Preprints. An Old Information Device with New Outlooks*

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Individual scientists, "invisible colleges" (*1*), specialized groups of scientists, and scientific societies have been testing the expediency of distributing typescript copies (preprints) of papers before the formal presentation at a meeting or in a journal. (This discussion at times involves documents that were mimeographed, photoprinted, or otherwised duplicated.) Actually the idea is not new since it was expressed as early as the 17th century when academic groups in France and England circulated papers prior to and after the advent of scientific periodicals. This symposium on "Alerting Methods" seems an appropriate occasion to examine the dissemination and exchange of preprints and to consider the advantages and disadvantages in their use, especially as seen in the newer preprinting activities organized in recent times.

Preprint distribution usually takes place early in the information transfer chain at any one of several points in time prior to a formal presentation. Societies circulate conference papers as early as 2 months before the event or as late as the day of the meeting. Individual authors or specialized groups distribute preprints of papers either before, during, after submission to, or after acceptance by a journal. In this way, preprinted material may be available 2 to 9 months before its publication.

Societies and other organizations that distribute premeeting typescripts of papers expect better organized final papers and more active discussions at meetings. A unique example of this practice is furnished by the Faraday Society in England. This organization sends out preprints of meeting papers as early as 2 months before its semiannual meetings. However, papers are not read at the meetings; instead, the meetings are given over altogether to discussions of the papers (limited to members who have made advance request to be on the discussion program).

The practice of preprinting meeting papers is followed by the Division of Petroleum Chemistry of the American Chemical Society. It has preprinted its conference papers for the past 40 years. The Division believes that the preprinting has resulted in discussions of much higher caliber. Petroleum chemists also value their preprint booklets as compendiums of available literature on petroleum chemistry. Four other ACS divisions regularly engage in preprinting. This is favored by their memberships, even though they have to pay higher membership dues for it. Emphasis upon rapid research progress and the lack of a publication outlet, such as other divisions of ACS have, are other reasons these five divisions carry on preprinting.

The American Documentation Institute which with NSF and the NRC jointly sponsored an International Conference on Scientific Information held in Washington, D. C., Nov. 16–20, 1958, distributed a preprint booklet prior to the meeting. ADI is presently considering preprinting papers for its future meetings.

In regard to exchange of preprints by individual scientists and groups before publication of the papers, long "time lags" until publication and the relative lack of specialized journals, *e.g.*, too many general journals to search, have undoubtedly been factors in the spread of such exchange. Also, intense research activity leading to the rapid accumulation of research findings in a field has presumably contributed to it. Garvey and Griffith (*2*) in a survey of the information activities of members of the American Psychological Association found that 40% of the members distributed preprints to as many as 200 colleagues on an average of 9 months to 1 year before publication. In the social sciences where publication "time lags" are as long as 16 months, devices for faster communication are especially needed. Shilling (*3*) sent a questionnaire to nearly 700 bioscientists and found that 8% belonged to preprint-exchange groups.

Over the years scientists in the fast-paced areas of the physical sciences have followed the practice of exchanging preprints. In these areas, journals like *Physical Review Letters* and *Biophysical and Biochemical Research Communications* which publish papers in a 5- to 6-week period or earlier, serve the same purpose of fast dissemination of research findings.

Certain new and unique means for distributing preprints have now come into use. In one of these, the journal to which a paper has been submitted preprints the paper while it is still in process of editorial review. *Industrial and Chemical Engineering News* (*4*) offers this kind of preprint service. An IE&C subscriber can select any preprint he wishes from advance summaries, appearing in each issue of the journal. It is thus possible for a subscriber to order a complete photoprinted manuscript possibly weeks or months before publication. I might mention here also the preprint publication of tables of contents of forthcoming issues of journals. *Current Contents* publishes such tables of contents.

In the "invisible colleges" (a term that has recently become popular) it may be assumed that the members not infrequently exchange preprints as well as other communications. So far as I know there is no published list of these informal groups, but they are presumed to exist in most of the major scientific fields.

There is now a new preprinting activity that is making some of these "invisible colleges" more "visible" through

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a formalized device piloted by the National Institutes of Health and called an Information Exchange Group. David Green alerted the scientific community to this form of scientist-to-scientist communication by an article in *Science* in Jan. 1964 (*5*). In the instance he reported, the device was being used by 200 researchers working in the area of oxidative phosphorylation and terminal electron transport. Dr. Green is chairman of that group which is called "IEG # 1." Nearly 90% of the communications circulated by the members are preprints. (Discussions of papers are also circulated.)

Since the appearance of his report, other scientists interested in faster communication have organized IEG's in "Hemostasis," "Computer Simulation of Biological Systems," "Molecular Basis of Muscle Contraction," "Immunopathology," "Interferon," and "Nucleic Acids and the Genetic Code." The NIH is acting as "middleman" for these groups. Member scientists mail typed manuscripts, critical comments, and other types of communication to DRG (*6*), the present IEG center, where they are promptly photoprinted and sent to all members of their group. Updated membership lists, dispatched quarterly, keep IEG members continuously aware of the other scientists active in their now "visible college," and of the mailing address where they can be reached. Any scientist who is a *bona fide* researcher in an IEG's field of activity is eligible for membership and may apply or be nominated by other members.

The IEG system is fast and uncomplicated. Scientist-to-scientist delivery takes place within 14 days. Compared with the time it takes to publish the same information, the IEG activity saves an average of 3 months, with a range of up to 6 to 9 months of time saved. There is no editing.

IEG preprints are not indexed in abstract and index journals and are not to be found in libraries. They go only to the highly defined target audience.

One great advantage pointed out by Dr. Green is that the scientist is relieved from having to go through the "most likely" journals and scanning a large body of material of only marginal interest in order to keep up with advances in his field. "The esoteric journal comes to the reader," not the reverse (*5*). To be sure he must continue to do some browsing, since he has to have some awareness of what is going on in the scientific world outside the limits of his own research field.

Also since an "invisible" or "visible college" is not limited by national boundaries, the need to consult foreign journals is diminished. Over a third (38%) of the memberships of the seven IEG's now existing are outside the continental United States. Twenty-seven countries are represented. Indeed the IEG has recently—perhaps whimsically—been compared to a "Continuing International Congress" by mail.

A community of research interest would seem to be the *sine quo non* for viability of any group engaging in the exchange of preprints. Viability is thought to be dependent on careful selection of (1) a definite research area, perhaps a single phenomenon or several closely interrelated phenomena, and (2) a chairman who is an outstanding researcher in the area.

We have found in a survey of members of IEG # 1 that 10% of them circulate preprints before the same information is submitted for publication, and 58% at the same time. Some scientists prefer that preprint distribution take place only after journal acceptance ("in press"). This view is obviously represented in IEG # 1 since our survey found that 31% of the preprints were dispatched after acceptance by a journal.

Many questions arise with regard to storage and retrieval. What should be the ultimate fate of preprinted information? Should preprints be abstracted? How? Should they be stored and made available for general distribution? Where? In what kinds of repositories?

I have already stated the IEG preprints are not indexed or abstracted or made available in libraries, but it does not by any means follow that this information is lost to the general scientific community. In a survey earlier this year it was found that 75% of the IEG # 1 preprints had been published at that time; it is nearly 80% now. Thus most of the IEG information circulated as preprints will eventually be published (and in due time will appear in some abstract journal). But what about the information that never gets published? The loss of some information which fails to reach the scientific community in published form does not seem serious; at any rate, the IEG memberships have not brought this up for discussion to date.

In the case of meeting papers, however, ACS preprints are usually published by the respective divisions and can be found in libraries. Even if ACS preprints are not published later in a journal, they will eventually appear as abstracts in *Chemical Abstracts*. In the past, some ACS symposium preprints have been published as a unit in *Advances in Chemistry* (*7*). *Chemical Abstracts* believes that preprints are a valuable source of information which should be abstracted and made available to the scientific community.

The traditional information channels remain unchallenged by this activity. Preprinting optimally is an auxiliary information device that is distinguished by its early appearance in the information transfer chain. It is extremely unlikely that preprinting operations will ever supplant journals just as journals have not replaced books. On the contrary, this mode of expression among closed correspondence groups has led at times to the founding of a new journal. The antecedents of the first journal were groups engaged in the "commerce of letters." They disseminated complete manuscripts of work prior to the publication of the same information in books. Currently the ACS Division of Petroleum Chemistry hopes to convert their preprinting activities into a journal. Support for coexistence of both journals and preprinting comes from eight of the ten IEG chairmen and cochairmen who are respectively either editors, coeditors, or editorial board members of journals dealing with subject matter clearly allied to IEG topics.

Other kinds of problems in the preprinting of meeting papers were described in detail at the 1963 ACS meetings held in Atlantic City. Officers of the ACS Division of Coatings and Plastics feel that the preprinting problems are small, however, in comparison with the rewards.

Preprinting seems to be a device for quick scientist-to-scientist communication that will probably be with us for a long time. What the future holds for it ultimately, obviously depends on the quantitative evaluation of its impact on the advance of science.

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(5) Green, D. E., *Science*, **143**, No. 3604 (Jan. 24, 1964).

(6) Abbreviation for Division of Research Grants; the complete address is: Dr. Errett C. Albritton, Scientific Evaluation Section, Division of Research Grants, National Institutes of Health, Bethesda, Md. 20014.

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Industrial and Engineering Chemistry Research Results Service. Prepublication Availability of Complete Manuscripts*

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The Research Results Service of *Industrial and Engineering Chemistry* came into being in January 1962. It was part of a new concept of journal publication, designed to provide readers a combination of specialized coverage in a particular area and broad literature coverage of research and development affecting the whole field of applied chemistry and chemical engineering. The plan was given expression through a major redesign of I&EC, then starting its 54th year as the American Chemical Society's principal journal for publication of articles dealing with applied chemistry and chemical engineering.

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The new publication plan offers I&EC to subscribers as a monthly magazine addressed to the entire field of industrial and engineering chemistry, plus a choice of one or more separately bound, specialized journals publishing original papers. At present, three such specialized journals are published, each one quarterly on a rotating basis to permit one issue of a specialized journal each month. These quarterlies are titled *I&EC Process Design and Development*, *I&EC Fundamentals*, and *I&EC Product Research and Development*, to describe their areas of interest.

To round out the plan—to give readers the widest possible interest—the monthly I&EC offers two features directly related to the quarterlies. One is a section of