

Summary of Symposium

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At the outset in the organization of this symposium, the planning committee was most anxious to ensure that we might conclude our deliberations with not only a recital and summary of the current status of the resistance problem, but also with some concrete objectives to approach in applying this knowledge toward practical solutions. It has, therefore, been suggested that I attempt a summary of the proceedings of the past 2 days with this objective in mind. In my introduction, I said that resistance was one of the most intriguing and complex phenomena of the 20th century—I haven't heard anything here during the past 2 days to make me change my mind. It was reassuring to listen to Dr. Boger's recital of the woes of the medical profession with regard to microbial resistance to antibiotics and to learn that here is a parallel case of a very important problem which is far from a suitable solution. My luncheon companion, Dr. Hans Gysin, phrased our dilemma about as well as anything I've heard. When we were discussing the complexities of the resistance problem in comparison with those of space exploration, he said that "at least in space exploration we know where we want to go." Our preliminary speakers pointed out the large number of insect species that are becoming resistant, and if we accept the figure of approximately 5,000 species of important economic insects, it's obvious that anywhere from 2% to 4% of these, a very alarming figure, have already been demonstrated to be resistant to one or more of our important pesticides. I think that the statement Dr. Johnston made, after reviewing the picture of resistance in the cotton insecticide field, that he felt a thorough revision of pest control practice was most urgently needed, is one of the strongest impressions that I will take away from this conference. I am sure it's time that we faced up, as Dr. Johnston did so admirably, to the fact that there's no use just going on compounding our errors; we've got to back off and take a new look and make a new start. Certainly we've all been given impetus by every one of these excellent speakers, to review critically the various phases of our participation in the search for solutions to the resistance problem.

It's clear that the insecticide industry has met adequately the demands of entomologists for new compounds. I don't believe anyone here has indicated any dissatisfaction at all with the flow

of new compounds for screening. However, there is one bottleneck with which we are all concerned, and that is the extreme difficulty with which these discoveries can be registered and licensed and then brought into commercial usage. I think we have to face this issue very squarely. Nobody wants to see any less rigorous or thorough testing of these new materials, but on the other hand, one of the things about scientific progress is the inescapable improvement in the techniques of research and evaluation. Surely there must be some better way to register and license pesticides than the methods that are now being used. I believe that improvement can be made in the methods of toxicological evaluation just as they are continually being made in methods of screening for pesticidal activity, in every laboratory that I've ever visited. This is a challenge that we can throw out to the National Agricultural Chemicals Association and the Entomological Society of America together and I would like to make a personal suggestion that if we ever again have the good fortune to have a cooperative meeting of this kind, this topic in itself might provide a very suitable one for the agenda.

It's obvious from the standpoint of industry that some revision of screening methods and practices is in order. I'm sure after listening to Dr. Julius Johnson and Dr. George Ferguson that this is already in the minds of many research workers. We've heard again and again the need for toxicants which have a negative correlation with resistance, or new modes of action, or which are insect sterilants, et cetera. These compounds might already be on your stockroom shelves. This brings to mind the thought that there's nothing wrong with the production of new chemicals; we are producing them far more rapidly than we can evaluate them. Perhaps the overall ratio of biologists to chemists isn't quite what it ought to be. I see no reason why a compound should be given a quick routine scrutiny and put away forever, when perhaps we're overlooking the very things we need. Much more extensive biological screening seems to be very desirable.

The necessity for searching for new toxicants with unique types of action has been covered very adequately by Dr. Knipling and others. Almost everybody who devises a new scheme of insect control, *e.g.*, use of desiccating agents, insect hormones, and bacterial insecticides, states categorically without any basic information on

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