costa. The black component lines do not seem to be more distinct on one side than on the other of the pale included bands or spaces. The median field is blackish, becoming pale towards the outer line, it shows a pale, sometimes whitish cellular spot, surmounted with raised scales. It can be seen that these raised scales (easily lost in setting the insect) accompany the median lines as well as forming the discal mark and the linear patch on the basal field. The terminal edge of the wing is again pale or ruddy before the terminal black line. The fringes are blackish. The hind wings are pale yellowish white, shaded with fuscous on costal region and more or less terminally before the blackish terminal black line ; the fringes are dusky. Beneath the fore wings are blackish, marked with pale on costa ; hind wings as on upper surface. Body blackish gray, with often a reddish cast on thorax above and on the vertex. The eyes are naked, the labial palpi long, ascending with moderate terminal joint. Tongue rather long. The gray abdomen is annulated with dirty white, the legs are pale dotted. The species differ from the European *abietella* by the raised

scale tufts on the wings, and Prof. P. C. Zeller, who has kindly compared examples for me, declares it to be quite distinct from any European species. The pupa seems to differ from that of *abietella* by the clypeal prominence, which appears entirely absent in the European species, judging from Ratzburg's excellent figures. The larvæ is found to attack also various imported conifers; for this reason I supposed it might be an imported parasite. It has been noticed on the Scotch, Austrian and Russian Pine, and it will be found, I fear, a grave enemy to the cultivation of this genus of trees.

Since the insect is not noticed yet in any scientific publication, I propose to name it *Nephopteryx (Dioryctria) Zimmermani*, after Charles D. Zimmerman, of Buffalo, who has made many excellent observations on our noxious insects, and to whom I am greatly indebted for help in getting the present facts with relation to the species. He has kindly spent much time in climbing large trees and cutting out pupæ and larvæ and rearing the perfect insect.

The larvæ *abietella* is described by Ratzburg as living in the cones chiefly of various species of *Pinus*. Nevertheless he speaks of one instance in which it is found under similar circumstances to those which are usual with *Zimmermani*, which latter I have not yet noticed attacking the fruit. The European species is said to winter in pupa state. In the vicinity of Buffalo our species seems to be single brooded. I have not yet ascertained the winter state. Ratzburg recommends cutting off infested branches, but especially on small trees. I find the larvæ of *Zimmermani* usually infesting the *main* stem at the insertion of the branches. From the fact that the pitch of the trees offers a protection, I do not think that any washes would reach the insect. The knife, then, seems the only remedy.

Our species has a natural enemy in a small hymenopterous parasite with which I have found certain of the chrysalids to be filled.

THE UNITED STATES ENTOMOLOGICAL COMMISSION.

The enormous losses occurring yearly to agriculture in America from destructive insects are gradually awakening public attention in this direction, and also to the necessity of careful observations on the habits of these pests, with a view to their destruction or limitation. We were much gratified to learn that the late Congress of the United States, recognizing the importance of this subject, made a liberal appropriation to provide for the appointment of a commission of practical Entomologists to investigate and study the habits and life history of these insect pests, and thoroughly test such measures as have been or may be suggested with a view of lessening their ravages, the investigations to be carried on for several consecutive years. The Government has been particularly fortunate in securing the services of three eminently practical Entomologists to undertake this work, Prof. Riley, State Entomologist of Missouri, Dr. A. S. Packard, of Salem, Mass., and Prof. Thomas, State Entomoligist of Illinois. Prof. Riley has been designated Chief; Dr. Packard, Secretary, and Prof. Thomas, disbursing agent. While the destructive Rocky Mountain Locust, *Caloptenus spretus*, will specially engage the attention of the Commission during this year, careful observations will at the same time be made on other destructive pests. We desire to call particular attention to Dr. Packard's request in this present issue, for specimens in all stages of the Hessian Fly, Joint Worm and Wheat Midge, and trust that all our members will endeavour to aid the Commission in their labours in every possible way.

The headquarters of the Commission will be at St. Louis, Mo.; there will also be an office, with a clerk to attend to certain routine business, at the rooms of the Geological and Geographical Survey of the Territories, at Washington, D. C., Dr. F. V. Hayden in charge.

The locust area assigned to each Commissioner the present year is as follows:—

1. Prof. Riley takes for his field the region east of the mountains and south of the 40th parallel, the west half of Iowa, and, conjointly with Dr. Packard, British America west of the 94th meridian, where the principal source of the devastating swarms will probably be found.

2. Dr. Packard will take for his field West Wyoming, Montana, Utah, Idaho, and the Pacific Coast.

3. Prof. Thomas takes all the region east of the mountains not enumerated, including Nebraska, Minnesota, etc.

The publications will consist of circulars, bulletins, memoirs, and the annual report of doings and results of the work of the Commission.

To Prof. Riley are assigned more particularly the following divisions of the subject: Biology, or Natural History; Insect Enemies and Parasites; Remedies and Devices for Destruction.

To Dr. Packard: Anatomy and Embryology.

To Dr. Packard and Prof. Thomas, conjointly: Meteorological Bearings and Migrations.

To Prof. Thomas: Geographical Distribution, Enemies not Entomological, Agricultural Bearings of the Subject.

The Commission expects to secure co-operation with the United States Signal Bureau in affording meteorological data in connection with a study of the migrations of the locust; also, hopes to secure the aid of the Canadian Government in co-operating with it in its investigation in British America.

It is the determination of the Commission to confine its operations more particularly to the practical bearings of the subject, with a view to ascertain all possible remedies against these destructive insects. All else will be made subservient to the great object for which the appropriation was made, to wit:—

1. The best means of fighting the plague as it occurs in the States to which it migrates, but in which it is not indigenous.

2. The thorough investigation into its habits in its native home, with a view of preventing, if possible, its migrations therefrom.

The following are the topics on which data are requested from observers in all parts in reference to the destructive locust:—

1. Date, and time of day of the arrival of swarms.
   - 1*a*. Direction and force of the wind at the time.
   - 1*b*. Temperature and character of the weather at the time (clear or cloudy).
   - 1*c*. Direction of the flight, density, height and extent of the swarms.

2. Date and time of day of the departure of the swarms.
   - 2*a*. Direction and force of the wind at the time.
   - 2*b*. Temperature and character of the weather at the time.
   - 2*c*. Direction of the flight, density and extent of the swarms.

3. Date when the first eggs, if any, were deposited the present year.
4. Date when the eggs were most numerously hatching the present year.
5. Date when the eggs were most numerously hatching in previous years.
6. Proportion of eggs that failed to hatch the present year, and probable causes of such failure.
7. Nature of the soil and situations in which the eggs were most largely deposited.
8. Nature of the soil and situations in which the young were most numerously hatched.
9. Date at which the first insect acquired full wings.
10. Date when the winged insects first began to migrate.
11. Estimate the injury done in your County and State.
12. Crops which suffered most.
13. Crops most easily protected.
14. Crops which suffered least.
15. The prevailing direction in which the young insects travelled, and any other facts in relation to the marching of the young.
16. The means employed in your section for the destruction of the unfledged insects, or to protect crops from their ravages, and how far these have proved satisfactory.
17. The means employed in your section for the destruction of the winged insects, or to protect crops from their ravages, and how far these have proved satisfactory.
18. Description, and, if possible, figures of such mechanical contrivances as have proved useful in your locality for the destruction of either the young or the winged insects.
19. If your section was not visited in 1876, please state this fact.
20. If visited any previous year, please give the dates.

21. To what extent have birds, domestic fowls, and other animals, domestic or wild, been useful in destroying these insects?

As the successful prosecution of this work is as deeply important to the western portions of our Dominion (where immense damage is often inflicted by this destructive foe) as to any part of the United States, it is hoped that our Government will render all possible aid to the work of this Commission, either by instructions to parties engaged in surveys and other Government work in the western regions, to make the necessary observations, or otherwise by appointing suitable co-operating agencies to aid in the work.

No official report of the results of the labours of this important Commission has yet appeared, but the following telegraphic summary of the work of the season has lately been printed in the public newspapers:—

U. S. ENTOMOLOGICAL COMMISSION.

Report of its Labours in the North-West.

The Rocky Mountain Locust—His Parasites and Winged Enemies.

HOW THE GRASSHOPPER PLAGUE MAY BE STOPPED.

St. Louis, Nov. 12.—The labours of the United States Entomological Commission, appointed by Secretary Shurz last spring, to investigate the grasshopper plague, are drawing toward a conclusion. The Commission consists of Prof. C. V. Riley, State Entomologist of Missouri; Cyrus Thomas, State Entomologist of Illinois; and Prof. A. S. Packard, Jr., a Professor in the Peabody Academy of Science, of Salem, Mass.

The commissioners were appointed on the 20th of March, and a couple of weeks later the three members were out on their exploring tour. Prof. Riley took the States of Texas, Kansas, Iowa, and Colorado, and the British possessions as far north as the Saskatchewan Valley, and his investigations were to be directed more particularly to the biology of the grasshopper, generally called Rocky Mountain locust by entomologists, its entomological enemies and parasites, and remedies and devices for the prevention of the grasshopper plague. Prof. Packard's field was Montana, Utah, Idaho, the Western part of Wyoming, and the Pacific Coast, and he made a study of the anatomy and embryology of the grasshopper. The territory assigned to Prof. Thomas, embraced Minnesota, Nebraska, the eastern part of Wyoming, and all the other states and territories west of the Mississippi not taken by Profs. Riley and Packard; and the special subjects assigned to him were the geographical range of the grasshopper, his enemies not entomological, and the agricultural bearings of the subject. The original bill prevailed for a commission of five, and an appropriation of $25,000. Congress cut the money down to $18,000, and reduced the number of commissioners to three. Prof. Riley says all the commissioners met with unexpected success in their investigations. They met with the most cordial receptions among the people of the west and south-west everywhere, and were furnished by the farmers with a vast amount of valuable information which they never could have obtained if the informants had not felt themselves personally interested in the work of the commission. The U. S. signal bureau also aided the commissioners materially in furnishing them with accurate meteorological data, very necessary in the study of the migrations of the grasshoppers and their ova-deposits, as also the effect which climatic changes have upon them. Prof. Riley spent six weeks in the country in which the principal armies of grasshoppers are hatched, and which they leave as soon as the short, dry grass of the country, on which they principally subsist, is gone. The country is very thinly settled, but the professor was afforded every possible assistance in his investigations by the authorities of the Canadian Government, including Governor Morris and the Ministers of Agriculture and the Interior. Remaining in the British possessions about six weeks, Professor Riley closed his investigations and returned to Chicago, where he again met his fellow commissioners, Profs. Packard and Thomas, just returned from the districts visited by them Notes were again compared, views interchanged, and statistical and other matter exchanged, and the commissioners separated once more, returning this time to their respective homes to write up the results of their investigations. Prof. Riley has been at home now five or six weeks, and has been engaged on the report ever since his return. He expects to complete the report by

the middle of next month, and Profs. Packard and Thomas are to have theirs completed about the same time, when the commission will convene again and submit their labours as one work to the Government.

The result of the investigation of the commission has verified previous reports of Prof. Riley's individual investigations, and the commissioners are all of the opinion that a recurrence of the grasshopper plague can be prevented. They have found the native home of the insects; they know on what they feed, and when and under what conditions they migrate, the direction they take, and the distance they go, and the length of time they remain before they commence their homeward flight again. They know, also, the fatal effect that heavy rains and sudden changes of weather have on them, and that smoke will kill them as quickly as fire. They know, too, the parasites which live on the grasshoppers, and the birds—particularly the grackle and the English rook—that feed upon them. Knowing all this, they believe that the migration from British America can be, in a great measure, stopped, and that in case they do visit the fields of Missouri, Kansas, and other States of the union, the farmers can be forewarned in time to prepare for them with fire and water. The commission will recommend measures to Congress, looking to a Governmental treatment of this plague at its next recurrence.

NOTES ON LARVÆ—FONDNESS FOR WATER—HINTS TO BEGINNERS.

BY C. G. SIEWERS, NEWPORT, KY.

(*From the Canadian Entomologist.*)

Last spring, while collecting beetles under the bark of decayed logs, I met with numbers of the larvæ of *Arctia isabella* (hairs brown in the middle, black at each end of larva), about to spin up. Not knowing their hybernating habits, they had always baffled me, and under the impression that they would require another season to mature, had been turned loose. I collected some twenty, put them into a box with cotton and paper scrap, and they at once spun up, all but four. These wandered up and down for a week, having some want, and wasting away. It struck me they might want water. Wetting a sable, I proffered a drink. They all drank greedily, grasping the brush with their fore-legs, and even following it around. I watered them two or three days, but tired of this and threw them out. The same day they were found spinning up on the fence. This spring I collected another lot, and gave them some curved bark to spin in. About one-half refused to spin. I soused them with water. Two remained contumacious, but another wetting brought them to terms. The black larva of the Great Leopard Moth, *Ecpantheria*, hybernates also, spins up about the first of June, and emerges about the 15th with us. Feeds on Poke-berry plant, and will eat cabbage. I failed to winter some twenty this season. Either they dry up in the house, or mould in the cellar. They should be wintered out-doors, in a box without bottom placed on the ground and half filled with leaves and brush, exposed to the weather, but having proper drainage. They come out of the leaves in the spring distended by moisture. Whether they feed before spinning is uncertain. I collect them in the fall at the foot of willow trees, when digging up the pupa of *Smerinthus geminatus*.

It is generally claimed that moist leaves will induce scouring in the *Bombix mori*, but out-door larvæ get abundance of rain and dew, and may require it. In confinement they fail to get their full growth. Their food should be sprinkled daily. The great difficulty of keeping the food fresh deters many from rearing larvæ. To such I would say, try tin boxes or glass jars. Clean daily and keep moist. Two or three drops of water are sufficient. I have had a lot of empty fruit cans capped, and have kept food fresh in them for ten days. When the nearest food plant is three miles distant this is some object. I find that they do not require light, and but little air. When they cease feeding, remove to spinning or ground boxes. The ground must be kept moist, or the larva will be unable to remove the skin around the thorax, and strangle. If they find it too dry they will come out and try to escape. Many wander about for a day or two before burying themselves. Covering the ground with sod often expedites matters. When ten days have passed they may be sifted out to give place for others, and laid out in another ground box on top, as it is preferable to have

them in sight, an account of vermin. Never pull larvæ from their food, especially when moulting in changing food. Clip the old food off around them, and they will change themselves. Placing some hungry *Apatura clytons* three inches from fresh food, they struck a bee line for it.

Raising larvæ is by far the most instructive feature of Entomology, and very interesting. Entirely too little attention is paid to it. We want the whole life. How utterly ignorant we are, for instance, about the larvæ of *Catocalae?* Let all faulty females be confined, and they may lay impregnated eggs; try the young on willow, walnut or oak leaves. The female is known by the heavy body tapering to a point; the male terminates in a pair of claspers. Some species are readily determined by their antennæ, the males being more broadly pectinated than the females.

The larvæ of wood-boring beetles can be raised in tin or glass on wet saw-dust (not pine); any mixed hardwood or poplar will do. I have kept them so six and eight months, changing the saw-dust once a month. But they are very tiresome, as one may have to keep them a year or two.

HOW TO DESTROY CABINET PESTS.

By Prof. James T. Bell, Belleville, Ont

From the Canadian Entomologist.

There is nothing more annoying to the experienced, or more discouraging to the young collector, than to have his specimens destroyed by mites, by the *Anthrenus*, or by the larvæ of *Dermestes*. Against the ravages of these enemies there is no security. Paste and paper fail to exclude them; camphor is only a partial protector; and the only safeguard of our cabinets is constant vigilance, and the instant destruction of the offenders when observed.

For this purpose many methods have been suggested—saturation with turpentine, immersion in alcohol or benzine, exposure to a heat of 210 degrees in a drying closet or oven, &c.; but most of these ways are apt to injure, or even destroy, the specimens, while the last is often ineffective. Having, however, found a certain and rapid method of dealing with these intruders, I desire, through your pages, to make it known to my brother naturalists.

Some two years ago I had a magnificent female *Platysamia (Saturnia) cecropia*, measuring $6\frac{7}{8}$ inches across the wings when set out, which came out of a chrysalis in my breeding box. I succeeded in killing and stretching it without damage, and when dry, transferred it to my interim box, which hung against the wall. In about a fortnight I was annoyed to see its antennæ cut off, the head and thorax denuded of most of their down, and some large holes made in the abdomen. After some consideration, I placed a gallipot, containing about 25 grains of cyanide of potassa roughly bruised, with a very little water, in the bottom of the case. I then introduced six drops of sulphuric acid, and let down the glass. In less than a minute I had the satisfaction of seeing a fine, stout *Dermestes* larva writhing in the death agony on the bottom of the box. Since that time I have tried the same several times, and always with the same success. It is equally applicable to the destruction of moths, &c., in stuffed birds and quadrupeds, as no animate being can inhale this gas and live.

James T. Bell,
Belleville, Ont.

[Note.—Great caution would be necessary in using this remedy, not to inhale any of the highly poisonous gas which, by the use of the ingredients named, would be rapidly generated.—Ed. C. E.]

RECENT ENTOMOLOGICAL WORKS.

The following brief notices of some of the most valuable Entomological publications which have appeared during the past year, are from the pages of the *Canadian Entomologist*:—

Economic Entomology, by Andrew Murray, F.L.S., London, England. Aptera, 8vo., pp. 433, profusely illustrated with wood-cuts.

This useful volume is the first of a series of hand-books which are intended to serve as guides to the different departments of the collection of Economic Entomology in process of formation at the Bethnal Green branch of the South Kensington Museum, and also as practical treatises for the use of the public generally. In order the better to serve its primary purpose of guide to the collection, the contents of the several cases are described in this volume in the order in which they present themselves to the visitor, containing in some instances other specimens than insects. The work opens with a short chapter on Crustaceans likely to be mistaken for insects; for example, species of *Oniscus*, *Porcellio*, and *Armadillo*. Next in order are the Myriapods—Julidae and Scolopendridae; then Scorpians and their allies; Spiders, Mites, Lice, Thysanura (Spring-tails) and Lepismidae. Three new genera and thirteen new species are described in this volume.

The descriptions are briefly and plainly written, and the habits and life history of the species are delineated in a pleasing and popular manner. The work is well printed in good, clear type, and most of the illustrations are excellent. Already we have found it very useful, giving in a condensed form a vast amount of information not otherwise readily obtainable. We heartily commend this work to our readers, and trust that the talented author may be spared to complete the series proposed, which will appear in the following order:—2nd vol. Bugs; 3rd, Locusts, Grasshoppers, Cockroaches, and Earwigs; 4th, Two-winged Flies; 5th, Bees, Wasps, &c.; 6th, The Dragon Flies and May Flies; 7th, Butterflies and Moths, and lastly, the Beetles.

Ninth Annual Report of the Noxious, Beneficial and other Insects of the State of Missouri. By Chas. V. Riley, State Entomologist, March, 1877; 8vo., pp. 129 with 33 illustrations.

We welcome the ninth of this series of valuable reports with much pleasure. The following are the subjects treated of in the order in which they appear: The Gooseberry Span Worm; the Imported Currant Worm; the Native Currant Worm; the Strawberry Worm; Abbott's White Pine Worm; LeConte's Pine Worm; the Colorado Potato Beetle; the Army Worm; the Rocky Mountain Locust; the Hellgrammite Fly, and the Yucca Borer. The bulk of the report, sixty-seven pages in all, is occupied with details in reference to that terrible scourge of the West, the Rocky Mountain Locust, *Caloptenus spretus*, the other and less important subjects being much more briefly treated of. These reports contain an immense fund of valuable information, and have done much to popularize Entomology in America.

CATALOGUE OF THE LEPIDOPTERA OF AMERICA NORTH OF MEXICO.

By W. H. Edwards.

Part I—*Diurnals. (Published by the American Entomological Society, Philadelphia, 8vo. pp. 68 Price $1; interleaved for additions, $1.30.)*

This work of Mr. Edward's is conservative in its character, and as such is most refreshing; after having tried in vain to fathom the innovations with which we have for the past few years been perplexed, this excellent catalogue comes to our rescue, and will, we feel sure, be appreciated by all who do not believe in the excessive multiplication of genera and their establishment on minute and often variable characters. Here the dear old familiar names are nearly all in their places again, and we go back to the time-honoured method of heading our collections with *Papilio*, and embracing in it some 22 species.

For ourselves, we have for some time past been literally at sea in reference to names for butterflies, wandering about without chart or compass to direct us; we scarcely knew the name of any species, and didn't expect ever to have the time or disposition to master the new names proposed, and hence we have been so discouraged that we have done really nothing to our collection of butterflies for a long time past. We are not disposed to object to changes in nomenclature where it can be made to appear that a *necessity* for such modifications exists, but we have been unable to see any good reason for adopting the wholesale changes which have been proposed, and we believe that the great bulk of working Entomologists hold the same view. With a catalogue now more to our mind, sufficiently progressive, and, at the same time, a most convenient help, we shall be able to classify our species under genera we can comprehend, and go to work with a will again.

In the general arrangement the author, while adopting and incorporating some of the work of later systematists, adheres mainly to the order of Doubleday and his associates in the "Genera of Diurnal Lepidoptera," and where the genera have numerous species, as in *Colias*, *Argynnis*, *Thecla*, *Lycaena*, *Pamphila*, &c., they are for the sake of convenience divided into sections. In crediting genera the author strictly follows the rules adopted by American Entomologists at the recent meeting in Buffalo, and appends the name of the party who first gave the genus a proper definition. For this reason Hübner's genera are excluded and two of the genera made by Mr. Scudder in the Hesperidæ, *Amblyscirtes* and *Pholiosora*, have been credited to Dr. Speyer because his definition of them is the first published. With regard to Mr. Scudder, genera, we think he should have had credit for them. We all know what pains-taking and unsparing effort he has bestowed in labouring to introduce what he conscientiously believes to be needed reforms in Entomological nomenclature, and although the present generation of Entomologists is not disposed to adopt such wholesale reform as he proposes, he is undoubtedly *deserving of full credit* for any of his material which may be used. His work on New England Butterflies, in which all these genera are minutely defined, has long been written, but its expensive character has been an obstacle in the way of its publication. Under these circumstances, *which are very exceptional*, we regret that Dr. Speyer's references of these genera to Scudder have not been followed.

There are 506 species enumerated in this list, embraced in 64 genera. There are also references by the use of a system of special signs to all writers who have treated of the preparatory stages of our butterflies, no matter how briefly; we regard this as an excellent and valuable feature in the work. The catalogue is in every way well got up, and we hope all our readers will procure a copy of it, and if, after they have given it a careful perusal, they think as well of it as we do, they will set to work and arrange their collections in accordance with it, feeling profoundly thankful to the author for the timely relief he has afforded.

The Rhyncophora of America, north of Mexico, by John L. LeConte, assisted by George H. Horn. From the Proceedings of the American Philosophical Society, Vol. 15.

This work, which fills a volume of 455 pages, is probably the most important contribution which has been made to the Entomology of America for many years. Its production must have been attended with immense labour and long and careful study. In addition to the work of classifying this numerous and difficult group of insects, a very large number of new species are described. We tender our sincere thanks to the authors for their kindness in sending us a copy of this useful and long-needed memoir.

Manuscript Notes from my Journal, or Illustrations of Insects Native and Foreign; Order Hemiptera, sub-order Heteroptera. By Townend Glover, Washington, D. C.

In the 12th No. of Vol. vi., we called the attention of our readers to the issue of a valuable work by the same author on Diptera. The volume now at hand on the Hemiptera is published in similar form and style, quarto, on heavy paper, printed on one side only, and the text a fac-simile of the author's handwriting. In this volume there are ten excellent plates, nine of which are devoted to the illustration of the species to which the notes refer, and one to the figuring of those portions of the insects on which their classification is based. There are figures of 238 species, many of the smaller ones in duplicate, one showing the insect magnified, the other of the natural size. In addition to the plates and their explanatory matter, there are 134 pages of text, 2 explanatory, 17 devoted to the classification of the Hemiptera, and the remainder to notes on the insects themselves, their habits, the animal and

vegetable substances they injure, the remedies used for destroying them, &c., all being referred to in alphabetical order.

This work is another evidence of the indomitable perseverance of this energetic Entomologist, and will be a valuable aid to those who desire to study this hitherto much neglected order. The author has again placed us under deep obligation for his kind remembrance of us.

The Rocky Mountain Locust; being report of proceedings of a conference of the Governors of several western States and Territories, together with several other gentlemen, held at Omaha, Oct., 1876, 8vo., pp. 58.

We are indebted to our esteemed friend. C. V. Riley, for a copy of the above pamphlet, which contains much valuable information on the habits of this destructive pest, as well as a summary of the best means yet known for counteracting its ravages.

Packard's Half Hours with Insects, Boston, published by Estes & Lauriat, 1877, 12 mo., pp. 384, illustrated, $2.50, which was originally issued in twelve numbers, has lately been published in book form. We desire to correct some typographical and other errors of importance. Page 187, in explanation of Fig. 187, for Bucculating read Bucculatrix; page 289, line 23, for *Disippus* read *Archippus*, and in line 25, for *Archippus* read *Disippus;* page 305, line 13, for sumac, read cottonwood, and on page 306, in explanation of Fig. 236, for sumac gall read vagabond gall. We cheerfully commend this useful work to our readers.

Report upon the Orthoptera collected by the Wheeler Expedition, by Samuel H. Scudder; 8vo., 17 p. In this paper the author gives much valuable information in relation to the Orthoptera occurring on the eastern slope of the Rocky Mountains; 17 new species are described, and definitions of 8 new genera given. Report of the Hayden Expedition, from the Department of the Interior, containing Brief Synopsis of North American Ear-wigs, with an appendix of the fossil species; 8vo., 12 p. List of Orthoptera collected by Dr. A. S. Packard, in Colorado, &c., during 1875; 8vo., 7 p. Notice of a small collection of Butterflies made by Dr. Packard in Colorado and Utah. All by Samuel H. Scudder. We tender our best thanks to the author for copies of these papers.

Harpalus caliginosus from Nature, by Franklin C. Hill; two plates. We are indebted to Mr. Franklin C. Hill, of Princeton College, N. J., for copies of these excellent plates, recently published. They are beautifully finished and conveniently mounted on cards, 5 x 8, with all the organs and divisions both of the under and upper surface, distinctly named. They will prove a valuable help to beginners, and indeed to all who are not already familiar with the names of the different portions of the body of Coleopterous insects.

A FEW COMMON WOOD-BORING BEETLES.

BY THE REV. C. J. S. BETHUNE, M.A., PORT HOPE, ONT.

EXPLANATION OF THE PLATE.

Fig. 1. *Monohammus scutellatus* Say—A Pine-treé Borer.
Fig. 2. *Clytus speciosus* Say.—The Maple-tree Borer.
Fig. 3. *Orthosoma cylindricum* Fab.—A Pine-tree Borer.
Fig. 4. *Clytus robiniae* Forst.—The Locust-tree Borer.
Fig. 5. *Chrysobothris femorata* Fab.—The Buprestis Apple-tree Borer.
Fig. 6. *Saperda candida* Fab.—The White-lined Apple-tree Borer.
Fig. 7. *Monohammus confusor* Kirby.—A Pine-tree Borer.
Fig. 8. *Oberea tripunctata* Fab.—The Raspberry Twig Girdler.

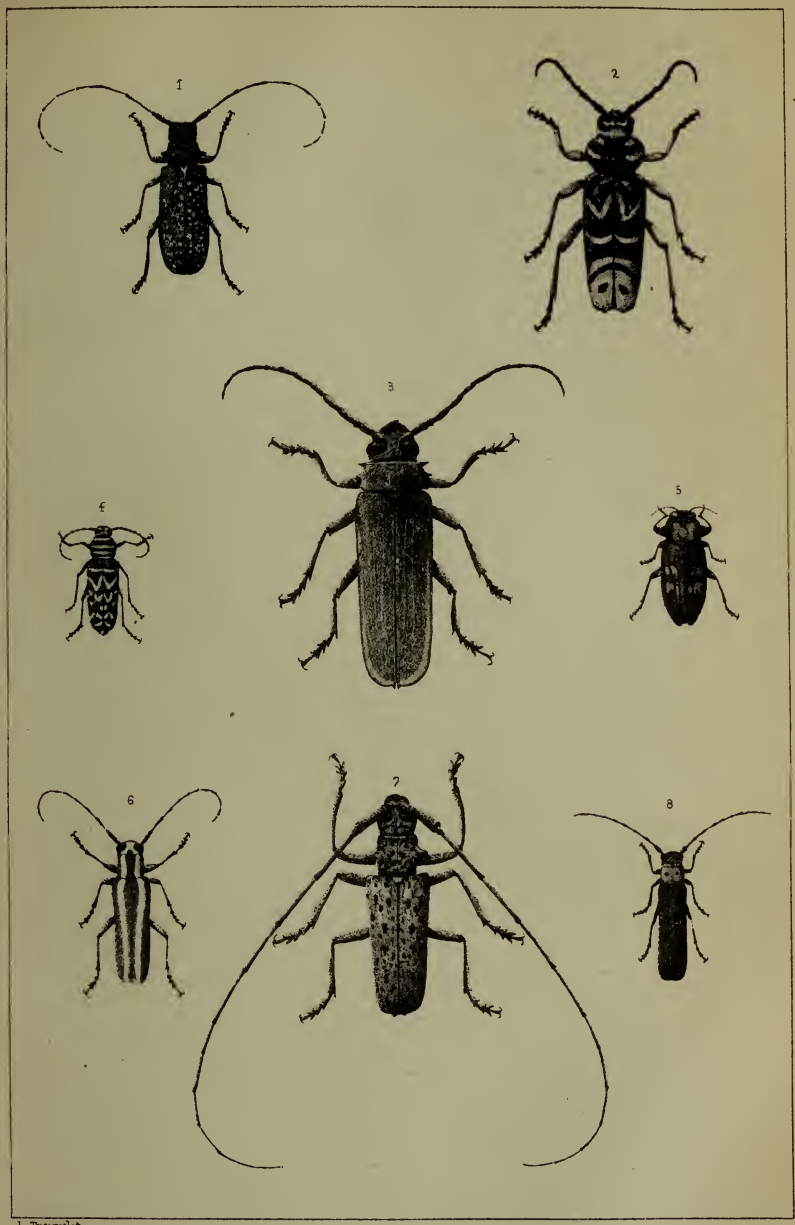
Our Canadian wood-boring beetles, with the exception of a few somewhat minute species, belong to the two great families of Buprestidæ and Cerambycidæ. These include an immense number of different genera and species; in Crotch's List of the Coleoptera of North America (north of Mexico), there are enumerated the names of no less than 169 species of the former family and 552 of the latter; about one-third of these are found in this country. It is evident, then, that to give a bare list of all our Canadian species of wood borers would occupy no little space, while a detailed description of them, if one were competent for the task, would fill many issues of this Report. We propose, therefore, on the present occasion to merely give a brief account of the eight species depicted on the accompanying plate. These we have selected on account of their frequent occurrence in almost all parts of the country, and the consequent familiarity of their appearanee even to non-Entomologists. Our readers will, we are sure, be pleased with the beauty of the figures, which have been admirably drawn upon stone by Mr. L. Trouvelot, of Cambridge, Massachusetts.

Taking the species in the order in which they are numbered on the plate, we come first to

I. Monohammus Scutellatus Say—A Pine-Tree Borer.

This beetle, which derives its specific name from its conspicuously white scutellum, is of a shining black colour on both the upper and under surfaces, thickly punctured with irregular impressions; on the wing-cases there are, as shown in the figure, a number of scattered whitish spots of various shapes and sizes; these, on close inspection, are found to be composed of dense short white hairs, which often become rubbed off and disappear; the thorax is armed on each side with a thick triangular spine; the antennæ are many-jointed, and about the same length as the body in the male, while in the female they are about twice that proportion. The size of the beetle varies from less than half an inch in the male to over three-quarters of an inch (exclusive of the antennæ) in the female. The larva is a large thick white grub, destitute of legs, divided into a number of well-marked segments; the head armed with a strong pair of jaws. The larva infests the pine, after the timber has been cut or newly fallen, and often causes serious injury to it by boring large oval-shaped holes which extend for long distances through the interior of the log. The perfect insects appear in June, and are sometimes very abundant; we have occasionally found them swarming in great numbers on fallen pine trees. The insect is common throughout Canada and the neighbouring States.

The following general account of the larvæ of the family (*Cerambycidæ*), to which this beetle belongs, taken from Harris's Injurious Insects, page 93-4, will be of interest, and will enable the reader the more readily to understand the structures and habits of these borers in their earlier stages. "The larvæ hatched from the eggs—which are laid by the parent beetle in holes and chinks of the bark—are long, whitish, fleshy grubs, with the transverse incisions of the body very deeply marked, so that the rings are very convex or hunched above and below. The body tapers a little behind, and is blunt-pointed. The head is much smaller than the first ring, slightly bent downwards, of a horny consistence, and is provided with short but very powerful jaws, by means whereof the insect can bore, as with



L. Trouvelot

a centre-bit, a cylindrical passage through the most solid wood. Some of these borers have six very small legs, namely, one pair under each of the first three rings, but most of them want even these short and imperfect limbs, and move through their burrows by alternate extension and contraction of their bodies, on each or on most of the rings of which, both above and below, there is an oval space covered with little elevations, somewhat like the teeth of a fine rasp; and these little oval rasps, which are designed to aid the grubs in their motions, fully make up to them the want of proper feet.

"Some of these borers always keep one end of their burrows open, out of which, from time to time, they cast their chips, resembling coarse sawdust; others, as fast as they proceed, fill up the passages behind them with their castings, well known by the name of 'powder post.' These borers live from one year to three or perhaps four years before they come to their growth. They undergo their transformations at the furthest extremity of their burrows, many of them previously gnawing a passage through the wood to the inside of the bark, for their future escape. The pupa is at first soft and whitish, and it exhibits all the parts of the future beetle under a filmy veil which enwraps every limb. The wings and legs are folded upon the breast, the long antennæ are turned back against the sides of the body, and then bent forwards between the legs. When the beetle has thrown off its pupa skin, it gnaws away the thin coat of bark that covers the mouth of its burrow, and comes out of its dark and confined retreat, to breathe the fresh air, and to enjoy for the first time the pleasure of sight, and the use of the legs and wings with which it is provided." This account of the larval and pupal state of the long-horned beetles, applies more or less closely to all the insects described in this paper, with the exception of No. 5, *Chrysobothris femorata*, which belongs to the *Buprestidæ*, a totally different family of beetles.

II. Clytus speciosus Say (genus *Glycobius* Lec.)—The Maple-tree Borer.*

The colours of this very handsome insect are deep velvety black and bright yellow. The figure represents its shape and markings so accurately that further description is unnecessary; the size depicted, however, is decidedly above the average. This wasp-like beetle is not very abundant, but may occasionally be found on Maple trees, which its larvæ infest both when growing in the forest and also when cut into cord-wood. The eggs are laid by the parent beetle on the trunk of the Sugar-maple during the middle of summer; when hatched the grubs penetrate through the bark and make long winding borings through the solid wood. Occasionally they are very destructive to young Maple trees, but on the whole they are not sufficiently numerous to be objects of dread. Should they at any time threaten injury to these favourite shade trees, the larvæ may be got rid of by passing a somewhat flexible wire into their burrows until it reaches the grub within. The entrance may be discovered by the sawdust that they cast out.

III. Orthosoma cylindricum Fab.—A Pine Borer.

This large beetle is the commonest and best known of our wood-borers; its habit of flying through open windows into lighted rooms during the warm evenings of July, usually to the great alarm of the inmates, has caused its appearance to be very familiar

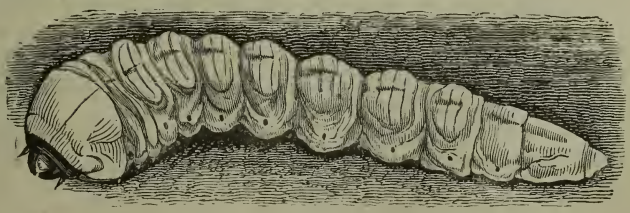


Fig. 1.

to every one. It is one of our largest beetles, measuring oftentimes as much as an inch and a half in length by over a third of an inch in breadth. Its general colour

* A full account of this Insect, by Mr. E. B. Reed, will be found in the Report of the Entomological Society for 1872.

is a chestnut brown, approaching black on the head and antennæ. The thorax is armed with three sharp spines on each side; each wing-case has three slightly elevated ridges running lengthwise for nearly the whole length; the eyes, which are situated behind the antennæ, are enormously large and very conspicuous. The larva (Fig. 1) is a large fat white grub, with powerful jaws of a darker colour; it feeds upon the wood of the Pine, and from its size often injures the timber very materially. It will, no doubt, however, be considered a decidedly beneficial insect by some of our readers who live in newly-cleared settlements, when we mention that it affects pine-stumps especially, and often aids materially in reducing them to a state of rottenness.

The perfect insect, like most of the long-horned beetles, posesses the power of making a curious creaking noise. In the generality of species this is produced by rubbing the joints of the thorax together, or against the base of the wing-covers; but this species, according to Professor Riley (*Canadian Entomologist*, vol. iv. p. 140), "is a true fiddler, stridulating, like the *Orthopterous Locustidæ*, by rubbing the hind femora against the elytra. If a specimen be carefully examined, the inside of these femora will be found rasped from the base to near the tip by a number of short longitudinal ridges, which, when played against the thin and sharp emarginations of the elytra, produce the rather loud creaking so peculiar to this beetle."

IV. Clytus robiniæ Forst—The Locust Tree Borer.

(The synonymy of this insect has been rather perplexing; it is now included in the genus *Cyllene* Newm.; for a long time we were accustomed to call it *Clytus flexuosus* Fab., but the specific name given above has the priority. It was also long considered to be identical with *C. pictus* Drury, that bores into the Hickory, but the late Mr. Walsh proved satisfactorily that the two species are distinct.) The general colour of this insect is deep black with light yellow stripes; on the head and thorax these stripes form narrow transverse bands, but on the wing-covers there is first of all a narrow yellow anterior edging (not shown in the figure); then a slightly flexuous stripe (not straight as in the figure); this is followed by a narrow zig-zag band forming a letter W across the wings, and three irregularly wavy and broken stripes; there is also a yellow dot at the tip, and broader stripes on the sides of the abdomen of the same colour. The antennæ are long and many-jointed, and of a dark brown colour; the legs are long and of a tawny hue. The larva is a whitish coloured grub, about an inch long and the thickness of an ordinary goose-quill, and is furnished with six very minute legs. When young it appears to bore chiefly into the sap-wood, but afterwards strikes off into the solid wood of the tree, perforating it in every direction. Its presence is early indicated by the little heaps of sawdust extruded from the holes, and accumulated about the base of the tree.

The following account of the habits of this insect, by Dr. Harris, (Injurious Insects, page 103), is so excellent and coincides so exactly with our own observations that we cannot forbear quoting it, though it may be familiar to some of our readers. "In the month of September," he says, "these beetles gather on the locust trees, where they may be seen glittering in the sunbeams with their gorgeous livery of black velvet and gold, coursing up and down the trunks in pursuit of their mates, or to drive away their rivals, and stopping every now and then to salute those they meet with a rapid bowing of the shoulders, accompanied by a creaking sound, indicative of recognition or defiance Having paired, the female attended by her partner, creeps over the bark, searching the crevices with her antennæ, and dropping therein her snow-white eggs, in clusters of seven or eight together, and at intervals of five or six minutes, until her whole stock is safely stored. The eggs are soon hatched, and the grubs immediately burrow into the bark, devouring the soft inner substance that suffices for their nourishment till the approach of winter, during which they remain at rest in a torpid state. In the spring they bore through the sap-wood, more or less deeply into the trunk, the general course of their winding and irregular passage being in an upward direction from the place of their entrance. For a time they cast their chips out of their holes as fast as they are made; but after a while the passage becomes clogged and the burrow more or less filled with the coarse and fibrous fragments of wood, to get rid of which the grubs are often obliged to open new holes through the bark. The seat of their operations is known by the oozing

of the sap and the dropping of the sawdust from the holes. The bark around the part attacked begins to swell, and in a few years the trunks and limbs will become disfigured and weakened by large porous tumours, caused by the efforts of the trees to repair the injuries they have suffered."

The history of this insect is rather a curious one. For a little over a hundred years it has been known to inhabit the State of New York, its appearance and habits being recorded by some English Entomologists of the last century. About thirty years ago it was found as far west as Chicago, whence it spread throughout the State of Illinois, but it was not till 1863 that it reached Rock Island, about two hundred miles further west, where—Mr. Walsh relates—it suddenly appeared in great swarms and utterly destroyed all the Locust trees. The first record we have found of its appearauce in Canada is by Mr. Couper, who states *(Can. Journal*, 1855, p. 377) that he observed some Locust trees attacked by this insect in Montreal in September, 1855. In 1862 it began to be very destructive to the Locusts in Toronto, and for several years was excessively abundant there. In 1867 we found it at Credit, about twenty miles west of Toronto ; it almost entirely destroyed all the Locust trees in the neighbourhood. In 1873 Mr. Reed relates it appearance in enormous numbers at London, Ont. ; now it appears to be generally distributed throughout this province, and occasionally becomes very injurious to these ornamental trees. The perfect insect, in the localities it frequents, may usually be found in September on the flowers of the Golden-rod *(Solidago)*, of which it eats the pollen, as well as upon the trunks of the trees it infests.

It is not easy to apply a remedy for an insect of this kind, still much may be done to save favourite trees in one's garden, provided they are not very large. The most satisfactory plan seems to be to rub over the trunk and large limbs of the tree with strong soap about the end of August ; this will prevent the mother-beetle from laying her eggs upon the bark in September. Of course the application will have to be renewed after heavy showers. Dr. Harris suggests that whitewashing, or covering the trees with grafting-wax, would be effective in repelling the female. It would be of benefit also to gather and destroy the beetles wherever they may be found ; children might be employed for this purpose to search the flowers of the Golden-rod as well as to carefully examine the trunks of the trees ; should they be too high up to reach, a sharp blow with a stick on the trunk of the tree will cause them to fall to the ground. A little familiarity will soon overcome the natural repugnance to handling so wasp like a creature.

V. Chrysobothris femorata Fab.—The Buprestis, or Flat-headed Apple-tree Borer.

This insect belongs to the family Buprestidæ, while all the others on our plate belong to the Cerambycidæ ; the difference in shape and structure, and especially in the length of the antennæ, is very noticeable in the figures. The accompanying wood cut (Fig. 2), when compared with that of the pine-borer given above (Fig. 1), will show our readers how this insect differs in this larval state, also from the long-horned beetles. The larva is shown at *a*, the chrysalis at *b*, the head and first segments of the larva at *c* and the perfect beetle slightly enlarged at *d*.

Fig. 2.

The natural history of the insect may be briefly related, as follows : The egg is deposited by the female beetle in the chinks and crevices of the bark some time during the early part of summer ; from this the young grub soon hatches, and works its way into the soft sap-wood immediately beneath. Here it eats away, while the cavity inside becomes larger and larger, and it increases in size itself, gradually working upwards until it becomes pretty well grown, when it bores into the solid heart of the wood, and forms a flattish burrow, corresponding to its own flat form. When several attack the same tree, as is generally the case, their burrows, of course approach very near each other, and cause its death ; in any case, they very much injure its vitality and bring on decay. In the spring of the year the grub assumes its pupa state, and comes out as a perfect beet' · in the

end of June, or during July, when it may be found basking on the tree trunks in the hot sunshine. It is very lively when danger threatens, and will take wing instantly if an attempt is made to catch it. Its blackish colour above so much resembles the bark of the tree that it readily escapes the notice of an ordinary observer; but beneath it is of a beautifully burnished dark copper colour, looking as if it were made of metal, beneath the wing covers it is bluish. While the figure gives the shape of the insect very correctly, it much exaggerates its size, which seldom exceeds three eighths of an inch; the light spots on the wing-cover are also erroneous in being very much too conspicuous.

The presence of the grub in the tree may be detected by the discolouration of the bark, and its flattened, dried appearance. All such spots should be opened with a knife, and the insect at once despatched. The burrows may be discovered by the presence on the bark of the fine sawdust cast out by the larva.

The insect attacks not only the apple, but also different kinds of oak, especially the white oak, and according to Prof. Riley, the mountain ash, linden or bass-wood, box-elder, beech, plum, pear, cherry and peach.

With regard to remedies, one important fact—we quote from Prof. Riley, (7th Missouri Report, page 76) should be borne in mind. The natural breeding place of the insect is undoubtedly in the old decaying oaks of our woods, and I have known it to swarm in old post-oak stumps from which the tops had been felled for a number of years. In fact it prefers partially dead or injured trees to those which are thrifty and vigorous, and partly for this reason, and partly because rough, cracked bark forms a better nidus to lay her eggs, in the species is most abundantly found on the south-west side of young apple trees where they are most apt to get injured by sun-scald. Sickliness in the tree, or injury from any cause predisposes to its attacks. It is for this reason that transplanted trees, checked as they are in their growth usually fare badly. But there is yet one other predisposing cause which few people suspect, and that is reckless and careless pruning, especially of the larger branches. Many a fine orchard tree, and many more city shade trees, receive their death shock from the reckless sawing off of limbs without effort being made to heal the wound by coating with grafting-wax, clay or other protecting substance. Around such an unprotected sawed limb, as around the frustum of a felled tree, the rain and other atmospheric influences soon begin their work of causing decay between the bark and the solid wood; and this is but the forerunner of greater injury by insects which are attracted to the spot, and which, though hidden meanwhile from view, soon carry the destruction from the injured to the non-injured parts. Among the insects thus attracted, the Chrybothris plays no mean part, where, had the wounded limb been protected, its presence would never have been known. It thus becomes of the first importance in treating this insect, to keep the young trees vigorous and healthy, and the bark as smooth and as free from injury as possible. Young trees are far more liable to be attacked than old ones, and consequently require greater care."

"As a preventive against the insects attack's there is nothing better than coating the trunks and larger branches with soap at least twice a year, once toward the end of May, and again in July or August. The soap is not only obnoxious to the beetle, but it tends to keep the bark clean and smooth, so as to offer no attraction to the female, and is withal beneficial to the tree. The trees should also be examined carefully late in the fall. At this season, or even in the winter time, the young borers which have just commenced work, are easily detected and destroyed by a knife before they have done much harm.

VI. Saperda Candida Fab.—The Two-Striped Apple-Tree Borer.

This insect, which rivals the foregoing species in the injuries it inflicts upon Apple trees, is a pale-brown beetle with two chalky-white longitudinal stripes running from the head to the apex of the wing-covers; its under side, legs and face are also chalky-white, and its antennæ a little darker; its length is about three-quarters of aninch. The larva is of a pale yellow or whitish colour, with a brownish polished head and black jaws; it is destitute of legs, but like other larvæ of the same family, it is enabled to move in its burrows by the contraction and expansion of its well-defined segments; when fully grown it is about an inch long. It may readily be distinguished from the preceding species by

its cylindrical and more symmetrical shape, as is apparent from the accompanying figure (Fig. 3). The larva is shown at *a*, the pupa or chrysalis at *b*, the perfect beetle at *c*.

The perfect insect (to quote from our Report for 1870) makes its appearance in June and July, but is seldom seen, as it usually remains in concealment during the day, and flies only at night. The females deposit their eggs upon the bark of the tree near the base of the trunk, or collar as it is termed. From the eggs are soon hatched out tiny whitish grubs, which penetrate the bark and leave a hole so minute that it soon closes up. For the first year the grub feeds only upon the sap-wood, in which it excavates a round smooth cavity immediately beneath the bark, generally nearly filled, when opened, with the saw-dust-like castings of the worm. These castings may very frequently be observed extruded from the burrow and on the ground at the base of the tree; whenever they are noticed search should at once be made for the borer within. As this borer does not occur in any part of Canada in which we have resided, we have had but little opportunity of investigating its habits, we therefore quote the following excellent account from our friend Mr. Beadle's Prize Essay on the Apple (*Fruit Growers' Report*, 1868, *p.* 172): "When the grub has become about half-grown it ceases to cast the dust out of its cavity, and proceeds to fill it up, at the same time boring a passage or gallery upwards into the heart of the tree. This gallery is continued upwards, of varying length, sometimes not more than two inches, and sometimes twelve inches, and is gradually brought outwards again to the bark of the tree, but not through it. When the grub has completed this gallery, it turns round and returns to that part which is nearest to the heart of the tree; this part it now enlarges by tearing off the fibre from the walls, and with this fibre carefully and securely closes the entrance, so that if some insect enemy should find its way through the hole in the bark at the collar into the chamber where it passed the first part of its life that enemy could not enter the gallery to its present abode. Meanwhile it crowds its sawdust-like castings into the upper extremity of the gallery against the bark, thus, at the same time, diminishing the danger of attack from that quarter, and keeping its chamber tidy. Having thus perfected its arrangements, it again turns round so as to have its head upward, passes the winter in a torpid state, and in the spring casts off its skin and becomes a pupa, from which in June the perfect insect hatches, climbs to the upper end of the gallery, tears away the fine sawdust, gnaws a hole through the bark and creeps forth." When several of these borers are at work in the same tree, their excavations approach each other so closely as often to girdle the tree and cause its destruction.

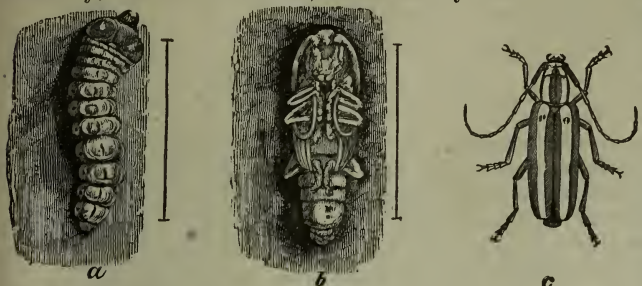


Fig. 3.

Many modes have been proposed for the destruction of this noxious insect, some of them essentially absurd, such as plugging up the holes in the trees which are made by the beetle when taking his departure from the scene of his early life, after he has finished his work of mischief. The simplest and most effectual remedies are: (1) the application of soap (cold made soft soap is especially recommended) to the trunk of the tree early in June and again in July; rub it well over, especially near the base of the trunk, and place a portion in the fork of the tree that it may be washed down into the crevices of the bark by the rains. (2) If the Borer has already taken up his abode in the tree, cut into his burrows with a sharp knife and get him out; his presence may generally be detected near the collar of the tree by the discoloration of the bark and by the sawdust castings. This is the most effectual, and by no means difficult remedy; much benefit, however, may also be derived from washing this part of the tree with lye, or any strong alkaline solution, which will penetrate the interstices of the bark and kill any young grubs that may be commencing to make their way inwards. The trees should be carefully examined—especially if young and not long planted out—at different times during the year, as well as in the Spring.

Thus far this most injurious insect has only been found in certain portions of this country, being very abundant in the Niagara district, and in the neighbourhood of Montreal and Quebec, but happily rare, or entirely absent, from almost all other parts. Prof. Bell (in the *Fruit Growers' Report for* 1875) relates that a specimen was captured in the year 1873 near the Town of Belleville; no doubt it was imported, probably in the larval state, in trees from the United States or some other district infested by the insect.

VII. Monohammus Confusor Kirby.—A Pine tree Borer.

This fine beetle, which is especially remarkable for the extraordinary length of its antennæ, is, in our pine regions, one of the most common and destructive of our insect enemies. Its general colour is an ashen grey, mottled with variable darker spots; the scutellum is white; there are also patches of whitish colour on the head, thorax and abdomen. These variations of colour, being due to a covering of very fine short hairs, which oftentimes are rubbed off, are not to be depended upon in the determination of the species. As in *M. scutellatus* (fig. 1), each side of the thorax is armed with a short thick spine. The length of the insect varies from three-quarters of an inch to an inch and a half—the average size being over an inch; the antennæ of the males vary in length from one and a half to three inches; those of the female are somewhat shorter. The larva is a large, white, somewhat cylindrical grub, destitute of feet. During the summer the female lays her eggs in crevices of the bark of the white and red pine, selecting for the most part timber that has been scorched by fire, or felled by the wind or the lumberman's axe; the larva when hatched soon eats its way into the wood, and before this period of its existence is closed it often burrows immense galleries through and through the solid interior. As it lives a long time in the larval state, the perfect insect is frequently only developed after the timber has been built into a house, and then suddenly emerges from its concealment to the great consternation of the inhabitants of the dwelling. The larva, when burrowing in the wood, makes a loud noise like the boring of an auger, which on a still night may be heard for a considerable distance. The species is very generally distributed throughout Canada and the Northern States; in the pine-growing regions it is often excessively abundant.

A very interesting and valuable account of this insect is given by the late Mr. E. Billings, of the Canadian Geological Survey in the *Canadian Naturalist and Geologist*, for December, 1862, (vol. vii. pp. 430-438). As the work is not likely to be in the hands of more than a very few of our readers, we cannot do better than give some extracts from it. Mr. Billings, from his long residence in the lumbering districts of the Ottawa valley, had more than ordinary opportunities of observing the life and habits of the insect, and may therefore be justly considered an excellent authority upon the subject. "These insects," he relates, "attack dead timber, and also trees which have received some injury, and are in an unhealthy condition. I have never seen the female laying her eggs on a perfectly healthy and sound pine tree. Timber newly fallen is always attacked by them. The first dwellings constructed in the new settlements are generally made of logs with either the whole or a portion of the bark remaining on them. The inside is not plastered, except in the crevices between the logs; if these latter happen to be pine, the *Monohammus* lays her eggs in the bark, on the outside of the house, and for months afterwards the larva may be heard in the stillness of the night, making a noise like the boring of a small auger. The perfect insect sometimes comes out on the inside of the wall, and suddenly drops down upon the floor, the table, or the bed, to the great alarm of the inmates, who imagine that an insect with such great horns must bite or sting with proportionate severity."

"For the manufacture of boards or planks, the pine trees are cut up into lengths of from twelve to eighteen feet, and are either drawn or floated to the mill. The logs are got out during the winter, and if they remain in the mill-yard one season, they are invariably found to be bored through in all directions by larvæ of these beetles, and the boards greatly deteriorated in value. Where extensive operations are carried on, a single lumberman will sometimes have a license giving him possession of over a hundred square miles of pine forest. In the months of May and June it often happens that great fires sweep through the woods, burning up all the fallen trees and dry branches strewn over the ground, and so scorching the living pines that most of them wither at the top and die during the season Trees thus injured are soon attacked by both *M. Confusor* and *M. Scutellatus*, and within one year are

so greatly bored that they are unfit for the manufacture of timber. Those experienced in the business, however, well understand the habits of the insect in this respect, and hasten to make the timber before it is destroyed. Pines scorched by the spring fires must be cut down and made into lumber the next autumn. After one of these fires it generally happens that there is a regular race between the lumberers and the beetles, the prize being a grove of white or red pine. I was told that Messrs. Egan & Co., lost £40,000 worth of timber by some unavoidable delay of a few months. Pine trees, when scorched, would be sound enough for timber five years afterwards, if it were not for the attacks of these formidable destroyers.

"When there are only a few pines, as in the neighbourhood of Montreal, it is rare to meet with more than one or two of these beetles together. But in the great forests of the Ottawa it is not unusual to find fifteen or twenty on a single tree. On one occasion I saw an extraordinary number, and entered an account of the circumstances in my note-book on the spot. It was on the 11th of September, 1857. I was at that time making some geological observations in the neighbourhood of Lake Clear, in the County of Renfrew. Following on the lumber road through the woods, I came to a place which had been burned over some time during the preceding spring. There was one large white pine standing on the sunny side of a small gently sloping hill. The height of this tree was about 120 feet, and its diameter nearly 3 feet. About 30 feet at the base was scorched; it was 60 feet to the lowest branch, and as nearly as I could judge, the foliage for 20 feet at the very top had turned yellow. The remainder was green, and apparently healthy. This tree was swarming with *M. Confusor*, and many of the females were occupied in laying their eggs. I think there were at least 300 of both sexes, and I saw several flying from other trees thirty or forty yards distant. In flying, the body is not horizontal, but inclined at an angle of only fifteen or twenty degrees from the perpendicular. The insects were on all parts of the tree, and they did not appear to take a firm hold of the bark, for a heavy blow with the hammer, at the base, would bring down a dozen at a time, some of them falling from near the top. While falling, they did not attempt to fly. I had fifty or sixty crawling around me at once, and had a fine opportunity to observe the very considerable variation in the size of the individuals, and the length of the antennæ. When two of them going in opposite directions, met face to face, a clumsy kind of fight took place, in which they reared up and pushed against each other, until one or other fell over backwards. They bit each other with their mandibles, but with no effect that I could perceive. The females fought with each other, or with the males, indifferently. There can be little doubt but that this tree was, during the next twelve months, totally destroyed. If there were 150 females, and each laid 200 eggs, and half of these produced a healthy larva, then in one year this tree must have been perforated by 15,000 galleries. I examined other trees in the neighbourhood, and on a few only did I see any of the beetles, usually from one to four or five on each. I can only account for the preference given to this particular tree, by supposing that it was in a better condition for the nourishment of the larvæ than the others, and that the instinct of the females directed them to it. It is probable that nearly all the females for a considerable distance around were thus brought together on one tree, and were followed by the males."

"I cannot say whether or not these insects ever attack a perfectly healthy and sound tree. I think they do not, and yet their ravages are certainly injurious to the commerce of this country, as they destroy a vast deal of fallen or scorched timber, which otherwise might be brought to market at any time during several years after the trees have received a death-blow by fire or storm. I think also that thousands of trees, only sufficiently injured by fire to throw them for a while into a weakly or unhealthy condition, would recover were it not for the attacks of these formidable creatures."

The only means of warding off the attacks of these destructive insects is to manufacture without delay, all scorched or fallen timber, and to strip the bark off all saw-logs that are left over a summer before being cut up in a mill. When the bark is removed the female has no convenient and safe place in which to deposit her eggs, and thus the timber escapes her attacks.

VIII. Oberea tripunctata Fab.—The Raspberry Twig-Girdler.

We now come to the last insect on our plate; the figure is a good deal exaggerated in size, the length of the beetle being under half an inch, and its width one-tenth of an inch.

Its colour is deep black, with the exception of the thorax above and the front part of the breast beneath, which are rusty yellow; on the thorax there are three small elevated black dots, arranged in a triangle (not two only, as in the figure), whence is derived the specific name of the insect. The antennæ are nearly, if not quite, as long as the body. The beetles are usually found in July and the beginning of August; they attack all the varieties of raspberry, and come into gardens from the fields and clearings, where we have often taken specimens and observed their work. The mode of attack is peculiar: the first appearance of injury is usually manifested by the withering and drooping of the ends of the young shoots. On inspection, it is found that at the base of the affected part there are two rows of punctures, half an inch apart, running completely round the canes, and so girdling them that the supply of sap is stopped and the tops necessarily soon wither and break off. The parent insect begins by cutting with its jaws a series of small punctures side by side around the cane, six or seven inches from the top. As soon as the first row is completed, it turns round, and facing the other way, cuts a second row, measuring the length of its own body. These two girdles being completed, it makes a small hole a little way above the lower girdle and deposits in it its small yellow egg. The whole operation occupies an hour or more. From this egg there hatches out in a few days a small, yellow, footless grub, which proceeds to burrow downwards, eating the pith of the cane and eventually causing its destruction.

In our Entomological Report for 1873, Mr. Saunders gives a full, scientific description of the larva of this insect and many other interesting particulars to which we beg to refer the reader. Though certain that the girdling of the raspberry canes was caused by this insect, he states that he had "not yet seen the bettle in the act of depositing their eggs" and making the girdles. We are glad to be able to complete the life-history of the insect by the account we have given above, which is taken from repeated observations that we made ourselves several years ago at Cobourg, the substance of which we embodied in an article in the *Canada Farmer* of 1869, (page 338.) The object of this singular girdling operation is, in all probability, to check the growth of the cane, and so prevent the crushing and destruction of the egg or larva by the rapid increase of cells and tissues in the plant.

An obvious remedy for the injuries inflicted by this insect is to break off *at the lower girdle* and burn the affected twigs, as soon as possible after they are observed to wither; the egg or newly-hatched larva will thus be destroyed and the increase of the species checked.

In the foregoing description of the wood-boring beetles figured on our plate, our aim has been, not to write an original dissertation upon the insects, but to gather together from various sources, as well as from our own observations, all the information respecting them that we have thought would be of interest or value to the readers of these Reports. We hope that the beauty and graceful forms of the insects will lead many of our country friends to collect for themselves, and then study the life history of these wonderful denizens of our groves and forests.

THE APHIDES OR PLANT LICE.

By W. Saunders, London, Ont.

Under the common term aphis or plant louse, is embraced a number of distinct species, belonging sometimes to different genera, but all resembling each other so closely in appearance or habits as to lead to their being grouped under one common name. So closely do many of the species resemble each other, that their distinguishing features cannot be made out without the use of a magnifying lens. There are very few plants, shrubs, ornamental or fruit trees, but are more or less affected by these insects, and on many of them they luxuriate and thrive to such an extent as sometimes to threaten their destruction. These plant lice are not restricted to any particular part of a plant; often they are found on the leaves, but sometimes on the stems, or again on the roots of plants, while other species roll up the leaves, or form gall-like swellings on them. This troublesome tribe of insects holds a position in regard to the vegetable world somewhat analagous to that of some well-known parasites on animals; hence the popular name plant lice. They belong also to the same great order of insects, *Hemiptera*, all of whom obtain their livelihood in a similar manner, viz., by suction. They are all furnished with a beak-like mouth, sometimes hard and solid, which is thrust into the plant or animal they are feeding on, and used to extract its fluids.

Plant lice are remarkable for their fecundity. People are often puzzled at finding their plants or trees swarming with plant lice, where a week or two before there was scarcely one to be found. As a general rule an aphis, during the summer season, reaches maturity in ten or twelve days from birth, after which it produces every day two young ones, which, contrary to the general rule with insects, are born alive. This rate of increase is maintained for a considerable period, from fifteen to twenty days or more; the young begin to produce in like manner in from eight to ten days, and so on through the third, fourth, and sometimes up to the twentieth generation in one season. Some idea may be formed of the numbers which in a short time this rate of increase would produce, from a calculation of Curtis, a celebrated English Entomologist, who has computed that, from one egg only, there would be produced in seven generations, taking thirty as the average of each brood, the enormous number of seven hundred and twenty-nine millions, so that were they all permitted to live, everything on the face of the earth would in a short time be covered with them. Indeed, sometimes the possible rate of increase is even greater than this. Dr. Fitch, late State Entomologist, of New York, has ascertained by actual experiment that in the case of the grain aphis, the wingless females become mothers at three days old, and thereafter produce four little ones every day, so that even in the short space of twenty days the progeny of one specimen, if all were preserved from destruction, would number upwards of two millions.

It may be urged in objection to these calculations, that no allowance is made for a certain percentage being males, but strange to say, all through the summer there are no males born, but all are fertile individuals, giving birth to others, and these to others still, independent of any influence from the opposite sex. With many species, some individuals of each brood acquire wings, while others are wingless; the wingless ones remain, of course, upon the plant on which they were produced, while the winged specimens fly to other plants, where they establish new colonies. About the middle of September the last generation for the year is produced, which consists of males and females, the males generally becoming winged. On reaching maturity, the sexes pair, when the females no longer bring forth young, but lay eggs, which are able to resist the severe cold of winter, and these hatching in the following spring, produce mothers which bring forth their young alive. The individuals composing the late brood having provided for the continuation of their race, generally die on the approach of winter.

It appears that there are, however, exceptions to this general rule. In the case of the grain aphis, Dr. Fitch says that he has watched it the year round so closely that he is perfectly assured that no eggs were laid and no males produced, and he further states that in the autumn the mature lice continued to produce young ones until they and their young became congealed upon the leaves of the young grain by the advancing cold of the season, and in this state they were buried beneath the snows of winter and with the warmth of the ensuing spring they were thawed and returned to life again. Prof. Cyrus Thomas also found living lice upon young fall wheat in South Illinois in the middle of winter, and after much sleet and rain had fallen. Even so far north as Connecticut, Prof. Verrill found numbers of wholly plant lice of all sizes on the branch of an apple tree so late in the year as December 11th, and this after two snow-storms and many cold rains and freezing nights. Indeed those who cultivate plants in their houses or otherwise under glass during the winter, will not require much evidence further than their own experience to convince them that plant-lice, tiny, tender looking, and juicy as they are, are endued with such perennial vitality and hardihood as to require great watchfulness and the frequent use of remedies for their destruction in or to keep them within due limits.

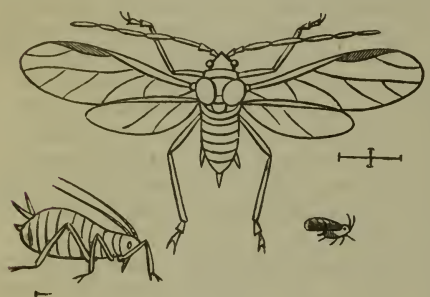


Fig. 4.

In figure 4 we give a highly magnified view of the apple aphis, *aphis mali*, both in the winged and wingless forms; the hair lines along side of the figures show the natural size of the insects. At the tip of the abdomen is seen a little projection; this is the ovipositor or egg laying instrument, and on each side of this is another little horn-like projection. These latter are called the honey tubes, and through them a sweet liquid is produced which is sometimes discharged upon the leaves of the infested plant, which drying up, forms a sweet glutinous substance known under the name of honey dew. In olden times the origin of this honey dew was shrouded in mystery, and many theories were advanced by sage philosophers to account for the strange phenomenon. Pliny, the great Roman naturlist, hesitates whether to call this honey dew the sweat of the Heavens, the saliva of the stars, or a liquid produced by the purgation of the air. Thanks to the careful observations of entomologists, philosophers have no longer any reason to puzzle themselves as to its origin.

In this connection another strange feature deserves explanation. Most attentive observers will have noticed that where trees or plants in the open ground are infested by plant lice, they are also much frequented by ants who are busy running up and down the trunk or stem the whole day long. This association of these insects has led some to suppose that the aphis are in some way produced from the ants, and we have heard of various ingenious devices being resorted to, to prevent the ants from ascending the trees, under the idea that in this manner the aphis might be in some measure got rid of. A slight examination will suffice to show the fallacy of this view, and reveal the real object the ants have in their visits. It is a well established fact, as most housewives know to their cost, that ants are very fond of sweet things. Examine closely one of the groups of plant lice which are being visited by the ants and you will see one or more ants walking about among them; apply a magnifying lens to the group, and you will presently perceive an ant drumming gently on the back of a plant louse with its flail-like antennæ until it coaxes the aphis to emit from its honey tubes a drop of the sugary liquid. This the ant absorbs and passes on to another, which is subject to similar treatment, and so on until having filled itself, it descends to the earth and having regained its nest, discharges the sweet fluid into the mouths of the helpless maggots, the larvæ of the future ants, which are entirely dependent for their sustenance on these industrious, working ants. Linneus, one of the earliest entomologists, and a most careful investigator, truly observes, "the ant ascends the tree that it may milk its cows, the plant lice." These honey tubes are shown more prominently in fig. 5, which represents a wingless aphis.

Fig. 5.

That the ants value their useful cattle, and carefully watch over them, there is abundant evidence ; they regularly visit them for the purpose of milking them, and, according to Dr. Fitch, "some of the ants remain constantly by them night and day to protect these small, weak creatures from being molested by their insect or other enemies. Thus, before we are able to inspect a colony of plant lice, we are first obliged to brush off or destroy the ants which are guarding them." The late Dr. Walsh says, "It is certainly true that the ants, if they can help it, will not allow any winged fly to visit their milch kine, being probably afraid that such flies come to rob them of the sugary fluid in which they take such delight. Thus, unconscious of what they are really doing, they often drive off Ichneumon flies, that would otherwise deposit their eggs in the bodies of the plant lice, and thereby cause their death, and *Syrphus* flies that would otherwise lay their eggs among the plant lice. But I have repeatedly seen them gathering in crowds round one of the fat fleshy aphis-devouring larvæ of the *Syrphus* flies, pulling him about in every direction, as if to ascertain whether he had got any honey in his body, like their friends the plant lice, and then, having apparently satisfied themselves that the fat gentleman was not in the grocery business, and not knowing that he butchered daily hundreds of their honey-producing friends, turn away in despair, and leave him, unharmed and unwounded, to his own devices, as a hard case that nobody could make anything of. It is apparently for the same reason, namely, to prevent sugar-loving flies from robbing them of their own private and peculiar honey dew, that ants occasionally construct a kind of tent round a little flock of their plant lice, but only where those plant lice are located on a twig, and never, so far as I have observed, where they are located on a leaf."

Notwithstanding all the care the ants may take to repel intruders, thousands of flies share in the sweets produced by the plant lice, and often the location of a colony of these insects, which would perhaps otherwise escape observation, may be detected by the loud buzz occasioned by the disturbance of the attending flies.

But there is seldom a rule without its exception, and while the details given above apply correctly to hundred of different species of plant lice, yet in the case of the grain plant louse, *Aphis avenae*, although the honey tubes are well developed, yet they emit no honey, and in consequence of this, as has been remarked by Dr. Fitch, this species is not attended by ants. To use the words of the late Dr. Walsh, "as this peculiar breed of cows gives no milk, the milk-maids do not think it worth while to visit them.

Having now given our readers same idea of the general habits and immense fecundity of these interesting insects, we shall refer in some detail to a few of the most troublesome and destructive species reserving what we have to say in regard to the remedies which nature has provided or man invented for their destruction until we have completed the enumeration.

The Apple-plant Louse (*Aphis mali*).

This insect which is represented in fig. 4 is the same as that which similarly infests the orchards in Europe and has doubtless been introduced on the trees imported into this country from across the Atlantic. The insects of this species of the previous year deposit in the fall in the cracks and crevices of the bark of the apple tree large numbers of their small oval black shining eggs. A large proportion of these are dislodged by the cold, driving rains and snows of winter, and destroyed ; doubtless also, multitudes are devoured by the smaller insectiverous birds. The survivors hatch quite early in spring before the buds are fully expanded, when the young lice locate themselves on the small, tender leaves displayed by the bursting bud, and there inserting their sharp leaks into the tissues of the leaves, pump out their juices. The wingless specimens are of a pale, yellowish, green colour with a yellow head and black eyes and are less than the tenth of an inch in length. The winged specimens have the head antennæ and thorax black, and the body green.

THE APPLE-ROOT PLANT LOUSE (*Eriosoma pyri*).

Fig. 6.

This species is a woolly louse which works under ground and produces upon the roots of the apple tree swellings or excresences (see fig. 6, a) of varying shapes and sizes; diseased growths which interfere seriously with the free circulation of the sap, an interference which often results in the death of the parts involved, and sometimes when these insects are very numerous their united efforts will occasion the death of the tree. In the more northerly parts of the Northern States this pest is very abundant and with us it is rare to receive a lot of young apple trees either from our own nurserymen or from those of the United States without finding some of them thus affected.

The mature louse (fig. 6, b) is about the tenth of an inch long including the closed wings of a dull colour with transparent wings and black legs, and with a peculiar downy or frosted look produced by the exudation from its body of a bluish white, cottony matter by which character it can often be readily recognised. When the wings are expanded the insect measures nearly $\frac{3}{16}$ths of an inch, (fig. 6, c).

As this species, situated as it is under ground requires different methods of attack from those which infest the leaves of plants and trees we will refer to them here. The only artificial remedy yet suggested for the destruction of this pest is hot water used plentifully so as to scald the roots, or, at least, the larger ones over their entire area. To accomplish this successfully, it will be necessary to carefully remove the earth from about the surface of the roots so as to lay them bare. No danger need be apprehended from using the water scalding hot as the application has often been made without injury. This remedy is not so applicable to large trees as it is to young trees in the nursery row or those lately planted. As a preparatory measure, mulching the tree has been recommended, which brings the insects nearer to the surface where they can more readily be reached by the hot water.

Nature's remedies are, however, in this instance, probably more effectual than any which man can devise. In the first place, these lice are subject to the attacks of a very minute parasitic fly; and secondly, they are destroyed by the larva of the "Root-louse Syrphus Fly," *Pipiza radicans*, fig. 7 (after Riley). This latter friend is a fat, footless grub, fig. 7*a*, which lives underground among the lice and devours large numbers of them; in the fall it changes to a chrysalis, fig. 7*b*, and appears in the perfect form as a fly, fig. 7*c*, in the following spring.

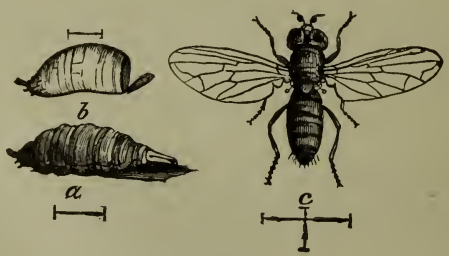


Fig. 7.

THE CHERRY-PLANT LOUSE, *Aphis cerasi.*

Probably no species of tree is so regularly infested by aphides as the cherry, and no species included in this large family of pests is more disgusting in appearance than this cherry-plant louse, for, while most others are of a more or less lively green colour, this is nearly black.

These insects begin to appear soon after the leaves have expanded, hatching from eggs deposited the previous year. They multiply with amazing rapidity, the young ones hud

dling around their parents so closely as to entirely cover the twig, leaf-stem, or portion of the leaf on which they are feeding; indeed it is not uncommon to find them two deep, a portion of the crowded host standing upon the backs of others, all intent on the one business namely, that of absorbing the juice of the tree, which they do by inserting their beaks into the succulent portions. They seem never to suffer from over-crowding. Dr. Fitch estimates—his calculation being based on actual count—that the two surfaces of a small leaf, but an inch long, would furnish ample space to accommodate a thousand of these insects.

When we consider the rapid rate of increase which prevails among the aphides, some details of which we have already given, it is not astonishing that the leaves, leaf-stalks, tender twigs, and even the fruit-stems are so soon found to be swarming with these pests, their black bodies literally covering every succulent portion, while all around flies, wasps, and other insects are swarming, keeping up a constant buz and hum about the infested tree, to which they are attracted by the sweet liquid which exudes from the bodies of these aphides. By the end of June they have usually attained their maximum numbers, for by this time their numerous enemies, which we shall hereafter refer to more in detail, have become so multiplied as to begin to get the better of them, and when once the scale is turned against them they are sometimes destroyed so rapidly and entirely that in a few days not a living specimen can be found, the empty skins of the slain being the only remaining relics of the vast hordes but recently seen. Dr. Fitch well remarks, "It is by looking at the works of nature in a definite manner, aud tracing out her operations specifically and in their minute details that we arrive at some faint conceptions of their magnitude and grandeur, and become vividly impressed with the truth that no other agency than that of a Creator infinite in wisdom and power could have peopled the world which we inhabit with such countless numbers, and such an endless variety of objects animate and inanimate, each occupying its appropriate sphere, and all so arranged as to fulfil the objects for which they were called into existence. Has the reader as he has passed a forest ever attempted to conjecture the number of trees which it contained? and has his mind passed onward to a surmise of the probable number of leaves growing upon each tree, and onwards still to the number of insects which may be drawing their sustenance from each one of these leaves; and still further to the number of miuute and infinitesimal parasites which may be subsisting upon these insects?" Such reflections could scarcely fail to lead the thoughtful observer "from nature up to nature's God."

During July the cherry tree generally enjoys some respite from the attacks of these tiny foes, but early in August they usually appear again to increase and multiply until being again overtaken by their enemies they are a second time overcome, this later brood is seldom as numerous as the first one. This black aphis seems to be restricted to the cultivated cherry, for we never find them invading any of our native or wild cherry trees, and these in turn seem each to have a species of plant louse peculiar to them, which seldom if ever attach themselves to the foliage of other kinds. Dr. Fitch has described in his first report on the noxious insects of New York, a green species *Aphis cerasifoliæ* which affects the undersides of the young and tender leaves of the choke cherry, and refers to another which infests the wild black cherry.

Thus we might go on enumerating and describing species after species to the exhaustion of the patience of our readers, for there is scarcely a tree, shrub, or plant, which is not at some period or other in the year infested with them. We would, however, particularly mention the currant plant louse *Aphis ribis*, which swarms on our currant bushes, and which has probably been imported into this country from Europe; the Cabbage-plant louse *Aphis brassicæ*, also introduced from Europe; the Hop-plant louse *Aphis humuli*, and the Grain-plant louse *Aphis avenæ*, since these from their great abundance frequently attract general attention.

We now propose to refer to the remedies which nature has provided, and man has devised for the destruction of these tiny foes, and beginning with the more important and most effective, we shall first advert to the natural enemies of the plant lice. It has been truly said, "the plant louse has but one friend—the ant, but its enemies are legion; and wisely is it so arranged, for were they permitted to increase and multiply at their natural rae without material check, ere a few months had elapsed every green thing on the face of the earth would be so covered with them as to cause general destruction.

Foremost in the list of enemies we must place the lady-birds which feed on little else than aphis either in the larval or perfect states. Probably the commonest species is that known as the nine spotted lady-bird *Coccinella 9 notata* fig. 8, a nearly round insect, of a brick red colour, with nine black spots, fig. 9, shows the same in the larval condition. Another common species is the two spotted lady-bird *Coccinella bipunctata* very similar in form and colour to the previous species, but smaller and with two black spots instead of nine.

Fig. 8.

Fig. 9.

The spotted lady-bird *Hippodamia maculata* fig. 10, is also frequently met with, and being found both in Europe and America has probably been imported from one country to the other. The colour of this is pink withlarge black spots. The thirteen spotted lady-bird *Hippodamia punctata* fig. 11, is rather larger than either of the preceding species and has thirteen black spots on a brick red ground.

Fig. 10.

Fig. 11.

The trim lady-bird *Coccinella munda*, Fig. 12, may be readily distinguished from most of the other species by its having no black spots on its red wing cases. The convergent lady-bird *Hippodamia convergens*, Fig. 13, is of a deep orange red colour, marked with black and white. Its larva *a*, is blue, orange and black in colour, *b*, shows the pupa or chrysalis suspended by the tail, and *c*, the perfect beetle. This insect is also very useful in destroying the eggs and young larvæ of the Colorado potato beetle.

Fig. 12.

A B C

Fig. 13.

The fifteen spotted Mysia, *Mysia* 15 punctata, Fig. 14, is one of the largest species. The perfect insect varies much in colour from a light grey to a deep chestnut brown. An ordinary observer might readily conclude that the different forms belonged to those of distinct species, the more prominent of these variations are shown at *d*, *e*, *f*, *g*, in the figure. This predacious species also devours the young of the Colorado beetle, at *a*, the larva of thislady-bird is represented in the act of devouring one of these young enemies. In addition to those we have enumerated, there are a number of other less common species, in colour mostly yellowish or reddish with black spots or bands. In the larval state they all resemble each other very much, being elongated in form and active in habit, usually of a dull colour withmore or less yellowish or bluish markings. Fig. 9 may be referred to as a type of the whole.

Fig. 14.

There is still another species, belonging to another genus of lady-birds, which, from its abundance and great usefulness deserves mention, we refer to the twice-stabbed lady-bird *Chilochorus bivulnerus*, Fig. I5, a highly polished black insect with two red spots, and which in form much resembles the half of a split pea. This species preys more particularly upon bark lice, and hence is most commonly found on the trunks and branches of trees. The larva, Fig. 16, is a verycurious, prickly looking creature, extremely active and voracious in its habits. Its chrysalis may often be seen on thetrunk of trees partly covered by the prickly larva skin.

Fig. 15.

Fig. 16.

Prominent also among the insects which subsist upon plant lice, are the aphis lions, the larvae of the golden-eyed and lace winged flies. The perfect insects are very pretty and delicate-looking creatures, with prominent fiery eyes, slender bodies, and two pairs of large, beautifully netted, pale green wings Many of them, however, when handled, impart an intensely disagreeable odour to the fingers, and one of a remarkably permanent character, Fig. 17 represents this insect in theperfect state.

Fig. 17.

The eggs of this insect are curiously placed upon stalks as shown in Fig. 18. Dr. Fitch says, "Nature has furnished these insects with a fluid analagous to that with which spiders are provided for spinning their webs, which possesses the remarkable property of hardening immediately on being exposed tothe air. When ready to drop an egg, the female touches the end of her body the surface of the leaf, and then elevating her body, draws out a slender and cob-web-like thread half an inch long or less, and places a little oval egg at its summit. Thus a small round spot resembling mildew is formed upon the surface of the leaf from the middle of w hich arises a very slender glossy white thread, which is sometimes split at its base, thus giving it a more secure attachment than it would have if single. The egg at its summit is of a pale green colour when newly deposited, but before it hatches it becomes whitish and shows two or three faint dusky transverse bands. The larva leaves it commonly I think in less than a week from the time it is deposited, through an opening which it gnaws in the summit, and the shell remains empty supported on its stalk, somewhat shrivelled and of a white colour.

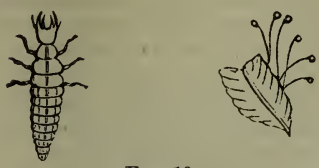


Fig. 18.

The young larva begins at once to seek its food, and if it finds itself in the midst of a colony of plant lice, many of these speedily fall victims to its enormous appetite, but if not so favourably situated, a vigorous search is generally rewarded by the finding of a cluster of insects' eggs or some newly hatched catterpillars, either of which will furnish our young traveller with a dainty meal. The larvæ of the different species vary somewhat in colour and ornamentation, but in most instances the ground colour is of a dull reddish brown, and there are whitish markings along the sides, and a dark central stripe. They all have long, narrow bodies, and are furnished with six rather long legs, and two long and slender, but powerful jaws curved like a sickle, and down each side of the body is a row of tubercles, each tubercle being tipped with a cluster of spreading hairs or spines. Fig. 18 will give a good idea of their general appearance. In some species the bristly clusters of hairs are so multiplied as to almost cover the surface. Dr. Fitch mentions a novel use to which these hairs are put, he says that these voracious creatures often conceal themselves from view by placing the empty skins of the victims they have devoured, between their radiating bristles so that they adhere and thus completely hide the insect from view. It is the skins of the woolly plant lice that they mostly employ for this purpose, and thus covered they resemble a little mass of white down adhering to the bark of the tree, presenting just such an appearance as does a little colony of woolly plant lice. By this device they are enabled to approach their victims without exciting their alarm and to quietly devour them one by one.

After acquiring full growth the ant-lion having made a hearty meal, remains for a time torpid, and then begins to spin its cocoon, which is formed from a glutinous fluid supplied and distributed by the hinder extremity of the body, a fluid which hardens as it is spun into threads. In a few hours the insect spins enough of its cocoon to hide itself from view, and when completed the threads composing the cocoon are so closely compacted as to give the surface a papery look. During the operation the larva contracts much in size and bandages itself so tightly within its enclosure that the cocoon appears very small in comparison with the size of the larva constructing it. Here the insect changes to a chrysalis of a pale green colour and remains in this condition in summer a fortnight, but if the insect belongs to the later brood, it remains in the chrysalis state all winter, appearing as a perfect fly the following spring.

Other enemies to the plant lice are to be found among the larvæ of the various species of Syrphus flies. These flies vary in size, some being smaller, others larger than the common house fly, and usually more slender in form, they are also handsomer, their bodies being of a bright yellow colour, banded and spotted with black. Fig. 19 represents one of the species. They are very swift of flight, darting about with great rapidity, again hovering with poised wing in the bright sunshine, or alighting upon flowers These flies place their eggs singly, fastening them to a leaf or twig infested by plant lice, usually placing them in the midst of a colony where the young larvæ may not have long to search for appropriate food. One cannot go far in summer in the careful examination of groups of plant lice without meeting with those small white oval eggs. The young larva when hatched

Fig. 19.

is not unlike a leech, both in appearance and movements. Having no eyes, it appears to be placed at a great disadvantage in the search for food, but fixing the hinder extremity of its body to the surface on which it is placed, it reaches as far as it is able to stretch first on one side, then on the other. If no food is reached, it moves a little further, and then repeats the same motions, and so on until it reaches a plant-louse, when at once it seizes its prey, holding it up in the air, as shown in fig. 20, until having sucked it empty, nothing remains of the louse but a shrivelled skin, and all this occupies scarcely more than a moments time; indeed it has been asserted that a medium sized larva will thus consume a hundred plant lice in an hour. These larvæ are semi-transparent, so much so that the movements of some of the internal organs are plainly discernible through the skin in one of the larger specimens. Their usual colour is whitish or greenish, with white, yellow or dull reddish markings, or with a combination of these down the centre of the back. When they have completed their growth, they fix themselves to the surface of a leaf or a piece of bark and contract themselves to an oval form, which gradually becomes hard and horny, and of a blackish colour, and within this shell the change to a chrysalis takes place, and in due time, from it the perfect fly escapes.

Fig. 20.

But the aphis has foes which attack it from within, as well as from without. Almost all insects are infested more or less by parasites, and the aphides are no exception to this general rule. There are several genera of tiny parasites which thus befriend man, all of which are included in one group named *Aphidiides*. Dr. Fitch's remarks on this interesting group are so much to the purpose that we quote them entire. He says: "These are all exceedingly small insects, little exceeding the twentieth of an inch in length, and mostly with black bodies, variously adorned with bright tawny yellow, and pale sulphur yellow bands and other marks. One of these small Ichneumon flies, resembling a winged ant in appearance, may occasionally be discovered busily at work among a colony of aphides. With her long thread-like antennæ stretched out in front of her, and rapidly vibrating, she approaches an aphis and touches it gently, much like an ant when nursing these creatures. By this slight touch, she at once ascertains whether the aphis has been previously visited. If it has not, she curves the tip of her abdomen forwards under her, puncturing the body of the aphis and inserting an egg therein. She then passes to another and another. From this egg hatches a minute worm, which resides within the aphis, subsisting upon the juices which the latter extracts from the plant. Thus it grows with the growth of the aphis, which furnishes the exact amount of sustenance which the worm requires for bringing it to maturity. It is singular that the parent Ichneumon fly knows if two eggs were deposited in the aphis the worms from them would die for want of a due supply of food, and that by a mere touch with her horns, she is able to ascertain which individuals have already been impregnated. Some of the species of Aphidius are larger than others, and their offspring consequently require a larger quantity of food; but each parent has the instinct to select an aphis of such size as will yield the amount of sustenance which its young requires.

"By the time the worm has attained its growth, the aphis becomes so exhausted that it dies. If it should now drop from the leaf to the ground, it would be liable to be found and devoured by centipedes and other insects which feed upon the carcases of animals of this class, and thus the worm within it would be destroyed. Nature has, therefore, so constituted the aphis that in these circumstances it dies without a struggle or a spasm, with its beak inserted, and its claws clinging to the surface of the leaf, standing with its antennæ turned backwards, and its whole aspect so life like that in the infancy of my studies, I supposed these were one of the varieties natural to the species with which they occurred. Their bodies are remarkably plump and smooth, commonly clay-coloured, or the hue of brown paper, and the aphis lions and other insects, which destroy the aphides, appear to pass by those which have these parasites within them. Hence, where a leaf or twig has recently been cleared of plant lice by their enemies, several of these ichneumonized individuals may frequently be found remaining upon it, dead and unmolested. In other instances, the whole colony of aphides appears to be exterminated by these parasites alone, the dead swollen bodies of their victims covering the surface of the leaves or twigs as closely as they can stand. The worm remains within the body of the dead aphis during its pupa state. It then cuts a circular hole through the dry hard skin, and comes out in its winged and perfect form."

"These parasitic insects, which feed internally upon the aphides, are as efficient in destroying them as the aphis-lions or any other class of their enemies. And it is truly wonder-

ful, that whilst every kind of tree and plant appears to have one or more species of aphis infesting and blighting it, each species of aphis seems to have a particular parasite preying upon and devouring it; for each kind of aphis, from which I have reared these insects, has furnished a species differing from all the others, and, in some instances, two species have been obtained from one kind of aphis."

How complicated and how wonderful are the marvels of Nature. There seems a providence in all these arrangements. Kirby has well said that it is strange that among the innumerable species of insects, many of them extremely fragile and exposed to dangers and enemies without end, no link should be lost from the chain, but all be maintained in those relative proportions necessary for the general good of the system; that if one species for a while preponderate and instead of preserving seem to destroy, yet counter-checks should at the same time be provided to reduce it within its due limits; and further, that the operations of insects should be so directed and overruled as to effect the purposes for which they were created, and never exceed their commission; nothing can furnish a stronger proof than this, that an unseen hand holds the reins, now permitting one to prevail and now another, as shall best promote certain wise ends, and saying to each "Hitherto shalt thou come and no further."

A few words will suffice to indicate the remedies which man has devised to lessen the numbers of these destroyers of vegetation. It is universally conceded, that where the remedy can be conveniently applied there is nothing more effectual than tobacco smoke. To exterminate them in green-houses, smoking—by strewing a few leaves of tobacco on hot coals—is regularly resorted to, and, if thoroughly done, is very effectual. A few favourite plants may be similarly treated by enclosing them in a light paper-covered frame and smoking under it, or by placing them under an inverted barrel or box; after such treatment the plants should be immediately washed with luke-warm water from a syringe or watering-pot. Where this remedy cannot be applied, drenching with tobacco-water has been recommended, also the application of strong soap-suds, or weak lye, sprinkling it freely on the plant, and even dipping the succulent ends, where the aphides cluster, into the liquid.

Hot water has also been recommended, but this, if not cautiously applied, is very apt to injure the plant. Some species will bear an application of water heated to 130° Fahrenheit, indeed, some few will bear a higher temperature than this without injury, but others are more susceptible in this respect, hence the remedy requires careful handling.

REPORT

ON

SOME OF OUR FRUIT INSECT ENEMIES,

FOR 1877.

BY B. GOTT, ARKONA, ONT.

It was with much pleasure and satisfaction that I was able to be present for the first time at our Society's annual meeting, last September, in London, Ont., I then and there imbibed deeper and wider ideas of the extent and importance of the work in which our entomologists are so ardently and devotedly engaged, I also had an opportunity of personal acquaintance with the characters and qualifications of the men who are the foundation and the noble pillars of the Society. The men then present were practical and intelligent, and the earnest sympathy they showed in the work and objects of the Society, could not be otherwise than encouraging to those engaged in this interesting and serviceable study. It is not easy to conceive how any people possessing and supporting such a Society, whose work and results are so palpable to the masses, can be otherwise than progressive; and as far as their productive results are concerned, every way prosperous. Should we not desire that the effective membership of the Society may largely increase, and that thus the educating and elevating influences of the study may be extended, and felt to be not only an assistance but a powerful helper of the people through the length and breadth of the land. In my own individual case I find my interest in the subject of entomology annually deepening and widening in proportion to the extent in which my attention is directed to it. Since being engaged to some extent as I have been for the last few years in the critical but interesting production and cultivation of fruit in this western part of Ontario; I found from the very start that something more was necessary to success than a mere knowledge of the theory of production. I found insect enemies to contend with, for which, in my ignorance, I had made but little or no provision. My combativeness was at once aroused; but finding progress in a hand to hand fight very slow, and not very encouraging or satisfactory, I began to reflect that prudence was the better part of valour, and I at once set myself bravely to the task of arriving at some knowledge of their differences, their habits, their possible numbers, and their possible use; with also some data for successful competition. I have not advanced far, but I soon found that my opportunities, my samples and specimens were not scarce, especially in our summer and growing season, and that their differences and peculiarities were very interesting, and their numerical forces sometimes appalling. Some were feeding voraciously on a specific plant, shrub, or tree, or on a class of these; and others were feeding as voraciously on their opposites. Some were most injurious and destructive in their immature state, and others needed the complete forces of maturity to do the same amount of effective execution; some were most active in their destructive work on the roots in the ground, some were content with the leaves, and yet others were satisfied with nothing of less value than the fruit. So I concluded that insect depredators were not wanting more or less for everything that grows. It would almost appear too, that we have peculiar local insect troubles, as though special and individual classes of insects were localized and restricted to sectional divisions; but by further acquaintance with the subject, I must suppose this can hardly be. However, it is beyond dispute, and capable of most positive and convincing proof, that in this department of natural research there is much to be studied and much to be learned; there is ample and profitable room for the intellect, and investigation of the most vigilant and the most penetrating.

Moreover, what abundant cause have we for gratitude and thankfulness to those patient, honoured, and great names whose owners have worked hard and long, and spent their valu-

able and industrious lives in this interesting field of inquiry, and have freely left us, as a legacy, the cherished results of their labours—"their works do follow them,"—and we are thereby assisted in those difficult and puzzling problems of insect life and insect differences and relationships; and although there is yet much to be done, much has already been accomplished and vividly portrayed before our vision. The field has already been surveyed and mapped, and it only remains for us to follow those lines to arrive at rich and desired results. I propose, therefore, in the following pages, to give as short and concise an account as possible of some of the most palpable insect enemies of our fruit, &c., for the past season. And this I do, not with the intention to supplant the able and graphic report of insect enemies by the President of the Fruit Growers' Association, in his address before that body last September; or of that of the President of the Entomological Society, at about the same time, but rather as an adjunct additional testimony in the same direction. I further may be allowed to state that I make no pretentions to scientific accuracy, but shall simply state my observations as they occur to me in my own untutored way. With these preliminaries I come at once to the subject in hand, viz :—

The insect enemies of our Fruits, &c., for 1877.

By this caption I do not mean that I shall confine myself exclusively to those insects merely which feed alone on our fruits, but shall include also those injurious to the leaves and even the roots and branches of our fruit trees and shrubs, as equally noxious to our fruit products and prospects. And first, I may mention the

American Lackey Worm, or Tent Caterpillar (*Clisiocampa Americana*)

Of Harris. For larvæ and eggs see fig. 21; the male moth is shown in fig 22, the female in fig. 23. This insect, by its appalling and unprecedented numbers, and by its voracious and devastating habits, at least in this section, for the last few seasons, has filled us with the most serious apprehensions for the safety of not alone our fruits, but also for the very life of the trees. So serious was this damage during the past season that the aid of legislation was talked of, to compel people to do what they could for the suppression of this insect grievance; because not only the orchards of the negligent and careless were thus blighted, but those also of the industrious and careful were besieged and destroyed by the very enemies his careless neighbour was rearing and helping to propagate. People began to ask of one another, "What is the use of planting and cultivating orchards, they will only be devoured and ruined by the caterpillars?" Aided also by *C. Sylvatica*, the larva of which is shown in fig. 24, those orchards standing in the neighbourhood of forests have suffered very severely; and although persistent and industrious, our efforts seem feeble and almost totally unavailing to save our orchards and our gardens. This latter insect is very active, and is on constant parade over trees and shrubs, over fields, orchards, and gardens, where anything can be found to gratify its devouring appetite; and then, it is recruited so plentifully and so frequently that we fairly sicken of the fight, and despair of the prospect of victory. But there is to this dark picture

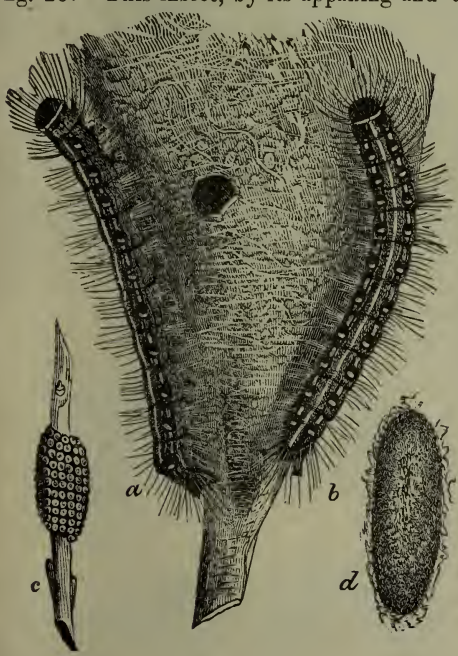


Fig. 21.

Fig. 22.

Fig. 23.

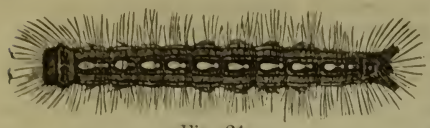


Fig. 24.

a cheering ray, a bright prospect of assistance, from a small ichneumon fly. On examining a number of the cocoons of *clisiocampa*, as they were safely nestled in the folded fragments of leaves left on the trees, we found a large proportion infested with maggots or small white grubs. These we found were of two or three distinct sorts; one was a largish white grub, and existed in the body of the caterpillar, sometimes solitary and sometimes in pairs, and entirely devoured the internal portions; and in other cases they were smaller and closely huddled together, but in each and every case the destruction of the caterpiller and of the future egg-laying moth was most complete.

Our methods for suppressing this grievance and lessening their numbers were not very effectual, but consisted in entrapping the moths by means of light, and in taking their egg clusters from the branches of the trees and destroying them. As soon as the young larvæ were hatched in the spring our practice was, as early as possible in the day, while they were yet very young and closely compacted, to collect them in masses and destroy them. In this way millions were easily and effectually captured and destroyed, but there are always some careless neighbours who would do nothing, and declare it was of no use fighting them as they would eat up the trees anyway, and so by swarming in from the forests, and those neglected orchards, the trouble was annoyingly kept up.

Measuring Worms (*Geometers*) and Leaf Rollers, (*Tortrices*)

were this year, as usual, very abundant on all our fruit and ornamental trees, shrubs and plants, but the diligent overseer, by his watchfulness and skill can, with comparative ease, so reduce these troublers that their work on the mass of foliage is scarcely perceptble. The only way they seem to us damage, and in which we feel them to be a burden is as assistants combined with the already multitudinous forces in the same field of destruction, we feel that we could readily do without their services.

The Currant Bush Borer (*supposed to be the European Aegeria Tipuliformis*, See fig. 25.)

Fig. 25.

is doing us considerable damage in our currant plantations, and here, too, this evil is permitted by the careless and indolent cultivators to increase upon us, so that eventually, currant growing in this country will become very uncertain and very troublesome. These insects eat out the heart of the young stem and so weaken it that it is incapable of ripening its fruit and shortly dies or breaks off. Of far more serious moment at present, however, is

The Currant or Gooseberry Worm (*Nematus Ventricosus*).

Fig. 26.

The larva of this pest is seen in fig. 26. The perfect fly, male and female, fig. 27; and the eggs as laid on the leaves in fig. 28. This abundant and voracious insect feeds readily in the larval state either on the leaves of the currant or those of the gooseberry, but I prefer to call it by

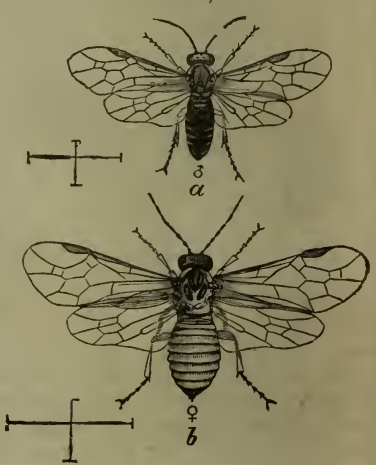


Fig. 27.

way of distinction, the *Currant Worm*, and the insect that feeds on the fruit of the goose

Fig. 28.

berry and currant, the *Gooseberry Worm.* This insect is very common and very injurious and has been for many years past, and in all parts of the country, so that a description is needless as all are thoroughly familiar with its appearance and its work. It is felt to be such a severe scourge, however, and so discouraging in its effects upon us that it has very sensibly, suddenly and effectually checked the production of this refreshing summer fruit. We seem to be helpless in the matter and have little or no respite for the incessant attacks upon us of several broods in one season, will effectually, baffle the most determined and the most industrious. Our readiest and best remedy is applying powdered *White Heelebore* to the surface of the leaves which is a temporary relief as it does not agree with the best functional interests of their insect-constitution. But the thought of poison among our summer fruits is rather appalling, and not of the most relishable or attractive character.

The Gooseberry Fruit Worm (*Pempelia Grossularia*).

Fig. 29.

For a representation of the moth and cocoon of this species, (See fig. 29). This is, perhaps, the most insidious and annoying enemy of the gooseberry and the currant. It winters as a chrysalid near the surface of the ground just under the bush where it was last feeding. In the early spring as soon as the sun has warmed the soil the active and vigilant moths appear, and after copulation, commence at once their work of egg depositing in the young fruit almost before the full and proper expansion of the blossoms. These eggs quickly give rise to little white, insidious worms that make their way into the very heart of the berry and grow and thrive upon its internals. As soon as this berry is consumed and unable, longer, to serve the worm any good and substantial purpose, it leaves and immediately attaches itself to another by means of its silken cords or web-like productions, and thus secures itself safely against all danger and loss. In this way it has attacked and destroyed a dozen or more berries to satisfiy its cravings before it has reached the period of maturity or the season for change. When this period arrives it falls to the ground by means of its silken threads, buries itself in the earth and changes to a chrysalis. The remedies are hand-picking, and the application of noxious substances to the bushes in early spring, but these are troublesome and partly ineffectual and hence not very satisfactory.

The May Beetle (*Phyllophaga Quercina.*—See Fig. 30).

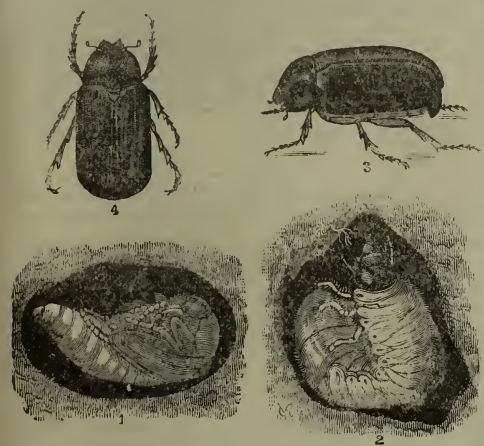


Fig. 30.

2 represents the larva, 1 the chrysalis, and 3 and 4 the perfect beetle. The larva of this active summer evening buzzing beetle stands charged with many and grievious offences against the farmer and the fruit grower. A neighbour of mine said to me the other day "My corn was only half a crop—those cussed white grubs eat it so; it wilted to the ground;" but I suppose that in his case, perhaps, something else did it. However, although our soil is peculiarly suited to their purposes, and is liberally supplied with the larva in all stages of growth. I have but one or two heavy grievances to lay to their charge, one of which I feel pretty deeply and severely. I had long noticed, after planting out young evergreens in nursery rows in the spring, particularly seedlings of spruce, hemlock, and fir, that occasionally several of them just after commenci g

their growth would suddenly wilt and at once give up ; and this Spring this occurred more extensively than ever. I was in difficulty and could not decipher the cause, as my land I knew was good and well adapted to their successful growth. Upon pulling them up, however, I found that every particle of fibrous root was entirely gnawed off; and besides this, the bark was taken off almost up to the collar, and the tough naked woody branches of the roots only left. This last season I lost whole rows in this way, and, on closely investigating the case, I am pretty well satisfied that the larvæ of the May Beetle are chargeable with the whole trouble ; and worse, I know of no remedy! The other charges are, eating the roots entirely off from several of our strawberry plants, and also eating large and injurious holes in our potatoes, &c., &c.

The Hawk Moth, or *Sphinges*

are growing annually more numerous, but we have no very grievous complaints to make against the fine and handsome larvae of these beautiful moths. Occasionally, however, the foliage suddenly disappears from some branch of our apple trees or our cherry trees, or it may be from our grapes or our potatoes, or perhaps from the tomato vines, and we know from the character and the abundance of the surrounding droppings that one or more of these diligent creatures has been at work. These ravages, however, are not burdensome, and then we readily bear with much from them solely on account of the magnificence and grandeur of their characteristic appearance. About the second and third weeks in October last there were a number of fine larvæ discovered among the grass and late-growing green plants in this place. They were about two and a half or three inches in length, fine green colour, mixed and striped with yellow ; had the characteristic horn on the last segment, and would curl up as a crescent on being disturbed. I could not determine it, but I have reason to believe it was one of the sphinges.

Cut Worms.

With these I sometimes conclude that the very earth is infested, so great are their numbers and so active their operations. There are evidently many species of them, but the worst and by far the most dreaded is the sneaking thief that cuts our cabbage and tomato plants after they have commenced to grow so finely.

Agrostis Devastator

of Harris, and very correctly labelled. These are the most insidious in their attacks, and the most annoying in their devastations, apparently, of any of our garden enemies, and we seem powerless in our defences. They are the most industrious while we are asleep, and like many another dastardly thief hide as soon as the light appears. Our remedies are, vigilant searching for them and destroying them by hand.

The Potato Beetle *(Doryphora decemlineata).*

No longer maintains the destructive character which it brought with it at the first, nor are our people so alarmed and troubled by its presence ; it has become now a familiar matter-of-course arrangement. Although yet pretty numerous, it affects only the careless and the indolent ; the industrious and the ingenious not only baffle their efforts, but to a very large extent render them harmless. It is now well ascertained by our potato raisers that the first broods are comparatively light, and that the insects best efforts are not made until mid-summer and after, so by planting largely or altogether early maturing varieties, and these placed in the ground as early as possible to get their tops and their tubers ripe before the second brood appears, all danger is out of the way. The beetle is perfectly baffled by this arrangement, and it goes wandering about over the fences and on the streets and roads seeking green fields where to pasture, and to deposit its myriads of eggs. This season the crop of potatoes,

at least in this section, has been most abundant and of great excellence, the variety mostly *Early Rose*, the best potato that was ever given to the American people. Our remedies for the beetle were hand picking ; and occasionally a dose of Paris Green applied as a liquid.

THE GRAPE VINE BEETLE *(Pelidnota Punctata*, see fig. 31.)

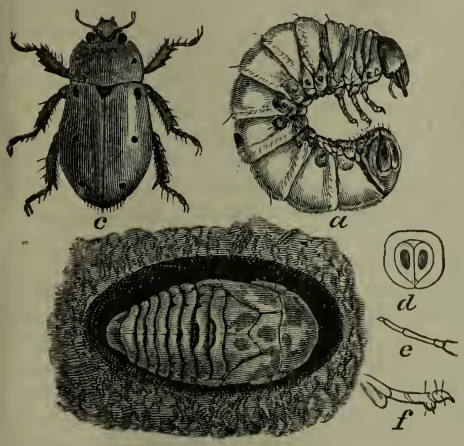


Fig. 31.

Seems very fond of harboring about our grape vines, and has this season been pretty plentiful, but we fail to observe that its presence is an alarming evil or that its injuries are very distinctly marked. It rather appears a sort of harmless case, a pretty creature, whose only office is to vary and beautify nature. But these remarks are not in the least applicable to THE GRAPE VINE FLEA BEETLE, Fig. 32 larva; Fig. 33 the perfect beetle *(Haltica Chalybea)*, whose numbers in the spring are rather alarming. This insidious, heartless little arch rogue attempts to baffle and frustrate our plans in the very start. This it does by boring into the swelling bud and totally destroying its promising contents, and thus by one effort he flattens our sanguine hopes by taking the entire product of the bud, leaf, cane, fruit and all. We this year hired our children to capture them on the vines as they were at work, which they readily, cheerfully and effectually did. In this way their efforts were greatly lessened. It is becoming more and more evident that we also in this country may yet have trouble from THE GRAPE VINE PHYLLOXERA *(Phylloxera Vastatrix)*. I have already seen specimens of it, and it is my most decided opinion that unless some effectual remedy is found, our grape vines will be found to suffer much from the injurious effects of this tiny insects, upon their leaves and especially their roots. Grape growers should seriously study this subject at once ; for should the evil become established upon their vines, it would at length be very difficult to eradicate. For description and very full particulars, see Rev. Mr. Bethune's very able and instructive article on the subject in the Society's Report for the year 1874.

Fig. 33, the perfect beetle.

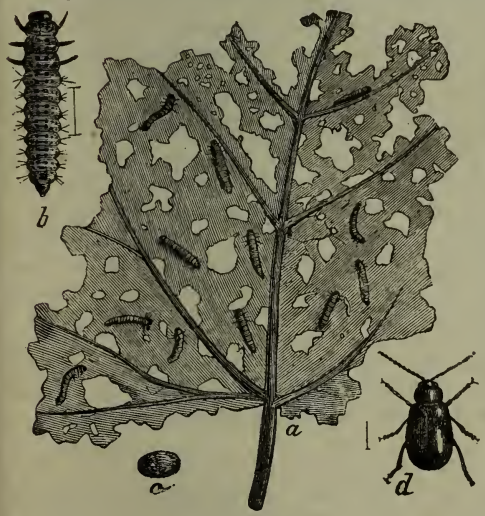


Fig. 32, larva.

PLANT LICE (*Aphididae, Fam. Eriosoma*), particularly. Although aphidians in great numbers and different species feed very heavily upon the leaves of our Cherry, Pear, Apple and other trees, yet this white woolly aphis feeding in immense numbers on the stems and shoots of our young apple trees seem to be the most injurious, and should be looked after most vigilantly. They differ from most insects in one particular, viz.: they attach themselves to a certain spot or spots on the trees, and without locomotion attract their food to them! An opening is made in the bark of the tree which bleeds freely for their support. And the accumulation of unused or unsuited matter forms excresences about the place. It seems to me they pump very heavily on the vitality of the tree, especially in its young and tender years ; and should be kept off by means of oil applications, or destroyed by the hand rubbing them from the spot and crushing them.

THE APPLE FRUIT MOTH.—(*Carpocapsa pomonella*).

commonly called codling moth. (See Fig. 34). As usual, has been very dilligent this season, and wherever there was fruit upon which to feed, it has shown that this fruit was not overlooked. An account of the general and almost unparalleled scarcity of the fruit, however, this season, it is confidently hoped that they have not propagated to any great extent, and that a comparative immunity from their ravages may be expected in the future. The apple-grower must ever be industrious, and at all times on the watch, never forgetting that "*eternal vigilance is the price of fruit.*" This advice also holds good in the case of plums, for THE PLUM CURCULIO (*Conotrachelus Nenuphar*, see Fig. 35), has had much better accommodation for rapid propagation than that of the apple moth. The plum crop in some sections was very abundant and good; but in others it was totally destroyed by the workings of this industrious and active beetle. I noticed also that the little Turk, as it has appropriately been called, would not scruple to attack our peaches, in case a scarcity of plums occurred, and that in this way the the peach crop this season suffered very severely.

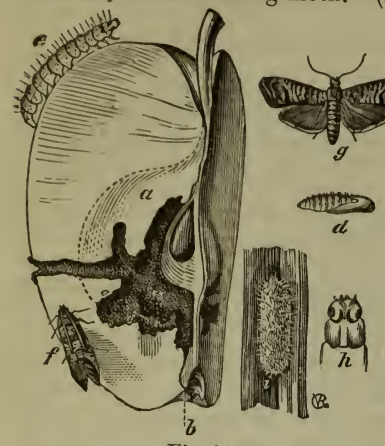


Fig. 34.

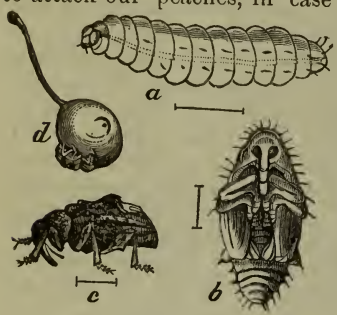


Fig. 35.

THE CABBAGE WORM (*Pieris rapae*), has this season been at work in full force, and has been very generally and extensively disastrous to our cabbages. They are very troublesome, especially to market gardeners, and where remedies were not used, the cabbages were totally destroyed. The parent of this larva seems to have no definite conception of the nature and severity of the changes of our climate, and in this respect it shows its foreign origin, as in any fine day in October she may be seen busily flitting about over the cabbages, &c., apparently eager in the business of depositing her eggs; and the young larva may be seen thus late in the season in all stages of development, regardless of the severe and destructive changes that are at hand. A sharp Canadian frost comes as it did this year, Nov. 9, and lays the whole brood motionless on the ground. Nevertheless there may be some danger of protecting these late worms in our cellars and cabbage pits, where the crop has been early stored away; and so the conditions for future broods may thus be secured. But perhaps there is little need of concern on this point, as insect nature has usually been found to carefully and effectually provide for itself.

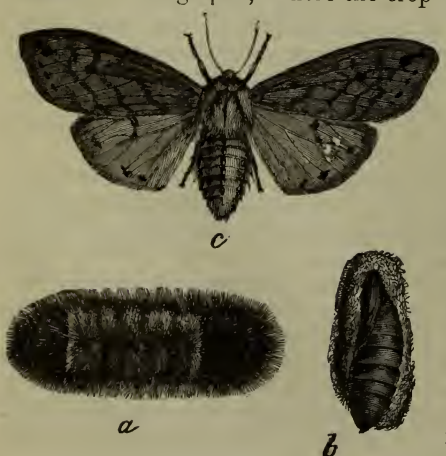


Fig. 36.

THE ISABELLA TIGER MOTH.—(*Arctia Isabella*. See Fig. 36 for representation of this insect in its various stages).—As usual, has an abundance of her hairy larva abroad this fall. But as these hairy caterpillars are not known to be very seriously injurious to vegetation, and so scarcely come under our caption. I therefore pass them gently by. I have thus hastily glanced at some of the most common and prominently destructive insects that have come forcibly before my notice this season. I regret, however, my utter inability to treat the subject more thoroughly, and to better advantage.

The following details were got up for one of our weekly newspapers this summer, and entitled,

AN INSECT REGISTER FOR 1877.

May 10th.—Tent caterpillars first hatched out.
May 25th.—Gooseberry worms began actively to work into the young fruit.
May 30th.—Forest tent caterpillars began to leave the woods in great numbers.
June 1st.—The currant worms began to work on the leaves, but apparently were not so numerous as formerly.
June 18th.—Potato beetle larvae began to hatch out, but not so numerous as in former years.
June 20th.—Gooseberry worms leave the bushes, and retire into the ground to change. Also cut worms are not so numerous or destructive as in former years.
June 21st.—Tent caterpillars began to spin cocoons and retire to change.
June 25th.—The plum weevils very numerous, and have destroyed many of our plums and peaches. Also the apple fruit worm, or codling moth, larva not much to do this season—*no apples.*
" —Canker worms, measuring worms, and other larvae of various insects are very plentiful this season, and we are suffering much from their depredations.
June 27th.—Not many tent caterpillars now abroad.
June 28th.—First swarm of bees this season.
June 30th.—First newly-made tent caterplllar's cluster of eggs. Moths perfected.
" —The currant worm moth still propagating, and young hatching out.
July 2nd.—Pea beetle began to deposit eggs in young peas.
Oct. 12th.—The cabbage worm butterfly still depositing her eggs, and the young larva still hatching out.
Nov. 9th.—Hard frost, completely stopped the cabbage worm from further increase.
Nov. 12th.—Canker worm moths very thickly on the wing, their females clustering on the branches of the trees.
Nov. 29th.—Musquitoes, black flies, and most of the insect world silently nested away for this season.

Arkona Nurseries, November, 20th, 1877.

ON GRAPE VINE GALLS.

COMPILED BY JOSEPH WILLIAMS, LONDON, ONTARIO.

THE GRAPE-VINE APPLE GALL. (*Vitis pomum*) WALSH & RILEY, ORDER, *Diptera* FAMILY, *Cecidomyidæ*.

The following discriptions have been compiled from the valuable reports of Prof. C. V. Riley, St. Louis, Mo.

Besides the leaf-gall caused by the Grape Phylloxera, the Grape Vine is subject to various other gall-growths or excrescences, the nature of which often puzzles the vine grower. I shall give an account of four of the most conspicuous which are found in Missouri. They are all caused by Gall gnats (*Ceoidomyidæ*), the larvæ of which are distinguished by being of an orange-colour ; but more especially by having on the upper surface, near the head, a horny process known as a breast-bone.* This process is variable in shape, but more often clove-shaped, Y-shaped, or oar-shaped. It always has a stem, which is mostly hidden, and terminates in two projections or prongs (sometimes three in those which are oar-shaped), which are armed with sharp points. It is retractile, and the prongs may be exerted at will, and are doubtless intended to assist in abrading the tissues of plants, so as to cause an abnormal flow of sap, which serves as food for the larvæ. That they have little, if anything, to do in causing the gall growth, we may infer from analogy, and from the fact that many Cecidomyidous galls are formed before the larvæ hatches, and depend on something deposited with the egg. The perfect flies are of a dull black colour, like that represented at figure 37, (*a* female, *b*, antennæ of male), aud many species so closely resemble each other, that it is next to impossible to distinguish them when dry. Those which produce the galls here mentioned, are difficult to rear, and with one exception not yet known.

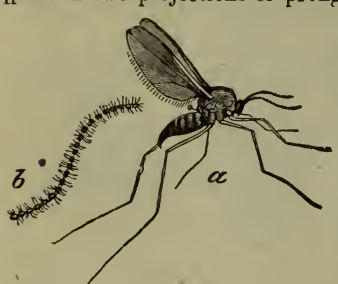


Fig. 37.

The Grape-Vine Apple-gall has been a fruitful source of speculation, and has given rise to some curious botanical theories, as the following extract will attest :

AN APPLE GROWING ON A GRAPE-VINE.

A Vegetable Phenomenon.—In the garden of Capt. David E. Moore, Lexington, Va., there is growing on a grape vine, a fully developed apple. On one side of the apple is an appearance of what might have been a grape-bloom. This interesting *lusus naturæ* is, as far as we know, without precedent, and of course has attracted marked attention, and caused no little speculation in the circle learned in such matters about Lexington. The prevailing opinion, we learn, is that an apple-bloom falling accidently upon a grape-bloom, became incorporated with it and produced the result ; but, if so, is it not singular that such an accident has never occurred before ? And, if so, again, does it not teach that the grape and apple may be grafted on each other ? We hope the pomologists of Lexington will note very

* This process is said by all authors with whom I am acquainted, including Baron Osten Sacken, to be neutral, for which reason I suppose, it has been called the "breast-bone." I believe myself that it is dorsal. As, however, it sometimes has a good deal the form of the breast-bone, or "wish-bone" of a fowl, the term may be retained, though conveying a wrong idea. The larvæ are also said to differ from all other insect larvæ in having fourteen joints. I have examined a great number of Cecidomyidous larvæ without being able to make out any such abnormal number, while in many species it is difficult to detect more than twelve and a subjoint. Usually, I have been able to clearly make out thirteen joints and a subjoint, which is,the normal number in insects. (*Rules.*)

carefully all the phenomena of this freak of nature, and that they will have the apple photographed, with a portion of the vine, before its removal, for engraving and publication in Horticultural journals.—*Richmond Whig.*

When growing on vines in the vicinity of hickory trees, it has ridiculously been considered a hybrid fruit between these two very widely separated plants.

The form of the gall is variable—sometimes being quite flattened or depressed, but more often spherical, or flattened at base and more pointed at tip. When young it is downy on the outside, and succulent, with a pleasant aciduloous flavour. When mature, it usually has eight or nine longitudinal lobes, as in a musk-melon, and is smoother (Fig. 38 *a*). A transverse section (*b*) shows it to consist of a fleshy outside covering, like the hull of a walnut, and of a much harder, woody interior, with numerous longitudinal two-tiered cells or cavities, the upper tier twice as long and more regularly separated by harder fibre than the lower. The yellow larvæ are found in these cavities, and they have a brown clove-shaped breast bone. This gall which bears so great a semblance to a fruit, doubtless carries the semblanc still further by falling to the ground. And, as the seed is released upon the death of the fruit which surrounded it, and consigned to the bosom of the great mother earth for development, so the larvæ escape from the decomposing and softening gall to consign themselves likewise to the same great nursery, which seems to be absolutely necessary for their well being and growth, as I have kept the galls for over a year out of earth and away from her fecund influences without getting the perfect gnats.

Fig. 38

This gall was first described in the *American Entomologist*, (vol. 1, p. 106.)

THE GRAPE-VINE FILBERT-GALL, (*Vitis coryloides*) W. & R.

(Order, *Diptera;* Family, *Cecidomyidae.*)

This gall (Fig, 39 *b*), as its name implies, bears some resemblance to a large bunch of filberts or hazel-nuts. It is found more frequently than the other, and especially on the River Bank grape (*Riparia*), in the month of July. It is an assemblage of separate galls, more or less coalescent, varying in number from ten to forty or more, and of different shapes, being either round, irregularly oval, fusiform or pyriform, but generally narrowing at the tip. When young, these galls are densely pubescent or woolly on the outside, but less so when mature. The interior is fleshy, juicy, sub-acid, and a tranverse section shews a single longitudinal cell in each (Fig. 39 *c*). The gall is evidently a deformation of a bud, as it springs from a single point where a bud would be, and often has quite a stem to it. A stunted deformed leaf is also sometimes found upon it, as given in the figure.

The larva is orange-yellow, partly transparent, partly opaque, and has the breast-bone clove-shaped, as in the preceding (Fig. 39 *a*), first described in *Am. Entomologist*, (l. p. 107).

Fig. 39,

The Grapevine Tomato-Gall, (*Vitis tomatos.*)

(*Made by Lasioptera vibis O. S.*)

(Order, *Diptera*, Family, *Cecidomyidae.*)

Fig. 40.

The following clipping will show that this gall, which is quite common on the River Bank grape and its cultivated varieties, has not remained unnoticed by the curious, and that it has, like the others, its fruit resemblances.

Freak in a Vineyard.— In gathering grapes to-day we found one of the clusters in shape a *perfect tomato.* It is of quite large size, and on the outside is divided into eight segments or lobes, having a seed to correspond with each segment or lobe. It was found on a cluster of one of Rogers' Hybrids, and a peculiarity is, that the grape is *blue*, while this is *red.* In flesh and seeds and all else it is a perfect grape. President Wilder's Trophy tomato stands about three rods from the vine. I call upon President Wilder to explain with what sort of propagating qualities he has invested his Trophy tomato, to know, if we continue the cultivation of that fruit, whether our apples, plums, cherries, etc., will or will not turn into Trophy tomatoes. I have saved the eight seeds for the further solution of the problem. If President Wilder declines an explanation for *fear of the consequences*, I call upon all the horticulturists of America to commence at once an investigation and I will furnish them with the *hide*, which I have carefully preserved as a testimony against him.— *Rural New Yorker.*

R. L. Dorr.

Dansville, Livigston County, N.Y. Oct. 6th, 1872.

It is the most variable gall with which I am acquainted, as it may be found of all sorts of fantastic shapes, from the single, round cranberry-like swelling on a tendril to the large collection of irregular bulbous swellings on the stem or leaf-stalk; sometimes looking not unlike a bunch of currants or a bunch of grapes, but more often like a bunch of diminutive tomatoes, such as the Cluster Tomato, grown by Mr. J. C. Ingham, of St. Joseph, Michigan. It was first briefly described together with the fly which produces it, by Baron Osten Sacken (Diptera of N. A., part I. pp. 201–2). The substance of the gall is soft, juicy and translucent, the flavour pleasantly acid, and the colour yellowish-green, with rosy cheeks, or else entirely red. Each swelling has several cells (Fig 40*a*) in each of which is nursed an orange-yellow larva, which, upon the dissolution of the gall, enters the ground to transform, and emerge a pale reddish gnat with a black head and antennæ and gray wings.

This gall-maker is subject to the attacks of at least two different enemies—one a species of *Thrips*, which invades the cell and destroys its inmate, and one a true Hymenopterous parasite, belonging apparently to the family *Proctotrupidæ*, and which after killing the gall-maker, spins a cocoon within the cell.

THE GRAPE LEAF TRUMPET-GALL—(*Vitis viticola O. S.*)—*Order Diptera. Family Cecidomyidæ.*

This is another, more regular gall, made by a gall-gnat which has not yet been described. is elongate, conical, and grows more or less numerously from the surface of the leaf, looking something like a small trumpet. (Fig. 41) I have found it on both wild *Cordifolia* and *Riparia*, and it doubtless occurs on their cultivated varieties. It is also found on *Labrusca* and *Vulpina*. (See A. E., II. p. 28.) The usual colour is a bright crimson, but it sometimes inclines to green; especially when young or on the under side of the leaf; for though it is more often found on the upper side, I have met with it antiposed. Upon cutting into these galls, we shall find them to be hollow, and each to contain a pale orange larva, which probably resembles those already mentioned in transforming under ground. The gall was at first briefly described by Baron Osten Sacken (Diptera of N. A., part I., p. 202). Similar but distinct galls grow on the leaves of Hickory and Hackberry, but are always green.

Fig. 41.

DRAGON FLIES.

By Joseph Williams, London, Ontario.

In the months of July and August there are few insects more abundant than the Dragon flies, and none which attract more attention from even the most indifferent observer, and a description of the more common kinds and some account of their habits may not be uninteresting. For the following account we are largely indebted to the graphic description of A. S. Packard, Jun., in our "Common Insects."

In various countries these insects have received various popular names—the French call them Demoiselles; the Germans, Florfliegen or Gauze-flies, or Wasserjungfern or Virgins of of the Water; while the English style the Dragon flies, Horse-stingers, or Devil's Darning-needles. The English terms, although less poetical than those of our European friends, are, we believe, more appropriate to the private character of these insects.

The accompanying illustration of one of our most common species (*Libellula trimaculata*), Fig. 42, will give an idea of the appearance of these insects. Of the general character of the group Packard says:—"Were we to select from among the insects a type of all that is savage, relentless, and bloodthirsty, the Dragon fly would be our choice. From the moment of its birth until its death, usually a twelvemonth, it riots in bloodshed and carnage. Living beneath the waters, perhaps eleven months of its life, in the larva and pupa states, it is literally a walking pitfall for luckless aquatic insects; but when transformed into a fly, ever on the wing in pursuit of its prey, it throws off all concealment, and reveals the more unblushingly its rapacious character.

Fig. 42.

"Not only does its horrid visage and ferocious bearing frighten children, who call it the 'Devil's Darning-needle,' but it even distresses older persons, so that its name has become a by-word. Could we understand the language of insects, what tales of horror would be revealed! What traditions, sagas, fables, and myths must adorn the annals of animal life regarding this dragon among insects!

"To man, however, aside from its bad name and its repulsive aspect, which its gay trappings do not conceal, its whole life is beneficent. It is a scavenger, being like that class ugly and repulsive, and holding literally, among insects, the lowest rank in society. In the waters it preys upon young mosquitoes and the larva of other noxious insects. It thus aids in maintaining the balance of life, and cleanses the swamps of miasmata, thus purifying the air we breathe. During its existence of three or four weeks above the waters, its whole life is a continued good to man. It hawks over pools and fields and through gardens, decimating swarms of mosquitoes, flies, gnats, and other baneful insects. It is a true Malthus' delight, and following that sanguinary philosopher, we may believe that our Dragon fly is an entomological Tamerlane or Napoleon sent into the world by a kind Providence to prevent too close a jostling among the myriads of insect life.

"We will then conquer our repugnance to its ugly looks and savage mien, and contemplate the hideous monstrosity—as it is useless to deny that it combines the graces of the Hunchback of Notre Dame and Dickens' Quilp, with certain features of its own—for the good it does in Nature.

"Even among insects, a class replete with forms the very incarnation of ugliness and the perfection of all that is hideous in nature, our Dragon fly is most conspicuous. Look at its enormous head, with its beetling brows, retreating face, and heavy under-jaws—all eyes and teeth—and hung so loosely on its short weak neck, sunk beneath its enormous hunch-

back—for it is wofully round-shouldered—while its long, thin legs, shrunken as if from disease, are drawn up beneath its breast, and what a hobgoblin it is!

"Its gleaming wings are, however, beautiful objects. They form a broad expanse of delicate parchment-like membrane drawn over an intricate network of veins. Though the body is bulky, it is light, and easily sustained by the wings. The long-tail undoubtedly acts as a rudder to steady its flight."

While we do not hold the Dragon fly to be the "very incarnation of ugliness and the perfection of all that is hideous," as does the author above-named we do not believe its benefits to man have been exaggerated. The rapid flight and enormous range of vision of these creatures enable them to capture other insects with ease; while, their taste not being limited, they destroy moths, butterflies, and other insects without compunction, and they have been known to destroy and eat each other as well as very small fishes. However, it is this ravenous propensity which makes this insect so valuable to man, as they destroy immense numbers of other insects which are injurious to vegetable and other products, while they do not injure these substances themselves. A few of them shut in a house will soon rid it of flies, bugs, and mosquitoes, and therefore their presence should be welcomed. The popular opinion that they are dangerous to man is without foundation, as they can neither bite, sting or poison him.

We may now consider the development of *Libellula trimaculata*, previously figured, as it furnishes some curious and interesting information, and may be taken as representing that of the group.

When the female is about to deposit her eggs, she attaches herself to some plant growing out of the water, and pushing her abdomen beneath the surface, glues a bunch of eggs to the submerged stem or leaf (Uhler). These eggs produce larvæ which have a distant and ugly resemblance to the perfect insect. The larva is active and passes its existence in the water, feeding on numerous weaker insects. It possesses a curious syringe-like apparatus situated in the end of the body, by which it discharges a stream of water for a distance of two or three inches behind it, thereby propelling the insect forward. The motion thus given is most irregular and appears to be beyond the control of the larva. This curious arrangement serves for respiration as well as locomotion.

The larva soon reaches the pupa state (corresponding to the chrysalis state of a butterfly), in which it is also active, crawling over the bottom of the stream preying on other insects. In this state it is longer than the larva and still more resembles the perfect insect. When about to become a perfect insect, the pupa climbs up some suitable plant near the surface of the water, and attaching itself firmly awaits the last great change. In a short time the skin opens down the back and the adult Dragon fly, by bending backwards and forwards for some time, emerges. It only requires to remain a few hours, until its wings attain their full size and hardness, when it starts off on a life-long expedition of plunder.

Fig. 43.

In Fig. 43 we have a representation of three stages in the life of a foreign *Libellula*. The figure on the left shows the larva using its *mask* to capture prey; the figure on the right represents the perfect insect in the act of emerging from the pupa case.

The full-grown *Libellula* may be described as follows:—The body is much elongated and cylindrical, and attains a length of two inches, in average specimens. The head is large and bears two very large and prominent compound eyes. These eyes which consist of many thousand facettes each, are so large that they meet on the upper surface of the head. This great power of vision

is still increased by three simple eyes, or ocelli, situated on the upper surface of the head. From the front part of the head project two short tapering antennæ. The mouth occupies the front surface of the head, and is a most formidable structure. The upper lip is broad and conceals very powerful toothed organs, called mandibles; the other organs of the mouth are also armed with strong teeth which enable the creature to satisfy its carnivorous desires. The most remarkable portion of the mouth, however, is the lower lip, a large, flat, lobed organ, closing the mouth from the under side, and which may be projected forward to a comparatively great distance when attacking other insects.

The thorax, or middle portion of the body, is three or four times as long as the head, and very much greater in diameter. It resembles the head in colour, being of a medium chocolate shade, and is sparsely clothed with very short hairs of the same hue.

The abdomen, or posterior part of *L. trimaculata* tapers very gradually to the end, and is much smaller than the thorax in diameter, but more than twice its length. The colour is slightly paler, and is relieved by a line of yellowish blotches along each side, which gradually becomes smaller in size toward the end of the body. The upper surface is arched, while the under is flattened.

The legs are six in number, and are attached three to each side of the lower surface of the thorax.

The wings, which are four in number, are attached two to each side of the upper part of the thorax, and are about one and a quarter inches long, and three-eighths to nearly half an inch in breadth; the front ones being slightly the narrowest. The substance of the wings is a very delicate network covered by a thin transparent membrane, having a shining surface. From the place of attachment of each wing, there proceeds a narrow elongated patch of a deep brown colour, while from about the middle of the wings there is a large irregular patch of the same colour, which extends completely across. The structure of the wings combines great strength with lightness, thereby enabling the insect to fly with very great rapidity. Their shining surface, transparency and brilliant colouring in this and other members of the same order, combine to give them a beautiful appearance when flying in the bright sunshine, and evidently suggested the popular names given to them by the French and Germans.

Fig. 44.

There are several other members of the same group which are more or less common in various parts of the country.

Libellula quadrimaculata, the four-spotted Dragon fly, (Fig. 44.) is seen on the wing in June, flying through dry pine woods far from any standing water.

Another very common Dragon-fly is the ruby Dragon-fly *Diplax rubicundula*, which is yellowish red.

Fig. 45.

Fig. 46.

Fig. 47.

Another common form is *Diplax berenice*, (Fig. 45, male; Fig. 46, female). The accompanying cut (Fig. 47.) represents the larva, probably of this species, according to Mr. Uhler. It is black, the head blue in front, spotted with yellow, while the thorax and abdomen are striped with yellow. There are fewer stripes on the body of the male, which has only four large yellow spots on each side of the abdomen.

Still another specimen is *Diplax Elisa*. It is black, with the head yellowish and with greenish yellow spots on the sides of the thorax and base of the abdomen. There are three dusky spots on the front edge of each wing, and a large cloud at the base of the hind pair towards the hind angles of the wing.

Rather a rare form, and of much smaller stature is the *Nannophya bella*, (Fig. 48.) It was first detected in Baltimore, and was afterwards found unfrequently by a pond in Maine. Its abdomen is unusually short, and the reticulations of the wings are large and simple. The female is black, while the male is frosted over with a whitish powder.

Fig. 48.

In the allied genus *Agrionina*, there are many interesting insects; we give an illustration in fig. 49. of one of the most common, *Agrion saucium*. This insect is smaller in size than those we have previously mentioned.

Fig. 49.

Although in this country we rarely see Dragon-flies gathered in large numbers at one time, yet it is known that in some countries they not unfrequently form immense swarms. In Kirby and Spence's Entomology we find the following:—"Meinecken tells us, that he once saw in a Village in Anhalt, on a clear day, about four in the afternoon, such a cloud of Dragon-flies (*Libellulina*) as almost concealed the sun, and not a little alarmed were the villagers, under the idea they were locusts; several instances are given by Rosel, of similar clouds of these insects having been seen in Silesia and other districts; and Mr. Woolnough, of Hollesley in Suffolk, a most attentive observer of nature, once witnessed such an army of the smaller dragon-flies, (*Agrion*) flying inland from the sea, as to cast a slight shadow over a field of four acres, as they passed.

A migration of Dragon-flies was witnessed at Weimar, in Germany, in 1816, and one far more considerable, perhaps the greatest on record, May 30th and 31st, 1839, when cloud-like swarms of these insects, chiefly (*Libellula depressa*) were seen at Weimar, Eisenach, Leipsig, Halle and Gottingen, and the intervening country, extending over a large district."

Although so well known in the adult or perfect state, comparatively little is known of the transformations of Dragon-flies. They may be easily kept in aquaria where their various changes may be watched, and any one who can spend the necessary time and patience in rearing them, so as to trace up the different stages from the larva to the adult fly, and describe and figure them accurately, will do good service to science (Packard).

The graceful appearance of these insects has not escaped the notice of poets, for Moore alludes to them as "the beautiful blue damsel flies," while Tennyson, in his poem of the "Two Voices," gives the following description:—

To-day I saw the Dragon-fly
Come from the wells where he did lie.
An inner impulse rent the veil
Of his old husk: from head to tail
Came out clear plates of sapphire mail.

He dried his wings: like gauze they grew;
Through crofts and pastures wet with dew
A living flash of light he flew.

THE HESSIAN FLY.

(*Cecidomyia destructor Say.—Diptera : Tipulidæ.*

By the Rev. C. J. S. Bethune, M.A.

For many years this Province has happily been almost entirely free from the ravages of the Hessian Fly. During the present year (1877) however, this very destructive insect has again appeared in the wheat-fields, and is attracting much attention from farmers and others specially interested in the culture of this most important cereal. As far as we have been able to obtain information the Hessian fly has been recently observed in the counties of Grey, Simcoe, York and Ontario, and also in the County of Oxford. No doubt, if not checked, it will soon spread over a much wider area, and cause much loss and disappointment to our wheat-growers.

The subject being one of so great importance, it has been considered advisable to reproduce here our Report upon this insect, published six years ago (*Report of the Entomological Society of Ontario*, 1871, pages 392-5).

The Hessian fly, together with a number of other most destructive insects, has come to us from the other side of the Atlantic. European entomologists have repeatedly maintained that it must be a native of America, as no such insect was observed amongst their wheat-fields during a long series of years ; and Mr. Curtis has even gone so far as to call it "the *American* wheat-midge," in contradistinction to what he terms "the *British* wheat-midge" (*C. tritici*). It is now, however, generally admitted that it is of European origin, and it is almost certain that it was first brought to this continent in some straw used for the purpose of packing by the Hessian troops, under Sir William Howe, during the American War of Independence. These soldiers landed on Staten Island, and on the west end of Long Island, in the year 1776, and in this neighbourhood the fly was first observed; hence it obtained its popular name of "Hessian Fly." Having multiplied in these places—as Dr. Harris relates—"the insects gradually spread over the southern part of New York and Connecticut, and continued to proceed inland at the rate of fifteen or twenty miles a year. They reached Saratoga (two hundred miles from their original station) in 1789." Proceeding in this manner, the tiny pest gradually spread over the country, and has been found in almost every locality where wheat is grown. In the old world also, its depredations have been sufficiently great to attract notice in England, France, Germany, Austria, Switzerland, Italy, Russia,—in fact in almost every country where this grain is cultivated to any extent. Our own Dominion, though frightfully devastated in subsequent years, was not invaded by the pest till about the year 1816, when it became prevalent in Lower Canada. It appears to have been first noticed in this Province in the year 1846. (For a detailed history of its progress in this country and the neighbouring States down to the year 1854, see Prof. Hind's Essay, pp. 42–46.)

So much has been said and written respecting the Hessian fly, and so many descriptions of it have appeared in agricultural and scientific publications, that we feel disinclined to attempt any new account of it or repeat once more "an oft told tale." As we have no new light to throw upon the subject, and, with the exception of some specimens received from Ancaster during the past summer, have had no opportunity for some years of investigating its habits, we shall not hesitate to make free use of the writings of others, especially those which are not likely to be accessible to the majority of our readers. In every case we shall, of course, make due acknowledgement of the source from which information is derived.

The Hessian fly, though known for its destructive qualities for some time before, was first scientifically described by Mr. Say—one of the most eminent of the early American

Entomologists—under the name of the Destructive Midge (*Cecidomyia destructor*). "This insect—Dr. Fitch relates—as a general rule passes through two generations annually. The first of these occupy the autumn, winter and fore part of spring, and is reared at the roots of the young grain slightly under the ground. The second occupies the remainder of the spring and summer, and is nurtured in the lower joints of the straw. The time when its several changes occur, however, is not perfectly uniform, being varied by the climate, the state of the weather and perhaps other contingencies, and it is not improbable that individual specimens, placed in circumstances unfavourable to their developement, in some instances have their growth so much retarded as to require even a whole year to complete their metamorphoses. In the ordinary course of nature, therefore, our crops of winter wheat are liable to two attacks of the Hessian fly, one generation reared at its roots produeing another which occupies the lower joints of the stalks. Thus the larvæ and pupæ are present in it almost continually, from the time the tender young blades appear above the ground in autumn till the grain ripens and is harvested the next summer. Our spring wheat, on the other hand, can rear but one brood of these insects; they consequently resort to it but little if at all. Nor can the Hessian fly sustain itself except in districts where winter wheat is cultivated, in which to nestle during the autumn and winter."

The eggs of the autumn generation are deposited by the female fly generally early in September, in the young fall wheat, in a crease of the leaf. Twenty or thirty eggs are laid on a single leaf, and these hatch out in about four days if the weather be warm. Mr. Tilghman, of Maryland, has published in *The Cultivator*, of May, 1841, the following minute and interesting account of the mode in which the eggs are laid: "By the second week of October, the first sown wheat being well up, and having generally put forth its second and third blades, I resorted to my field on a fine warm forenoon to endeavour to satisfy myself by ocular demonstration whether the fly did deposit the egg on the blades of the growing plant. Selecting a favourable spot to make my observation, I placed myself in a reclining position in a furrow, and had been on the watch, but a minute or two before I discovered a number of small, black flies alighting and sitting on the wheat plants around me, and presently one settled on the ridged surface of a blade of a plant, completely within my reach and distinct observation. She immediately began depositing her eggs in the longitudinal cavity between the little ridges of the blade. I could distinctly see the eggs ejected from a kind of tube or sting. After she had deposited eight or ten eggs, I easily caught her upon the blade and wrapped her up in a piece of paper. After that I continued my observations on the flies, caught several similarly occupied, and could see the eggs uniformly placed in the longitudinal cavities of the blades of the wheat, their appearance being that of minute reddish specks." These eggs are computed to be about one-fiftieth part of an inch in length.

When hatched from the egg, the next proceedings of the insect are thus related by Mr. Herrick:—"The little wrinkled maggot or larva creeps out of its delicate membraneous egg skin, crawls down the leaf, enters the sheath, and procceds along the stalk, usually as far as the next joint below. Here it fastens lengthwise, and head downwards, to the tender stalk, and lives upon the sap. It does not gnaw the stalk, nor does it enter the central cavity thereof; but as the larva increases in size, it gradually becomes embedded in the substance of the stalk. After taking its station the larva moves no more, gradually loses its reddish colour and wrinkled appearance, becomes plump and torpid, is at first semi-translucent, and then more and more clouded, with internal white spots; and when near maturity the middle of the intestinal part is of a greenish colour. In five or six weeks (varying with the season) the larva begins to turn brown, and soon becomes of a bright chestnut colour, bearing some resemblance to a flax-seed." Two or three larvæ, thus embedded in a stalk, serves to weaken the plant and causes it to fall down, or to wither and die.

In this condition, the "flax-seed state," as it is usually termed, the insect remains all winter. Regarding the structure and formation of this peculiar appearance there has been much controversy, into which we need not enter here. Suffice it to say, that some have held the opinion that the larva spins its cocoon which bears this form; others, that it is the hardened outer integument of the worm, separated from the insect, which remains within; others again, and notably, the late Mr. Walsh, that the pupal cocoon is exuded from the larva. Whatever may be the process, in this condition it remains till the warm days of spring arrive, when the insect eompletes its pupal state, and finally comes forth as a tiny two-winged fly. (Fig. 50.)

Fig. 50.

"The head, antennæ, and thorax of this fly are black; the hind body is tawny, more or less widely marked with black on each wing, and clothed with fine greyish hairs. The egg-tube of the female is rose-coloured; the wings are blackish, except at the base, where they are tawny, and very narrow,—they are fringed with short hairs and are rounded at the tip; the legs are pale red or brownish, and the feet are black. The body measures about one-tenth of an inch in length, and the wings expand one-quarter of an inch or more. After death the hind body contracts and becomes almost entirely black." (Harris, *Injurious Insects*, p. 570.) The antennæ of the female are about half the length of the body; those of the male three-fourths. The former are composed of sixteen oval joints twice as long as thick, and clothed with a number of hairs; the latter have short, round joints, each with a chord of rather long hairs.

After these flies come forth from the pupa state in the spring they speedily, set to work to lay their eggs on the leaves of the spring wheat, now appearing above the surface of the ground, as well as upon that sown the autumn before. From this batch of eggs another brood is soon hatched, the work of destruction goes on, and late in summer the second generation of flies comes forth. The larvæ of the summer brood are found almost always under the sheath of the leaf just above the first joint; their suction of the juices at that point weakens the stalk so much that a high wind very soon bends it down, and even breaks it off when the straw approaches ripeness. Of course the size and value of the grain is also immensely lessened by the absorption of the sap, which ought to go to filling out the ear. The winter brood attack the young plant lower down, and injure it at the root, frequently killing it outright.

Having now traced the life of the insect from the laying of the eggs in one autumn to the same point in the following year, we may turn our consideration to the remedies for the foe, which, as in the case of the wheat midge above, may be classified as natural and artificial.

Natural Remedies.—Though we are, unhappily, so very deficient in natural checks to the spread of the wheat-midge on this side of the Atlantic, our case is very different as regards the Hessian fly. It is preyed upon and devoured by a number of parasitic insects, whose combined attacks are computed to destroy nine-tenths of every generation of this pernicious foe. Mr. Say described one of the most useful of these parasites under the name of *Ceraphron destructor*. It is a shining black four-winged fly, about one-tenth of an inch in length. "In the month of June, when the maggot of the Hessian fly has taken the form of a flax-seed, the *Ceraphron* pierces it through the sheath of the leaf, and lays an egg in the minute hole thus made. From this egg is hatched a little maggot, which devours the pupa of the Hessian fly, and then changes to a chrysalis within the shell of the latter, through which it finally eats its way, after being transformed to a fly. This last change takes place both in the autumn and in the following spring. Two more parasites, discovered by Mr. Herrick, also destroy the Hessian fly, while it is in the flax-seed or pupa state." (Harris.) A fourth has been found by the same observer to attack the eggs of the enemy. "This egg parasite is a species of *Platygaster*. It is very abundant in the autumn, when it lays its own eggs, four or five together in a single egg of the Hessian fly. This, it appears, does not prevent the latter from hatching, but the maggot of the Hessian fly is unable to go through its transformations and dies after taking the flax-seed form. Meanwhile its intestine foes are hatched, come to their growth, spin themselves little brownish cocoons within the skin of their victims, and in due time are changed to winged insects, and eat their way out."—Harris.

It is owing almost entirely to these minute allies that our crops have been preserved to so great an extent, of late years, from the ravages of the Hessian fly. For a time the pest inflicted great damage, but its enemies soon increased and gathered strength, and have succeeded in keeping it within due bounds. Assuredly, we should feel deeply grateful to the merciful Creator, who has provided such effectual, though apparently insignificant, means to save the fruits of our fields from destruction.

Artificial Remedies.—These are often attempted, but seldom with entirely satisfactory results. The best precaution to take—where the insect has shown itself in numbers and where the wheat-midge is not apprehended—is to sow the next crop of fall wheat as late as can be done with safety in the autumn—about the middle or towards the end of September

This course prevents the parent fly from obtaining any young wheat upon which to lay their eggs, and destroys the prospects of another generation. A fertile, thoroughly-cultivated, and well drained soil is as effectual a means of escaping loss from the attack of this insect as any, probably, that can be mentioned. Benefit may also be derived from the sowing only of an approved flinty-stemmed variety of wheat, which is thus more capable of resisting the fly's attacks upon it. But after all the chief reliance for immunity is to be placed upon the labours of the parasitic insects mentioned above.

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