# News of Science

## NAS-NRC Closes Coordination Center

The National Academy of Sciences–National Research Council announces with regret that the Chemical-Biological Coordination Center, now in its eleventh year of operation, is to be discontinued. Although there has been widespread agreement among scientists familiar with its activities that the center has great potential value to science, financial backing adequate to continue the center at an effective level of operation has not been found. Over the years, support has been provided from within the Government by the Army and Navy, the National Institutes of Health, the Atomic Energy Commission, and the National Science Foundation; and from outside the Government by the American Cancer Society. But despite the efforts of those agencies, the funds available for the center have decreased while its steady growth has called for an increasing level of expenditure. The point has finally been reached where its effective operation is no longer possible.

No scientist is unaware of the problem posed by the expanding volume of scientific information, both in the published literature and in the mass of test data lying generally unavailable in internal reports and file cases. There is no better example than that of research on biological responses to chemicals. Recognizing more than 10 years ago the eventual necessity for some scheme of collection and correlation of chemical-biological data, a small group of scientists who had struggled with certain aspects of this problem during World War II proposed a center to investigate methods for realizing such a scheme. Parent of the project was M. C. Winternitz, whose enthusiasm and vision rallied supporters for the organization that was to be called the Chemical-Biological Coordination Center.

With a small staff and the files of the war-time Office of Scientific Research and Development Insect Control Committee as a beginning, the center embarked on an uncharted course. The history of the first years records the contributions of many scientists to the major problem of converting chemical-biological information to a coded form that could be recorded and sorted by machine methods. Gradually, through several stages, a Chemical Code and Biology Code took shape, both designed for use with IBM punched cards. Finally, a time arrived when it was clear that the codes were at a stage at which their further improvement could best come about through actual use. The Chemistry Code, which was published in 1950, has been used since that time with no major changes and with gratifying success in the retrieval of chemical information. It has been adopted by a number of other organizations, with some modification to meet their particular needs.

The Biology Code has gone through six mimeographed editions but has not been published because of its continuing state of evolution and expansion to meet the changing requirements of the material with which it deals. It has now reached a stage, however, where its publication is justified, together with the "key" containing essential explanations and directions for the use of the code.

For 6 years the center has been collecting data from a selected list of publications, from unpublished sources, and from its own screening program, a program in which the center has acted as liaison between submitters of compounds and a series of independent laboratories carrying on biological tests. As a result of this activity, each year has marked some improvement in the method of handling data, in the codes, in the caliber and speed of coding, and in the size of the files.

As the center has developed, it has been considered to serve three main purposes. First, with its codes and machine methods and its growing files, it has steadily built up its capacity for the discovery and exploration of systematic correlations between chemical structure and biological activity or between different biological actions, relationships that might be recognized only through large-scale machine correlating. In that sense, the center has had the potential of becoming a unique tool for creative research.

Second, the center has provided an increasingly useful bibliographical resource because of its vast accumulation of information on the biological actions of chemicals. Despite its small staff and the handicap of its developmental difficulties, the center has become a source of information that some agencies have learned to consult regularly. Even though the files have by no means represented complete coverage of the available data, these agencies have recognized them as containing much information unobtainable elsewhere and as providing data not revealed by mere title and author indexes.

Third, the center has developed a background of research and experience on the methodology of data handling in the chemical-biological field that has enabled it to improve its own techniques and to advise other organizations from time to time in the establishment of their files. This is an aspect of the center that has been considered of prime importance, both as a service to others and as a contribution to the management of the formidable information-handling problems of science generally.

Processing of data into the files of the center has now been stopped. The screening program, which served a unique function, has been discontinued except for final details. The final closing operations will probably continue over the next 5 or 6 months. It is expected that the Biology Code and Key will be published; that final information from the screening program, which would not otherwise be generally available, will be published in the concluding volumes of the center's regular series of *Summary Tables of Biological Tests*; and that a history of the center will be prepared.

Of the greatest concern is the disposition of the master files of chemistry and biology code sheets (containing written abstracts as well as data in code) and of the IBM cards which index the code sheets in as many ways as the punching allows. Every effort will be made to retain these files intact. In the meantime, some sections of the files will be duplicated to meet particular needs that have been presented. As the staff dissolves, however, further requests will become increasingly difficult to accommodate.

The files have reached such proportions that they have created space problems. This situation points to the eventual need for other machine methods of storage and sorting, perhaps the substitution of magnetic tape for punched cards. The master file consists of nearly 100,000 biology code sheets and more than 63,000 chemistry sheets, which occupy 21 standard file cabinets (84 drawers). There are three chemistry card files of 63,000 3- by 5-inch index cards each (name, serial number, and molecular formula files). The total number of IBM cards, necessary for efficient information searches, is more than 1.5 million; these occupy 21 22-drawer steel card cabinets. The basic sets of punched cards correspond in number to the 63,000 coded compounds and 218,000 lines of biology data (on the 100,000 biology code sheets); rearrangement of these into subsidiary files to facilitate searching accounts for the balance of the 1.5 million cards. A file is also retained of all original reports of test results from the screening program.

The Chemical-Biological Coordination Center has achieved much in the 11 years of its existence. Briefly, it has developed and tested a practical, functioning pattern for a center for chemical-biological information. But that accomplishment has embraced many things. Chemical and biological codes have been developed and their utility has been thoroughly tested on a large and diverse body of data. Coding and checking procedures have been worked out in practice. Machine-handling techniques have been successfully demonstrated in actual correlation studies. And the practical business of coding, filing, and handling of chemical-biological data on a large scale has been reduced to an everyday routine.

The Academy–Research Council is indebted to the hundreds of scientists who have taken part in the development of the center, and to the devoted staff that has carried out its actual operations; their vision has been great, their service to science notable. The experience and accomplishments, the shortcomings and difficulties, of the center demonstrate important lessons for similar undertakings that will inevitably be necessary in the future if science is to learn how to manage its own output.

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## AEC Industrial Hygiene Awards

Prospective applicants have *until 1 Mar.* to file requests for appointments in the 1957–58 Atomic Energy Commission special fellowship program in industrial hygiene. This program, which leads to the master's degree in industrial hygiene, is administered for the commission by the Oak Ridge Institute of Nuclear Studies. Fellows enroll for an academic year of graduate training in the subject at the Harvard University School of Public Health or at the University of Pittsburgh Graduate School of Public Health.

Basic fellowship stipend is $2500, with an additional $350 allowed for spouse and each dependent child. Awards include payment of normal tuition and fees required by the university; a travel allowance of 6 cents per mile for the fellow from the place of application to his assigned university; and financial assistance to attend the annual meeting of the American Industrial Hygiene Association. One or more years of graduate experience may qualify a fellow for an additional $200 in the basic stipend.

Requirements include a bachelor's degree in engineering or a basic science, acceptability for graduate work at the university he selects, and U.S. citizenship. Applicants must be under 35 years of age. Additional information and application blanks may be obtained by writing to the Fellowship Office, Oak Ridge Institute of Nuclear Studies, P.O. Box 117, Oak Ridge, Tenn.

## Research Funds

A review of the flow in 1953 of research and development funds was recently completed by the National Science Foundation. The review analyzed both the sources of the funds and their expenditure, the flow totaling $5.4 billion, which is 1.5 percent of the gross national product.

The sources of the funds were these: the Federal Government, $2.8 billion, or 52 percent; industry-oriented organizations, $2.4 billion, or 44 percent; colleges and universities, $130 million, or 3 percent; and other institutions, such as privately endowed foundations, $50 million, or 1 percent. The contribution by colleges and universities does not include such items as salaries for principal investigators.

The funds were spent in research and development as follows: the Federal Government, 18 percent; industry-oriented organizations, 72 percent; colleges and universities, 9 percent; and other institutions, 1 percent.

Thus, in 1953, the Federal Government used about one-third of its $2.8 billion for conducting its own research, with the remainder dispersed through contracts and grants to other organizations. Industry spent virtually all of its $2.4 billion, with a very small amount going to colleges and universities. And the colleges and universities spent a sum equal to 3 times their contribution.

## Insect Physiology

The *Journal of Insect Physiology* will begin publication in March. This is an international journal which plans to bring together in one place the best contributions on insect physiology from all parts of the world. The journal is to be published by Pergamon Press in London. Manuscripts should be sent to one of the following editors: Prof. V. G. Dethier, Department of Biology, Johns Hopkins University, Baltimore, Md., U.S.A.; Dr. H. E. Hinton, Department of Zoology, University of Bristol, Bristol, England; or Prof. M. Lüscher, Zoologisches Institut der Universität Bern, Bern, Switzerland.

## Instrument Stations in the Deep Sea

Heretofore it has been difficult to moor instrument stations in the deep sea, and their effectiveness was limited even for the few days that they continued to function. However, during recent operations in the Pacific, a group from the Scripps Institution of Oceanography succeeded in mooring instrument stations in depths of from 3200 to 4700 meters. They were installed for the purpose of obtaining synoptic data over a large area. The moorings employed taut wire and a primary float below the level of wave action. (Earlier installations of similar stations had been set at about 700 fathoms.)

The stations were equipped with recorders, vertical instrument strings, power supply, lights, and radar targets. Sixteen of these units were maintained for a period of more than 4 months in the region of the northeast trades. Highest wind velocities during the period were about 37 knots. Natural attrition accounted for the loss of surface components of two stations, but parts of several of the moorings were recovered at the end of the period and were in excellent condition. Therefore, it would appear that the basic problems of kinking, chafing, and electrolysis have been solved.

The maximal horizontal excursion of the instrument station in the extremes of weather and current during the test period is unknown, but it was not more than the limits of accurate navigation—that is, $\pm 1$ mile. Calculations indicate a total excursion of the submerged float to have been $\pm 300$ meters under the extreme conditions.

Installation of a mooring required about 45 minutes after arrival on station, exchange of the instrument platform took about 15 minutes on subsequent visits. Cost of the moorings, exclusive of the surface platform and instrumentation, was about $700 each.

It is believed that this development, which was supported by the Office of Naval Research, will find important application in exploration of the deep ocean. A discussion of the method and a detailed description of the technique are in preparation and will be available upon request from the director of the Scripps Institution of Oceanography.

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