

practice. Japan is to start a similar system at the beginning of 1972. The effects of these changes on the volume of patent literature are quantified in Table VI. Short term fluxes in the flow of published literature such as these make it difficult to quantify the long-term rate of growth of the primary literature.

Another type of change was instituted by the United States in 1968 when the Patent Office started to issue defensive publications,<sup>4</sup> whereby an applicant elects to publish an abstract of a patent application in the *Official Gazette* in lieu of completing a formal examination by the Patent Office. Upon publication of this abstract, the applicant agrees to open the complete file record to public inspection. So far, this has resulted in few such publications.

### CONCLUSION

There are many signs today of change in our patterns, forms, and methods of communication of chemical research and technology. More far-reaching changes are likely over the next decade as more and more publishers and information processors turn to computer technology as an answer to their growing economic problems.

Coordinated application of computer technology

throughout the scientific information-handling community can make it possible to interlink the various primary and secondary information processors and the library community into an effective, international, interdisciplinary information network. It can substantially reduce the overall cost of operating the scientific and technical communication complex by eliminating much of the duplication of effort that now exists and result in far more useful information services for scientists and engineers in all disciplines. However, this is not something that will be accomplished in a few years. Although the necessary technology exists, we need to learn to apply it effectively to information handling. Also, information production and utilization is a worldwide, multidisciplinary problem in which many organizations have vested interests; this tends to slow progress.

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## Modern Techniques in Chemical Information

### A New Graduate-Undergraduate Course at Illinois Institute of Technology\*

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**In 1968, the chemical literature course at IIT was expanded and modernized; it is now offered for graduate credit and is accepted as a substitute for the second foreign language requirement for PhD candidates. The course presents a survey, with library exercises, of the traditional techniques of chemical information, followed by a discussion and illustration of modern methods for handling chemical information.**

The presentation of a course in the use of the chemical literature has a strong tradition at Illinois Institute of Technology. If memory serves us correctly, the course was started by Peter Bernays, now at Chemical Abstracts Services, about 1946 and was offered each year to undergraduates at the junior level as a two hour, one semester course. We have for these many years regarded training in the use of the chemical literature as a subject deserving a separate, formal course, and not something to be picked up casually, inadvertently, or accidentally.

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Illinois Institute of Technology is particularly well endowed with the physical prerequisites for such training, since the John Crerar Library is on our campus and the Chicago Public Library, three miles distant, is a depository library of the United States Patent Office. Furthermore, in recent years IIT Research Institute (formerly Armour Research Foundation) has developed a strong and active group in science and technical information under the leadership of Martha Williams. We also have strength in computer technology in the IIT Computer Center, which is in the process of getting new housing and hardware under the directorship of Peter G. Lykos, who is also, fortunately, a professor of chemistry.

Two years ago, with support of a major grant from

the National Science Foundation, the IITRI group initiated the development of a regional center for the storage and dissemination of chemical information for commercial and educational use.<sup>1</sup> The educational aspect of this project was undertaken cooperatively by the senior author of this paper, who joined Martha Williams and Eugene Schwartz of IITRI in the preparation of a Workbook and Syllabus for a new and greatly modified version of our traditional chemical literature course.

Over 20 years of experience gained from our PhD program had shown us that nearly all of our beginning graduate students, who came from other schools, did not have adequate training or experience in the use of literature techniques. Therefore we decided to approve the new course for graduate credit and to permit it to be substituted for the second foreign language requirement. In the two years this has been in effect, most of our second stage graduate students who have passed the qualifying examination for admittance into the PhD program have elected to take the course rather than to attempt the second foreign language examination (a reading knowledge of German is still required).

In format, the new course meets for two hours per week for a 14 or 15 week semester, including a midterm and final examination. The course outline is well exemplified by the following list of chapters in the Syllabus and Workbook:

1. Information Systems
2. Indexing and Classification
3. Primary Information Sources
4. Patents
5. Secondary Information Sources-1: Abstracts, Reviews
6. Secondary Information Sources-2: Reference Works
7. Chemical Information Centers
8. Chemical Structure Storage and Reproduction
9. Manual and Automated Search Systems
10. Information Retrieval in a Current Awareness System

The first seven topics provide a survey of the traditional literature sources and techniques, which are well described in the standard textbooks. This material is covered in approximately the first half of the semester, and each topic is accompanied by exercises and problems which

require two to four hours of library work for each hour of class time. The last three topics deal with recent developments in storage and retrieval of chemical information. In connection with these lectures and discussions, each student prepares a profile for a machine current awareness search of the *Chemical Abstracts Condensates* tapes. The same topic is used for a manual search of *Chemical Abstracts*. The printout of the machine search is available within two or three weeks and provides the basis for a realistic discussion of the advantages and limitations of a current awareness search in the present state of the art.

The second major project is the preparation of a small review article in the style of *Chemical Reviews*. A retrospective as well as a current-awareness search is required in the compilation of the bibliography, and the idea of a creative review is emphasized. Hopefully, the student learns how a good review can be much more than a collection of previously scattered facts and data. Each review is a practical contribution in the sense that either the student or a faculty member is really interested in the subject. In most cases the review has been requested by a member of our faculty, who also participates in the initial definitions of the search problem and in the final evaluation of the results.

The response of the students to our course has been favorable, and we are encouraged to continue to revise the course in the light of experience gained each year. In the area of machinable data bases, we hope to continue to incorporate exercises in the use of such material as it becomes available to us. Another possibility for the future is the development of programs in which this course would serve as the introduction to a sequence of studies in science information and science writing, either at the graduate or undergraduate level. Such a program could be a valuable minor field for either the BS or PhD candidate in chemistry.

#### LITERATURE CITED

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