THE CANADIAN BEE JOURNAL

Vol. 18, No. 10. OCT. 1910 $1.00 Per Annum

A Swarm of Bees without Stings

B patient, B prayerful, B humble, B mild,
B wise as a Solon, B meek as a child,
B studious, B thoughtful, B loving, B kind;
B sure you make matter subservient to mind;
B cautious, B prudent, B trustful, B true,
B courteous to all men, B friendly with few;
B temperate in argument, pleasure and wine,
B careful of conduct, of money and time,
B cheerful, B grateful, B hopeful, B firm,
B peaceful, benevolent, willing to learn;
B courageous, B gentle, B liberal, B just,
B aspiring, B humble, because thou are dust.
B patient, circumspect, sound in the faith,
B active, devoted, B faithful to death,
B honest, B holy, transparent and pure;
B dependent, God-like, and you'll be secure.

REV. JOHN DOOLY.

The Canadian Be

Devoted to the Interes

JAS. J. HURLI

Published mo
The HURLEY PR
Brantford,

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The Canadian Bee Journal

Devoted to the Interests of Bee-Keepers

JAS. J. HURLEY, Editor

Published monthly by
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Brantford, Ont.

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Place of Meeting: Toronto. Hall and dates to be selected by Executive.

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The Canadian Bee Journal

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The Canadian Bee Journal

PUBLISHED MONTHLY

JAS. J. HURLEY, EDITOR, BRANTFORD, ONTARIO, CANADA

Vol. 18, No. 10. OCTOBER, 1910 Whole No. 548

The Albany convention was a great one.

* * *

President York makes an ideal chairman.

* * *

Among the Canadians present Mr. Byer and Mr. McEvoy were the two most popular men in attendace.

* * *

The absence of Editor Hutchinson, through illness was much regretted by all.

* * *

In Mr. N. E. France, the genial General Manager of the National, the Association has a most energetic and indefatigable worker.

* * *

Our thanks are due to Mr. Thorndyke, the genial representative of the A. I. Root Co., of New York, for courtesies received on our visit to that great city, We are pleased to state also that he is a Canadian boy.

* * *

Dr. Miller in Gleanings says: "Wm. McEvoy is asked (Canadian Bee Journal, p. 242,) 'Can combs that have had foulbrood matter in them be made safe to use again?' He replies: 'No, positively, no.' Likely that refers to American foul brood." It does.

* * *

The National Convention at Albany was a pronounced success. We enjoyed it very much. At the close of the convention, in company with Mr. C. H. Webber, of Cincinnati, O., we went on to New York, and had a most enjoyable time. Mr. Webber was a fine companion, and we hope to have the pleasure of meeting him again.

We must beg our readers to overlook the lateness of this issue. Our one week's holidays has upset our usual routine. Also we held the issue a few days to get the programme of the Ontario convention, as this is the last issue before the meeting.

* * *

And now we learn from the Boston Transcript that Prof. H. J. Franklin, who has charge of the cranberry experiment station, at Wareham, Mass., says that bees are absolutely essential to the growing of cranberries. An experiment by which part of the plants were protected against the bees showed little fertilization. Great is the honey bee!

* * *

One of the pleasures of our attendance at the convention was the meeting with Dr. Phillips and Dr. Burton N. Gates. To the latter gentleman our readers are indebted from time to time for translations from foreign bee journals. We were delighted to find both these gentlemen young men. They have bright and useful careers before them. Dr. Phillips has already achieved fame as a bacteriologist.

* * *

We are pleased to announce that Mr. W. J. Brown, after a sojourn in California for about a year, has returned to Ontario. Like Mr. Lang, he has decided that Canada is good enough for him. After spending one season in Southern California he has found that section unequal to Ontario for producing honey. Mr. Brown's address is now Chard, Ont. He expects to meet all his old friends at the Ontario Convention next month.

The Post Office Department of New Zealand provides small mail bags in which to carry queens. They are small, bright, red bags, perforated with half-inch holes bound with brass. These special mail bags are provided on request of the shipper of the queens. This is a splendid idea, and should be brought to the notice of our Postmaster General. In bags of this description queens could be shipped from Canada to New Zealand with a much greater measure of safety.

* * *

A clever New Zealand correspondent writes: "Talking about 'shaking,' I believe the treatment could be applied to the people who keep bees with better effect than it could to the bees themselves." He is right. There are about five thousand bee-keepers in the province of Ontario alone, not to mention the other provinces, and of this number only about one thousand are readers of bee journals. A shaking up is certainly needed.

* * *

"71,000 pounds of honey from 900 colonies, spring count, increased to 1,150 colonies, besides selling a car load of bees to Mr. M. A. Gill last spring"—that's the way a leter ends from E. F. Atwater, of Meridian, Idaho. I tell you such reports as that make me feel good—look as though "something was doing in our line of business."—Editor Hutchinson in Bee-Keepers' Review. A magnificent testimony to the prescience of Mr. Hutchinson in his gospel of "keep more bees." A few examples of this kind will soon demonstrate that bee-keeping is a "business" that will stand up with any other business.

* * *

The Ontario Bee-Keepers' Convention will be held in Toronto next month, November 16th to 18th. We trust that there will be a rousing gathering. All will be pleased to learn that Mr. S. D. House, of Camillus, N.Y., will be in attendance; also Mr. P. G. Clark, of Borodino; Mr. Oscar Dines, Syracuse, president of the New York Bee-Keepers' Association; and also Mr. George B. Horne, of Black River. The presence of these distinguished gentlemen will add much to the success of the convention. Mr. R. B. Ross, of Montreal, promises something interesting in reference to the markets for dark honey in Quebec; Miss Robson, of Ilderton, will discuss, "Can a Woman Run an Apiary."

* * *

Our readers will greatly appreciate the kindness of Mr. John Fixter, of Macdonald College, in replying so fully to the enquiry of Mr. John McEwen, on the question of Sanfoin Clover as a honey-producing plant. His statement is very full and complete. Mr. Fixter has placed the C. B. J. under an obligation for his contribution, for which we wish to express our thanks and hearty appreciation. In order that his statement may achieve the maximum results we would suggest that our readers hand it out to their farming neighbors, and thus instruct those who are supplying the bee pasturage in the cultivation of this valuable variety of clover. It would be a good act also if local papers were asked to published it. Information of this kind is of great value, but will accomplish little unless it reaches the farmer.

* * *

The letter of a New Zealand Reader in this issue will doubtless be read with much interest. It is written by one who knows. This matter of disinfection is a bogey. The McEvoy method without frills is sufficient to remove the disease. We say "remove" because the disease is never "cured." Our British friends have fooled with drugs a long time without result. It must be understood, of course, that we refer to "American" foul brood.

CANADIAN BEE-KEEPERS.

J. L. Byer.

No. 2

Among the younger generation of Canadian bee-keepers, no one is better known or more highly respected than Mr. J. L. Byer. One of the most regular and able contributors to the C B. J., he has earned the respect and gratitude of every one of our readers. His capabilities are widely known on the other side of the boundary and Canadians were pleased when they learned that he had been invited to father the discussion on the subject of "Extracted Honey from Nectar to Market," at this year's National Convention.

Friend Byer is a young man and we are all expecting great things of him. A brief account of the main features of his career should prove of interest to every Canadian bee-keeper. We have read recently several somewhat discouraging statements respecting the prospects Canada offers to would-be bee-keepers. Of course but few will take such statements seriously. None of us regard bee-keeping as a means of getting rich quickly. The real bee-keeper—the genuine article—is an optimist and likewise a philosopher. The chief consideration with him is not how much money there is in bee-keeping, but how much real happiness can be extracted from his profession. Now from this point of view Mr. Byer is a rich man.

Even in the days when he started bee-keeping with an almost depleted exchequer he was a rich man His is the disposition that realizes just how much hard cash is requisite to make a man happy, and he can be happy I believe, without a cent. Cheery, ever willing to help his fellows, simple in his tastes, Mr. Byer is the man to disarm the misanthrope.

Mt. Joy, the village in York County where is the home of our friend, is the seat of a little community of earnest and religious folk, descendants of those grand old patriarchs who, pilgrims from an unkind Fatherland, suffered the persecution which was their making.

All around Mr. Byer's little homestead one sees evidences of the persevering and thoughtful character of the inhabitants of the district in the splendid tillage and heavy crops that are the rule. Mr. Byer was born some 37 years ago, within half a mile of the house in which he is now living, his father being the pastor of the community. He attributes what he refers to as the "lazy streak" in his disposition to the fact that he was compelled by circumstances to commence work at the age of twelve years, and being the eldest of the family, more than the average share of work fell to his lot. He had, however, passed his entrance examinations to the High School when but eleven. For six years after leaving school he worked steadily on the farm, when he took a notion to learn telegraphy with the object of entering upon railroad work later on. It is characteristic of some people with "lazy streaks" to possess also alternating and industrious streaks of a correspondingly violent nature. Young Byer, perhaps something after this manner, pursued his new studies with such vigor that although in six weeks he was a competent telegrapher, yet the strain of the overwork was so great that he was seized by an attack of brain fever. His case for two months was thought to be hopeless. Mr. Byer now regards the illness as one of those providential sign posts pointing out the road to prosperity. Anyhow, on his recovery he lost all desire to follow up his proposed plans of taking up railway employment, and recommenced his old work on the paternal homestead. At the age of 21 he married—and those who are acquainted with Mrs. B. know how singularly fortunate he was in his choice of a wife. He continued to work on the farm until the death of his mother, an event

which resulted in the break up of the home. Possessing practically no capital, he had now to turn round, seeking a means of obtaining a living. The idea of taking up the bee business presented itself to our friend, and Providence happily furnished an acquaintance who had bees to sell and who was willing to wait a year for his money. In addition to tending the bees, which the first season more than paid for themselves. Mr. Byer worked out on neighboring farms. More bees were purchased and in due course he was under no necessity to work away from home any more. From that day to this our friend's affairs have prospered. At the present time he possesses some 360 stocks. Of these about 250 have been purchased at different times. There is a want of uniformity in the patterns of the hives, as will be seen from the photograph illustrating these pages. In the circumstances this could not be avoided, but Mr. Byer has now set out to transfer his stocks gradually into hives of uniform pattern. The hive that obtains the preference in the Mount Joy yards takes a frame of unusually large dimensions. It goes without saying that fine results are obtained. A master of the craft will be successful, we believe, with any type of hive. We should not, however, care to recommend such a large hive to a beginner. It has its advantages, doubtless, and after all, every man must decide for himself which hive he can best work with.

Mr. J. L. Byer at His Yard.

We had the pleasure recently of spending several days at Mount Joy. We visited the three yards which are all situated at convenient distances from the Byer home. The buckwheat was in full bloom, and there was a fair crop of buckwheat honey in the supers. Carnio-

lans are the race chiefly in evidence, although we saw some very fine specimens of Italian queens Mr. Byer imported recently. The stocks showed a quiet temper and but little smoke was necessary for their subduing.

Like the majority, perhaps, of bee-keepers, Mr. Byer, has an able assistant in his wife. Indeed, we doubt whether there is another lady in the world who has wielded the uncapping knife to the same extent as our host's wife. Our photograph of the family, taken under adverse conditions, at half past six on a wet morning, show Mr. and Mrs. Byer with their children.

If we desired to mention an example of the truly successful bee-keeper we should point to the proprietor of the bee-yards at Mount Joy.

W. W

Mr. Byer and Family "At Home."

MISCELLANEOUS

It is estimated that more than a hundred thousand varieties of plants would disappear if bees did not visit them.

* * *

Friend Bullamore, your learned discourse on bee-stings brings to mind many pleasant hours spent together in discussing bee science. We intend to use your "stupefactive-cum-hexamethylene tetramine" passage (B.B.J. p. 368), as a test in orthography the next time we come across a precocious youngster.

* * *

A writer in Gleanings complains that the ordinary ten-frame hive as usually constructed is not wide enough to permit of the proper manipulation of the frames when the latter are coated with propolis

at contact points. If the width of hives be increased by three-eights of an inch, and two slats of wood three-sixteenths of an inch in thickness placed between the two outside frames and the hive walls, the trouble can be avoided. When one of the slats is removed there is sufficient room to loosen the frames.

* * *

Again, the aphis is not the only honey-dew producing insect. As we pointed out in a former issue, there are others. The pear psylla has been very abundant in Ontario this season, and we have repeatedly watched our bees gathering the honey dew.

* * *

We are not aware that anything in the nature of a **"honey-sac quite separate from its ordinary stomach"** has ever been traced in the case of the aphis, nor is it certain that the cornicles are used for the purpose mentioned by D. M. M.

* * *

The American Bee Journal in its current issue again brings up the question of the origin of honey-dew, and quotes D. M. M. We certainly think Editor York is treating the canny Scot somewhat unkindly. We cannot imagine that the latter holds to his original views on the subject. Let us again point out that the characteristic feature of the family of insects to which the aphis belongs is the organ we may term its proboscis, by means of which the tissue of the plant is pierced, and the plant sap sucked up. The aphis is physically incapable of imbibing already exuded plant juice.

* * *

The question as to whether honey-dew is an **excretion** or a **secretion** is of very little importance or interest to the bee-keeper. It has long been established that the fæcal matter of these insects is quite a different substance from honey-dew. There can be but little doubt that the latter is a waste product which it is of vital importance for the insect to rid itself of.

How many Canadian bee-keepers are acquainted with the metal ends devised by that eminent English bee-keeper the late W. Broughton Carr (W.B.C.)? By means of these handy little appliances, frames are spaced with exactness and very little trouble is ever experienced through propolising of the frames.

* * *

Comment has been made on this side respecting the reluctance on the part of some well-known bee-keepers in England to support the proposed Foul Brood legislation movement in that country. It should not be forgotten that in many counties in the Old Country there exists a system of inspection quite as thorough as that which we have in this country. Affiliated to the British Bee-keepers' Association are the County Associations, which appoint qualified experts to visit the apiary of every member, and to report and advise as to brood diseases. If by Act of Parliament this system can be extended and improved, the Old Country will be a long way ahead of us in the matter. We wish the pioneers of the bill every success.

W. W.

BRANT COUNTY BEE-KEEPERS ASSOCIATION

The Brant County Bee-Keepers' Association met recently, President Bayless in the chair. After routine business, Mr. J. W. Clark, of Cainsville, was elected president; Mr. Grieves, vice-president; Mr. W. J. Craig, secretary. It was decided to have a bee-keepers' convention on or about February 1st, date to be announced later. It was also determined to have an open field day on May 24th next at the home of Mr. Shaver, Cainsville. A resolution was passed re the co-operative sale of honey, and one of the delegates to the Ontario Convention next month in Toronto, was instructed to bring the matter before the convention for discussion. It was thought that a definite move in this direction should be made.

"EXTRACTED HONEY—FROM NECTAR TO MARKET."

J. L. Byer, at National Convention.

When receiving the first intimation from our Secretary that I was expected to say something on the above subject at this gathering of bee-keepers, I remarked to a friend that it was an old and very common-place theme—one in which it would be very hard to bring out anything new, particularly so, as nearly every issue of our different bee journals have articles bearing upon this line of thought.

My friend retorted that this was the case with almost any phase of the industry at the present time, and that it was only by "keeping eternally at it," that any advancement would be achieved. With this thought in view, and with little hope of bringing anything new before you, I shall briefly outline a few essentials that I have found by actual experience to be necessary in the production of a good article of extracted honey for table use,—indeed I am quite sure that it will also pay those in the long run, who produce other grades of honey for manufacturing purposes, to also take pains to produce the very best grades that are possible in their location, as from what I can learn, even the manufacturers who require honey, do not, from choice, use the thin, unripened stuff.

If asked to briefly epitomize the essential factors that enter into the production of **good** extracted honey, I would among other requirements mention the following: Good strong colonies, at least a fair flow of honey, and the possession of enough drawn super combs to permit ripening of the honey on the hives and allow for storage of honey at the same time.

And after the extracting is done, that all honey be put into retainers as soon as possible, as in our climate honey is more apt to deteriorate than improve when left exposed to the atmosphere for any length of time.

By the term "our climate" of course I include all the territory having a humid atmosphere like Ontario, as there is no question but that there are many sections in the Western States that these remarks will not apply too. Our subject title speaks of "nectar" and "honey," and by this we would understand that there are different stages in the production of honey by the bees. Our dictionaries give us little modern light on the word "nectar," as we use the term in bee-keeping, for the word like many more in the English language has changed its meaning faster than the lexicographers have been able to keep pace with. Students of mythology know that the original term nectar, was used to designate the food of the Gods, and at the present period our best dictionaries in addition to this meaning also define the word as meaning any very sweet drink. But nectar as we bee-keepers uderstand the term, means the freshly gathered sweet substance found in flowers and carried into the hives by the bees.

While nectar is undoubtedly sweet and more or less pleasant tasting when thus gathered, yet experience has taught us that if this freshly gathered article is extracted from the combs too soon without having had the excess of water eliminated by the bees, the sweet taste is but transitory, and it would indeed be a libel on the taste of the aforementioned Gods to insinuate for a moment that they feasted on such an inferior and ill-tasting food as the resultant product is apt to be.

Modern methods of bee-keeping render it exceptionally easy to produce unripe honey, and I am glad to say as well, that in the hands of bee-keepers so inclined, these same methods render it easy in the majority of cases to produce a good well-ripened article.

I say "in the majority of cases," as unfortunately on rare occasions for all

we can do to the contrary, our honey will not come up to the standard we would like, owing to peculiar weather and other conditions that sometimes are hard to be explained.

We have said that modern methods make it quite easy to produce unripe honey, and in this statement we have in view the fact that nearly all extracted honey producers have drawn super combs carried over from year to year, and how easy it is to empty those combs rapidly and often when the honey is coming in good and lively! Of course it is impossible to bring up the subject of producing **good** extracted honey, without saying something about the number of supers to be used in the process. In this connection, while a very few still prefer but one super, it is gratifying to know that the great majority of the fraternity have come to the conclusion that best results both in quality and quantity are attained by using two or more supers for each colony of bees to be operated on.

In my own case, I have by force of circumstances been obliged to use both systems to a limited extent, and never yet have I been able with one super anything nearly as small as the eight-frame L., to operate without sacrificing either quality or quantity, and I feel bound to say that any one attempting to produce a real good article of table honey with an equipment of one super per colony, will lose in one way or the other—quite likely in both. After all my using of different styles of hives, with one or more super per colony, I have come to the conclusion quite positively that in order to produce a good crop of honey it is necessary to have a large stock of extracting combs, and that in order to produce a crop of **good** honey, the same requisite is just as imperative.

Not so many years ago, the dealers of honey in Canada, did not offer very much encouragement towards the production of well-ripened honey, and "color" was all they thought about when a sample of honey was shown to them. However, this state of affairs has now changed, and good "body" is just as essential as "color" to the dealer who is thinking of stocking up for the season. This reminds me that a few years ago the Ontario Association of bee-keepers had a well-known apiarist from the New England states, lecturing at its Toronto convention, and in the course of his remarks he stated that in his locality the people preferred a honey that would run freely like syrup, rather than an extremely thick article that was not so nice to handle. Perhaps the taste of the people on this side of the border differs from that of us Canucks, but in glancing down the "honey for sale" column, in one of your trade journals, this view is not substantiated. These ads. speak of the honey "being left on the hives till after the flow was over, before being extracted," "thick and well-ripened," "still on the hives," and other like phrases. Strange that no one of these advertisers speak about their honey being extracted before being sealed over, ripened artificially in tanks after being extracted, or in some other way seek to convey to the would-be purchaser that they have something other than good well-ripened honey to offer.

In regard to the use of tanks for artificially ripening honey, I will not dispute the fact that the process is possible to a certain extent with conditions just right, yet I have to get my first taste of honey so ripened that would in any degree compare with the naturally ripened article as finished by the bees while yet on the hives. It is noteworthy in this connection, that very few beekeepers now advocate the tank system of ripening honey, while not so many years ago many would be found to champion the method. We purpose saying nothing in regard to implements, hives or other fixtures used in the production of extracted honey, believing that we are in the main speaking to

an audience that are
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an audience that are not beginners and after all these are but minor factors, and if considered necessary, can be touched upon in the discussion that is to follow.

Insofar as the marketing is concerned, the problem is pretty well solved when we have the right kind of an article to offer, as it is a pleasing fact to know that good extracted honey is now regarded as a staple food product, and not a luxury. To our mind it is to the interest of the bee-keepers as a body, to encourage the sale of honey in the granulated state, which is a natural condition for honey to be in after being extracted for any length of time. This will naturally, to a certain extent, discourage the use of glass as containers of honey. Right here I wish to say that the buying of honey in glass is an extravagant way to purchase honey. To be sure we recognize the fact that much honey will continue to be sold in glass packages, but after all, those in the main who profit most by this method of retailing, are dealers rather than producers.

A writer in a recent issue of the Review, claims that when honey is bought from the producer at eight cents, that it is not possible to sell it to the consumer at less than 25 cents in bottles. In our humble opinion eight cents is much too low a price for a man to receive for first-class honey, if he is keeping bees for a living, while on the other hand 25 cents is too high a price for the mechanic or artisan to pay who has to work for a living.

If the present system of getting honey before the consumer calls for twice the sum in profits for middlemen as was originally paid the producer for the honey, then there is something wrong in the system, and the sooner the producers recognize this fact and act accordingly, the better for them.

In conclusion would say to producers of first-class extracted honey, do not think or act as though your product is in any way inferior to comb honey; use intelligent and honest methods in your work, and there is no question to my mind, but that the use of our product will increase by leaps and bounds as it has been doing during the past few years. The element of suspicion that formerly lurked around extracted honey is fast disappearing, and it is up to us to help the good work along by offering nothing but well-ripened honey and showing the same animosity toward the thin unripened article that has been accorded the adulterated stuff in the past; for after all it is an open question as to which has done the most harm to the industry, in the days gone by—adulterated honey or unripe honey. Personally I accord to the latter article the most odium of the two.

At the National meeting at Albany, Mr. McEvoy introduced the question of spring feeding between fruit bloom and clover. A lengthy discussion followed. Mr. J. E. Crane, of Middlebury, Vt., the great comb honey expert, told of feeding 2,000 pounds of sugar between fruit bloom and clover, and by so doing got from 15,000 to 20,000 more sections of comb honey, and increased his colonies from 600 to 800. He also told of a bee-keeper in his locality failing to get a crop because he neglected to feed. Mr. McEvoy stated that the fate of the honey crop hung on how the brood was fed between fruit blood and clover, because it was from this brood the bees came that gathered the crop. Mr. L. C. Root, said that if the bees were neglected at this time they would kill the drones and throw out brood. Mr. France said that the discussion of this question was well worth the attendance at the convention.

Now is the time to renew your subscription to the Canadian Bee Journal.

QUESTION COLUMN

Precautions with Supers During Winter

As I am a subscriber to your journal I beg to ask you if there is any special care needed to preserve the combs in supers during the winter? If so, what precautions should one take? Would it be advisable to feed buskwheat honey (candied) back to the bees, and if so, what proportion of water should I mix? Could you also recommend a good commission merchant in Toronto market.

Trusting this will not take up too much of your question column.

F. G. Saunders.

[Put your combs in the supers and pile them up five or six or ten high. Put a metal queen excluder at the bottom. It will prevent mice getting in. Mice are very destructive to combs. When you have them piled up, place a saucer about three-quarters filled with carbon bi-sulphide, on top, and cover over well. This will evaporate and being heavier than air, will go down. This will destroy all moths, spiders and other insects. Your combs will come out in the spring in perfect condition. The combs may stand in a cold place as frost will not injure them. Be careful, however not to let a light come in contact with the fumes of the acid as a bad fire might result.

Do not feed candied buckwheat honey. It will be useless at this time of the year. Feed sugar syrup made of two parts granulated sugar to one part water, and if possible give it to the bees at about the temperature of new milk or a little warmer, and give the bees all they will take. Place it on the hives in the evening. There are several commission men in Tornto or Hamilton who will take your honey, but we would not like to recommend anyone. We will ask one who knows better than we do to write you privately about the matter.—Ed.]

The Toronto Fair—A Suggestion.

I noticed in your September edition a paragraph stating that only five bee-keepers exhibited honey at the Toronto National Exhibition. Permit me to say that I think the reason can be easily explained. In the first place the building is the poorest on the grounds, and as honey classes in the highest grade, it should be given a building suitable for its class. Exhibitors of honey have to go to a big expense to decorate and present their exhibit in a neat, clean, tasty way. Now, sir, to take an exhibit of honey to Toronto Exhibition means a lot of work and expense, besides a loss to your business at home. The building is occupied by seven or eight different classes of products, butter, cheese, meat, cold storage, ice cream and chocolate fudge, and the honey is away at the back end where you have to pass through all the above mentioned to see it. We believe a beautiful display of honey is the nicest attraction on the grounds and ought to have its place amongst the highest grades of produce. We also notice that Mr. Morley Pettit, representing the O. A. C., gave demonstrations with bees in a different building, around which crowds collected all day. As the honey is the product of the bee, why should not a suitable building be provided for both exhibits together.

G. E. Johnston,
One of the Exhibitors.

Cannington, Ont.

MEETING OF MIDDLESEX ASSOCIATION

The Middlesex Bee-Keepers' Association will meet in the City Hall, London, on Saturday, November 5th, at 10-30 a.m. Interesting papers and addresses will be given by prominent bee-keepers. All are welcome. The annual election of officers will take place.

A. Dowswell, President.

E. T. Bainard, Secretary, Lambeth, Ont.

DISINFECTION NOT [illegible] NEW ZEA

By a New Zeal

A hundred years ag not troubled with ge seem to be fighting th (with a bottle of disi infection with some p almost a fetish. Thi case with Mr. D. M. I at the subject again Journal (see C.B.J. hard to convince Britis where cleanliness and accomplish a cure it and superfluous proceed well. Defeated on all experience, Mr. M. ha tive opinions from ot world. Seeing that t only and that one of New Zealand, a littl affairs here might alter of the opinions at leas

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Firstly, then I woul brood has not **been** supp being suppressed, and se of what has been acc is not due to the result as it is almost unheard

DISINFECTION NOT PRACTICED IN [illegible] NEW ZEALAND

By a New Zealand Reader.

A hundred years ago the world was not troubled with germs but now we seem to be fighting them at every turn (with a bottle of disinfectant), and disinfection with some people has become almost a fetish. This seems to be the case with Mr. D. M. Macdonald as he is at the subject again in the Irish Bee Journal (see C.B.J. July). It seems hard to convince British bee-keepers that where cleanliness and method alone will accomplish a cure it is an unnecessary and superfluous proceeding to disinfect as well. Defeated on all points of practical experience, Mr. M. has cited authoritative opinions from other parts of the world. Seeing that they are opinions only and that one of them comes from New Zealand, a little explanation of affairs here might alter the value of one of the opinions at least.

I did not know that any other country had an Apiaries Act as good as ours, but as the point is not very important we can afford to waive it. Mr. M., however says that in no other countries **has** the scourge **been** more effectively suppressed than in Switzerland and New Zealand. He would then lead us to believe that this is so because the leading authorities in these two countries are so emphatic on disinfection. As a bee-keeper who is fairly familiar with the conditions in the largest bee-keeping province in New Zealand, and one who has closely followed the work of the apiary inspectors, I claim to be able to speak accurately of affairs apicultural so far as New Zealand is concerned.

Firstly, then I would say that foul brood has not **been** suppressed yet, but is being suppressed, and secondly the credit of what has been accomplished so far is not due to the results of disinfection, as it is almost unheard of. True, Mr. Hopkins says in his Bulletin No. 18: "Be sure to disinfect or burn everything used during the operations of treatment and a solution of izal should be kept for disinfecting the hands, knives, etc. Directions are given on the bottles." He also says: "Time and experience have so convincingly proved that treatment by drugs (so prominent at one time), utterly failed to make any inroads on the disease that it would be waste of time to discuss the matter here. We have in the McEvoy treatment, when properly carried out, an effective cure, which has already been tried and proved in probably thousands of cases in New Zealand, and that is the one I advocate." He then goes on to vary the McEvoy treatment by advising the use of a clean hive and the empty "hive, bottom board and cover, if sound and worth saving, should be cleaned and thoroughly disinfected with a strong solution of carbolic acid or izal, or singed inside by fire." Further on he quotes Dr. White, in Bulletin No. 75, Pt IV of the United States Department of Agriculture as to the powers of resistance in the spores of B. larvæ, viz., boiling water 15 minutes, 5% solution carbolic acid and 1.1000 solution corrosive sublimate two months.

This is all Mr. H. says on the subject and if it was necessary and to be insisted upon, why did he not give fuller directions for disinfection? Clearly Mr. H. is in doubt and not having had much to do with foul brood himself he draws on other authorities with the above results. As these are "the proper steps to take to cure disease," I have sometimes wondered whether Mr. H. would have prosecuted any one who failed to disinfect, for failing to "take such measures as may be necessary to cure the disease" as the Act has it. However, the work of inspection has been carried out by others whom I have questioned on the matter, and they say that disinfection is not considered necessary and is not insisted upon. The result is that owners are not put to so much extra trouble and incon-

venience and the small amount of work required of them is performed more readily and willingly.

Although the foul brood is only being suppressed the results so far are most satisfactory. Several districts occupied by large commercial apiaries are already clear of disease (I have it from the owners themselves). This result has been attained without disinfection but **not until** the old box-hives in farmers gardens had been got rid of. It is an offence here to **keep** bees in box hives, and the visit of an inspector, with the fear of a £5 fine, is a prime factor in ridding the country of the real cause of reinfection—the box hive. In other districts where disease was rampant in box hive and frame hive apiaries, the results of the work already done are very encouraging to us as bee-keepers. We are hoping to see the inspectors following up the work in these districts until every hive is clean and then they can turn their attention to fresh districts so that in time the foul brood will be stamped right out.

CATCHING A SWARM

Peter Cameron.

In September I gave an account of bringing down a swarm of bees when they were making for the bush. I promised to write my experience with another swarm that were on the wing.

Not many days after my adventure with the first swarm, I put a swarm into a hive with a frame of last year's comb and other frames with starters. In about an hour they came out. They did not settle on anything. I saw they were getting ready to go to the bush. I got my sheet and a maplepole, and made a kind of flag. In a short time they were ready for their journey. I got under them and waved my flag in the thickest of them. They did not like it a bit. So they turned swiftly around to one side and a few yards nearer to the bush. I was under them again waving my flag, but they whirled swiftly back to the other side, and also a few yards nearer the bush. This kind of fun continued until we came within forty or fifty yards of an elm tree about six feet high. Down they came and clustered on a limb about a foot and a half from the ground. As soon as they were clustered I wound my flag about them; then got a saw, cut the limb and put them in the same hive again. I was completely tired out and I think the queen was too. It was such a hot day, and in a field of heavy timothy and clover, but I had good sport. I am about seventy years old, and if any person can tell of an easier way of doing what I did I would be much obliged.

A SIMPLE METHOD OF WATER PURIFICATION

G. G. Nasmith, Esq., Ph.D. and R. R. Graham, Esq., M.B., Laboratory of the Provincial Board of Health.

A level teaspoonful of chloride of lime should be rubbed into a teacup of water. This solution should be diluted with three cupfuls of water, and a teaspoonful of the whole quantity should be added to each two gallon pail of drinking water. This will give .4 or .5 parts of free chlorine to a million parts of water and will in ten minutes destroy all typhoid and colon bacilli or other dysentry-producing organisms in the water. Moreover all traces of the chlorine will rapidly disappear.

This method of purification has been tested with Toronto Bay water inoculated with millions of bacteria. Every germ has been destroyed and it has been unnecessary to boil the water.

This method should be very valuable for miners, prospectors, campers, and those living in summer resorts where the condition of the waters might not be above susupicion.

John W. S. McCullough, M.D.,
Chief Health Officer for Ontario.

SANFOIN CLOVER

Mr. John Fixter, of Macdonald College, Tells of Its Merits.

Can you give any information about sanfoin clover? Is it a honey plant and will it thrive on sandy loam that is self-draining?

John McEwen

Reply

Replying to enquiry re Sanfoin Clover. Sanfoin has no equal as a honey producer, and as a fodder it is relished by all kinds of live stock. In its cultivation and manner of growth it resembles alfalfa, but it is slightly finer and grows much thicker in the bottom, having a more decided stooling habit, which makes it better for pasture. It is especially liked by sheep. The soil best suited to the growth of this plant seems to be a deep, rather dry loam, containing a fair proportion of lime, with good natural drainage. It will, however, do well upon almost any soil that is well drained and contains a fair amount of plant food. Heavy clay loam and light sandy soils both produce excellent crops of sanfoin, but on the latter it naturally requires generous manuring. It should never be sown on land likely to be covered with water at any season of the year. A good seed bed is of great importance, also to have the soil perfectly free from weeds. An excellent plan is to follow a hoed crop. If the hoed crop has been kept thoroughly cultivated and the weed growths kept out of sight Sanfoin should succeed as well as alfalfa. Plow the land fairly deep as early in the autumn as possible, leave it well set up to the winter frosts. About the 20th of May, if the soil is in perfect condition, plow the land again, this time shallow. If the soil is damp, delay the plowing until it dries. The wet soil would bake after being worked and prevent the small seed from germinating. Harrow the surface thoroughly—make a perfectly fine seed bed before sowing. Another plan is to pulverize the soil and to clean the land from weeds, just as soon as the hay or grain crop is off; do not plow but simply cultivate and harrow. First cultivate as shallow as possible, then pass the iron harrows at a good sharp walk across the first cultivating. This operation will break up the sod or stubble very fine and leave it on the surface to dry out. The second cultivating should be in the opposite direction to the first, and likewise the harrowing. It usually takes about four cultivations and four harrowings to make a perfect job. All cultivating and harrowing must be done on fine sunny days, and the sooner after harvest the better. The number of times to cultivate and harrow must be gauged by the growth. If possible all growth must be kept out of sight and all vegetation brought to the surface to be dried out by the sun. This dead but valuable material may during the autumn be plowed under to decay and add fertility to the soil; by the next spring the land should be in good condition for sowing.

The Importance of Testing the Germinating Power

Many failures have been reported from bad seed. Sanfoin being very little grown in this country the seed is liable to be kept for a number of years and when sown germinates poorly. I would advise enquirer to import his seed and to make a thorough test of germinating power before sowing.

Sanfoin may be sown at the rate of thirty pounds per acre and at the same time sow 1½ bushels of a very early ripening barley. After sowing run a light harrow over the land to cover any seed that may be left on the surface. After the sanfoin and barley is well up and the soil perfectly dry, put on the land roller. The roller will level the surface for the mower. It will also break the crust formed by the frequent spring showers and let the air into the roots of the

plants and by breaking the crust at this time it will conserve the moisture. If the soil is in good condition and you wish to force the growth of sanfoin and enrich the land, when the barley is about one foot high, put on the mower and allow all cuttings during the season to remain on the land. This will act as a mulch and by frequent cuttings the first season the roots will get much stronger growth and the land enriched by the cuttings. Should a crop of barley be desired the first season, harvest it as early as possible to give the sanfoin a chance to make a strong growth before autumn. Do not allow any animals on the Sanfoin field, especially the first season.

JOHN FIXTER.

ITEMS OF INTEREST.

Dr. Burton N. Gates.

Bees work by moonlight, according to Herbert J. Rumsey, Dundas, N. S. W., in the Australian Bee-Keeper. Bees were observed at work on a plot of Japanese buckwheat during a bright moonlight night. They were so numerous that their hum attracted attention.

Formerly Australia was exporting hon y to South Africa in considerable quantit es. According to the August issue of the "Australian Bee-Keeper" the market is now closed to Australia for bees, honey and wax, because of the occurrence of brood disease in Australia. There is an effort to certify that exports are from disease free apiaries, it being asserted that the United States has already conformed to the requirement of South Africa and is becoming possessed of the market.

Honey—Food Value.

Fisher, Dr. Irving, Yale University, 1910: Le miel occupe le primier rang parmi les aliments de choix. Elsass-Lothringischer Bienen-Zitcher. Vol. 38, No. 8, pp 188-189:

Most of people are ignorant of the food value of the substances which serve as our nourishment. It is to remedy this that Professor Irving Fisher of Yale University has constructed a table which he urges to be posted in all academic institutions and in the eating places, so as to have conspicuous at all times that which might be termed "l'echelle alimentaire." The table follows:

List of foods according to their food value, established by Professor Irving Fisher:

Fruits, nuts, cereal, **honey,** butter.

Potatoes and shelled legumes.

Little butter, salt in small quantities, cream, milk, eggs, cane sugar, chocolate, milk curds.

Legumes, eaten with the pods.

Pastry, cheese, Roquefort, etc.

Bouillon, meat extracts.

Meats, fish, poultry, liver.

A NATIONAL NEWSPAPER

The Globe has tried during all its history not to lose sight of the fact that a newspaper can play an important part in nation and empire building. One way in which this has been effectively practised is by keeping trained members on its staff constantly "on the wing," in search of useful and interesting information. Wherever important national work or world events in which Canadians were concerned were taking place, or where pioneer development was in progress, there The Globe commissioners have been reporting with intelligent discernment for the benefit of this country.

This policy has rarely, if ever, been more generally practised than at present, To-day the Managing Editor of The Globe Dr. J. A. Macdonald, is in Mexico, where a three week's celebration of the centenary of republican government is being held, and upon his return he will contribute a series of sketches on that interesting country—a country whose rela-

tions to Canada are

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The Announcement f

tions to Canada are becoming very close.

Capt. Jaffray Eaton is representing The Globe with the Q. O. R. in England, the only exclusive press correspondent on the trip.

Mr. W. J. Jeffers, another member of the staff of The Globe, is at present on a pioneering trip in the Gowganda, Elk Lake and far north country. Mr. Jeffers is exceptionally equipped for such an expedition having spent several years in the mining camps, America and South Africa.

Mr. M. O. Hammond, Editor of the Illustrated Magazine Section of The Globe is contributing letters on the political situation in the United States. These will be continued during the next few weeks, Mr. Hammond's instructions being to travel wherever good "copy" from a Canadian viewpoint can be secured. It goes without saying that not in fifty years has so much interest been taken by Canadians in United States politics as is the case at the present time.

The Globe is trying to live up to its record in the matter of keeping its readers posted aside altogether from the ordinary sources of local and telegraphic news.

STORIES AT LESS THAN A CENT APIECE

In the fifty-two issues of a year's volume The Youth's Companion prints fully two hundred and fifty stories. The subscription price of the paper to Canada is but $2.00, so that the stories cost less than a cent apiece, without reckoning in all the rest of the contents—anecdotes, humorous sketches, the doctor's weekly article, papers on popular topics by famous men and women.

Although the two hundred and fifty stories cost so little, they are not cheap stories. In variety of scene, diversity of incident, skill and truth in character-depicting, they cannot be excelled.

The Announcement for 1911, beautifully illustrated, giving more detailed particulars of these stories and other new features which greatly enlarge the paper will be sent to any address in Canada free with sample copies of current issues.

Every new Canadian subscriber receives free The Companion's Art Calendar for 1911, lithographed in twelve colors and gold, and if the subscription is received at once, all the issues for the remaining weeks of 1910.

THE YOUTH'S COMPANION,
144 Berkley St., Boston, Mass.
New Subscriptions Received at this office.

ONTARIO BEE-KEEPERS' ASSOCIATION

November 16-18, 1910—County Council Chambers—Programme

"Lessons for Beginners," Alex Dickson, Lancaster.

"The Buckwheat Honey Markets of the East," paper by R. B. Ross, Jr., Montreal.

"Bee-Keeping for Young Men," Homer Burke, Highland Creek.

"The Prevention of Swarming," S. D. House, Camillus, N. Y.

"The Successful County Association," E. T. Bainard, Lambeth

"Address of Welcome," Warden Pugsley, of York County.

"Can a Woman Run an Apiary," Miss Ethel Robson, Ilderton.

"Disposal of Cappings," W. A. Chrysler, Chatham.

"The Large Exhibitions and the Beekeeper," Morley Pettit, Provincial Apiarist, Guelph.

"A Year's Experience With Clark's System of Queen Rearing," H. G. Sibbald, Claude.

"Review of Apiary Inspection for 1910," Morley Pettit, Provincial Apiarist.

"Can We Co-operate Further in Selling Than Through the Crop' Report,' William Couse, Streetsville.

P. W. Hodgetts, Secretary.

FEEDING BETWEEN FRUIT BLOOM AND CLOVER.

Increased Mr. Crane's Crop of Section Honey.

William McEvoy.

A question was placed on the table in the Albany convention asking Mr. Crane to tell the bee-keepers about how much more section honey he secured through feeding between fruit bloom and clover in 1910.

Mr. Crane replied, saying between fifteen and twenty thousand more sections of honey.

Some one in the convention asked him how many colonies he had, meaning spring count. He said 600 and increased to 800.

I followed Mr. Crane and said that the fate of the honey crops hangs on how the brood is fed between fruit bloom and clover, because it is from the brood that is in the combs at that time that the bees come to gather the honey crop.

Mr. L. C. Root came next and he said the bees would kill the drones and drag out brood, meaning workers as well as drone brood.

I will here explain what I meant by saying that the fate of the honey crop hangs on how the brood is fed between fruit bloom and clover. When bees run out of **unsealed stores** between fruit bloom and clover, and frosts or cold wet weather sets in and continues for some days it is then that the brood suffers on account of all the **unsealed** stores being used up and the bees not uncapping honey fast enough to keep pace with the amount of brood requiring **immediate feeding**; bees will at such times kill drones, drag out brood, ball some queens as well as let some brood starve in the comb.

Mr. Crane is one of the best comb honey producers in the world, and a man whose word I have unlimited confidence in. I believe that Mr. Crane got the full 20,000 more sections of comb honey through feeding between fruit bloom and clover in 1910, and if we figure the 20,000 sections at 16 cents each, it will be seen that he got over $3,000.00 more comb honey for the feeding he did. Besides considerable of his increase was due to his feeding.

SPRING FEEDING

James Storer

A great many bee-keepers have good reason to remember the spring of 1910, especially those that depend on feeding for stimulating in the early spring.

Mr. Adams says that without early feeding his crop would have been a failure. Mr. Byer was feeding and was not quite so successful. You object to outdoor feeding owing to the loss of bees by tumbling over each other.

May I give my experience with an outyard three miles from my home. In the fall of 1909, I prepared 62 colonies for winter and put them in a house cellar. The people who owned the house lived right over the cellar but did not go near the bees all winter; neither did I. They were put in winter quarters Nov. 6th, and taken out March 28th, all alive and in good order. They were put in as good shape as possible, that is given small entrances, covered over with newspapers on the top of frames. Nothing more being done to them (except about four that were a little short of feed, each of which got a frame of honey), till about May 10th, when the weather was good for a few days. About this time the queens were clipped and all thoroughly examined. Some were beginning to get short of stores and others had far too much; nothing more being done to them till after fruit bloom failed near the end of May.

I then commenced and fed 20 pounds of granulated sugar, dissolved in twenty pounds of water daily till June 13th fed

outside in iron feeders with floats and saw no loss of bees as you intimated. Colonies were of about equal strength and all got their share. It might be interesting to some to know how long it took the 62 colonies to remove the forty pounds of sugar—just about fifty minutes. My returns for white honey were a little better than Mr. Adams'. Then we have a fall flow from buckwheat which was not as good as usual, say about 40% short. With me it is not a question of what will bring a colony through the winter; it is, how much I can get into the hive the latter part of September. Or as Doolittle puts it in October Gleanings, "Millions of honey at our house."

THE ALIMENTARY CANAL AND ITS GLANDS

It is no exaggeration to say that eating is the most important thing that any animal does and that its alimentary canal is the most important organ it possesses. The entire system suffers when there is a deficiency in the food supply or an impairment in the digestive apparatus. Every other function is either subservient to or dependent upon that which furnishes nourishment to the cells. The senses of sight, smell and taste are all more or less concerned in the acquisition of food. The muscular system enables the animal to hunt for it, to dig for it, to climb for it, or to chase living prey either on the ground, in the water, or in the air, and to kill, tear and chew it when obtained. The blood is the servant of the stomach, for its entire function in insects is to carry the products of digestion to the body cells. The heart furnishes the motor power of the blood. The respiratory function is accessory to that of digestion, inasmuch as it furnishes the oxygen which unites with the waste materials ejected from the cells and renders them capable of being removed from the blood. This removal is accomplished partly by the respiratory system itself and partly by special excretory organs. Thus we see that the sense organs and the muscular system are the agents that cooperate in obtaining the raw food, the digestive tract is the kitchen of the body in which the food is prepared for use, the blood is the waiter that distributes it, while the respiratory and excretory systems are the refuse gatherers that remove waste products. The nervous system holds the controlling power over all these organs. It regulates them in the performance of their duties and co-ordinates their actions so that they all work together. It makes a unified organism out of what would otherwise be simply a complex mass of variously specialized cells.

The reproductive function alone contributes nothing to the individual. In fact, the production of spermatozoa by the male and of eggs by the female and the nourishing of the embryo and the young create a demand upon all the other organs for material which is separated from the individual that produces it. But this is what the organism exists for; this is its reason for being. At least this is what it amounts to in the case of the individual, though from a wider philosophical standpoint the real truth is probabably just the reverse, viz., any species exists because its individuals reproduce themselves.

The writer has already made frequent use of the word "cell," assuming that the reader is familiar with the meaning of this word as used in anatomy and physiology. The entire body of an animal or plant is made up of cells or their products. The word, however, is misleading, for a cell is not a small sac or empty space, as was at first supposed from the study of plants, but is a little protoplasmic body or corpuscle, visible only under the microscope, surrounded by a membranous cell wall and containing a small internal body called the nucleus. The different cells of the body are

specialized in groups to do some one particular thing—the salivary cells create saliva, the muscle cells contract, the excretory cells pick out waste substances from the blood and so on. But this specialization does not signify that each cell does not perform its own vital processes in addition to its specialty. The fact that it remains alive and works means that the complex chemical components of its body substance or protoplasm are constantly being reduced to simpler compounds which are expelled, while new protoplasm is built up from the supply of food material brought by the blood. This double process of destruction and reconstruction is known as metabolism, while its two phases, the breaking-down process and the building-up process, are known as katabolism and anabolism, respectively.

Now, while all the cells of the body must have nourishment, none of them, except those of the alimentary canal is capable of utilizing the raw food materials that an animal obtains in a state of nature. These materials must therefore be changed into some other form in order that they may be assimilated by the cells. This change is called digestion.

The single cell composing the body of a Protozoan, living free in nature, digests its own food and then assimilates the products of its own digestion. But of the cells constituting the body of any multicellular animal, only those of the alimentary canal are capable of digesting raw foodstuffs, and, moreover, as digestion is the specialty of these cells, they have also to digest the food for all the other cells of the body.

The two most important changes that must be brought about in the natural food by digestion are those which make it soluble in the blood and which render it capable of passing through animal tissues. In the first place, the food must diffuse through the walls of the alimentary canal as a liquid which mixes with the blood, for there are no pores or openings of any sort from the alimentary canal into the body cavity; and in the second place, it must pass through the walls of the cells themselves. The digestive changes result chiefly in a breaking down of the complex molecules of the raw food materials into more simple chemical substances These are taken up by the cells and reconstructed into complex protoplasmic molecules which can not escape through the cell membrane until they are again broken down into simpler forms.

The waste products of the cells consist principally of carbon, hydrogen and nitrogen. These are converted by the oxygen supplied by the respiratory system into carbon dioxid, water, and compounds of urea. The first being a gas, mixes with the air in the tracheal tubes and so reaches the exterior during exhalation. Much of the water is also given off through the tracheal system in the form of vapor which exhales from the spiracles, but, since insects are covered by their hard chitinous shell, it is probable that they do not "sweat." The compounds of urea, and probably also some water, are separated from the blood by the excretory glands, called Malpighian tubules in insects which empty their products back into the alimentary canal, whence they are discharged with the fæces from the intestine.

Digestion is brought about by substances called enzymes which are contained in the various liquids mixed with the food in the alimentary canal. These liquids are secreted by the salivary glands and by the cellular walls of the stomach

The Salivary Glands

The opening of the salivary duct on the base of the probiscis has already been described. The true salivary glands, those corresponding with the salivary glands of other insects, are arranged in two pairs, one situated within the head and the other within the thorax. The four ducts unite into one median tube which enters the base of the labium at

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The salivary glands of the head (System No. 2 of Cheshire, postcerebral glands of Bordas) lie against the posterior walls of the cranium. In the worker each consists of a loosely arranged mass of pear-shaped follicles or ăcini whose individual ducts unite irregularly with one another and eventually form a common duct on each side. Their two ducts unite with the median duct from the thoracic glands just before the bases of the mesocephalic pillars. In the drone these glands have a quite different appearance from those of the female, each consisting of a compact mass of very small follicles connected by minute ducts and flattened against the posterior walls of the head. A large lobe of this gland in the drone extends forward on each side against the face, between the compound eye and the clypeus, thus occupying the position of a large mandibular gland in the worker, and in the queen. There is also a prominent triangular mass of glandular cells in the zone situated just above the ocelli, which has been described by Bordas (1895) as a separate gland opening by two ducts into the œsophagus just behind the pharynx. The writer, however, has been utterly unable to discover any such ducts, though two suspensorial ligaments of the anterior end of the œsophagus are attached to the wall of the head at the posterior ends of these glands, and might easily be mistaken for ducts. These "postocellar glands" of Bordas, moreover, appear to be simply detached lobes of the postcerebral glands. They are prominent also in the queen and are represented by a few follicles in the worker.

Bordas describes the follicles of the postcerebral glands in the worker as hollow sacs, each having a large lumen lined with a chitinous intima. Their secretion, he says, is a thin viscid liquid, pale yellow in color and having a slightly alkaline reaction. According to Schiemenz (1883) each gland is developed as an outgrowth from the common duct of the thoracic glands.

The salivary glands of the thorax in the bee (System No. 3 of Cheshire, thoracic salivary glands of Bordas) are the ones that correspond with the ordinary salivary glands of other insects. They are described by Schiemenz (1883) as being formed inside of the outer covering (tunica propria) of the first part of the larval silk glands. But it is of common occurrence in insects that the salivary glands are temporarily specialized as silk-producing organs in the larva. In the adult worker these glands lie in the ventral part of the anterior half of the thorax. The two are widely separated anteriorly, but their posterior ends are contiguous. Each consists of a mass of small, many-branched, glandular tubes opening into several collecting ducts which empty into a sac near the anterior end of the gland. From each of these reservoirs, then, a duct runs forward and fuses with the one from the opposite side just within the foramen magnum of the head. The common duct thus formed turns downward within the head, receiving the two ducts of the postcerebral salivary glands and then enters the base of the mentum, to open as already described on the upper side of the ligula at the root of the glossa and between the bases of the two paraglossæ. The secretion of the thoracic glands is said also to be weakly alkaline. Therefore the entire salivary fluid poured out upon the labium is alkaline, and it must be designed to act especially upon the food taken through the proboscis.

This action, furthermore, on account of the location of the salivary opening, may take place before the food enters the mouth.

The food of the bee consists normally of pollen, nectar, and honey. The first is eaten entirely with the mandibles, while the other two are taken through the proboscis. The pollen is to the diet of the bee, what meat is to ours; that is to say, it contains the proteid or nitrogen-containing ingredient of the food which is necessary to the support of any animal, and also substances comparable with fat called in general hydrocarbons. The nectar and honey consist principally of grape sugar, fruit sugar, and cane sugar, which belong to the class of chemical substances known as carbohydrates. Now, all of these foodstuffs, except the grape and fruit sugars, have to be changed chemically by the digestive process before they can be absorbed into the blood. The pollen, which contains the proteids and hydrocarbons of the food, is taken directly into the mouth by means of the mandibles and apperently is not digested until it reaches the small intestine, and therefore it would seem that it is the can sugar which must be affected by the saliva. The change, or inversion, as it is called, of cane sugar, which has a very large molecule, consists of its reduction to grape and fruit sugars which have smaller molecules. Starch must also be reduced to simpler and more soluble compounds before it is capable of absorption. Its inversion is effected in us partly by the saliva, but starch appears to form a very inconsiderable element in the bee's diet.

The Alimentary Canal.

The alimentary canal is a tube which extends through the entire length of the body, and, on account of being more or less coiled, it is generally considered longer than the length of the body in insects. It has no openings of any sort into the body cavity. The internal organs are packed closely about it, and the interstices are filled with the blood, there being no special arteries or veins in insects. The amount of space occupied by the alimentary canal varies according to the amount of food it contains, and for this reason it seldom looks exactly alike in any two individuals examined.

The part of the canal immediately following the mouth forms an enlargement called the pharynx. Succeeding this is a slender tube which leaves the head by the foramen magnum above the small transverse tentorial bar and traverses the entire length of the thorax. This is the œsophagus. In the anterior part of the abdomen the œsophagus expands into a large thin-walled sac which is ordinarily called the crop or ingluvies, but which, in the bee, is known as the honey stomach. Behind this is a short, narrow, neck-like division, with rigid walls constituting the proventriculus. Then comes a large U-shaped part, with thick, spongy-looking walls containing numerous annular constrictions. This is the ventriculus or stomach, of the bee, frequently referred to as the "chyle stomach." Following the ventriculus is a short, narrow, coiled small intestine having a circle of about one hundred long, greatly coiled, blind thread-like tubes opening into an anterior end. These latter are called the malpighian tubules. Functionally they do not belong to the digestive tract, since they are excretory organs, corresponding with the nephridia of other invertebrates and with the kidneys of vertebrates. Following the small intestine is the large intestine, or rectum, which is often distended by its contents into a great sac occupying a large part of the abdominal cavity. Six whitish bands on its anterior end are called the rectal glands. The rectum opens to the exterior through the anus which is situated, as already described, at the end of the rudimentary tenth or last segment of the abdomen.

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After this brief general survey of the parts of the alimentary canal, we shall proceed with the description of each detail, and at the same time give what is known of the rule each plays in the process of digestion. What is known, however, about digestion in the bee, or in any insect, for that matter, really amounts to nothing, but the views of various writers on the subject must be discussed briefly, in order to show how little has actually been demonstrated.

The pharynx lies in the anterior part of the head close behind the clypeus, extending from the mouth dorsally to above the antennæ, where it turns posteriorly and contracts into the much narower œsophagus. Attached to its walls are numerous suspensorial muscles, whose contraction must expand the pharyngeal cavity, while the latter may be contracted by the sheet of muscles surrounding its walls. In this way the pharynx is undoubtedly able to perform a sucking action, by means of which the liquid foods are taken into the mouth. Its lateral walls are strengthened by two long, chitinous rods, which arise from the median anterior plate in its floor. The anterior end of this plate is prolonged into two free, tapering lobes which hang down over the lower rim of the mouth. The plate, in the worker, and the basis of the rods are shown in ventral view, removed from the pharyngeal wall. Near where the rods join the plate are two long, chitinous pockets, opening above, which receive the ducts of the two large glands lying within the anterior part of the head. Between these two pockets is a transverse row of cells, which have been described by Bordas (1895) as the "sublingual glands," but this name is not appropriate in insects, for, while the gland in question may be suggestive of the sublingual salivary gland of vertebrates, it does not lie beneath the tongue or lingua of the bee. Although the pharyngeal plate lies upon the floor of the true mouth, it is not, as already explained, the equivalent of what is properly called the tongue, lingua, or hypopharynx in other insects—this organ being absent in most Hymenoptera. The only suggestion the group of cells the ventral or median ventral pharyngeal gland in distinction to the large lateral glands. The plate itself is shorter than the worker, and its anterior lobes are smaller. The lateral glands and their receptacula are entirely absent, but the median glands are much larger than those of the worker. Bordas says that each acinus of the latter glands in both the worker and the drone is provided with a fine, sinuous canaliculus, and that these tiny ducts open separately in two bundles on the lateral parts of the pharyngeal plate. The lateral glands are present in the queen, but are very small and rudimentary.

Especial interest attaches to the large lateral pharyngeal glands of the worker, because they are regarded by many as the source of the brood food and the so-called "royal jelly," which is fed to the larvæ and to the adult queens and drones by the workers. Each consists of a long coiled string of small ovate follicles attached to one median duct, and the two are intricately packed into the anterior and upper parts of the head. Each acinus consists of a solid mass of several small cells, which are penetrated by a large number of fine, chitinous ducts, arising in the neck of the acinus from the common ducts of the gland. These follicular ducts can be very clearly shown by treating a part of the gland with weak caustic potash, which dissolves the protoplasm of the cells and brings out the bunch of ductules very clearly.

The fact that these glands are entirely absent in the drone and at best rudimentary in the queen shows that they must in some way be connected with the special functions of the worker. Schiemenz (1883) and Cheshire (1886) have shown that

their development in the different species of bees is in proportion to the social specialization. They vary from a group of cells opening by separate ducts upon the pharyngeal plate to the highly developed condition they present in the honey bee. The writer questions, however, whether these authors did not mistake the median pharyngeal glands of these lower genera of bees for rudimentary representatives of the lateral glands. Bordas states that the former occur in all Hymenoptera, but Schiemenz and Cheshire did not seem to recognize them. The bumblebees have them almost as well developed as the honey bee, especially the large females. In the genus Psythirus they are similar to those of Bombus, but are smaller, while in such genera as Andrena and Anthophora they are rudimentary or consist of a few scattered cells. Both Schiemenz and Cheshire have thus argued strongly that these glands of the pharnyx are the organs that produce the brood food. On the other hand, Schonfeld (1886) has made an equally strong plea in favor of the ventriculus as the producer of this important material. He believes that the brood food, especially royal jelly, is regurgitated chyle. Both Schonfeld and Cook (1904) fed bees in a hive some honey containing powdered charcoal, and later found this in the brood food in the comb cells, thus, apparently confirming its ventricular origin. However, the charcoal that got into the cells might have come from the mouth, the œsophagus, or the hone stomach. It, of course, could not have gone through the stomach walls and entered the pharyngeal glands, as proved by Dr. J. A. Nelson, from microtome sections of bees fed on lampblack. The arguments, then, in favor of the stomach, and the pharyngeal glands seem equally strong, and perhaps the truth is, as occurs in so many cases, that both sides are right —that the brood food is a mixture of chyle from the stomach and of secretion from the pharyngeal glands.

Arnhart (1906) seems to adopt the position that the brood food is chyle which has been acidified by the addition of an acid from the glands. He states that the acid reaction of the royal jelly is due to the presence of three-fourths of 1 per cent. of tartaric acid. The contents of the ventriculus, on the other hand, and for that matter of all the parts of the alimentary canal, are alkaline. Hence, it seems very logical to suppose that if the brood food comes from the stomach, its acid constituent is furnished by the glands in the head. But the difference between the brood food found in the cells and the contents of the ventriculus is so great that it would seem as if a very substantial addition of something more than a mere preservative acid must be made to the latter.

The brood food is given to the queen larvæ, known as royal jelly, is a gummy paste of milky-white color when fresh but when taken out of the cell it soon acquires a darker tone with a yellowish tint. Under the miscroscope it appears to be a homogeneous, very minutely granulated mass. It is very acrid and pungent to the taste, and must be strongly acid. Samples examined by the writer taken from cells containing queen larvæ two and four days old contained a number of fresh undigested pollen grains but no bits of hair such as occur in the stomach.

The possible ventricular origin of a part of the brood food and its regurgitation will be further discussed when we treat of the stomach. The writer does not advocate any personal view regarding the origin of this larval food—the fact is there is not enough known about it to enable one to formulate any opinion worth while. We know only that the whitish paste comes out of the mouths of the workers but we know nothing of where it is made or of how it is made. Hence we can but await the evidence of further investigation.

The brood food is fed to the larvæ by the workers and is produced in greatest abundance by the younger individuals. The larvæ of the queens are said to receive nothing but pure royal jelly throughout their entire developmental period, while the larvæ of the drones and the workers are given the pure product only during the first three days of their life. From the beginning of the fourth day on, honey is said to be mixed with the diet of the drones and workers and, in the case of the former, undigested pollen also. Moreover, the adult queens and drones receive a certain amount of prepared food throughout their lives; if they do not get it they become weak. While they can feed themselves with honey, they apparently cannot eat pollen, and consequently are not able to obtain the proteid element of diet unless fed this in a pre-digested condition by the workers. During egg-laying activity the queen especially demands this food, and by furnishing or withholding it the workers probably have the power of stimulating or inhibiting her production of eggs. Arnhart (1906) says that the workers feed it to weak or starved members of their own class, the material being accumulated upon the upper surface of the mentum of the bee whence it is sucked up through the proboscis by the other. All of these statements, however, concerning the feeding of the brood and the differences in the diet need to be verified. They are based chiefly on the work of Planta, published in 1888. Cheshire (1886) states that the stomachs of queens contain a substance which is "microscopically indistinguishable from the so-called royal jelly," scarcely a pollen grain being discoverable in it. If this is so, it would seem to prove that the queen is fed this substance by the worker, for the stomach of the latter is invariably filled with a dark-brown slime containing a varying amount of pollen and in no way resembling royal jelly. Cheshire further states that before impregnation the stomachs of the queens always contain pollen, the royal jelly being found in them two or three days after impregnation, when all traces of pollen have disappeared.

The narrow œsophagus is a simple tube, with a thick chitinous lining and muscular walls. The epithelium is very rudimentary, its cell boundaries being lost and its nuclei appearing as if imbedded in the lower layers of the thick transparent intima. The muscles are disposed in an outer layer of transverse fibres, and an inner layer of longitudinal ones.

The honey stomach is simply an enlargement of the posterior end of the œsophagus lying within the anterior part of the abdominal cavity. It is best developed in the worker, but is present also in the queen and in the drone. The organ should perhaps have been named the nectar stomach, for its principal function in the bee is to hold the nectar as it is collected from the flowers, and to allow the worker to accumulate a considerable quantity of this liquid before going back to the hive. Hence, since the honey stomach is a sac, with very distendible walls, its apparent size varies greatly. When empty it is a small flabby pouch, but when full it is an enormous balloon-shaped bag with thin tense walls. The histological structure of the honey stomach is exactly the same as that of the œsophagus. The numerous high folds into which its epithelium is thrown permit the enormous expansion of which the sac is capable. When a worker with its honey stomach filled with nectar reaches the hive, the nectar is either stored directly in a cell or is given up first to some other worker, who places it in a cell.

It would appear that all the food swallowed by a bee must go first into the honey stomach, and since the bee's diet consists of pollen and honey as well as nectar, one would suppose that in regurgitatin, the latter the bee would also disgorge the pollen it might have recently

eaten. Honey which is made from the regurgitated nectar does indeed contain some pollen, but most of the pollen eaten by the bee is undoubtedly retained in the stomach as food. The apparatus by means of which the pollen is supposed to be separated from the nectar belongs to the following division of the alimentary canal, but it is not known that the worker takes nectar, and pollen for food, into its honey stomach at the same time.

The proventriculus forms the neck-like stalk between the honey stomach and the true stomach or ventriculus, but a very important part of it projects up into the honey stomach. If the honey stomach be slit open, a short, thick, cylindrical object will be seen invaginated into its posterior end and having an X-shaped opening at its summit. This opening is the mouth of the proventriculus, and its four triangular lips, which are thick and strong, mark four longitudinal ridges of the proventricular tube. This structure is commonly known as the "stomach-mouth" and is supposed to be an apparatus designed especially to enable the worker to pick out pollen grains from the honey-stomach and shallow them on down into the true stomach or ventriculus, while the nectar is left to be stored in the hive. Cheshire says: "While the little gatherer is flying from flower to flower her stomach-mouth is busy separating pollen from nectar." This notion is so prevalent among bee writers in general that it passes for a known truth. Yet it has really never been shown that the worker eats pollen while she is gathering nectar. Probably no more pollen is ever mixed with the nectar in the honey stomach than is found in the honey itself. Furthermore, under normal conditions pollen never accumulates in the honey stomach, even when the bee is not collecting nectar,—or at least the writer has not observed it—while, finally, both the proventriculus and its mouth are just as well developed in the queens and drones as in the workers, though neither of the former are known to eat pollen, and they certainly do not gather nectar.

If the honey stomach be cut open in a freshly killed bee, the proventricular mouth may be seen still in action. The four lips tightly roll together and sink into the end of the proventricular lumen. This, of course, suggests their picking pollen out of the nectar, but it is probably simply the ordinary process by means of which the proventriculus passes any of the food in the honey stomach on to the ventriculus. Nearly all insects have some such proventricular apparatus, which simply takes the stored food from the crop as it is needed by the stomach. In some insects it forms apparently a straining apparatus, which prevents coarse, indigestible fragments from entering the stomach, while in some the proventriculus may be a triturating organ comparable with a bird's gizzard. Bees however do not crush the pollen either in their mandibles or in the proventriculus, for it occurs in perfect condition in the ventriculus.

Hence, before the current notion that the "stomach-mouth" is for the special purpose of taking pollen out of the nectar in the honey stomach can be accepted it must be first demonstrated that the workers eat pollen while the honey stomach contains nectar to be stored in the cells, i.e., any more than is disgorged along with the nectar; and, secondly, a reason must be shown why the queens and drones should have a "stomach-mouth" as well developed as that of the worker. In the meantime it appears most logical to regard the proventricular mouth as simply the ordinary apparatus, possessed by insects in general, by means of which all of the food is passed from the crop to the stomach.—By R. E. Snodgrass (Bul. 1 Tech. Series), issued by the U. S. Department of Agriculture..

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