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The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

## Information Transfer and Retrieval

Keeping informed of new research results is a matter of concern to all who are engaged in science or technology. However, the magnitude of the problem and the mechanisms employed for the transfer and retrieval of information differ widely, depending on the kind of activity involved. For those engaged in efforts at the leading edges of scientific discovery, information retrieval presents no great problem. For those engaged in technology, and especially those concerned with patents, a more serious difficulty exists, one which has been described as an information crisis. This has received attention from the President's Science Adviser, Jerome Wiesner, and is currently the concern of a committee in Congress headed by Representative Pucinski of Illinois.

In some areas of fundamental research there is no crisis, for jet travel and the telephone permit fast and complete interchange of information. Consider the procedures of scientists who are leaders in a field such as molecular biology. These men (or women) quickly become aware of each other's work and come to form an invisible college. They keep each other informed of progress through visits, telephone calls, letters, and mimeographed preprints of papers. By common consent they publish in a limited number of journals. While they participate to a degree in the large national meetings, their favorite place of meeting is the small, closed symposium.

Membership in the "college" is informal and is won on the basis of scientific contributions. Young men achieve it most readily by working in a laboratory where the senior workers already belong. There they have an opportunity to learn early of new developments and current ideas. Nevertheless, a man of sufficient competence and imagination, no matter where he is working, can achieve membership through excellence.

Men who are active in a fast-moving field know that only a limited number of workers are likely to make significant discoveries, and that they themselves can keep abreast of new developments if they are in close contact with those few. They also know that colleagues with whom they are not in contact, and even newcomers, will publish their findings in perhaps a half dozen journals. It is not even necessary for each individual to scan this limited number of publications, for he will learn through the "grapevine" of anything particularly significant.

Another advantage possessed by a member of the "college" is the ability to readily evaluate the work of others. Through his own judgment and through consultation with others he can quickly identify those who do highly imaginative, reliable work and be warned of those who are careless. It is also easy for him to spot and disregard those who talk about, and publish repeatedly, the same limited body of facts, or variants of them.

The attitude of those who have ready access to new information relevant to their activities and who can obtain evaluated material of prime significance was expressed by one molecular biologist, who told me, "If all of human knowledge could be put on a computer and I could press a button and get all the information on DNA, I doubt that I would ever touch the button."

For those who are not on the "grapevine" or who wish to apply the results of basic research, the problem is quite different, and a well-conceived machine system of information retrieval would be useful. To be of maximum value, however, such a system would have to possess the speed and some of the capacities of evaluation already enjoyed by members of the invisible colleges.—P.H.A.