REPORT ON OVERSEAS TRIP

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I T A L Y

I departed from Auckland, New Zealand, on 29 April and arrived in Rome, Italy, on 5 May, when I commenced fourteen days' annual leave. While in Rome I saw Conte Dr A. Zappi Recordati, who occupies much the same position in the Italian Department of Agriculture as does Mr Fawcett in New Zealand. The Count has a special interest in bees, having kept them himself, and is President of the Italian Government Beekeeping Association. The Count was most helpful and gave me a letter of introduction to the National Institute of Apiculture at Bologna, which is the centre of Italian beekeeping research.

In conversation the Count said that the food habits of the Italians are such that it is difficult to sell much honey in Italy. Insecticides are becoming a menace to bees and are being applied from the air. Acarine disease was introduced into Italy across the French and Austrian borders in 1940. It is now treated by burning strips of paper containing an insecticide inside the hive - these Folbex strips are sold by the Geigy Co. The Frow remedy is not used. The use of royal jelly in pharmaceutical preparations, and even toothpaste, is sweeping Italy and is an embarrassment to the Government, who do not recommend it.

Later, I visited the National Institute of Apiculture, directed by Dr Ida Giavarini, assisted by Dr Giulia Giodani.

The Institute is well appointed, with an agricultural museum, chemistry and biology laboratories, and offices. Samples of bees are received from all over Italy for diagnosis of disease, routine dissection being carried out by a staff of eight girls. Acarine and Nosema diseases are common in Italy, and A.F.B. is fairly widespread. As far as I could gather, diagnosis of bee diseases and their treatment is the main function of the Institute. Some research is carried out on academic subjects.

TREATMENT OF ACARINE AND NOSEMA

Acarine: A mixture of methyl alcohol (98%) and essence of mustard (2%) is used to treat the affected bees inside the hive. A wick is placed in the bottle holding the mixture so that evaporation occurs more rapidly. One application is given in Autumn and two in Spring. None are given in Summer. This method is much faster in application than the Folbex one, in which strips impregnated with insecticide are burnt in the hive. One of the Folbex strips must be burnt each week for eight weeks, treatment being discontinued in Autumn and Winter. Eight strips cost 2/6 in Italy.

Nosema: Fumagillin is used.

QUEEN RAISING APIARIES UNDER SUPERVISION

When acarine disease reached Italy, many countries, such as England, ceased to import Italian queen bees. The Italian Government then took steps to ensure that queens were raised in certain apiaries supervised by the Institute, so that they could be guaranteed free from acarine disease, and the export trade revived. I inspected the largest of these apiaries, belonging to Gaetano Piano at Castel S. Pietro Dell ' Emilia. All hives within 3 Kil. of this apiary must be inspected at intervals for acarine disease. Twice yearly, samples from all 500 nuclei in the apiary are collected and examined for acarine disease at the Apicultural Institute. If these tests prove negative, a Government Certificate is issued for export. The weakness of the scheme appears to me to be that they have no staff with a practical knowledge of bees at the Institute, and apparently depend on the queen bee breeder himself to collect the samples. Countries that already have acarine disease and wish to import queens could rely on such measures, but they are completely unreliable for New Zealand, which is free.

Management of Queen Bee Raising Apiary: Two nuclei per box are used, with frames less than half Langstroth size. Both nuclei are covered with one roof. The Dolittle system of raising queen cells is employed, and apiary management is very efficient. The apiary site is most picturesque and the honey flow lasts six months from various sources. Alfalfa provides the main flow.

S W I T Z E R L A N D

I arrived in Berne, Switzerland, on 19 May, and remained there at the Liebefeld-Berne Bee Research Station until 28 May. The Station is under the direction of Dr H.U. Gubler.

The Swiss State runs a Federal Experimental Station at Berne, with branches at Wadenswil and Zurich. The beekeeping section, under Dr Gubler, is attached to the Dairy Research Station and has under its control, besides research, an advisory service run by part-time Apiary Instructors. These send in samples of bees and combs for diagnosis of disease and give practical advice. There are no full-time Apiary Instructors.

Little honey is eaten in Switzerland; crops are poor, and there are no commercial apiarists. Honey-dew from pine trees is a valuable crop.

I spent sufficient time with each member of the staff to obtain full information on the work of the Station. The result of these talks and demonstrations is now set out:-

MR H. SCHNEIDER - ACARINE DISEASE

Without treatment a hive suffering from acarine disease is certain to die in one to two years. The mites lay four to six eggs in the prothoracic/tracheae only, where they take two to three weeks to become adults. Infested bees do not die through suffocation or through wing damage caused by the mites sucking their blood. Drones and queens can become infested.

Dr Morgenthaler found that only young bees can become infested. He took bees that were 100% infested and mixed them with bees of varying ages. Infestation of bees older than five days was negligible, and bees older than nine days, which would be on field duties, did not become infested. Infestation cannot occur outside the hive.

Mites can enter the tracheae of old bees, but it is easier for them to enter those of young bees with less stiff bristles protecting the spiracles, and they prefer to parasitize these. When the infestation is fourteen days' old, young mites are continually leaving the spiracles, and in Winter, when no young bees are available to infest, they attack the roots of the bee's wings, where they suck its blood. They are driven out of the tracheae as these become hardened with

dried blood and excretions. Although conditions at the wing bases are not as congenial as inside the prothoracic spiracles, the mites can develop fully in these places. Very badly infested bees may lose their wings, but others may only lose their use; such bees cannot fly in the Spring, and crawl out of the hives. After March, young bees are available for infestation and mites are not found at the wing bases. If more than 50% of the bees in a hive are infested in the Autumn, it dies, while if the infestation is less than 50%, it is weakened. Bees die only if the wing bases are infested, and loss of honey production is due to lack of bees and not to the weakening of bees suffering from a tracheal infestation only. Exceptions to this are as follows:-

(i) If a new hive is formed with bees, but no hatching brood, the mites will attack the wing bases of old bees because no young bees will be available for three weeks.

(ii) If a hive is infested 70-100%, the mites may attack the wing bases because insufficient young bees are available.

It is only during the Spring inspection that the beekeeper discovers hives infested with acarine disease. During the Winter months the bees may have starved to death through being too weakened to crawl to their honey stores, or many may be unable to fly when leaving the hive in the Spring. The agitation of bees by the mites causes the bees to breed much earlier than usual, and this is a symptom of the disease.

Schneider constructed an apparatus which could measure the weight required to tear the wing off a bee; 20 g. is required for healthy bees, but as Winter progresses it is found that increasing infestation lowers the weight required for diseased bees to 5 g. The hind wing is used as it is more infested at the base.

A hive with an 80% infestation showed no wing damage after Frow treatment. An infested hive treated with sulphur showed some damage.

By tearing a wing off a living bee, Schneider can tell if it has a wing base infestation, but great experience is required before this method of diagnosis can be used accurately.

A very active queen will lay so many eggs that the acarine mites cannot infest a high proportion of the young bees and the hive can

cope with the disease. In countries such as New Zealand, where the bees do not hibernate, the wing bases would not be infested and little mortality would be expected.

It has been shown that bees with tracheal damage only do not live a shorter time in an incubator than uninfested bees.

Infestation in Switzerland occurred prior to 1922, when work on acarine was commenced. A beekeeper in Geneva bought infested bees in France and sold them in Switzerland, so spreading the disease. The French-speaking part of Switzerland was more infested than the German part, which bought fewer of this beekeeper's hives. Now bees are not allowed into Switzerland from countries known to have acarine disease, and permission must be obtained to import them from acarine-free countries. The disease crosses the Swiss border, via swarms, from France, where control is not efficient. Attempts have been made to educate French beekeepers along the border in methods of treatment, but the position is hopeless.

Spread of Acarine: The disease is spread by young bees drifting from hive to hive and by swarms. Marked bees have been found more than one Kil. away from their parent hive. If one infested hive is found, all hives in apiaries within bee flight of it have been exposed to infestation. At first, when control measures for Acarine were applied in Switzerland, a cordon of 3-4 Kil. diameter was put round uninfested hives and all hives within this area were treated until free from disease. Later, it was found that infested hives were always found outside the cordon. Cordons are still applied, however, in spite of their limitations.

A good beekeeper can diagnose acarine disease, or at least suspect its presence, when 20% of the bees in a hive are diseased. Early diagnosis is most important. Beekeepers are obliged to inform the Research Institute when acarine is discovered.

Treatment of Acarine Disease: At first no treatment was available and infested hives were destroyed. Later it was found that other cases of disease always occurred nearby; so if a few mites were found in neighbouring hives, these hives, too, were destroyed. Destruction of diseased hives was carried further and further afield, but still the infestation was found.

Then, in 1928, Frow's remedy came at a time when a law was being framed which would have meant that all bees within flight range of a diseased hive must be destroyed. So Frow's remedy saved the industry. It was:-

Nitro-benzol	...	2 parts
Petrol	...	2 parts
Safrol	...	1 part

Two c.c. were put on a pad fitted with a handle, so that it could be inserted in the hive. Treatment was carried out for seven consecutive days and the pad then left in the hive for three more.

Many other ways of applying the treatment are known, but this official method is the best available. During the war methyl salicylate was used as a substitute for safrol, but it was not so good. Other combinations of drugs were also tried without improvement. The Frow remedy suffers from the disadvantage that it cannot be used during the breeding period, because it may kill the young larvae, so it can be used only in Winter. Sometimes, when fine weather comes in Winter, bees are able to fly from the hive, and as they have lost their sense of smell through the Frow remedy, robbing starts. The treatment must be stopped at once in such cases. In 1945, although 10,000 francs worth of damage was caused to bees by the Frow treatment, some beekeepers still considered it was satisfactory. It was realised by now that all hives in the areas affected with acarine would require Frow treatment if the disease was to be eradicated. It was difficult to carry out such a programme, although acarine is considered an epidemic disease in Switzerland and hence the Government had powers to order such general treatment. However, this would have involved much responsibility and the Frow treatment had been found to be not 100% effective as some mites survived its application.

Then Rennie's sulphur treatment was applied. Sulphur-impregnated paper is lit in a smoker and the SO_2 puffed into the hive. Schneider considers this treatment quite safe. Three puffs are given each hive for ten days, treatment is stopped for one week, and then the hives are treated as before for ten days. Mr Schneider considers this method most effective if it can be carried out longer than above, until the first young bees appear - say, every second day for

two months. Although an easy and quick method, it is not always carried out properly.

The Folbex treatment has only recently been developed. It is now the official remedy. Remedies for the red mite were tried for acarine control at Liebefeld, being sent there by the Geigy Co. Chlorobenzene (chlorobenzilate) was found to be the best and was used to impregnate absorbent paper which could be burnt in an open space in the hive. The treatment should commence during the first week in April, when young bees are being reared. These remain free from acarine as the old bees die. One Folbex strip is burnt once a week for eight weeks.

Every beekeeper in Switzerland is ordered through the Government to attend an instructional course in the use of Folbex. There are severe penalties for non-compliance - a fine and destruction of all the beekeeper's hives. There are twenty-two Cantons, each with a part-time bee inspector who works with the local veterinarian, who is responsible for all animal and bee diseases; during his training he attends a course of a theoretical nature on bee diseases. Each Canton carries out its own programme of disease control and most have different methods of doing this. The Liebefeld laboratory supplies advice.

After each Folbex treatment the beekeeper and the apiary instructor both have to sign an official sheet (see copy). The sheet is retained by the apiary instructor. Experience has shown that eight sets of signatures are necessary to ensure that the treatment has been carried out. After the eight treatments, Liebefeld examines samples of bees from the treated hives. If properly applied, the treatment is 100% effective in eradicating the disease. Five treatments are not considered sufficient, and eight are necessary. Switzerland is now largely free from the disease, after the use of Folbex for four years.

The correct time in the season to apply Folbex is all important. If used in New Zealand, careful consideration of this aspect would be necessary. The amount of Folbex required in New Zealand would be more than in Switzerland, on the basis of ½ strip per five combs of bees.

Folbex must be applied at night, when all the bees are inside the hive. After lighting the strip, the hive is closed for half an hour. If the hive is opened before the half hour has elapsed, the bees will rush out, and if the hive remains closed more than the half hour, the bees will be distressed.

The Folbex strip may be placed on a metal holder, which can be pushed inside a hive along the floor after ignition. This method could be used for treating Langstroth hives. A sample of the metal holder was obtained, together with a sheet of instructions for the use of Folbex strips.

The use of methyl alcohol and mustard oil (see notes on Italy) for the treatment of acarine is cheap and easy, but not 100% effective. It must be carried out permanently and causes robbing. It is not used in Switzerland.

In Belgium the P.K. treatment (material made in the U.S.A.) is used. It is similar to Folbex.

Dissection for Acarine Disease: The following solution is used to keep insects awaiting dissection:-

Oudemann's	Alcohol, 95%	1000c.c.
	Distilled water	400c.c.
	Glacial acetic acid	128 c.c.
	Glycerine	80 c.c.

The complete trachese must be dissected for a satisfactory diagnosis.

STEPS TO TAKE SHOULD ACARINE APPEAR IN NEW ZEALAND

The question of what steps to take if acarine appeared in New Zealand was fully discussed with Dr Gubler. In Switzerland the procedure may be summarised as follows:-

An area where the disease appears is cordoned off and bees cannot be moved out unless the whole area has been free from acarine for one year after a compulsory treatment of infested hives with Folbex strips.

In Dr Gubler's opinion, acarine disease would not be as severe in New Zealand as it is in Switzerland, because there is a long period, six months, in Switzerland during which no young bees are being raised. If acarine disease is found in New Zealand, destruction of the apiary

where it appeared would be unlikely to eradicate it, according to Swiss experience - it would have already spread over a large area and outbreaks would flare up later.

It would appear that the best steps to take in dealing with an outbreak of acarine in New Zealand would be as follows:-

(i) A cordon of a radius of 10 Kil. to be put round the infested apiary.

(ii) Find all infested hives in the apiary.

(iii) Destroy bees in badly infested hives and treat lightly infested ones with Folbex.

(iv) No hives to be moved out of the area until a year after the disease completely eradicated.

The following facts are of value in planning such a campaign:-

(a) Disease resistant bees are not known.

(b) Acarapis dies within a day in a dead bee, and quicker on equipment, which thus cannot transmit the disease.

(c) The Frow remedy would not be of much use in New Zealand because it causes robbing when bees are able to fly, as they can do much of the year in our mild climate.

DR MAURIZIO - VARIOUS SUBJECTS

Dr Maurizio has worked on a variety of subjects. She is noted for her work on pollen analysis.

Testing the Biological Value of Different Foods for Bees: Bees not more than twelve hours old are caged and fed the test foods in an incubator at 30°C. They are examined for Nosema, as this would affect their metabolism. Control bees are fed on sugar syrup only. After a minimum period of three weeks the pharyngeal glands and fat bodies of the bees are removed and examined. Their size and development are estimated compared with those of the control bees. Hydrolysed casein (vitamin-free) plus vitamin-free dextrose was being tested when I saw Dr Maurizio. This work would of great use in evaluating pollen supplements.

Biological Tests for Bee Poisons: These were of great interest to me, as I think they will be of increasing value in New Zealand. Crickets are used for testing pollen from rape, which is often

sprayed with a solution of benzene hexachloride. The pollen is removed from the bees' pollen baskets. A pollen trap could be used in its collection. The crickets, two to three days old, are left with the pollen in a plugged test-tube for twenty-four hours. They are supplied with water from a piece of water-soaked blotting paper. One cricket is used, followed, if death occurs, by another as a check. If no pollen but dead bees only are available, Aedes aegypti larvae are used. A poisoned bee is macerated in a test-tube of water and ten larvae added. Eggs of the larvae are supplied by the Tropical Institute. The larvae soon show signs of poisoning in a positive test.

Pharyngeal glands: These have two functions (i) they secrete brood food and royal jelly and (ii) they secrete invertase. But invertase enters honey from the plant as well as from the bee. The glucose-fructose ratio varies in honey and the reasons for the variation are being investigated.

DR GUBLER - NOSEMA APIS AND SWISS BEEKEEPING

Fumagillin has been found effective against Nosema. Sugar syrup containing 35mg. per litre is fed for three weeks, the volume given being 4-5litres-9035 mg. per c.cm. The dosage of fumagillin is affected by the way in which bees winter. In Switzerland, where the bees hibernate in Winter, the dose would be different from that given in New Zealand, where they breed throughout the Winter.

When no honey is coming into a hive, few young bees are raised and the old bees would live longer and be more affected with Nosema. This situation has applied recently in Switzerland, which has experienced several severe seasons. The climate of the Winter preceding an outbreak of Nosema is usually severe, according to Ruth Lottmar.

It would be expected that the Winter preceding the New Zealand epidemic of Nosema in 1946-1947 would be severe (February, March, April severe ?). This would mean that no young bees would be coming on and the old ones would be heavily infected.

Types of Swiss Hive: The Swiss have developed a special hive, which is used mainly in bee-houses. The combs are large, being 35 cm. by 27 cm. This type of hive and the bee-houses themselves are

completely unsuitable for commercial beekeeping, and it is not surprising to find there are no commercial beekeepers in Switzerland.

In the French part of Switzerland, Dadant hives are used in beehouses, or they may be kept in the open and wintered without packing.

Not long ago from 14-16 lb of honey was collected by a hive in Switzerland, but now the crop is only 8-10 lb. The climate has become worse, more shrubs and flowers are destroyed so that the ground can be used, and insecticides are employed on an increasing scale.

F. BAUMGARTNER - DIAGNOSIS OF DISEASE

E.F.B. This is caused by Strep. pluton, usually with B. alvei as a secondary invader. Yellow brood appears in the cells of the brood combs. This brood breaks up if it is removed. Strep. pluton is expelled orally by the larvae, and it can be found on the cappings. Strep. pluton is also excreted by the larvae. In diagnosis bacteria are removed in scrapings from the inside of the cappings and examined, nigrosin being used as a background stain. They can also be found in the yellow parts of the larvae.

Bac. orpheus sometimes accompanies Strep. pluton, which must be found for a positive diagnosis. The presence of B. alvei and Bac. orpheus alone is not conclusive. Nigrosin stain is used to provide a background for the three organisms, which are examined with a X950 oil immersion. Strep. pluton can be recognized by its characteristic appearance. (See specimen slides).

E.F.B. is treated with terramycin, although this does not always effect a cure. In some parts of Switzerland the bees and combs are burnt, as in the case of A.F.B. The disease is regarded as less dangerous than A.F.B. Combs should be burnt immediately the disease is found, as they are infectious for about a year.

HERR A. BRUGGER - EFFECT OF CLIMATE AND TEMPERATURE ON NOSEMA

A Nosema infection itself may be relatively harmless, but when allied to other factors heavy mortality may occur. Swiss beekeepers think the pollen collected may be connected with increased mortality, but this is doubtful.

Mr Brugger's views apply probably only to Switzerland, where they have been so far worked out only for a restricted area.

When the Swiss winter finishes in March, the bees become active, except in areas with a high altitude, where they are retarded. If such active bees are fed sugar water, they will be stimulated to fly, and if infected with Nosema, they will be unable to regain their hive, the brood will be uncared for, and the hive will die out. It would have been better to leave the hive to collect nectar supplied by Nature. If hives are short of stores, sugar should be fed in Winter, not Spring.

If the Summer, including July and August, is fine, there is practically no Nosema the following Summer. 1947 was the best Summer of the century. 1948 was the contrary, with much rain and cold. 1949 was a fine Summer, very hot and dry; but there was a very great outbreak of Nosema in the less high areas of Switzerland. Here the rainfall was about twice that which fell in the more mountainous areas during 1948. If breeding bees are fed with sugar syrup before July, they can resist Nosema, but if fed after July, they die because they are stimulated at the wrong time.

HERR W. FYG - QUEEN BEES

Herr Fyg is the leading expert on diseases and abnormalities of the queen bee, and receives specimens from all over the world.

He said that there are 68 different types of disease and abnormality which can afflict queen bees' reproductive organs. Queen bees sent to him are given a number and all particulars are entered on a special form. (See specimen). So far he has dissected 4,000 queen bees, all of which are preserved for reference. Abnormalities in organs other than the reproductive organs can cause sterility or malfunction.

Von Leeuwen's Fixative for Bees

1% picric acid in absolute alcohol	12 T.	Parts by vol.
40% formalin	2 T.	" " "
$CHCl_3$	2 T.	" " "
Conc. Acetic acid	1 T.	" " "

Wash after soaking in above and keep in 70% alcohol. The bodies of the bees should be opened.

Melanosis: Caused by a yeast-like organism or by a bacterium.

Calculi: Calculi form in the rectum and cause injury because the queen cannot excrete and may become distended. The enlarged rectum constricts the oviducts and prevents the queen laying.

Nosema: Many package queens in the U.S.A. are affected.

Amoeba disease: This never affects queens.

Virus disease: A very common disease of queens. A very young queen will be found laying only drone eggs, due to defective sperms. The virus affects the sperms in the spermatheca and enters other organs also. The sperms develop characteristic curls. Herr Fyg discovered the cause of the disease in 1947. The virus is found in the fore intestine, ectoderm, and reproductive organs. No other type of bee, or even queen larvae, have been found with the disease.

Endocrine Glands: These suffer from disturbances about which little is known; from the corpora allata come hormones which stimulate egg laying; the corpora cardicum secretes hormones; there is a prothoracic gland.

PRACTICAL BEEKEEPING

On 25 May, I went for a drive with Dr Gubler through Mattstetten, Murzelen (where the schoolmaster keeps bees), and Sarisvil, to inspect bee-houses and see the Swiss way of keeping bees. The bee-houses and hives are very expensive and complicated, and appeared to me to be uneconomic, even when allowance was made for local conditions.

I saw a bee-house on wheels, which is towed up to the woods for a month every year so that the bees can collect honey-dew from the pines. The owner (Mrs Staehli) mixes this with flower honey and sells it for a good price.

I think it likely that ordinary, double-walled hives, or single-walled hives with some insulation or winter packing, would be far more efficient and economical than the hives kept in bee-houses. The only advantage of bee-houses appears to be that bees kept in them are easier to handle.

NOTE: A very useful type of hive balance was inspected - the Meier Kunten Bienartikel (400 F.).

A large collection of scientific papers was obtained from the Liebefeld staff.

After leaving Berne, I followed an itinerary arranged by Dr Gubler and attended the Seventh International Congress of Comparative Pathology at Lausanne. One of the papers delivered dealt with the effect of industrial wastes on bees.

I then spent a day at Val Mont, Montreux, with Mr Frankhauser, who is secretary of the local beekeepers' association. I particularly wished to see something of the beekeeping in this French-speaking area of Switzerland, as Dadant hives are used here without bee-houses. These hives resemble Langstroth ones, but have deeper frames.

Mr Frankhauser's hives are kept in the open, without bee-houses or special shelter, in an apiary at an altitude of 700 metres. He considered the bee-houses were unnecessary. At greater heights he winters hives in a box-like structure which affords some protection. Usually one super only is used in Switzerland for brood, but the combs are bigger than in our Langstroth hives.

In Zurich, I visited Professor Bovey at the Entomological Institute, where he teaches apiculture. Recently, he has been forced to spend his time dealing with a disease affecting larch trees. This is being combated by spraying affected trees with a virus which attacks the caterpillars causing the disease. He is interested in the work of our Forestry Department. Later, in London, I arranged for the Department to contact him.

I also visited Dr Horber at the Oerlikon Research Station. He has been carrying out interesting work on acclimatising bumble-bees to new sites. The nesting boxes for the bumble-bees are first used as homes for mice, so that the nest material can acquire the authentic mousey smell which attracts bumble-bees. Dr Horber is also making migration studies on wire-worms, which are marked with radioactive wires attached to their bodies. Radioactive D.D.T. is being fed to the Colorado beetle so that acquired resistance to D.D.T. can be studied. Dr Horber specializes in studying the effect of wire-worms on field crops.

F R A N C E

I reached Paris on June 3rd and left on June 16th. The bee research station of Bures-sur-Yvette is situated some miles outside Paris near the little village of that name. It is directed by Dr Remy Chauvin who has a laboratory staff of twelve of whom five are qualified. Facilities and equipment are good, but some of the buildings are old. However, Dr Chauvin told me that ample funds were available for rebuilding which was to commence shortly. The station has been in operation only six years.

THE FRENCH BEEKEEPING INDUSTRY

There are about 150,000 beekeepers in France of whom 300-400 keep bees as a full-time occupation. These professional beekeepers usually keep 600-1,000 hives, although some have more. Beekeepers are obliged by law in France to register their hives. But because a fee is charged many do not register, and it is considered that only 30% of commercial beekeepers comply with the law. Thus the above figures are only estimates, and too much reliance should not be placed upon them. The beekeepers have no official Journal, and their meetings are mainly for social and not instructional purposes. They are behind other agricultural workers in education and outlook.

Honey crops vary greatly in different parts of France. In exceptionally good years the maximum would be 40 kilograms per hive, but the average crop is about 10 kilograms per hive. Lavender, Rosemary, Hubam, and Orange honeys are obtained in a pure state and sold as such.

Many French honeys do not granulate; when once heated they usually remain liquid. They frequently contain excess moisture, rendering them liable to ferment. Consequently, interest was shown in the New Zealand work on removing such moisture by means of a vacuum. (Paterson, C.R. and Palmer-Jones, T.: A Vacuum Plant for Removing Excess Water from Honey).

TREATMENT OF DISEASE

Dr Chauvin considers that the state of the French beekeeping industry is such that it is not economic to treat hives affected with acarine and nosema or attempt to prevent the spread of disease.

A.F.B. is efficiently controlled by transferring the bees to foundation comb and burning infected material. Sulphathiazole is used as a spray on the combs for its control.

E.F.B. is considered more serious than acarine disease but is not treated.

Acarine is kept in check by the winter climate which is more severe than that of Britain. In Corsica which has a milder climate and much greater flow of honey than France acarine disease is a serious menace. This state of affairs is the reverse of what the Swiss said would be the case!

Brother Adam in Devon bred what he claimed to be acarine-resistant bees. These bees were found at Liebefeld to owe their resistance to an infection with torulopsisapis yeasts which attack acarapis. A second yeast, Kloeckera apiculata, has been found which attacks acarapis. It was isolated from the tracheae of bees. Boxes containing ampoules of a culture of this yeast, together with ampoules of sterile saline, are available in France. The contents of an ampoule of the yeast culture is mixed with sterile saline and the mixture sprayed over combs in the acarine infested hives. A specimen box of cultures was obtained from Dr Chauvin. The cultures will keep about three months.

Although these two yeasts control acarine in England, Northern France and Ireland, they are of no use in Southern France or Corsica. It thus appears that the issue is affected by some factor like weather.

In Corsica an organism, Bac. Lichenoides, has been found which attacks acarine mites. Experiments are being carried out to discover if it will control acarine disease.

Efficient biological control of acarine would be preferable to control by acaracides, particularly as bees close their spiracles against the fumes of substances like Folbex.

POLLEN ANALYSIS

Pollen analysis of honeys is carried out and a pollen survey of French honeys is being made.

The individual hives in a group of hives usually collect different pollens, and the reason for these preferences is being investigated. Pollen pellets are collected in traps for botanical

examination; the pellets are analysed chemically to find if their composition varies.

CRICKETS AS TEST INSECTS FOR INSECTICIDES

The use of these insects was first developed at Bures-sur-Yvette. It was found that very young crickets are best, as these are extremely susceptible to all the insecticides which affect bees. G. domesticus is the species of cricket used. It will lay its eggs, which take two to three weeks to develop, in moist sand. In rearing the crickets a small porous flower-pot of moistened sand is attached to a box covered with gauze and the whole kept in an incubator at 30°C. The crickets are fed on crushed corn and lettuce leaves or other greens.

WORK ON BEE NUTRITION

The effect on the growth of the ovaries of young bees (2-5 days) fed various substances, such as vitamin B, is being studied.

HIVE ACTIVITY

Dr Chauvin has devised a most ingenious method of measuring hive activity. As bees leave the hive they cause drops of water to collect in a recording rain gauge. The volume of water collected is proportional to the number of bees which leave. A paper was obtained describing this apparatus.

ROYAL JELLY

This is forwarded to Bures-sur-Yvette by commercial firms for tests. If it is not passed by Bures-sur-Yvette as being sufficiently pure the firms will not accept it from the suppliers.

The age of royal jelly at the time of removal from the hive can be judged by examining it for skins shed by the queen larvae and measuring the size of the spiracle openings in these. Measurement of the physical properties of royal jelly from many cells give very similar results. When testing the purity of royal jelly pH, acidity, conductivity, surface tension, and colour are measured. Identification of contained pollen grains is also carried out. Royal jelly may be stored indefinitely at about -10°C.

Royal jelly is of no value in cosmetics. It contains testosterone and is used especially to treat senescence and restore the virility of

old men. It is given by intramuscular injection in hospitals.

Preparation of royal jelly for injection: After extraction from the queen cells it is lyophyllised and desiccated in a vacuum at -60°, being freeze dried. It is mixed in a hypodermic with sterile saline for injection intramuscularly, after sterilization by filtration under special conditions. But no standard method is yet available as the hospitals are continually changing their methods. 20 mg. are given every two days to patients.

There is only one reputable manufacturer of royal jelly in France - Joullie. He calls his preparation G.R.50.

A private firm has contributed money to help Bures-sur-Yvette carry out research on royal jelly. Paper chromatogrphy is being used in the isolation of the unknown constituents of royal jelly.

Ten queen cells give one gram of royal jelly. This is the mean quantity calculated by weighing the yield from 180,000 queen cells.

Papers have not yet been published on royal jelly by Dr Chauvin.

Commercial Production of Royal Jelly: I visited M. Bosc, 37 Avenue des Rossignole, a commercial beekeeper who is now concentrating on the production of royal jelly rather than honey. Usually, apart from selling honey, he deals in swarms and hives. In winter he extracts venom from bee stings and sells it to firms making up preparations for treating rheumatism. In a season 1,250,000 stings are removed.

M. Bosc commenced royal jelly production five years ago under the direction of Dr Chauvin. He has a large apiary outside his house in which is situated a laboratory where girls remove the royal jelly.

In producing royal jelly queen bees are first removed from their hives and placed alongside them in a small nucleus. Then 72 cell cups, on bars sliding into frames, are placed in the queenless hives. A drop of royal jelly is placed in each cell cup from a plastic container which is kept warm so that the jelly remains liquid; this incites the bees to draw out cells. The young larvae are then placed in the cells, and after two and a half days in the hive, the queen cells are removed and the royal jelly sucked off by an attachment to a water-pump. On its way to the pump it is trapped in a sterile bottle supplied by a commercial firm. Before sucking off the royal jelly the grub is removed. After use the cell cups, now queen

cells, are returned to the hive because bees prefer them to artificial cell cups.

M. Bosc uses Dadant hives in his apiary. He considers that production of royal jelly does not interfere with the collection of honey. Each hive is used to produce two lots of queen cells (72 x 2) before its queen is returned.

M. Bosc produced 10 - 20 kilograms of royal jelly last year. This year he will produce 40 kilograms.

POLLEN TRAPS

Much work has been done at Bures on developing more efficient pollen traps. In one of the best types the trap fits on top of the hive and the bees enter it through circular openings punched in metal sheets. These openings can be made exactly the correct size for the bees, unlike the openings in wire gauze which are not very regular. Pollen collected in such traps is shielded from the rain and is dried by the heat from the hive. The address of the firm making the sheets is:-

Gentois,
40 Boulevard Richard Lenoir,
Paris.

The perforations are 5 m.m. in diameter for the metal strip through which the bees enter the pollen trap and 4 m.m. in diameter for the metal strip covering the box in which the pollen is collected.

THERAPEUTIC USE OF POLLEN

Pollen appears to have a beneficial effect upon the constitution and may cause an increase in weight. Tests on humans are being made with pollen of known floral source. Under certain conditions practically pure pollens can be obtained in France and these are used in the tests. Pollen is used for treating intestinal diseases, especially of the large intestine. It acts like an antibiotic. One soupspoon (about two teaspoons) is taken daily for 2-3 weeks.

Ten tons of powdered pollen will be sold in France this year. Pollen samples sent to Bures by beekeepers throughout France and Morocco are first tested on mice before the bulk pollen they represent is released to the firms selling it to the public. This precaution is taken in case poisonous pollen exists. Mice fed two to three

months on pollen alone are unaffected adversely even when young and pregnant.

At Bures pollen is dried in an incubator and stored at a low temperature to prevent spoilage by growth of the yeasts and bacteria it contains. The pollen should be ground very fine before storage to destroy pollen mites and the eggs of other insects which could hatch out later.

SOME CONCLUSIONS

Unlike the Swiss research station at Liebefeld, Bures-sur-Yvette does not concern itself greatly with the treatment of bee diseases and, except for fostering the large scale production of pollen and royal jelly, has little contact with the beekeeping industry in France.

Very little has been published on the properties and therapeutic value of royal jelly, and the development of its use on a large scale, with the backing of Bures-sur-Yvette, seems, in the present stage of knowledge of its properties, a somewhat hazardous undertaking. If the use of royal jelly should eventually become accepted in the United Kingdom it would, with the knowledge obtained, be possible to produce it commercially in New Zealand and send it there by air.

The use of pollen for medicinal purposes does not yet seem to rest on any sure foundation, and until more knowledge is available its production on commercial lines is not warranted in New Zealand.

U N I T E D K I N G D O M

While in the U.K. I was attached to the Bee Department, Rothamsted Experimental Station, Harpenden, where the information in the first part of this report was obtained. The head of the Bee Department is Dr C.G. Butler.

TREATMENT OF BEE DISEASES - DR L. BAILEY

EUROPEAN FOUL BROOD

The effect on E.F.B. of the quaternary ammonium compounds such as Cetavlon and Deciquam is being investigated. Deciquam has been found to destroy E.F.B. but is too toxic to bees in the necessary

concentration.

I. LABORATORY METHODS: These compounds are tested on larvae reared artificially in polythene cell cups kept in jars above 2% KOH solution. The KOH keeps the humidity at about 90% and removes excess CO_2. Incidentally, it has been found that combs made of polythene are useless for practical beekeeping because the wax moth will bore through them. Perspex can be used instead of polythene, and round holes may be bored in it instead of the usual hexagonal ones. The polythene or perspex cups are stored in alcohol to keep them sterile.

Testing of Cetavlon: Three bee larvae infected with E.F.B. were removed from a hive and ground up in a mortar with 5 c.c. of distilled water. The strength of the infection was tested by spreading a standard loop of the suspension obtained over an area of one sq. cm. marked on a slide, and examining the smear under the microscope against a nigrosin background. If necessary, larvae may be kept alive for several days after removal from a hive in a refrigerator at 30°C.

Serial dilutions of the suspension were then prepared, using Cetavlon as a diluent, so that the infected material was exposed to one part of Cetavlon in 1,000, 10,000, and 100,000. These dilutions were stored for 24 hours in a refrigerator at 3°C. It appears possible that larvae infected with E.F.B. may contain some volatile toxic substance as sometimes, when their freshly ground-up bodies are used in tests on healthy larvae grown in cell cups, unexpected mortality of these occurs. If this material is kept for some days before use, however, such mortality does not occur.

Then a loopful of royal jelly was placed in all the cells of four pieces of polythene comb, each of which contained twelve cells. One such group of twelve cells is always used for testing each dilution or as a control.

A two-day-old larva was then put on top of the royal jelly in each cell and the four pieces of comb placed above the 2% KOH in four screw-top jars after inoculation with loopfuls of 1/1,000, 1/10,000, 1/100,000 Cetavlon plus the undiluted suspension of ground-up larvae as a control. The jars were kept in an incubator at 34°C. This operation was completed at 5 p.m. At 10 a.m. next

day the larvae were given a loopful each of royal jelly, and at 6 p.m. a loopful of special yeast food - 25% honey and 10% yeast extract (Difco). The royal jelly was stored in the inner cabinet of a refrigerator at -10°C. Under such storage conditions it can be held for a year. On the third day yeast would have been fed the larvae at 10 a.m. and 6 p.m., but feeding was discontinued as the larvae were mainly dead.

NOTE: A fine pipette with a very small bulb is used to deliver a drop of yeast extract on top of the larvae. A fresh pipette is used for each group of cells and it is placed in lysol after use. The platinum loop used to deliver royal jelly and other material to the larvae is flamed when appropriate.

Further Tests Commencing 19/7: Larvae two days old were placed on loops of royal jelly in cell cups at 10.30 a.m. At 11 a.m. another loopful of royal jelly was given to ensure an adequate food supply, and the larvae were inoculated, in the usual groups of twelve, with loopfuls of 1/1,000, 1/10,000, and 1/100,000 Cetavlon. One group was also inoculated with the undiluted infected material, and an untreated control group was maintained. 19/7. 6 p.m: Royal jelly fed. 20/7. 9.30 a.m: Yeast extract fed and also at 1 p.m. and 5.30 p.m. On 20/7 all the larvae were alive except those treated with 1/1,000 Cetavlon which is thus shown to be toxic in this concentration. 9.30 a.m.: Yeast extract fed. Noon: Yeast extract fed, larvae short of food. 5.30 p.m.: Yeast extract fed. 22/7 Larvae killed and smears prepared.

The experiment showed that concentrations of 1/10,000 and 1/100,000 Cetavlon prevented the infection of all larvae. Undiluted infected material caused disease in several larvae.

NOTES: The Americans rear larvae three days old on nylon gauze touching cotton wool soaked in the yeast plus honey solution already described.

Larvae can be conveniently transferred by sucking them against a fine opening at the end of a glass tube.

Mortars and equipment used for handling E.F.B. are sterilised in Lysol to prevent the disease spreading to apiaries.

II. FIELD METHODS: Experiments are being conducted on the feeding of Cetavlon to hives infected with E.F.B. and the spraying of combs of such hives with it. The mode of transmission of E.F.B. is being studied.

An E.F.B. infection always drops in summer during the honey flow. Is this due to the antibiotic effect of freshly gathered honey? Some authorities have found that honey has such an effect but it does not last.

ACARINE DISEASE

Efforts are being made to discover an acaracide which will destroy the mites with one or two applications, and not eight, as in the case of Folbex.

Ovotran or PCPCBS: Strips of heavy blotting paper were soaked in 5% $NaNO_3$ and dried, then soaked in ovotran and dried. Finally they were folded in a "V" shape, with holes punched along the mid-rib to assist combustion, macerated with a file, and burnt in hives to find what effect the fumes would have on the bees and queens. It was found that the bees in strong hives were excited and dropped down on the burning strips which they put out. In weaker hives the strips burnt satisfactorily.

NOTE: PK and dimite have the same effectiveness against acarine as chlorbenzylate.

Steps to Take if Acarine Found in New Zealand: Dr C.G.Butler considers, as did the Swiss, that if acarine was found in one apiary it would already have spread to others. He suggests:

(i) All bees should be destroyed in the infested apiary.

(ii) A cordon 3 - 5 miles in radius be put round the infested apiary and no bees be allowed in or out.

(iii) Examination of all hives within the cordon should be made and infested bees destroyed, if practicable, or treated with an acaracide such as Folbex.

(iv) We should cease all importations of bees from the U.S.A.

(v) I consider we should have the means to compensate beekeepers whose bees were destroyed in such an emergency - perhaps a type of insurance.

NOSEMA DISEASE

The effect of pH upon fumagillin is being studied by feeding solutions of it to bees artificially infected to the maximum with Nosema.

The effect of sugar syrup upon fumagillin is being estimated by making up the fumagillin in sugar syrup and feeding the original solution to Nosema-infected bees at monthly intervals for six months.

Artificial Infection of Bees with Nosema: A dose of one million spores per bee ensures that the bee becomes heavily infected with Nosema. The spores are obtained from the intestines of infected bees and counted in a haemocytometer. They are fed in sugar syrup on the wires of a cage to 180 bees at the rate of a million spores per bee. The bees are not given sugar syrup until they have consumed this infected material. Then they are supplied with water and sugar syrup.

Acetic Acid: A very effective method of treating Nosema depends on exposing infected material to acetic acid fumes. These fumes also kill the eggs and larvae of the lesser wax moth in 24 hours. Experiments are now being carried out to discover if the greater wax moth is also killed.

Transfer of Combs: Nosema may be treated by placing the queen bee and one comb of brood in the centre of a super of foundation comb which is separated by a queen excluder from the old brood chamber placed underneath. The old brood comb is removed as soon as possible. This method depends on the fact that dried faeces in combs carry the Nosema spores and spread the infection. Acetic acid kills the spores in dried faeces. See reprints for full accounts.

APPARATUS FOR COLLECTING SAMPLES OF BEES

The rapid removal of samples of bees from hives is often necessary for diagnosis of disease or to study the effect of treatment. A very convenient apparatus has been designed at Rothamsted for the purpose. In brief it consists of a piston which sucks the bees into a removable sampling chamber. The apparatus is compact and hand-operated. A scale drawing was made.

U.K. AND IMPORTATION OF BEES

The importation of queen bees from Italy was stopped some time ago more because the bees were heavily infected with Nosema than because of Acarine infestation.

The U.S.A. has only recently banned the importation of bees from European countries, and much acarine must have been brought in before this measure. But apparently it has not become established there. During a visit just after the last war Dr Butler dissected bees in many parts of the U.S.A., but never found one acarine infestation. But bees in the U.S.A. have a serious type of Nosema and E.F.B. is widespread.

HIVE VENTILATION

It has been found at Rothamsted that bees winter much better in a humid atmosphere if small vents are put in their hive lids. These vents are two in number and placed opposite each other. Diagrams showing their location have been obtained.

BEE BEHAVIOUR

Mr Ribbands has been carrying out experiments on the scent of bees. He has found that the scent of the bees in a hive is determined by the type of nectar they are collecting. Bees from different hives can enter each others hives with impunity if they are collecting the same nectar.

There is evidence that queen bees can be safely interchanged between hives collecting the same nectar.

I spent a short time with Ribbands in Wales working on this subject. We brought up ten hives which, together with another ten, were placed in two groups on the heather. Before being brought to the heather all surplus honey was removed so that after a few days all the hives would have stored only heather honey under like conditions. Then the queens in each group were interchanged without any losses.

FACTORS AFFECTING THE NECTAR SECRETION OF WHITE CLOVER

The opinion at Rothamsted is that farming practices that enrich the soil and favour growth of white clover also favour nectar secretion. But application of ammonium phosphate or other treatments which cause rank growth reduce nectar secretion as the growth occurs at the expense of the nectar producing plant substances.

BEESWAX

Much beeswax is imported from E. Africa and used in foundation comb which is often unsatisfactory in performance owing to the low m.p. of such waxes. A market is open to New Zealand in this sphere.

NICOTINE SULPHATE AS A REPELLENT

Kelsey of the D.S.I.R., Ashburton, has stated in a letter to our Department that the addition of nicotine sulphate at the rate of 1 part in 1,280 of D.D.T. spray would repel bees. Dr Butler does not agree and states that nicotine sulphate is in any case too volatile to last long, whereas D.D.T. is persistent.

POLLINATION OF RED CLOVER

Dr Butler asserts that under the conditions found in the U.K., very good pollination of this crop with hive bees takes place. These often collect extractable quantities of red clover honey. Bumble bees are not needed. This does not necessarily apply to New Zealand conditions.

POLLINATION OF BROAD BEANS

Hive bees pollinate these very efficiently and bumble bees are quite unnecessary for this purpose. The beans have extra floral nectaries which are sometimes visited by bees instead of the flower nectaries. Hive bees also sometimes collect nectar through the holes bored at the base of the flowers by bumble bees.

IMPORTATION OF BUMBLE BEES

Instead of importing bumble bees as pollinators, Dr Butler suggested it might be better to bring in the small bee Melipona Iridapennsis. (Really a Trigona bee). This is very prevalent in South India and Ceylon and is an excellent pollinator. The colony has multi-queens and does not swarm away. The bees store very little honey. The bees would be unlikely to live in the colder parts of New Zealand. I do not think this scheme practicable.

STAFF AND RUNNING COSTS OF BEE DEPT., ROTHAMSTED

Six professional workers are employed in the Bee Department and there is one apiarist, a secretary-typist, and twelve technicians, making a total of twenty. Salaries for the professional workers range from £2,000 (Dr Butler) to £800. The total cost of salaries

is £13,500. Total expenditure per year for the Bee Department is over £16,000 without allowance for building maintenance or services.

Beekeeping is regarded as of such importance in the U.K. that during World War II it was classed as an essential industry and supplies of sugar were made available to all beekeepers, even those with only one hive.

The average annual crop of honey produced in the U.K. is difficult to estimate, but would probably not exceed 1,200 tons, compared with 4,000 to 6,000 tons in New Zealand.

BUCKFAST ABBEY

On 2nd August I arrived at Buckfast and stayed there until the 6th, spending the time with Brother Adam of St Mary's Abbey, Buckfast. He is a very efficient beekeeper and has specialised in producing and extracting heather honey, which resembles N.Z. manuka honey in many ways, particularly in being difficult to extract.

Brother Adam raises over 200 queen bees every year, most of which are used to requeen the Abbey hives which number more than 300. These are thus, for the most part, requeened every year.

Isolated Mating Apiary: I visited the queen mating apiary on Dartmoor, about 10 miles from the monastery, at a height of 1,300 ft. in a sheltered valley. Conditions here are ideal for controlled mating as there are no other bees within a radius of six miles and no swarms could maintain themselves on the moor. The mating boxes are made to accommodate 16 Dadant half-frames, each box being divided into two (crosswise) to take them. Another division (lengthwise) by means of movable division boards gives four compartments each holding four half-frames. These mating nuclei can support themselves, and a fertile queen can overwinter in them, but they are small enough to prevent drones being raised. The correct type of drone is provided by full sized hives maintained in the apiary.

The mating boxes are supported on single legs of preserved timber, and have a roof with a small gable and an inner feeder mat. The roof is secured by a chain which passes over the top and is fastened to the leg.

Moving Hives to the Heather: When the honey flow in the low lying areas, mainly clover, finishes, the hives are moved out in August to Dartmoor where a second flow is harvested from the heather. One apiary of 32 hives is moved at a time in a truck. The hives are closed in front with wooden blocks and covered with wire screens. These are secured with two metal rods which have wing nuts welded to the top so that they can be screwed into metal threads fixed in the bottom boards. The apiaries are made ready for moving the day before. While at Buckfast I helped to prepare and move two apiaries. The bees are moved out between 5 and 6 a.m. when the air is still cool. The whole operation was very simple because of good equipment and organisation.

Honey and Wax Extraction: Extraction of the non-heather honey crop proceeds on usual lines, a radial extractor and steam-heated uncapping knife being used. The heather honey is extracted by cutting out the combs, wrapping them in cloth, and placing them in an electrically heated hydraulic press which operates at a pressure of 0.63 tons per sq. inch. Twenty-three tons of honey have been pressed in twelve days with a loss of only 1.2% of honey. The press would cost approximately £1,500 now. The extracted honey, whether centrifuged or pressed, is pumped into storage tanks - eleven each of 2.5 tons holding capacity. All tanks are fitted with coils through which warm water can be circulated before the honey is bottled. Heather honey contains much water, up to 23%, and must be heated to about 120°F. to sterilize it and so prevent fermentation.

An automatic bottling machine which can fill 1,500-2,000 1 lb. cartons per hour is used. It was manufactured by the Roberts Patent Filling Machine Co., Ltd., Deane Road, Bolton.

The press used for extracting the heather honey was built by Messrs Wilcocks, Dial Foundry, Buckfastleigh, Devon. This firm manufactures beekeeping equipment for Buckfast Abbey, France, and Egypt. I interviewed Mr Wilcocks and saw their honey tanks, radial honey extractors, and honey pumps. These last are much more expensive than ones made in N.Z. The other equipment is well made but would be expensive as it is not mass produced. The heather honey press showed extremely good workmanship. Similar presses have been manufactured for tropical countries with viscous honey, and for

Mr Gale a successful commercial British beekeeper. I have asked Mr Wilcocks to send me specifications and prices of the honey press and other equipment.

Acarine Disease: Brother Adam does not believe in treating acarine disease but in breeding bees that are resistant to it. He has bred a bee which is so resistant that acarine causes him no trouble, although bees in his district are usually very prone to develop the disease. The resistance is not due to yeasts on the bees attacking the acarine mite but is inherited as a dominant trait. Rothamsted are sceptical of Brother Adam's claim.

SCOTLAND

WEST OF SCOTLAND AGRICULTURAL COLLEGE

On 15th August I met Mr James H. Savage, Head of the Beekeeping Department, West of Scotland Agricultural College, Auchincruive, Ayr. On 16th August we visited an apiary at Culzean Castle and on 17th August ones at Glenapp Castle, Glossoch and Drumlamford. The bees in the first two apiaries were collecting nectar from mixed flora while those in the last two were collecting it from Bell and Ling heather.

Mr Savage, like all Scottish beekeeping experts, is rationalizing the equipment used by Scottish beekeepers. He recommends beekeepers to use either Modified National or Smith hives, and is against the multiplicity of gadgets and odd types of hive used by many beekeepers.

Apart from some diagnostic work the practical side of beekeeping is his main concern. He will soon be running 100 hives in one home and several out-apiaries for teaching purposes.

He has devised a method of inserting drawn out comb, instead of the usual starter, in sections which might be of value in New Zealand if section honey production is expanded for export. He is sending me a pamphlet with full details of this method.

EAST OF SCOTLAND AGRICULTURAL COLLEGE

On 19th August I saw Mr J. Cunningham, Advisory Officer in Beekeeping to the East of Scotland College of Agriculture at Bush House near Edinburgh. He is engaged on the same type of work as Mr Savage.

On the 20th we visited one of the apiaries maintained by the College in a clover and heather region at Hundleshope, Peebleshire. We also saw the honey house and apiaries of Mr W.W. Smith, a very efficient commercial apiarist at Innerleithen.

On the 22nd I saw Mr Ormiston's apiary at Torquhan, Stow, Midlothian. He is a very successful part-time beekeeper with about thirty hives. He depends mainly on heather honey for which he uses "ekes" or bars with little or no foundation comb. He is certain that the bees produce more honey when he uses these than when he employs sections with the usual starter.

NORTH OF SCOTLAND COLLEGE OF AGRICULTURE

On 24th August I met Mr Jeffree, research officer in beekeeping at the above College. He has one qualified assistant and there is also Mr Deans who is engaged on research independently.

Mr Jeffree said that in Scotland a staff of three is engaged on research and there are about nineteen advisory officers. The total annual cost of running this establishment would be about £20,000 to £25,000. The salaries for advisory officers, corresponding to our Apiary Instructors, rise to about £1,000.

On the 25th we visited apiaries on the heather at Garrol Hill and Dinnet. On the 26th I drove to Peterhead with Mr A.S.C. Deans. On 27th I met Mr MacArthur, beekeeping advisory officer at Elgin.

BEEKEEPING RESEARCH IN SCOTLAND

Mr Jeffree is concerned largely with the application of statistics to beekeeping. Mr Deans thinks that sulphathiazole is perfectly satisfactory for treating A.F.B. in Scotland where he recommends its use on every occasion. In England Dr Butler considers it should never be used because it does not eradicate the disease but only keeps it hidden.

Mr Deans has found that dusting bees with fumagillin at the rate of 2 g. per hive of Fumadil B. has proved an effective method of treating Nosema. The bees swallow the drug when cleaning each other.

He has found that the Acarotoxin yeast cultures used in France have no effect on acarine disease in Scotland. He is using a method of treating acarine which depends on vapourizing dichlorobenzoic acid. This method appears simple and effective. Full details were obtained.

The three Scottish Colleges of Agriculture all maintain large well-equipped buildings for the use of the beekeeping advisory officers who impressed me with their efficiency. The research facilities are also good.

MR PRYCE-JONES, PHYSICAL CHEMIST

On my way south I spent the 30th with Mr Pryce-Jones a physical chemist well known for his work on heather honey which resembles manuka in many of its properties. I interested him in manuka honey and can call upon him for advice regarding problems associated with it in the future.

PULBOROUGH, MARLBOROUGH, AND GLOUCESTER

I attended the West Sussex County Council Education Committee's Summer School for Beekeepers at Lodge Hill, Waterefield, Pulborough. This was held from 9th to 11th September and was attended by about 100 beekeepers.

At Pulborough I met Mr E.W.D. Madoc of Madoc's Apiaries, Watton, Norfolk. Mr Madoc, who operates 1,000 hives, gave an address on the methods he uses. He estimates that it costs £3 a year per hive for maintenance. Mr Madoc and I visited on 11th September Mr David Rowse, Honey Farm, Bramley, Basingstoke, Hants, who has 400 hives and uses modern extracting plant. On 13th September I visited Mr A.W.Gale, Church Farm, Mildenhall, Marlborough, Wilts. Mr Gale, who has 1,700 hives, is probably the largest beekeeper in Britain. He is up-to-date in his methods but employs far more labour than would a New Zealand beekeeper. We spent a day visiting his apiaries and removing feeders from his hives. The hives are wintered in one super only on which a feeder is placed in the autumn so that the bees can fill empty cells with sugar syrup. Mr Gale had two men helping him in this work.

On 14th September I visited Mr E.G. Burtt, beekeeping appliances manufacturer, Gloucester. Here I met Mr H. Ashford, County Beekeeping Instructor, and attended a meeting of the executive of the Gloucestershire Beekeepers' Association. I also met Messrs W.A. Robinson and E.S. Barlow, Foulbrood officers, with whom I visited apiaries. In addition I saw the plant of Mr Bradford, a commercial beekeeper.

It is interesting to note that these commercial beekeepers use much the same methods as would similar ones in New Zealand.

Two differences in management which could probably be adopted with advantage in New Zealand are as follows:-

WINTERING ON SUGAR SYRUP

Commercial beekeepers in the U.K. all winter in one brood super in which they leave what honey remains at the end of the season and also what sugar syrup the bees can take from a feeder placed upon it in the autumn. The bees, which have plenty of pollen, winter very well and profits are increased. The application of this system in New Zealand is worth investigation.

HIVE VENTILATION

Rothamsted and all commercial beekeepers consider roof ventilation essential to prevent excessive moisture condensing in hives. There is now much evidence available proving such ventilation helps bees to winter. Its use in New Zealand would probably reduce the quantity of honey produced with excess moisture.

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APIDICTOR

Commercial beekeepers must examine hives at intervals during the spring to prevent swarming, which weakens the hives and reduces their honey crop. Hive examination is heavy work and costly in labour. Mr E.F.Woods, a Sound Engineer of the B.B.C., has recently invented an instrument called an apidictor which he claims will detect swarming in beehives in a few seconds without the need to pull them to pieces and examine the combs. It consist of a microphone which is inserted in the hive entrance and picks up the special sounds emitted by bees in a hive when it is preparing to swarm. These sounds are relayed to the beekeeper through amplifying and screening equipment and he then knows which hives in an apiary require attention. Two of these instruments have been flown to New Zealand for the first extensive trials yet made. If the trials are successful, the apidictor will be of great value to commercial beekeepers.

BEE RESEARCH ASSOCIATION

I spent a day with Dr Crane, Director of the Bee Research Association. The Association has an immense collection of books, reprints, journals, etc., dealing with every aspect of beekeeping. I was able to buy from the duplicate collection of journals nearly all the missing numbers of the Bee World needed to complete the set at Wallaceville Animal Research Station. This is the only set in New Zealand and is available to all members of the Agriculture Department.

POISONING OF BEES BY DUSTS AND SPRAYS

No legislation dealing with this subject exists in the United Kingdom. I have, however, obtained full copies of that in force in Germany and France. The German decree has been translated into English.

DESTRUCTION OF BEES IN HIVES INFECTED WITH A.F.B.

It will be recalled that one of the main problems associated with the control of A.F.B. has been to find a satisfactory means of destroying the bees in infected hives preparatory to burning. The use of cyanogas is dangerous and smoke generators have faults.

The following method is based on trials carried out at Rothamsted, and after further tests in New Zealand may be found to be the answer to the problem. When applied to a hive the aerosol at once prevents the bees flying and they can be burnt without the danger of any recovering.

Destruction of Honey Bee Colonies using Pyrethrum Aerosol

Apparatus: 1 Aerosol Projector ex Messrs Sparklets, Ltd., Queen Street, N.17.
Volume of container 100 ml.

Materials: For each hive 1 Sparklet bulb.
70 ml. solution containing

Pyrethrum Extract 25%	4 ml.
Acetone	36 ml.
Tetrachloroethane	30 ml.

1 newspaper

Procedure: Insert nozzle of projector in the entrance of the hive and give one short spray into the hive. Block up the entrance with paper, except for a small hole. The initial dose of pyrethrum will activate the bees. Spray two-thirds of the remainder into the hive, both upwards through the entrance and down through the feed

hole. Wait for two minutes, loosen the crown board, spray across each corner of the combs, refit crown board and leave the hive for at least ten minutes but preferably longer.

Care must be taken to allow the projector to stand for a while after filling, to ensure that the temperature of the liquid equals atmospheric values. Cold liquids will result in poor atomisation.

The addition of a curved end to the nozzle will improve its use on hives.

Purchase of Extract: The overseas agents for the Pyrethrum Board of Kenya and other sources of African Pyrethrum have no agents in New Zealand, but as the annual amount likely to be consumed is small, the London Agents, Messrs Mitchell Cotts, Ltd., Winchester House, Old Broad Street, E.C.2., have undertaken to ensure the availability of this material on the receipt of a direct order. The current prices are about £4 per pound of extract. Reference P/1101(B)/5613 should be quoted.

DESTRUCTION OF BEES WITH EXCESS AMMONIUM NITRATE

Excess ammonium nitrate burned in a bee smoker is lethal to bees in a closed hive and the effectiveness of this method of destruction will also be tested at Wallaceville.

FILMS ON BEES

On 3rd November I visited Mr C.P.Abbott in London. He specialises in producing films about bees with the co-operation of Dr C.G.Butler of Rothamsted. The Department in New Zealand recently bought one of his productions dealing with artificial insemination. Mr Abbott screened all his films for me and I have a list of them with prices. Mr Abbott will reduce these 20% if they are ordered by the New Zealand Department of Agriculture. I think two films should be ordered if possible. One shows bee behaviour and the other dissection for acarine.

MR F.S. MILNE, N.A.A.S. BEEKEEPING ADVISORY OFFICER AT ROTHAMSTED

Much valuable information has been obtained from Mr Milne; it includes film strips, information on spray poisoning, diagnosis of disease, and work of the advisory service.

I was shown a viewing box containing an ultraviolet bulb which had been found very useful in demonstrating the presence of American

foulbrood in the scale stage in combs. The scales fluoresce and can be immediately recognized.

The ultraviolet bulb is mounted horizontally and the light is concentrated to some extent by a lens so that it falls over an area large enough to cover most of the comb being examined. Material required:-

125 Watt black glass mercury lamp MBW/V for 240-250 volts	£3. 0. 0.
Choke type Z1838	£4.19. 0.
3 slot B.C. lamp holder, brass, back plate type S3158	3. 2.

The above apparatus will be very useful at Wallaceville.

COURSE FOR FIELD OFFICERS OF THE N.A.A.S.

This course was held at Westham House, Barford, Warwick, for four days. It was attended almost solely by Field Officers, who correspond to Apiary Instructors in New Zealand. Lectures and demonstrations were given and I lectured on New Zealand beekeeping. The course was most interesting and I was impressed by the standard of those attending. However, the organization of the Advisory Officers is very cumbersome and they are responsible to several authorities, which does not make for efficiency in the field.

BUILDING RESEARCH STATION, GARSTON, WATFORD

I visited this station to find out if any new paints or preservatives suitable for bee hives had become available. It appears that we have nothing to learn regarding the preservation of timber with substances like Celcure. However, the Station was helpful in the matter of paints and I have much information on two-paint systems which will be of use in New Zealand.

TERRAMYCIN

The New Zealand branch of the Pfizer Drug Company has been sending literature to beekeepers recommending the use of terramycin for the treatment of American foulbrood. While in London I saw the Pfizer Co. and they agreed to advise their New Zealand branch to cease this campaign as the use of terramycin is contrary to our policy.

Terramycin is not considered in the U.K. to be in any way superior to sulphathiazole for treating A.F.B. It would be likely to enter extracted honey and would not destroy spores. In Scotland they use both sulphathiazole and terramycin for treating A.F.B., and claim success, but have published no detailed papers supporting their conclusions. In England tests showed sulphathiazole unsatisfactory for treating A.F.B. Tests of terramycin in the U.S.A. have shown it to act much like sulphathiazole, and there seems no point in repeating similar work in New Zealand.

BENFORD PETROL DRIVEN WHEELBARROW

The firm manufacturing these, Messrs Benford Ltd., the Cape, Warwick, has furnished me with full information. I think the barrows might be of value to commercial apiarists in carrying honey supers as they are very sturdy, cheap, and economical to operate. They are fitted with balloon tyres and could be manoeuvred between hives in an apiary. A special body for holding supers could easily be fitted. They cost about £120 f.o.b. in the U.K. John Chambers and Son, Wellington, are the New Zealand agents.

ADRENALINE FOR HYPERSENSITIVITY TO BEE STINGS

Adrenaline in a very convenient form of ampoule for treating severe cases of hypersensitivity can be obtained from Cuxon, Gerrard & Co., Ltd., Oldbury, Birmingham. The sterile ampoule has a protected sterile needle which can be bared and pushed into the skin of the patient in cases where symptoms are too severe to risk waiting until the arrival of a doctor. A box contains five 1.1 ml. Ampins. Injection Adrenaline Tartrate B.P. 1 in 2,000. A sample box was brought back to New Zealand.

VARIOUS

I visited Dr F.N. Howes, Kew Gardens, an authority on bee plants, and spent a day with Mr R.O.B. Manley one of the best-known commercial beekeepers.

Many photographs were taken and are being made up as projector slides for use in lectures.

Film strips dealing with interesting aspects of beekeeping in the U.K. were obtained together with hundreds of reprints.

U N I T E D S T A T E S A M E R I C A

On 22/11, I arrived by air in New York and proceeded to Washington where I met Mr J.I. Hambleton, Head Division Bee Culture, U.S. Department of Agriculture, Beltsville, Maryland. Mr Hambleton was most co-operative and went to much trouble in helping me to arrange my itinerary in the U.S. to the best advantage. I stayed at Beltsville until 26/11.

The work at the Division of Bee Culture, Beltsville, is largely of an administrative nature but I obtained information on the use of the Brine Shrimp, Artemia, in a biological test for detecting poisoning of bees by insecticides which should be of great value.

BRINE SHRIMP TEST FOR INSECTICIDES

The brine shrimp eggs can be bought from shops selling requisites for aquariums in the U.S.A. and I brought back a supply. Probably they are obtainable in Australasia. Local varieties could be used and might even prove more sensitive to insecticides than the American ones. This is a field for study. The advantage of the brine shrimps over goldfish, mosquito larvae, and crickets in biological tests is that they are extremely easy to grow and keep alive and are very sensitive to insecticides. In addition symptoms of poisoning are very easily detected by the behaviour of the shrimps.

Hatching Solution for Shrimps:

NaCl	120.00 g.	
$CaSO_4 2H_2O$	6.88 g.	
$MgSO_4 7H_2O$	12.80 g.	
$MgCl_2 6H_2O$	34.00 g.	
KCl	3.20 g.	
$MgBr_2$	0.40 g.	NaBr can be used.
Distilled water	4000 cc.	

A concentrated NaOH solution added by dropper is used to adjust the pH of the hatching solution to 9.5.

It is advisable to use glass distilled water.

A two gallon glass jar about 1 x 1 ft. is used to hold the shrimps. The level is kept constant and the pH checked once a month to maintain it at 9.5.

Great care must be taken to avoid the use of aerosol or other fly sprays in rooms containing the brine shrimps.

The eggs are hatched out in shallow trays of hatching solution with floating wooden bars under which the shrimps swim to the light, so being separated from egg shells and debris.

Feeding Brine Shrimp: A suspension is made of the type of yeast used for baking bread. It is then added by dropper (4-6 droppers full at a time). The shrimps require feeding when the tank solution is clear.

I. Test Method Using Double Strength Hatching Solution: One hundred bees are macerated in a mortar with 10 g. of anhydrous sodium sulphate and extracted with 10 cc. of acetone with is evaporated to near dryness, but not quite, and suspended in 10 cc. of double strength hatching solution and filtered. After this the volume is brought up to 100 cc. with additional double strength hatching solution.

The shrimps (1-3 or more) are placed in a measured amount of this suspension (usually 1-2 cc.) in agglutination tubes, being handled with a medicine dropper. Readings are taken after two hours and if the shrimps in the unknown solution are floating on the surface and unable to swim down in the tube, or are dead, it is considered as a positive test for the presence of insecticides. Controls are run in parallel with similar extracts from normal bees and must be negative after at least three hours.

Trial runs with adult bees have been successful at the level of 1-10 gamma of insecticide per bee. Additional runs on a large scale will soon be made to establish the approximate level at which various insecticides can be detected by this method.

II. Test Method Using Distilled Water: One hundred bees are macerated in a mortar with 10 cc. acetone. The acetone is reduced in volume to 1 cc. and is suspended in 10 cc. distilled water and filtered. Then it is diluted with distilled water to 100 cc. Shrimps are sucked up into droppers and this solution is drawn up round them. The points of the droppers are rested on sheet plastic to retain the solution while the shrimps are under observation.

Shrimps cannot live very long in pure distilled water and method II has been found to be more sensitive than Method I.

Tests for Insecticides using Method II.

	1 p.p.m.	0.1 p.p.m.	0.01 p.p.m.
Chlordane	2		
Methoxychlor	1	2½	2½
Lindane	1	1	1
Toxaphene	1	2	2
D.D.T.	1	2	18
17147	3	1	2
Control	48 hours - negative.	7	20

PESTICIDE CHEMICAL RESEARCH SECTION

I saw Dr Roark, Head, and Mr R.H. Carter of the Pesticide Chemical Research Section, Entomology Research Branch, U.S.D.A. Beltsville, Maryland, Washington.

This Section deals with residue investigations on fruit and analysis of samples of bees suspected of having been poisoned by insecticides.

Books used by the Section which would be of value at Wallaceville were :

Analysis of Insecticides and Acaracides by Francis A. Gunther & Roger C. Blinn. Interscience Publishers Inc. N.Y. $14.

Guide to the Chemicals Used in Crop Protection, Hubert Martin. Second Ed. Dec. 1953. Canada. Dept. of Agriculture. $1.

This book is issued with supplementary sheets and can be obtained from The Director, Science Service Laboratory, University of Western Ontario, Sub. P.O. London, Ontario, Canada.

Annotated Bibliography of Analytical Methods for Pesticides. Section II. Food Protection Committee Food and Nutrition Board National Academy of Sciences, National Research Council, Washington, D.C. July 1954. $2. Pub. 241.

TREATMENT OF HONEY WITH ACTIVATED CHARCOAL
(Mr Clay, Dept. of Agriculture Bld. Washington)

The U.S. Department of Agriculture does not favour the treatment of honey with activated charcoal or bentonite and takes steps to prevent their use. Diatomaceous earth, not exceeding .5-1% by weight of the honey treated, is considered satisfactory to use. The activated charcoal is too severe in its action, removing too much from the honey. A method for detecting treatment of honey with charcoal or bentonite has been worked out. It can be obtained from Dr J.W. White, Biochemical Division, Eastern Regional Research Lab. U.S. Department of Agriculture, Philadelphia, 18, Pennsylvania, U.S.A.

Much effort at Beltsville is being directed to replacing pesticides with biological methods of control.

Mr Hambleton's opinion was that, at least in the U.S.A., legislation was necessary to control the indiscriminate use of insecticides.

LOUISIANA UNIVERSITY

On 26/11 I reached the U.S. Department of Agriculture at Louisiana State University, Baton Rouge, Louisiana. Here I was met by Dr Whitcomb and later was driven by Dr E. Oertel to see two of the local beekeepers.

Visit to Bessonet: We visited the Bessonet Bee Co. run by Mr Bessonet and his two sons at Donaldsville near Baton Rouge. They have 2,000 hives and also deal in package bees, honey, and queens. Most of the honey produced in Louisiana is dark and not processed properly by the beekeepers. Bessonet buys this honey and treats it so that it can demand a good market price. This he does by pumping the warmed but not diluted honey through a filter press with filter aid (not charcoal). A very powerful pump is used to force the honey through the press. Bessonet uses an "electronic" bottle filler which is the most efficient I have seen. It will fill 2,000 1 lb. bottles per hour. There is a version of the machine developed for filling 60 lb. tins or other large containers which can be set to fill these to any level and then cut out. The "electronic" bottle filler costs £365. Details of the machines were obtained.

I also visited Mr Newton a beekeeper operating on a smaller scale than the Bessonets.

General: Work on package bees has shown that they travel better in the dark. Plastic bags have not proved satisfactory for their carriage. Four pounds of bees can be removed from a stock without causing demoralisation. Sulphathiazole is not used in California, Arizona, or Louisiana.

Artificial Insemination: Dr Mackensen who works on this at Baton Rouge said that it is not being used anywhere in the U.S.A. by commercial beekeepers. Some hybrids produced in Government Stations and marketed by commercial beekeepers have not proved satisfactory. Work is now being concentrated on the genetical approach.

Gravity Honey: Louisiana honey is usually of low specific gravity, and much interest has been shown in the plant developed at Wallaceville, for treating such honey.

UNIVERSITY OF ARIZONA, TUCSON, ARIZONA

I spent the 29/11 with Drs McGregor and Woodrow who, together with Mr Todd, run the bee research department.

Effect of Insecticides on Bees in Arizona: Bee mortality in Arizona has been caused by dusting cotton, alfalfa, and melons with insecticides.

25 lb. of 5% D.D.T. (technical grade) per acre does not affect bees. Lindane is highly toxic and if it is applied bees should be moved out of the area. Parathion also is extremely toxic. Both these insecticides are applied from the air in Arizona. Malathion is safer for mammals than parathion but is equally toxic to bees. Dieldrin is more dangerous to bees than parathion because it persists longer. Aldrin is used for grasshopper control. Systox is safe for bees and could replace parathion. Toxaphene is used more than any other insecticide in Arizona. A mixture of 15% toxaphene, 5% D.D.T. and 40% Sulphur (rest filler) can be used without causing bee mortality. Endrin is used on cotton. It is probably as toxic as aldrin and dieldrin to bees.

Control of Application of Insecticides in Arizona: In Arizona the application of insecticides is controlled by a board on which are representatives of the growers, applicators, University, and beekeepers. A similar board exists in California. The board licences the applicators of insecticides and must be kept informed of projected dustings. These are not permitted if bees may suffer. The planes of applicators are marked so that they can be identified, and insurance must be carried, so that if bee losses occur money is available for compensation. If bee mortality is caused the beekeeper affected notifies the board, and usually the matter is settled without difficulty. If the applicator is not co-operative his licence may be withdrawn.

Applicators are given advice on the use of insecticides which do not cause bee mortality and are instructed how to apply insecticides most efficiently.

Dr L.A. Carruth, who represents the University of Arizona on the Board, being head of the Entomology Department, gave me the above information. He is collecting and forwarding articles containing further details.

Red Clover: Even with a density of nine hives per acre red clover pollination is not considered satisfactory in Arizona.

General: In addition to work on insecticides bee behaviour and pollination are being studied.

SAN LUIS OBISPO, CALIFORNIAN BEEKEEPERS' MEETING

I reached San Luis Obispo on the 30th and attended a meeting of Californian beekeepers. Here I met Mr Frank E. Todd of Arizona who drove me to Davis University at Sacramento the next day. I had a very interesting talk with Mr Chas. B. Read, Manager of the Valley Pollination Service, Mettler Station, Bakersfield. Mr Read has developed a most efficient pollination service provided by the hives of a large group of Californian beekeepers whom he represents. He considers that one hive per acre is necessary for the efficient pollination of white clover. With many types of crop three to five hives per acre are necessary.

The organic phosphate insecticides are not used without a permit in California and this is not issued if the area is one in which bees are kept. Other insecticides can only be applied at a time when bees are not flying. Sprays, not dusts, are generally used to prevent drifting.

BUREAU OF CHEMISTRY, SACRAMENTO AND DAVIS UNIVERSITY

On 2/12 I visited Mr Robert Z. Rollins, Assistant Chief, Bureau of Chemistry, Department of Agriculture, Sacramento.

Mr Rollins outlined the system in operation in California for the protection of the beekeeper from the effects of insecticides. The Department of Agriculture there operates the following checks:-

1. Control over the labelling and registration of pesticides.
2. Those applying pesticides must be registered.
3. Fourteen materials, classed as injurious, cannot be used without a permit which must be produced by the purchaser or he will not be supplied by the merchant. These materials must be applied

according to standard procedure. They include arsenicals applied in dust form, the organic phosphates, systox, and the weedkillers.

All these safety measures are controlled and administered by the Bureau of Chemistry in California which also controls fertiliser application.

The Agricultural Commissioners of the various Californian Counties can add to the above regulations so as to allow for peculiar local conditions such as prevailing winds. These County Agricultural Commissioners issue the permits for the application of pesticides and lay down conditions for their use after checking local conditions.

Last year 4,000,000 acres were dusted with pesticides in California. Twelve thousand pesticides are registered.

Parathion has been found heavily contaminating honey and pollen (100 parts per million).

A full collection of pamphlets outlining the regulations was brought back. Information on legal aspects can be obtained in Stanford Law Review, Dec. 1953, Vol. 6, No. 1. This is obtainable from the Stanford University, Palo Alto California, $1.50.

DR ECKERT, PROFESSOR APICULTURE, DAVIS UNIVERSITY, SACRAMENTO

Dr Eckert said that when 2-4D was first dusted from the air immense damage to crops was caused by drifting.

If bee mortality results from aerial application of pesticides the beekeeper reports the losses to the local Agricultural Commissioner who sends out an Apiary Instructor to collect samples of bees and full details. It is usually an easy matter to find the operator responsible because of the system of licencing applications and marking planes.

The Crop Improvement Association in California maintain a research organisation in Davis University, Sacramento, where experiments are carried out with various types of plane and dusting and spraying equipment so that advice can be given to applicators. The organisation has its own aerodrome, workshops, aeroplanes, aviators, and research staff. It works in close touch with Dr Eckert, Professor of Apiculture, with whom I visited it.

SUMMARY

I. The length of time allowed for the visit to the U.S.A., thirteen days, was barely sufficient to permit me to obtain fairly complete information on the system of control of application of insecticides and prevention of bee mortality in force in Arizona and California.

II. Information was obtained on artificial insemination, pollination services, treatment of honey, and other matters.

III. There is no doubt that as the application of insecticides from the air increases many more samples of bees suspected of having been poisoned will be received at Wallaceville. Use of the brine shrimp method should materially reduce the amount of time required to test these samples. If preliminary tests with the shrimp proved negative it would not be necessary to proceed with time-consuming analyses. Although not qualitative positive brine shrimp tests would suffice in certain cases of poisoning where all the background was known.

D I S C U S S I O N A N D C O N C L U S I O N S

Beekeeping research centres were visited in Italy, Switzerland, France, the U.K., and the U.S.A.

The Swiss have concentrated more than any other country on the prevention and treatment of bee diseases, and much valuable information was obtained from them, particularly concerning acarine, nosema, and European foulbrood. Information on acarine from this source and from the Bee Department, Rothamsted, has been used in drawing up the following plan.

PLAN TO FOLLOW SHOULD ACARINE BE DISCOVERED IN NEW ZEALAND

(a) All bees to be destroyed in the infested apiary.

(b) A circular cordon six miles in radius to be put round the infested apiary and no bees allowed out of the area enclosed until a year after the disease is completely eradicated.

(c) Examination of all hives within the cordon to be made and infested bees, and if practical all bees in apiaries containing infested bees, must be destroyed. If the economic loss involved in carrying out such a policy would be too great, treatment with an acaracide such as Folbex would be necessary.

(d) All importations of bees from the U.S.A. to cease as although acarine has not so far been found there the U.S.A. until recentl imported bees from acarine infested countries.

(e) The Department to ensure that it has the necessary authority to carry out this scheme. The question of whether some form of compensation should be given to the beekeepers involved to be considered. Perhaps beekeepers could organize an insurance scheme of their own such as Bee Disease Insurance in the U.K.

(f) A new film on acarine dissection will soon be available in the U.K. and should be ordered. Steps should be taken to train Apiary Instructors in acarine dissection. At present new types of acaracide are being developed. Later, when the position is stable, supplies should be ordered.

The following facts are of value in planning what steps to take:-

(a) Acarine-resistant bees are not known.

(b) Acarapis dies within a day in a dead bee, and quicker on equipment, which thus cannot transmit the disease.

(c) The Frow remedy would not be of use in New Zealand because it causes robbing when bees are able to fly as they can do much of the year in our mild climate.

ACARINE DISEASE MAY BE DISCOVERED AT ANY MOMENT IN NEW ZEALAND AND IT IS VITALLY IMPORTANT THAT A PLAN TO ERADICATE IT SHOULD BE PREPARED WITHOUT DELAY. SUCH A PLAN SHOULD BE CAPABLE OF INSTANT APPLICATION.

THERAPEUTIC USE OF POLLEN AND ROYAL JELLY

Much attention has been given in France to the large-scale production of pollen and royal jelly and their use as therapeutics. Production of these substances could be developed in New Zealand but is not recommended because their use in medicine does not yet rest on any sure foundation and is frowned on in the U.K.

EUROPEAN FOULBROOD

European foulbrood is regarded as more serious than American foulbrood. Although never discovered in New Zealand it is possible that its presence here has been overlooked through the difficulty of

diagnosis. Experience in identifying it overseas was gained and when time permits a search for it will be undertaken.

HIVE VENTILATION

It has been found at Rothamsted that bees winter much better in a humid atmosphere if their hive lids have small vents. Roof ventilation would probably reduce the quantity of honey produced with excess moisture in the more humid parts of New Zealand and experiments in its use will be initiated.

WINTERING ON SUGAR SYRUP

Commercial beekeepers in the U.K. all winter in one brood super; they leave in this what honey remains at the end of the season and also what sugar syrup the bees can take from a feeder placed upon it in the autumn. Bees winter very well on honey and sugar syrup if ample pollen is present and this system might profitably be introduced in New Zealand where bees are wintered on honey alone.

DESTRUCTION OF BEES IN HIVES INFECTED WITH AMERICAN FOULBROOD

Two new methods have been investigated in the U.K. and will be tried in New Zealand. One depends on the use of a pyrethrum aerosol and the other on using excess ammonium nitrate.

APIDICTOR

The apidictor is a recently invented instrument which the inventor claims can detect swarming in bee hives without the need to pull them to pieces. It consists of a microphone which is inserted in the hive entrance and picks up the special sounds emitted by bees in a hive when it is preparing to swarm. Two of these instruments have been obtained for trials in New Zealand. If these prove successful the apidictor will be of great assistance to commercial beekeepers.

BRINE SHRIMP BIOLOGICAL TEST FOR INSECTICIDES

The brine shrimp method of testing for insecticides will be of great value in diagnostic work and its use is being developed at Wallaceville.

PROTECTION OF BEES FROM AERIAL APPLICATION OF INSECTICIDES AND WEEDKILLERS

In all overseas countries where aerial application of insecticides and weedkillers has been developed it has become necessary to protect the interests of the beekeeper by legislation. Thus in Germany and France the beekeeper is fully protected and the onus is on the applicator to avoid causing bee mortality. In California and Arizona also the beekeeper is protected by a very comprehensive system of legislation. In England aerial application of insecticides has not been developed and protective legislation has not yet become necessary.

In California, where every precaution is taken to prevent bee losses through aerial application of insecticides, and a vast body of past experience is available such losses, although rare, still occur sometimes. But when they do the beekeeper has the right to compensation. In New Zealand, where aerial application of insecticides has only just commenced, bee losses, such as the recent heavy ones in Canterbury, must be expected particularly while experience is being gained.

Recently I attended a civil aviation conference in Wellington convened to discuss the question of the control of aerial application of insecticides and weedkillers. Here it was significant that the representatives of the applicators stressed several times in discussion that at present beekeepers have no legal protection against bee losses caused through application of insecticides and weedkillers.

I AM CONVINCED THAT THE SITUATION CAN BE ADEQUATELY MET HERE ONLY BY THE PASSING OF LEGISLATION DESIGNED TO PROTECT THE BEEKEEPER AND GIVE HIM THE RIGHT TO LEGAL REDRESS IF LOSSES OF BEES OCCUR.

RESOURCES AVAILABLE FOR BEEKEEPING RESEARCH OVERSEAS AND IN NEW ZEALAND

The value of the Swiss honey crop is about the same as that of New Zealand, but much less honey is produced, its price being artificially kept up by a duty on imported honey. The value of the bees as pollinators in Switzerland is considered, as it should be in New Zealand, to be about ten times the value of the honey crop.

However, although both New Zealand and Switzerland have beekeeping industries of approximately equal value, far more is spent in Switzerland on beekeeping research. The Laboratory at Liebefeld has a staff of eight, three of whom have degrees, while the remaining ones are highly qualified technicians. The equipment and library is very good. I should estimate the Swiss expenditure on beekeeping research as at least five times that of New Zealand.

Beekeeping research in France is undertaken in two research stations, that of Bures-sur-Yvette being the largest. Bures has a staff of thirteen, five of whom are qualified. Facilities and equipment are good and the station is expanding. The French honey crop is about equal in value to the New Zealand one.

At Rothamsted Bee Department in England the staff of twenty comprises six professional workers, an apiarist, and thirteen others. The average annual crop of honey produced in the U.K. is difficult to estimate accurately but would probably not exceed 1,200 tons, compared with 4,000 to 6,000 tons in New Zealand.

In Scotland two professional workers and one apiculturist are engaged in research.

IT IS APPARENT THAT THE BEEKEEPING RESEARCH ESTABLISHMENT IN NEW ZEALAND OF ONE PROFESSIONAL WORKER AND ONE TECHNICIAN IS INADEQUATE BY OVERSEAS STANDARDS AND SOME INCREASE IN STAFF SHOULD BE CONSIDERED IF THE EFFICIENCY OF OUR BEEKEEPING INDUSTRY IS TO BE MAINTAINED.

The writer was well aware of the above position before leaving New Zealand but wished to obtain first-hand information before making any recommendation.

It is considered that far more time than in the past should be devoted to diagnostic work and treatment of bee diseases at Wallaceville. This work together with the increasing amount of time which should be spent in studying the effect of insecticides on bees would alone justify the appointment of a professional worker to the bee laboratory.