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AUTHOR Callaghan, A.; And Others
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ABSTRACT

Since 1966 the Chemical Society Research Unit in Information Dissemination and Retrieval at the University of Nottingham has been evaluating the use of "Chemical Titles" (CT) and "Chemical-Biological Activities" (CBAC) as current awareness services. Early results of this evaluation led to the Students' Chemical Information Project (SCIP) designed to spread knowledge of these services. Part I of this two part report on the SCIP reviews the project and its major results. The main objectives were educational: it was hoped that experience gained in the use of CT and CBAC would lead to more knowledge of the existence and use of conventional chemical and related information services. Secondary objectives were to gain operational experience in the routine provision of computer-based services on a large scale, to investigate the feasibility of using specially trained research chemists to act as intermediaries between the users and the service supplies, to learn something about the information habits of students and (ultimately) to have users with some experience of computer-based services working in Government, academic and industrial laboratories. (for Part II see LI 002 563). (NH)

Report to the Office for Scientific and Technical Information, on Project SI/21/23

February 1969

STUDENTS' CHEMICAL INFORMATION PROJECT.

October 1967 - September 1968.

Final Report : Part I

by

A. Callaghan ..... University College, London
T. H. Cannon ..... University of Oxford
E. J. Herbert ..... University of Warwick, Coventry
C. M. Lee ..... Chelsea College of Science and Technology, London
P. Leggate ..... University of Edinburgh
M. Poustie ..... University of York

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Dr. R. Baker, Institute of Computer Science, University of London, who carried out the analysis of the final questionnaire.

Dr. A. K. Kent, Chemical Society Research Unit, whose unit was responsible for providing the fortnightly Chemical Titles service.

Dr. G. A. Somerfield, OSTI, who acted as project co-ordinator.

The report is issued in two parts:

Part I. A review of the project and the major results. This part of the report is being widely distributed to those participating in the experiment.

Part II. Details of operations, statistics, results of questionnaires and research reports from liaison scientists. One copy of this part is being sent to all university libraries and chemistry departments in the U.K. Further copies are available on request from the Office for Scientific and Technical Information, Department of Education and Science, Elizabeth House, York Road, London, S.E.1.

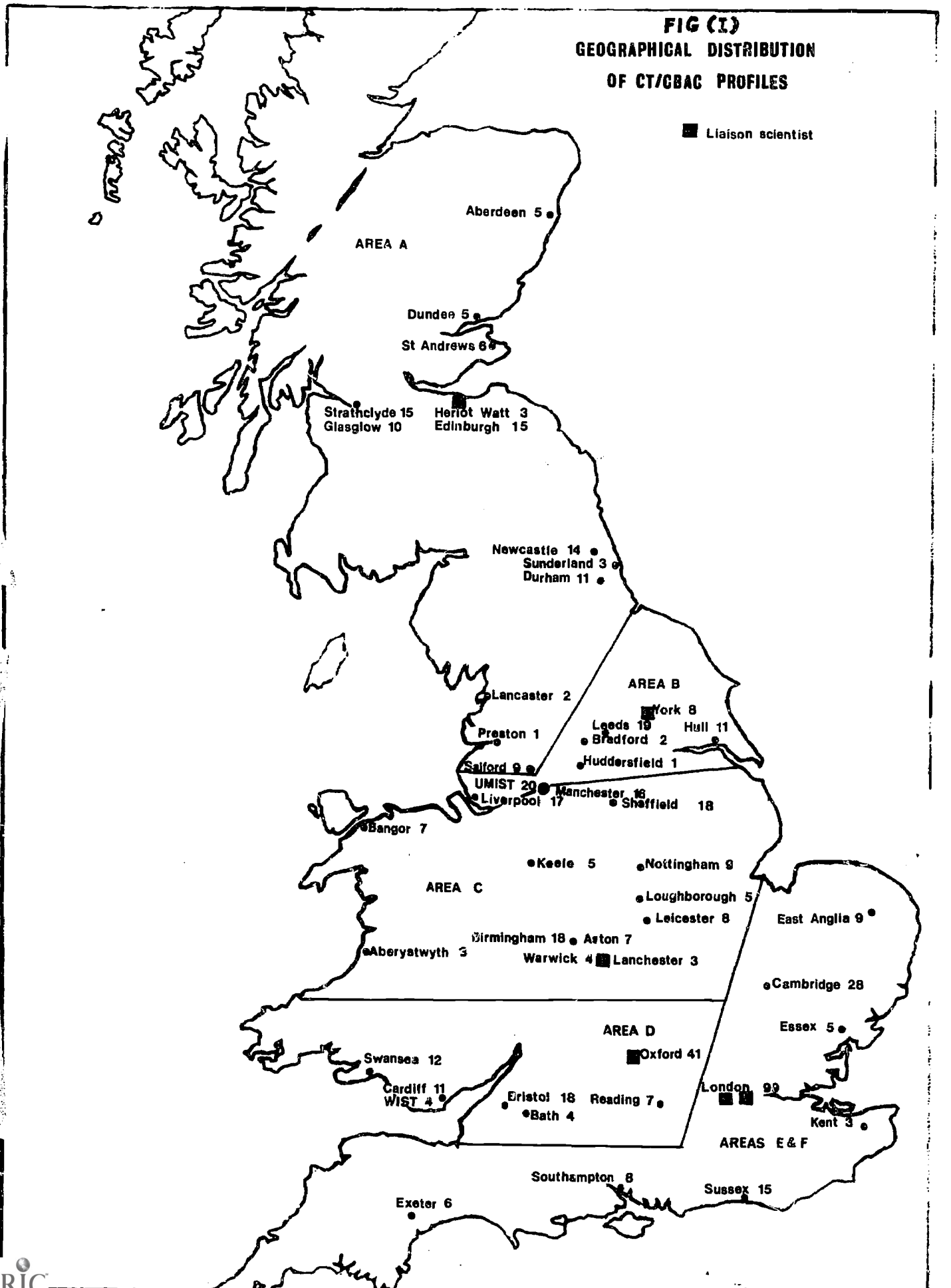
FIG (I)
GEOGRAPHICAL DISTRIBUTION
OF CT/CBAC PROFILES
Liaison scientist
Aberdeen 5
AREA A
Dundee 5
St Andrews 6
Strathclyde 15
Glasgow 10
Heriot Watt 3
Edinburgh 15
Newcastle 14
Sunderland 3
Durham 11
AREA B
Lancaster 2
York 8
Preston 1
Leeds 19
Hull 11
Bradford 2
Huddersfield 1
Salford 9
UMIST 20
Manchester 16
Liverpool 17
Sheffield 18
Bangor 7
Keele 5
Nottingham 9
AREA C
Loughborough 5
Leicester 8
East Anglia 9
Birmingham 18
Aston 7
Aberystwyth 3
Warwick 4
Lanchester 3
Cambridge 28
Essex 5
AREA D
Swansea 12
Oxford 41
Cardiff 11
WIST 4
Bristol 18
Reading 7
London 99
Bath 4
Kent 3
AREAS E & F
Southampton 8
Sussex 15
Exeter 6

PART I

Introduction

In recent years, several computer-based information services have become available to the scientific community. Some are multi-disciplinary, e.g. Automatic Subject Citation Alert (ASCA); some cover single disciplines, e.g. the Medical Literature Analysis and Retrieval System (MEDLARS) and Chemical Titles (CT); and some cover restricted areas within a discipline, e.g. Chemical-Biological Activities (CBAC). However, at the start of 1967, it has been estimated that less than 1,000 out of 300,000 graduate scientists and technologists in the U.K. had used a computer-based information service covering the published literature in a major discipline.

Since its inception in 1966 the Chemical Society Research Unit in Information Dissemination and Retrieval at the University of Nottingham, with financial support from the Chemical Society and from the Office for Scientific and Technical Information (OSTI), has been evaluating the use of CT and CBAC as a current awareness service. Early results of this evaluation were promising and led OSTI to promote the Students' Chemical Information Project (SCIP), designed to spread knowledge of the CT/CBAC services. Under this scheme, all final-year Ph.D. students in chemistry supported by the Science Research Council were offered a CT or CBAC service from the CS Nottingham Unit. Over 500 students in 65 universities and colleges were involved in the project and included nearly 200 organic chemists, slightly fewer physical chemists, and about 100 inorganic chemists. The remaining students ranged from analytical chemists to pharmacologists and biochemists.

The main objectives of this project were educational; it was hoped that a large group of academic users would gain experience in the use of this type of computer-based service, and that they might learn more about the existence and use of conventional chemical and related information services. Secondary objectives were to gain operational experience in the routine provision of computer-based services on a large scale, to investigate the feasibility of using specially trained research chemists to act as intermediaries between the users and the service suppliers, to learn something about the information habits of students, and (ultimately) to have users with some experience of computer-based services working in a large number of Government, academic and industrial laboratories.

Six chemists, each with at least three years' research experience, were selected by OSTI and trained by the CS Nottingham Unit in the formulation of "profiles" (the lists of search terms specifying the user's interests). Each of these "liaison scientists" was located in a university chemistry department and was responsible for 80-100 students in universities in his area (Figure 1). Students were visited first in October or November 1967, when the liaison scientist normally gave a short introductory lecture to participants (and others) describing the scheme and the method of preparing a profile, followed by individual interviews with the students (lasting about one hour) during which the profile was constructed.

During the year, each profile was searched fortnightly against current issues of CT or CBAC, and the retrieved titles were sent directly to the student. Amendments were made to the profile as necessary. Students were visited a further two or three times and during the visits they were asked to describe their information habits prior to receiving the service, the effect of the service upon these habits, and their overall impressions of the service.

Reception of the Project

When it was first described to them, most students were interested and enthusiastic about the project; only a few were openly sceptical about its usefulness. As students were not revisited in most cases until they had received a few printouts from the searches, their first reactions to the output could not be accurately judged. However, it did seem that, although they had been warned to expect a high proportion of irrelevant references, the actual appearance of "trash" in the output produced a feeling of disappointment. Nevertheless, during the follow-up visits to the students, the liaison scientists formed the impression that further experience with the scheme had led the students to realise that it was only a few minutes work to select the useful references from the total list. At the end of the scheme, the students appeared to be largely in favour of the service and were more fully aware of both its limitations and its capabilities than they had been previously. In very few cases did the students appear to be apathetic towards the scheme or to consider it a waste of time.

The reactions of other members of the department to the project were not studied to the same extent, but some generalisations may be made. With very few exceptions, heads of departments were helpful and usually co-operated in arranging lectures and interviews. Other members of staff, when their opinions were sought or given, showed interest in the scheme and many were anxious that it should continue, although questions of cost were not discussed. In some cases, supervisors took an active part in the formulation of profiles and some expressed willingness to perform this function themselves.

Students' Information Habits

During the course of visits to the 65 universities and colleges, the liaison scientists were able to gather some knowledge about the information habits of the students. Of this, the most striking (and disquieting) fact was that at least 40% appeared to have had no training in the use of libraries or information services at any stage of their careers. Only about 10% of the students had been given a formal lecture on the use of the literature at undergraduate level; even fewer had received similar training at graduate level. In few cases were students satisfied with this aspect of their training and this should be borne in mind when their methods of information retrieval are considered.

From the statistics available, it is not possible to describe the information habits of a typical postgraduate student. Rather, some statistics relating to the number of students using particular methods of information retrieval can be given. Before receiving the service, there were some students, perhaps 5%, who made no effort to do current literature searching at all. Of the remainder, about 50% relied entirely on the scanning of 6-10 primary journals for current awareness, and a further 30% scanned a similar number of primary journals together with a secondary publication. Of the secondary publications, Current Chemical Papers (CCP) was the most available and the most used; about 75% made some use of it but only 35% used it regularly. Relatively few students used either CT (printed version) or Current Contents (CC), even when these were available; indeed not many students were familiar with either of these publications (about 10% of the students were not aware of any current awareness publication). Rather surprisingly, 15% used Chemical Abstracts as their major current awareness tool; one reason for this is probably the need for more information than the title alone, particularly in foreign-language journals. In some cases the scanning of primary journals was divided between the members of a group and the information obtained was discussed at regular literature seminars. Collaboration between supervisors and colleagues for retrieval of information varied considerably (see Chapter 3 in Part II).

For retrospective searching, Chemical Abstracts was used by almost all the students. The use of other abstract publications was uncommon and largely restricted to chemists with fringe interests; thus pharmacists and biochemists used Biological Abstracts. Other abstract journals used included Physics Abstracts, Nuclear Science Abstracts and Analytical Abstracts.

Chemical Abstracts was only once said to be unavailable; in about 25% of cases it was available in the university library and in the remaining cases it was available within departmental libraries. Generally, departmental libraries were

well stocked and library facilities (department plus university) were good. However, it appeared that the libraries were not always used efficiently; this may have been due to the students' lack of training in the use of the literature.

Effect of the Service on Information Habits

A more comprehensive survey was carried out on the changes in students' habits after the service had been in operation for about 8-9 months. As a result of their involvement in the project, the time spent in scanning conventional current awareness publications decreased for half the students, and remained the same (frequently no usage) for the others. On the other hand, more people had used a secondary publication for current awareness purposes than before the project - perhaps out of curiosity. CT itself had been used (admittedly on a very irregular basis) by more people than were familiar with it at the start of the project. Less time was spent in scanning both abstract journals and primary journals. Slightly more than half of the students spent the same amount of time reading original papers as before, but the others spent more time doing so; however, this may be a normal result when students are busy writing a thesis. There was no significant change in the number of primary journals seen. Half the students considered that the scheme had saved them time compared with conventional secondary sources - on average about one or two hours a fortnight.

Role of the Liaison Scientist

One object of the experiment was to assess the role of specially trained liaison scientists in the implementation of the project. Their main task would be to administer the scheme in a given area, to help students formulate their research profiles, and to provide liaison between the students, the Chemical Society Research Unit, and the Office for Scientific and Technical Information. These liaison scientists would ideally have the following characteristics:

1. Technical ability to formulate profiles.
2. Broad knowledge of chemical information sources and the ability to communicate it.
3. Acceptability to participants, including the ability to understand the problems found in research, to talk the same "language" as the student, and to be respected by him on a professional level.
4. Acceptability to the chemistry departments.
5. Willingness to accept a temporary appointment.

It was thought that for the purposes of the present exercise, postdoctoral chemists would be very suitable for the posts - after training in points 1 and 2.

An interest in information work among such a group would also be of value in the future development of the subject. It was recognised, however, that such people might not wish to lose contact entirely with basic research, and so a division of time consisting of two-thirds information work and one-third research was planned. The following six people were appointed, all of whom either had Ph.D.s or submitted theses during the year. With one exception, P.Leggate, they remained in the institutions in which they were originally conducting research. At Edinburgh, however, it proved difficult to start up a new research project at the same time as the information project. All the liaison scientists found the work enjoyable and stimulating.

Liaison Scientists

Name	Location	Research Experience
A. Callaghan	University College, London	6 years: magnetic properties of inorganic compounds
T. H. Cannon	Physical Chemistry Laboratory, Oxford	3 years: nuclear electron double resonance
E. J. Herbert	University of Warwick, Coventry	6 years: natural products
C. M. Lee	Chelsea College of Science and Technology, London	9 years: pharmaceutical chemistry, determination of drug structures
P. Leggate	University of Edinburgh	11 years: natural products, organic photo-scintillators
M. Poustie	University of York	3 years: kinetics and mechanisms of organic oxidation reactions

The "liaison scientist" type of appointment was necessarily an experiment in itself and there have been discussions about its merits. Two points in particular have been involved - first whether high research qualifications are necessary for the work of a liaison scientist, and second whether the 2:1 ratio of information work to research is workable. There is no simple answer, but among the liaison scientists themselves the consensus was as follows:

1. It was felt that a level of research experience higher than that of the student was very valuable in gaining the confidence of participants and the co-operation of heads of department, but that it may not be necessary for the technical task of profile construction. The skills needed for this task were more those of the inquisitor - the ability to ask the right questions and identify the important answers. The research knowledge necessary to construct the profile was within the student himself - the purpose of the liaison scientist was to extract it from him.

2. It was felt that although it was possible to do chemical research while spending most time on information work, the division tended to be inefficient. This neutralised to some extent the advantage to the individual of exploring a new field while retaining a productive interest in the old. The alternative of spending research time on information research was practised by two liaison scientists to whom the complete break with chemical research was acceptable, and this was found to be a satisfactory answer. Certainly a research function of one type or the other would seem to be essential if Ph.D. chemists are to be recruited into information work. It must be borne in mind, however, that full-time, but temporary, information appointments are likely to reduce the number of potential recruits. Full-time appointments presuppose a rather decisive commitment, and temporary posts will not be attractive without clearly defined opportunities beyond them.

Relationship of the Project to other Information Services

One question which was raised at the beginning of the year was what impact, if any, the project would have on library services. For instance, would there be a sharp increase in inter-library loans due to the increased number of references notified in less common journals? In fact, it proved very difficult to isolate data pertinent to the project from the overall university or departmental library statistics, and so on the whole it was necessary to rely on the impressions of the liaison scientists and on data from the students themselves.

Over one quarter of the students found that they were frequently notified of interesting references which were not immediately available in their library, mainly because the required journal had not arrived. In the case of some American journals the delay was a serious one: for example, the Journal of Chemical Physics was not available in some university libraries until three months after the computer print-out. Delays of one or two weeks were very common, and some students considered this to be one of the most frustrating aspects of the scheme. Neither this delay, nor pursuit of references in uncommon journals, seemed to cause a particularly large increase in inter-library loans. Students would only request loans if they were quite sure the reference they wanted was valuable. If there was any uncertainty (as there often is with title-only references) they would prefer to wait until an abstract appeared, even though this might take many months. Contacts between library staff and students could be improved; only 15% of participants had asked the assistance of library staff during the year, apart from initiating a loan request. The liaison scientists were able to discuss the scheme with senior librarians in the majority of institutions visited and found them, in general, to be interested in the scheme.

In using liaison scientists to administer the project, it was felt that they would have an opportunity to stimulate (and then partially satisfy) a student's interest in all sources of chemical information. This proved to be the case to a greater extent than was initially realised. Many students were unaware of important traditional information sources, even though they were in their final research year. Relatively new services were even less known. At one institution which took the Science Citation Index a member of the library staff expressed the opinion that it could not be very valuable because no-one used it. It turned out that none of the participants in the project even knew of its existence. No one had responsibility for telling them, and they had not come across it themselves. It is very likely that the informal educational aspect of a liaison scientist's work could be profitably extended in the future.

One particular problem that appears intractable at the moment is the translation of foreign papers. Two-thirds of the participants had been notified of interesting titles in languages they could not read. The only general way of tackling this problem now is to wait until the abstract is published in Chemical Abstracts and hope to glean the required information from that source. Expert translation is costly and takes time; however at least one university library has attempted to overcome this problem by compiling a list of members of staff who are prepared to translate specific languages for internal readers.

Benefits of the Scheme

The scheme has demonstrated its practical value in an academic environment in that many students consider that they have obtained a quicker and more comprehensive coverage of journals than previously. There are also more aware of conventional and computer-based services and of the necessity to exploit them properly.

The final questionnaire (section E) provided evidence that some 160 important references retrieved by the CT/CBAC service might have been otherwise missed. In addition, most students claimed that the service missed few references of importance though this assessment obviously depends upon the students' own ability to find such references. The effect of the service on the research output of students has not been measurable, but nevertheless there have been a number of occasions when a rapid alert to a particularly important paper has resulted in a change of direction of research long before the paper would normally have been discovered. Savings of this type among industrial scientific communities could prove to be extremely valuable although they are difficult to identify and assess financially. Nevertheless, direct time saved, disregarding any indirect savings, e.g. by better flow of information leading to changed direction of research, was quite considerable. If the students had been working in an industrial organisation where time saved could be

utilised for further productive work, the saving of 1-2 hours a fortnight (section C, final questionnaire) for 500 postdoctoral staff at, say, £2 an hour including overheads, (cf. Chemistry in Britain, 1968, 4, 529) would amount to £25,000 - £50,000 a year. Such financial benefits would, however, be illusory unless the time so saved were used productively.

The general field of information science has also benefited in that four liaison scientists have taken up full-time information posts. In addition, three students who took part in the scheme have now themselves become liaison scientists.

Recommendations for Future Experiments

The benefits discussed in the previous section have led to consideration of the extension of the scheme. It is considered that the scope of any future projects should be extended to permit a full exploration of the liaison scientist's role in information work and to permit definition of his useful functions. Both objectives and methods should be designed to exploit the special qualifications of the liaison scientist (subject knowledge and research experience) and the opportunities afforded by individual interviews with research workers. The following recommendations are made on the administration and organisation of such projects:

(1) Range of Service and Users

As many as possible of the computer-based and other new information services in the physical and biological sciences should be included in the experiment. The research workers using the services should be selected from a much wider scientific spectrum. One result of this expansion would be that the liaison scientists would often be dealing with information requirements in subject areas of which they have no specialist knowledge. Some indication might therefore be obtained of the extent to which subject knowledge is a valid criterion of the liaison scientist's effectiveness. In addition, an assessment could be made of the feasibility of the full-time liaison scientist dealing with a wide variety of computer-based services - as an alternative to the use of personnel specialising in a single service for a more widely dispersed population.

(2) Education

Modified procedures for making computer-based services available to academic populations should be investigated with a view to increasing the

effectiveness of user education, and also making more efficient use both of the liaison scientist's time and of the service. Further specific recommendations are made below (5-8).

The computer-based services should not, however, be considered in isolation from other information services. The more general educational objective is the creation of a greater awareness by research scientists of the scientific literature and the information sources which provide entry to that literature. This more general objective can only be achieved in collaboration with university librarians.

(3) Evaluation

The data collected on service performance gave a indication of the users' assessment of the service but not a rigorous evaluation. The opportunity for personal contact with a large number of academic research workers could be used as the basis for a more thorough evaluation of the comparative performance of both computer-based and conventional current awareness services.

(4) Research

The combination of a liaison function with chemical research should be abandoned. However, if possible, the research training of the liaison scientist should be put to use within the information field. Possible areas in which 'research' could be instigated are:-

(i) The production of aids to profile construction. For example, the development, in collaboration of the CS Nottingham Unit, of an adequate thesaurus for Chemical Titles or Chemical-Biological Activities, based on the vocabulary of existing profiles.

(ii) The development of experimental composite services in special subject areas by the synthesis of both computer-based and conventional current awareness tools. These services would normally be designed to serve the interests of a number of research groups located in different universities and would, therefore, represent a move away from the 'personal' profile.

(5) Procedure for User Education

(i) The present procedure, in which a seminar is followed almost immediately by an interview, has resulted in most of the profile construction being undertaken by the liaison scientist, often after the interview.

Users must be encouraged to take a greater part in the construction and monitoring of their profiles. There should be an interval of at least four days between the initial seminar and the interviews to allow ample time for users to define information requirements and outline a profile.

(ii) Written aids for users - Training in the use of services by the lecture/interview technique should be backed up by printed 'instruction sheets'.

(a) A list of the available services giving details of coverage, type of data base, etc.
(b) Instructions on the procedure for profile amendment.
(c) Instructions on 'feedback', including definitions of 'relevant', 'missed' and 'important' references.

(iii) Information seminars - It will only be possible to provide a minority of academic research workers with an experimental computer-based service. Seminars or lecture courses, organised at the university level, would enable a much wider population to be given some insight into the nature and possibilities of such services. Preferably such seminars should be organised in collaboration with university librarians; the liaison scientist could deal with mechanised services, and the librarian with other services. However, careful planning of such seminars is essential; they should not be treated as 'informal' lectures.

(6) Group Profiles

There should be a greater, though not exclusive, emphasis on services designed to serve a research group, rather than an individual student. The 'group profile' should be a more economical method of using the computer-based service. In the short term, the increased use of group profiles would enable a larger number of research workers to gain experience in the use of the services. In the long term, they may prove to be the only economically viable method of providing computer-based services. Furthermore, the group profile may be preferred in cases where research workers with closely related interests collaborate, whether formally or informally, in scanning the current literature.

(7) Use of Local Personnel

(i) If possible, a member of staff or a research student in each department should be enlisted to help in administration, i.e. organisation of lectures and interviews, distribution of literature. Alternatively, where

participation can be organised at the university level, rather than departmental level, assistance could be sought from a member of the library staff.

(ii) The use of 'local liaison scientists' should be explored in a limited number of universities. A member of the department staff (postdoctoral fellow, or student) or of the university library could fulfil the role of liaison scientist within one or more departments in their own university. The full-time liaison scientist would act in a consultative or advisory capacity if necessary. This should provide information regarding the relative merits of the part-time, home-based and full-time, itinerant liaison scientist.

(8) Supporting Staff

Adequate supporting staff are required to deal with administration and the collection of statistical data. The collection of feedback should be the responsibility of the secretarial staff and not the liaison scientists. The possibility should be considered of using graduate assistants (possibly part-time) to assist in the technical aspects of profile construction.

Conclusion

In conclusion, further experiments should be undertaken, using full-time liaison scientists whose functions would be more diversified than in the present project. Such experiments should determine whether or not the full-time scientist has a special contribution to make as an interface between the computer-based service and the research worker who wishes to use these services.