

and industry reports. It is futile to expect students to find what is important and hence a principal function of a university teacher is to help his students find what they need. A large reprint collection is useful here and I have encouraged my students to start their own at an early stage of their student days.

In brief summary, the problems of information on pesticides are especially difficult for university researchers, agricultural advisors, and teachers because, on the one

hand they have the responsibility of recommending measures for pest control, but little or no voice in formulating regulations regarding residues that steadily are being imposed by governmental agencies. On the other hand, the growing mass of information on pesticides makes it well nigh impossible to give the proper instruction to students whose future activities will range from very practical use of pesticides to research on fundamental problems of toxic action.

## Problems in Handling Pesticide Information

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The problems I shall discuss are those which may be categorized as

1. Current Awareness
2. Retrieval
3. Correlation
4. Standardization

Viewed in isolation, the size and growth of the pesticide literature are quite manageable as scientific literature goes. The number of pesticide books, such as those by Frear, Metcalf, etc., published yearly is remarkably small, and total number of significant books which have been written fill from three to four shelves in a library. About two dozen journals throughout the world account for over 90% of the significant pesticide articles being published. These articles number less than fifty per week, and most are concerned with the pesticidal activity of a specific or generic pesticide; the next most written about area is residue analysis. The world's output of pesticide patents is approximately thirty per week, of which, however, at least one-third are counterparts. The patent literature for the most part is concerned with the use of organic chemicals as pesticides.

The scientist engaged in pesticide research and development views the pesticide literature not in isolation but as a part of the total literature. This is the root of both the current awareness and retrieval problems of the pesticide scientist. Indeed, these problems will persist as long as mission-oriented scientists must use discipline-oriented information services for their information needs. Information services, such as Chemical Abstracts, Derwent, and Information for Industry, classify and index a document from the pesticide viewpoint only when the document dis-

closes this objective. They index organic chemicals from the nomenclature viewpoint, not from the toxophoric group viewpoint as needed by the pesticide scientist. For these information services to do otherwise would be a disservice to a majority of their subscribers. This is not to say, however, that information services could not do a better job for their mission-oriented users. I suggest that the first step in this direction should be taken by the mission-oriented users. For the pesticide scientists, the Pesticide Subdivision of the Division of Agricultural and Food Chemistry is a natural vehicle for engaging the cooperation of information services to increase the effectiveness of these services for both awareness and retrieval. The ultimate, of course, is a Pesticide Information Service, comparable to that of the American Petroleum Institute's petroleum information service. Time is not available, however, to consider the pros and cons of this approach.

One of the greatest needs of pesticide scientists is a mechanism for the correlation of chemical moieties and functional groups with toxicological data. This is an area in which information and pesticide scientists may gainfully join forces. Solutions to this problem will contribute towards controlling the vast amount of apparently unrelated data resulting from pesticide research activity and contribute towards our understanding of the underlying principles governing the relationships between pesticides and pests.

Low reliability and lack of consistency of toxicological data in the literature have been a most frustrating problem, a problem which can be eliminated by a cooperative effort. Standardization of analytical methods is another area which is amenable to a cooperative effort. The most obvious solution to these problems is an ASTM for pesticides.