Comments and Communications

Science Communications[1]

ANY organism, says Wiener (*1*),

> . . . is held together . . . by the possession of means for the acquisition, use, retention, and transmission of information. . . . A group of nonsocial animals, temporarily assembled, contains very little group information, even though its members may possess much information as individuals. Properly speaking, the community extends only so far as there extends an effectual transmission of information.

In some respects, the world of science today resembles a group of nonsocial animals with very little group information. According to Flynn (*2*), ". . . the acceleration of research and the increase in research publications are world-wide. . . . We are threatened with being choked with the flood of our own research production."

About 750,000 original papers appear annually, of which only about one third are abstracted (*3*), and the total volume of scientific literature increases by about 5% per year (*4*). There are thus physical, as well as intellectual, bases for the narrowing of comprehension which has accompanied the intense specialization among scientists in recent decades. According to the findings of the Royal Society Scientific Information Conference of 1948 (*5*),

> . . . we must expect inferior science from those who cannot work at the great research centers, until mechanisms are developed to insure that every scientist, no matter where he may be, may have access to the record of science to the full extent to which it can contribute to his investigations.

Perry (*6*), chairman of the Division of Chemical Literature of the American Chemical Society, puts it in more immediately practical terms, pointing out that

> . . . failure to make full use of recorded chemical knowledge may seriously impede a research program and make it more costly. For whenever helpful information and data recorded in the literature are overlooked, it is virtually certain that needless experimental work will be done in the laboratory. It is a rule with few exceptions that the cost of laboratory experimentation is many times greater than that involved in having a literature expert locate the record of previous experimentation.

Librarians for centuries, scientists much more recently, have been concerned about the canalization and flow of knowledge. At a recent conference on abstracting under the auspices of the Natural Sciences Division of Unesco, "Many present expressed the opinion that conditions have now become so chaotic that scientists will be compelled to aid in seeking some solution" (*7*). It is not the purpose of this paper to list the detailed techniques developed, or the suggestions advanced, but rather to propose for discussion an organizational device by which American scientists through the AAAS may greatly promote the advancement of science. Worthy at least of mention, however, are the growth of the asbtracting services, and especially the achievement of international formal cooperation in physics abstracting (*8*); the establishing of the Division of Chemical Literature of the American Chemical Society; and the formation of the Science Office of the U. S. Department of State, to promote the international exchange of scientific information.

Although a large and increasing number of scientists are devoting their full time to problems and services of "science intelligence," there is no professional organization of such persons. Such a group is proposed by Miles (*9*), who lists 27 areas of endeavor in which an organization of scientific and technical communications specialists might be active. Whether or not such a group is formed, the suggestion of the Assistant Administrative Secretary of the AAAS should be considered: that an interdisciplinary AAAS Committee on Science Communications be charged with the fostering of improvements in "literature science" (*10*). Whatever the type of communications group, it might contribute greatly along the following lines:

1) By providing a forum, accessible to all subject areas of science, for the suggestion, discussion, and dissemination of communications techniques;

2) By aiding in the adoption of criteria for standardization and curricularization of the training of workers in science communications;

3) Not least important, by recognizing publicly the existence of communications work as a professional-level occupation of social and scientific value, comparable to that of bench research or teaching;

4) By facilitating, in the very nature of the organization, exploitation of interarea developments in science ("it is these boundary regions of science," says Wiener, "which offer the richest opportunities. . . . They are at the same time the most refractory to the accepted techniques of . . . the division of labor.");

5) By freeing the bench scientist for his specialized work, improving the form and content of communications, and facilitating the flow, promotion, and exploitation of ideas;

6) By counteracting to some extent, on the technical level, the current constriction of channels of communication among scientists, and between scientists and laymen.

Several, and perhaps all, of the subject-area sections of the AAAS may be expected to be interested in a communications group, judging by the experience of the similar Cooperative Committee on the Teaching of Science and Mathematics. Possible composition of the communications group is indicated by the backgrounds of those attending the recent National Research Council Conference on Primary Publication: There were representatives of government, industry,

[1] Based on a paper delivered December 26, 1950, at Cleveland, Ohio, before Section Q of the American Association for the Advancement of Science.

journals, publishers, libraries, professional societies, and other organizations, including universities and research foundations (*11, 12*).

Industrial and governmental laboratories have had for some years, and at an increasing rate are establishing, science communications groups whose functions frequently embrace independent research and teaching, as well as service. No such units exist in academic and other nonprofit, nongovernmental institutions, so far as I am aware (*13*), although I have suggested such groups (*14*). Since, with the exception of the American Chemical Society, organizations of laboratory and clinical scientists do not recognize professionally the experts in communications in their fields, academic scientists are excusably hesitant to enter communications work lest it jeopardize their chances of advancement. The existence of a national communications group made up primarily of scientists might encourage literature science developments in academic staffs.

This proposal is fundamentally in the field of education and was presented accordingly before Section Q. The encouraging reception there is reminiscent of the fact that the Division of Literature Chemistry grew out of the Division of Chemical Education of the American Chemical Society. The proposal is not restricted, however, to the advancement of educational technology; as conceived, it concerns the entire function of the AAAS—the advancement of science.

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Book Reviews

Marine Geology. Ph. H. Kuenen. New York: Wiley; London: Chapman & Hall, 1950. 568 pp. $7.50.

Professor Kuenen states that in preparing a work on marine geology he wished to "introduce university students of geology to an important branch of the science," to provide a guide to students who wish to explore the field, and to advance science by presenting achieved results and the problems remaining to be solved. He seems to have accomplished his objectives, but the problems remaining to be solved are far greater in number than the certainly achieved results.

To discuss in detail the many subjects covered in the book would involve pages not available for a review. Only some of the high lights can be noticed. In successive chapters there are considered: physical oceanography, the sea basins. Indonesian deep-sea depressions, sources and transportation of marine sediments, the formation of marine sediments, coral reefs, geomorphology of the sea floor, and eustatic changes of sea level. The author emphasizes that many problems of marine geology await solution, and, although he presents many of them with sympathetic consideration of the views of others, Kuenen has no hesitation in stating objections.

Discussion of the movements of sea water is rather complete, but parts are not easy reading. It is shown that the movements are generally quite complex because of various factors involved. Places of little or no movement of marine waters are designated "poorly ventilated"—for example, the Black Sea and the fiords of Norway—but there are other fiords of similar character to which no reference is made. Consideration of poorly ventilated basins is timely, because they are rich in hydrogen sulfide, and though almost barren of life other than anaerobic bacteria they commonly contain much organic matter. The sediments are termed "euxinic." Overlying surface waters may be abundantly populated and, if the remains of the organisms living there settle on the bottom, perfect preservation is likely. Sediments of this origin are responsible for some black shales. The Baltic Sea is stated to have poorly ventilated bottom waters and to have hydrogen sulfide temporarily present, but nothing is said of the limans of the East Baltic, in some of which hydrogen sulfide is so abundantly formed that the odor may be carried for miles. Brief comment is made on the possibility that, under some climatic conditions different from those of the present, the deep bottoms of the sea might become poorly ventilated.

The author is of the opinion that the ocean basins have been permanent since the far distant past. Respectful consideration, however, is given to the views of other geologists who have suggested a lesser degree of permanence. Three oceans are distinguished: Pacific, Atlantic, and Indian. The Antarctic Sea, North Polar Basin, and Norwegian Sea are considered parts of these oceans. Other waters are marginal and inland seas, which may be deep or shallow. The