# THE BALANCE SHEET OF ENTOMOLOGY*

AS pointed out some years ago by a distinguished president of the American Association for the Advancement of Science, there must be, previous to the annual convention of every scientific society, one man who spends months worrying over the subject for an address and its mode of presentation—and this in spite of the fact that no one ever reads a presidential address except the man who prepares it. Not only is this true, but if any one ever did take the trouble to read through the presidential addresses given before any society that has existed as long as our own, he would find that everything had been said that could be said, or, at least everything that custom decrees as suitable for such occasions. Though differing in subject, treatment, and point of view, they resemble each other in expressing ideas with which we can all agree.

Every year we come together to exchange ideas, to record achievement and to rejoice in the progress we have made. In studying the addresses of my predecessors, there appears, however, to be one element that, at least, has not been over-emphasized, namely, the element of self criticism. Accordingly, the thought occurred to me that, in attempting an evaluation of the present status of entomological science, a little more stress might, with advantage, be placed upon our shortcomings and upon our failures to achieve what we might have accomplished, had the fullest use been made of the opportunities presented. The present speaker is well aware of his lack of qualifications to perform such a task, but hopes that the mere attempt may be of value in provoking thought and preferably some disagreement, from which constructive discussion may be expected to arise.

Looking back over the past twenty-five years, which is a most significant period in the history of our science, it is easier to observe the positive achievements than the failures. At the beginning of that time the first established branch of entomology, viz., taxonomy, was already old and had many splendid achievements to its credit, along with much work that had better not been done. When a few more able men with sound fundamental training in morphology, together with a few skilled biologists, geneticists and mathematicians escape into the rich field of taxonomy their methods may have a fertilizing effect upon the sometimes sterile science and perhaps a greater amount of concern may develop to ensure that species are biologically as well as bibliographically accurate. We hope it is not too much to expect, also, that a larger proportion of our taxonomists may pause in their compassing of land and water in order to discover new species, to prepare those careful revisions of a genus, family or order, preferably one of the members of which may conceivably have some economic importance, of which we have all too few.

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* By W. H. Brittain, Macdonald College, Quebec in *Sixty-Third Annual Report of the Entomological Society of Ontario,* Ontario Department of Agriculture, 1932.

At the opening of the period indicated we already had a number of classical papers in the field of morphology that have scarcely been surpassed and, when we consider such excellent sustained contributions as those of Snodgrass and the fundamental studies of our own Dr. E. M. Walker, we can only hope that their tribe may increase faster than the new nomenclature that certain others delight to create.

In insect biology, in its widest sense, we owe a great debt to a generation of inimitable observers who have all but passed away. Modern workers, with a new viewpoint, new concepts, new apparatus and new discoveries in sister sciences to aid them, are fast accumulating a mass of accurate experimental data that, in many cases, is not only supplying new facts, but giving us a new and better conception of fundamental principles underlying our science. One has only to read the presidential address of the late Dr. C. Gordon Hewitt, which dealt with insect physiology, before the American Association of Economic Entomologists in 1918, to realise what progress has been made even in that brief period, and no one who has observed the present trend can doubt that work in this field will proceed with increasing acceleration. It is to be hoped, however, that in the modern pre-occupation with experiments, in reliance upon apparatus and upon mathematical methods, we do not lose entirely that element that gave to the work of the older generation of naturalists its peculiar value.

In no way can the progress in entomology be more clearly observed than in the numerous well arranged, well written and well illustrated bulletins, that make so many of those of former years appear crude and unfinished. This is true of all entomological literature, but particularly to that relating to the economic phase of the subject. No one will pretend, however, that there is no need for further improvement in matters of form as well as in subject matter. It is a great pity that we cannot have more technical publications of a monographic character. We know of workers spending years upon a study in which countless difficulties have been encountered and overcome, and at the end the results are published in a six-page pamphlet. The data on which conclusions are based and the technique used, so important from the standpoint of the worker in the field and so essential for the progress of the science, are not mentioned.

Those who have much bibliographical work to do, as all research workers must have, find the multiplicity of series into which publications are classified a continual source of trouble and annoyance. We have research bulletins, press bulletins, technical bulletins, special bulletins, popular bulletins, extension bulletins, old and new series, circulars, special circulars, miscellaneous circulars, pamphlets, leaflets and what not in endless confusion, causing a constant rock of offence to the bibliographer, the filing clerk and the librarian. Surely all these categories are unnecessary. The taxonomic distinction between a circular and a pamphlet for example is difficult to discern.

Twenty five years ago there were no separate departments of entomology in our colleges and universities and at only two institutions had it attained the dignity of a separate subject. Not more than ten years ago the Dean of a graduate school at a great Canadian University remarked

to an applicant that surely he did not propose to spend his whole lifetime on such a trivial and narrow subject. A recent presidential address has outlined our progress in this field and further repetition is unnecessary.

Probably no one who is engaged in the teaching profession would look upon the present situation with any degree of complacency and all recognise the necessity of higher standards, sounder and longer training and improved equipment to keep pace with recent advances and discoveries. The present tendency is for a sounder background in the physical mathematical and biological sciences and for the postponement of specialised training. There is recognition of the fact that for professional requirements the university course is not sufficient and that there is no substitute for laboratory and field experience in a student's training.

The instructor today who encourages a student to enter entomology as a life-work is incurring a grave responsibility. We must have a more careful selection of the human material, a better trained product and a drastic cutting down in numbers. It may be that we should train more entomologists as some have contended. Those of us who have to do with students, however, know that during the last two years there have emerged from our universities a larger proportion of able young men incomparably better trained for their life-work than those entering the field a generation ago, and that many of these have been forced to take non-entomological positions or have joined the great army of the unemployed. It seems to the present speaker that, for a long time to come, we must endeavour to follow also the line indicated rather than to strive for mere numbers.

Employers, however, should not indulge in unreasonable requirements. To expect finished products of two or three year students or even of graduates is asking too much. We constantly see advertised positions demanding the most highly specialised training in a certain narrow field and we often hear public men complaining that they have had to go to some other country to get the man with the specialized experience necessary and perhaps blaming the universities for not providing such men. Does not this reveal a defect in our methods of securing men? Perhaps the position referred to is the only one of its kind in the country. It might be necessary to train a score of men in order to select one capable of performing the task. Would it not be better to select a man with the native ability and bent for that kind of work, together with the basic fundamental training upon which to base specialization in that particular field. Such a man should very soon succeed in outdistancing one of lesser ability chosen because he chanced to have the particular specialized experience desired. If we also had a more flexible system that would allow men to develop problems and then to create positions for them, we would be more closely approaching the ideal.

From the standpoint of organisation our progress has been so marked as to require little comment. The first official Provincial Entomologist was appointed in 1912 and a Dominion Entomologist only two years earlier. The highly developed organisation we have today carries with it certain dangers, the greatest of which is in over-departmentalization. The present trend is for grouping workers around a problem rather than around a subject. Fortunately there are signs that this idea is taking hold and it cannot be too strongly encouraged.

At the beginning of the period to which I have referred, we had, in economic entomology, scarcely emerged from the salt, wood-ashes and "pull up and burn" era. The impressive developments in chemical control were only beginning, while the utilization of the biological control method, of bioclimatic data in connection with economic outbreaks and distribution, the application of knowledge based on sense reactions and the whole technique of experimentation, is still in a state of rapid evolution. With all our progress there is still need for greater use of the discoveries made in other sciences, for the more general adoption of refinements in experimental technique in the working out of new methods. One does not have to make a fetish of the methods of mathematical analysis to observe that many entomological papers are often positively infantile in their disregard of what constitutes scientific evidence. In this respect we have fallen far behind the workers in other fields upon whom we used to look down as from a great height.

The past decade has shown a great expansion of so-called "plant-quarantine" organizations often overshadowing other services. Some legislation of this character that has been passed by national or local legislatures may have been wise, more has been futile and some vicious. There is more than a suspicion in some cases that such legislation has been seized upon as a weapon in the war of economic nationalism that is now sweeping the world. Those who have fostered this sort of thing have much to answer for. Whether the vast sums that have been expended on many of these projects might not, in many cases, have been put to a use that might have resulted in discoveries of basic significance and permanent value, is a thought that we cannot escape.

Dr. L. O. Howard once said that all entomology is economic and the late Dr. S. A. Forbes remarked that the economic entomologist is an ecologist whether he realizes it or not, working in that border land where the ecology of man and the insect is coincident. Carrying this thought a step further we may say that any science that can be utilized in the control of insects is within the province of the economic entomologist.

Strange as it may seem, our most conspicuous success seems to have been in the field of extension work. Still regarded as a harmless nuisance a few years ago, the economic entomologist has now reached a place where he no longer has to apologize for his existence. Such organizations as "Spray Services" are known and valued by those who used them. It is doubtful if those departments who formerly regarded themselves as exclusively entitled to the adjective "practical" can show a like record.

I do not refer to the foregoing fact for purposes of congratulation, because I fear that our happy position in this field is jeopardized by much that is said and done in the name of "publicity", but which might better be termed propaganda. Publicity by the right sort may be allowable: it may even be necessary, but our own system of government does not practically force that sort of thing upon public servants as it does in certain other countries; neither is it necessary to indulge in gross exaggeration in order to scare the public into according the support for a needed appropriation. One constantly sees definite figures quoted of insect damage, based on the flimsiest of data and figures claiming enormous financial savings as a result of the efforts of certain individuals or organizations.

It should be realised that this sort of thing undermines the scientific judgment and worse still the scientific integrity of those making such claims, so that, in the end, they come actually to believe the accuracy of their own "estimates". Since the great war it has become the diversion even of eminent scientists, together with a host of lesser imitators, to draw, in apocalyptic language, vivid pictures of what the poor old world is coming to as a result of the insect menace, in line with the motif employed with such telling effect by Maeterlinck in the famous passage in which he describes insects as our "rivals in these later hours and perhaps our successors." Aside from the aesthetic pleasure derived from such glowing periods, I confess that they effect me somewhat differently than they appear to do some other readers. Being perhaps of an essentially irreverent disposition, being sometimes "moved to unseemly merriment where wiser men are impressed", it only calls to my mind a nursery rhyme that I learned long ago about a certain "little orphan Annie" and the stories she told of "goblins that will git you if you don't watch out".

Even though it may be as the voice of one crying in the wilderness, it seems necessary to point out that this type of exaggeration is likely to lose us that measure of public confidence we now enjoy and to express the thought that it is better to say what is true rather than what is merely striking, to understate rather than overstate and to make no claims at all that cannot be justified on the basis of sure fact, weighed, tested and approved.

If, however, entomology has not registered its maximum potential achievement during the past quarter of a century, the fault cannot be laid in its entirety at the door of the entomologists. Much has been due to the failure of those in authority to realize the needs of the situation. No one has ever suggested, for example that the agronomists, the horticulturists, the animal husbandmen or geneticists should get along without living plants or animals to work with, and all the paraphernalia of caring for them. In a good many years experience with fruit and vegetable growers, I have never encountered any difficulty in securing all the land required for commercial tests. But is the same attitude shown by those in control of affairs at our experiment stations or agricultural colleges? It is not, and until the necessity of the entomologists and their colleagues the plant pathologists of having under their own control land, plants and equipment, without having metaphorically to go down on their knees for them is recognized, we can never hope to accomplish our greatest usefulness.

Those who ten years ago, thought that they saw entomological work assuming a dead level, have seen their fears proved groundless. Those who thought that they saw us coming to the end of the problems that confronted us have seen new fields of usefulness and new methods of research constantly opening up. Today there are countless problems vitally affecting the health, wealth and welfare of vast populations in all parts of the earth awaiting attention. The thought that I would like to emphasize in closing is that these problems can only be solved by those specially fitted by ability, temperament and training to do so.