

OPPORTUNITIES IN ENTOMOLOGY.

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Increasing interest in insect study has brought forth many inquiries relative to the opportunities in this important field. For this and other reasons a summary account is presented for those who may find pleasure or profit in the study of insects. The opportunities are limitless for the individual who finds pleasure in the study, for the person who is interested because of the relation of insects to his vocation and to the one who wishes to take up entomology as a vocation.

To me the study of insects is a satisfaction. It is satisfying because it provides a financial reward comparable with the other sciences, satisfying because it is a pleasing and interesting study with a never-ending variety of problems to be solved, and satisfying because it is a worthwhile service to mankind. I recall my personal reaction soon after leaving college. Being more conscientious than at present I failed to see during my first year of work, a service comparable with my salary, meager as it was. I had studied the corn root aphid, the white grub, and other insects and learned much of their life histories and habits and while I had enjoyed the work I could not but wonder if it was right to receive a salary from public funds for a work which was of no apparent value to the public. However, after several years of work, I saw the efforts of my studies on these insects utilized in developing control methods which saved hundreds of thousands of dollars for the farmers of the central west and I then realized that although we might spend years on the study of a single harmful insect the results would usually pay several hundred times the initial cost of the investigations.

We commonly think of entomology as a branch of agriculture because its economic phases do relate largely to agriculture. Dr. S. A. Forbes is authority for the statement that agricultural entomology is largely agricultural and but slightly entomological. Entomology is a broad subject touching every phase of human life. Aside from the importance of insects as destructive to crops and animals, they are of vast importance as pollenizers for commercial crops, and are important to the housewife, to the manufacturer, business man, and above all to the entire world because of their significant relation to human disease. Entomology has an intimate relation to every branch of agriculture.

We commonly think of entomology as economic or applied and to be sure this is true although as a pastime or hobby it is second to none and is so recognized by hundreds of men and women. To recognize the opportunities in entomology we should understand its problems.

Branches of entomology include taxonomy, morphology, physiology, bionomics, and economics. However, from the standpoint of organization or service we might for convenience divide it into four groups as follows:

Teaching. The training of students in entomology as a vocation or as an important part of their agricultural, medical, or scientific training.

Investigation. Includes research of all kinds in the pure or applied science of entomology.

Extension. Application of the results of research.

Regulatory. The enforcement of nursery and apiary laws and the application of quarantines.

A fifth activity which is distinct from any of the above because it includes some of each, might be called *Insect Suppression*. By this term we refer to the local infestations which may spread to new areas. The common examples are the various introduced insect pests such as the European corn borer and the Japanese beetle which have a restricted range at present and are of sufficient importance to call for every possible effort to prevent spread to new territory.

Opportunities. It is unnecessary to speak of the opportunities for the man who selects insect study as a pastime. He has an inexhaustible field which is unexcelled for variety and interest.

For the farmer or physician the field is both interesting and important and for them a good knowledge of insect life is of great importance, increasingly so as we learn more and more of the interrelations between plants, animals, humans, and insects.

To the man who seeks entomology as a vocation, it may be said that there is an increasing demand for persons well trained in entomology. There is a field for almost every type of man who finds pleasure in the subject, who has had the necessary training, and who has the energy to fulfill the exacting demands.

For convenience we may divide the vocations in entomology into two fields, the commercial and the professional or public service.

Professional Field. By far the majority of entomologists are now in public service. The Bureau of Entomology of the U. S. Department of Agriculture employs hundreds of men most of whom are investigators, studying the important interstate insect problems in co-operation with the various state organizations. The federal government also employs many men for service as quarantine officers at the various entry ports and at interstate quarantine stations. The Canadian Department of Agriculture employs similar services.

The state agricultural experiment stations and occasionally other state organizations require the services of large numbers of trained entomologists for investigational work. The state extension departments likewise employ large numbers of entomologists to carry the work to the citizens of their respective states.

The principal educational institutions of the country, especially the agricultural colleges, are constantly in need of highly trained entomologists for instructional work. Here again there is a demand for men especially fitted in practical as well as in the highly technical phases of entomological work.

The regulatory service in the various states calls for additional men. This service is sometimes connected with the state departments of agriculture, or with the state experiment station, and sometimes with other state organizations, as in Indiana, where the regulatory work is vested in the State Conservation Commission.

In addition to the opportunities referred to there is an increasing demand for entomologists for city and state boards of health, park commissions, and the like. Likewise there is a call for insect curators in the large museums of the country.

All of the above services, with the possible exception of the regulatory work, call for highly trained men and as will be noted the variety of service and the problems in entomology vary from the very practical to those of highest technicality.

Commercial Field. Within the past few years the demand for entomologists in the commercial field has been noticeable and there has been an increasing tendency toward the employment of men with entomological training by commercial concerns such as insecticide companies, spray machinery manufacturers, large co-operative agricultural associations and similar organizations. Likewise there is an increasing field for independent commercial enterprises involving mainly entomological training, and these include consulting entomologists, tree surgery and spraying. In some instances individual orchardists have found it worthwhile to employ men with special entomological training to handle their spraying operations.

In addition we have recognized the almost limitless opportunities for the beekeeper, both the large commercial honey producer and the beekeeper who utilizes his bees as a side line to fruit growing or poultry production or as an aid to fruit growing.

For the person who wishes to have a contact with foreign countries there is again an opportunity in the field of entomology, as collectors for individuals, museums, or commercial entomological concerns and as investigators for the U. S. Department of Agriculture.

Certainly the field in entomology is far-reaching almost beyond imagination.

Requirements. The saying of Agassiz "Learn something of everything and everything of something" is certainly true for the entomologist. Because entomology touches so varied a field of activities a broad, general undergraduate training is highly desirable. Probably no college curriculum offers better training for the prospective entomologist than that given by our standard agricultural colleges. This is important not entirely because entomology is largely agricultural but also because general farm practices will play an increasingly important part in insect control and consequently a fundamental knowledge of agriculture will be of immeasurable importance to the future economic entomologist.

Aside from a good foundation in agriculture the entomologist should have a good knowledge of the biological sciences and especially a good working knowledge of chemistry. There is at present an unlimited field

for the entomological chemist,—one who has a good chemical training and understands insect life. I would also emphasize the great value of mathematics and English, especially the latter, for the entomologist who has the ability to write and speak authoritatively, intelligently and convincingly will advance to the top of the profession.

Because of the need of a good foundation it is usually necessary, and certainly advisable, for one who contemplates entomology as a profession to secure his fundamental training in his undergraduate work and to anticipate graduate work for specialization.

In conclusion may I repeat that there is a big field for the entomologist and that he who enjoys nature will find satisfaction in the study of insect life as a vocation.

May I also venture to suggest the value of insect study as an avocation or as a part of one's training for agriculture. 1, A study of insects develops an understanding of insect life and of the fundamental principles of insect control which are often little recognized but are nevertheless essential factors for the successful and practical handling of insect problems. Information is available to those who request it but to understand why such recommendations are made is a fundamental factor in successful insect control. 2, Entomology trains the student in an appreciation of the importance of care, thoroughness, and accuracy and to that extent is a character-building subject. It develops the elements of character which contribute towards success. 3, It develops observational and deductive powers; an understanding of cause and effect. 4, Increases an appreciation of the importance of obscure or less evident factors influencing success in the growing of plants or breeding of animals. 5, Enlarges one's interest in the varied and interesting animal life in nature and emphasizes the importance of these small animals to human existence. 6, Entomology gives a knowledge which enables one to better understand the methods of insect control and thus minimize the huge losses which now result from chinch bugs, army worms, grasshoppers, Hessian fly, San Jose scale, codling moth, white grubs, cutworms, and the host of other destructive insects. On the other hand it teaches the value of the myriad of insects which tend to hold in check the destructive forms; of those which produce valuable products, and of those which are so important in pollinating our fruit and vegetable flowers.