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The Scientist, Scientific Information and the Library

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One of the manifestations of the rapid growth of science in recent years, has been the vast proliferation of scientific publications. Science and its communication are so intertwined, that scientific research and the dissemination of the results of research go hand in hand. The communication of science is a two-way process. On the one hand, the scientist must make the results of his research known to the scientific community as rapidly as possible, and on the other hand, he must be kept aware of the latest developments in his field of study in the quickest possible time. This two-way communication of information is essential to avoid duplication of work and unnecessary waste of time and money.

It is evident that communication of information in one form or another usually takes up a significant part of the working life of a scientist. The increasing output of scientific literature in all its ramifications is posing problems to the scientist, both to keep himself informed of ongoing research and to find information about a selected topic. It is relevant to note that the results of investigations conducted by S.C. Bradford show that the scatter of scientific literature involves searching papers on a specialized subject in three groups of journals. The first group consisted of a small number of journals containing a large number of relevant papers, the second consisted of an intermediate number of moderately productive journals, and the third group contained very many journals that only contributed a few relevant papers each. In quantitative terms, the ratios of the cumulative number of journals for these three groups were as $1 : m : m^2$ (where the data suggested a value for m of about 5).

The traditional tools of communication have been greatly improved and new techniques have been devised to meet the challenge of this literature explosion. These new tools and new methods, which are basic ingredients in the information services of the developed countries have been kept out of the average library in the developing countries due to their high cost, with the result that, not only are the scientists in the developing countries not making use of the new services, but are also unaware of their existence and capabilities.

How do scientists acquire scientific information in Sri Lanka? User surveys have been conducted in many parts of the world and the results have been subjected to intensive analysis, but no such studies have been made in this country. It is therefore better to frame the question in a different way. How should a scientist keep abreast of recent developments and conduct a literature search? Are the available information services in Sri Lanka meeting the users' needs adequately?

Information is used by scientists for two main purposes, firstly, to keep in touch with recent advances, i.e. for current awareness, and secondly to find out about a certain topic selected either for purposes of research or teaching, referred to as a retrospective search. The information is obtained from two sources, namely, formal channels, which are the written sources such as journals, textbooks, abstracting and indexing services, etc., and the informal channels, through personal contact.

The principal formal source of information is the periodical, and most scientists spend some time reading or scanning journals to keep abreast of new developments. The number of periodicals consulted and the time spent on reading them vary considerably from individual to individual. Surveys conducted show that the average number of journals consulted per week ranged from 5 to 15 according to the particular group investigated. The availability of journals will be a determining factor in the number of periodicals consulted by scientists. While periodicals are freely accessible in libraries in the developed countries, the number of titles available in developing countries is greatly restricted by the limited funds.

However, even in the developed countries, where most of the journals are available, the scientists do not find the time to scan all the journals in his own speciality and the peripheral journals where papers relating to his interests may be found. The conventional way out of this dilemma is to resort to consulting abstracting and indexing publications. The vast number of papers that are appearing is making these services larger and the literature included in them selective. Further, the prohibitive costs of these services make it possible for only a few libraries in Sri Lanka to subscribe to them. Due to the limited number of copies of the major abstracting and indexing journals available in Sri Lanka, it is doubtful if they are serving as tools of current awareness. Nevertheless, they are important tools for retrospective searches, which, if not as widely used by the scientists as they should be, are referred to by librarians and information officers to assist the scientists.

Indexes vary in their arrangement. They range from publications such as **Current Contents** which lists the title pages of selected journals, and others such as **Index Medicus, Zoological Record** and **Agrindex,** where articles are indexed under subject headings. The **Science Citation Index,** which is probably the most widely used index to scientific literature in the world, uses a relatively new method of organizing the contents of a collection of documents in a way that overcomes many of the shortcomings of the more traditional methods. It enables a literature search to

come 'forward in time' from a given starting point, which is achieved by indexing the citations to earlier work contained in the articles covered. To use these indexes effectively, the scientists should be familiar with them and well versed in the correct techniques of consulting the works.

Abstracting journals serve a more useful purpose than indexes. While the scientist will need to consult the original paper of a citation obtained from an index, he is presented with a synopsis of every item in an abstracting journal, and will need to obtain the original articles only of those that are found important for his work. Although, at first sight the intended use of an abstract journal seems to be to act as a guide to the original literature, many scientists also use abstracts as a substitute for the original literature. Due to the increasing output of literature, the major abstracting and indexing services have to be selective and this creates a drawback in these services to the scientists in the developing countries, as the percentage coverage of literature published in the developing countries included in the major abstracting and indexing services is very low. A recent study made by the World Health Organization on the use of health literature published in the countries of South-East Asia region, revealed that only 10 per cent of the literature published on bio-medical sciences was covered in the **Index Medicus,** and only 35 per cent of the literature when **Biological Abstracts** and **Abstracts of Hygiene** are included. The major abstracting journals are becoming very large and difficult to handle, and the cost is keeping them out of most libraries, though for an effective information service, they are indispensible. **Chemical Abstracts,** the world's largest abstracting service, and **Biological Abstracts** are accessible to the scientists in Sri Lanka, but **Excerpta Medica,** the premier abstracting services in medicine, and the **International Abstracts of Biology** are two examples of abstracting journals not available in Sri Lanka.

The increasing size of indexing and abstracting journals are making manual searches rather difficult. Further, in order to economise on the size of the publications, articles are being indexed only under the more important subject headings. Since the mid — sixties, these services have been computerized, which is affording better and speedier utilization of the databases. While the production of the abstracting and indexing journals continue to be one of the major products of these databases, they are now being used more and more for current awareness services and retrospective searches. Most of the computerized services simply mechanise the procedure of searching abstracting and indexing journals in the case of retrospective searches, or of current journals in the case of current awareness services. Many of the major services not only provide standard current awareness services, but also provide individually tailored alerting services.

For instance, BIOSIS (Bio-Sciences Information Science) which produces **Biological Abstracts** and **Bioresearch Index** provide a Standard Profile Service which is a current awareness service operating on set profiles in subjects of general interest giving 12 monthly computer printouts of references, costing $50 per profile a year, and also a Current Literature Alerting Service (CLAS) which is an individually tailored current awareness service giving 26 fortnightly batches of references on 5 x 8 in cards at $120 per profile per year. Similarly, MEDLARS (Medical Literature Analysis and Retrieval System) is the computer data base of **Index Medicus,** SCISEARCH operates as the **Science Citation Index** source tapes, and **Chemical Abstracts** database provide the United Kingdom Chemical Information Service (UKCIS). Most of the databases are now ON-LINE, providing immediate search capabilities. Probably the only database that has been utilized by scientists in Sri Lanka is MEDLARS, through the courtesy of the WHO who provide a free service to developing countries. It must be emphasized that these computerized information services could be utilized by anyone anywhere in the world. Unfortunately the costs are prohibitive to scientists in developing countries, but nevertheless, in some instances, the utilization of computerized information services may be justifiable.

A widely adopted method of doing a literature search by scientists is by following up citations in relevant papers. The papers cited will have more relevant citations, which will ultimately give access to most of the literature on the subject. The citations are particularly useful as indexes and abstracts are not comprehensive in coverage due to their selective policy.

The sources considered above are those that lead to the primary literature. The secondary literature, or the literature in digested form such as review articles and textbooks, also form an important source for acquiring information. The digested material, being about 2 to 3 years later than the appearance of the primary literature in the form of articles in journals, is more useful to the scientist as background introductory information on a research topic, rather than for recent developments. Reviews and textbooks are particularly important to the teacher who must convey to the student, in a concise form, the subject treated.

Information through personal contact is an important vehicle of communication. Private correspondence, the oldest form of scientific communication, is still widely used, but is not as important as other forms of information transfer. Most surveys indicate that discussions with colleagues rank with journal articles as the major source of research information. Informal group meetings where research topics are discussed, is a widely practised method of information transfer. The formal meetings, seminars, conferences, etc., also assist in the process of scientific communication

to a great extent. Most surveys show that conferences represent a highly efficient means of transferring information within a limited span of time.

Although great strides have been made in **informatics** during the last two decades, and the library has offered a much improved service to scientists in the transfer of information, the scientists have not taken full advantage of recent developments in information services. As a group, scientists tend neither to use all the bibliographical aids available nor to consult with professional librarians about their information needs.... Following on from this first phobia comes yet another — the general dislike scientists have of expending any great effort on the acquisition of information from the literature. One of the firmest conclusions of information usage surveys seems to be, indeed, that the intrinsic value of an information channel has little or no bearing on the frequency with which it is used. The important factor is always its accessibility.

This indifference of the scientist in regard to his informational needs can be remedied to a large extent, if he is made aware of the existing information services and their potential use. The scientist in Sri Lanka, and in most developing countries, has yet not begun to appreciate the assistance that could be obtained from the library, as, until recently there were only a few qualified persons in information work. With the development of programmes for the education for librarianship and the recognition of the importance of libraries in Sri Lanka, there is a positive move towards the provision of better information services for scientists.

The lack of a wide range of scientific literature has been due to the low financial allocations, non-availability for sufficient foreign exchange, absence of organised inter-library cooperation and the lack of suitable means of the duplication of scientific literature. Steps are now being taken by the Working Committee on Scientific and Technical Information, and the Sri Lanka Scientific and Technical Information Centre of the National Science Council to remedy those shortcomings. It is envisaged that in the not too distant future, there will be a coordinated library service with a more rational utilization of available funds for the acquisition of scientific literature, and an improvement in the back-up services, such as the provision of photocopies, inter-library loans, bibliographical services, etc., which will meet more adequately the users' needs.

While it is essential for there to be an informed library staff to deal with the dissemination of scientific information, it is equally important for the scientists to be aware of the availability and capabilities of the information services. The cooperation of the scientists with the library staff is necessary for the best utilization of the information resources.

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WORKSHOP ON EXPERIMENTAL DATA HANDLING

A 15 - day 'Workshop on Experimental Data Handling', co-sponsored by Bhabha Atomic Research Centre, Indian National Science Academy, Department of Science and Technology, Government of India, Indian Statistical Institute and Indian National Seientific Documentation Centre (INSDOC) will be convened at the Bhabha Atomic Research Centre, Bombay, from 1 - 15 November 1978.

This Workshop is to be attended by 30 participants which will include 10 from India and 20 from other Asian Countries. The topics to be covered include : Scientific, technical, tcchno - economic, and social data : their characteristics and differences; Problems of accessibility and dissemination of data for science and technology; Planning and design of experiments; Basic statistical concepts and techniques; Data sampling, quantification, collection and analysis; Systematic and random errors; Errors in data handling; Critical evaluation of data; Presentation of numerical and non-numerical data; Guidelines for reporting data. Organization for data collection, reporting, dissemination; Recent trends and international programmes in data field - UNESCO, CODATA (Committee on Data for Science and Technology); and other related subjects.

For further information, if desired, please write to the Head, Library and Information Services, Bhabha Atomic Research Centre, Department of Atomic Energy, Government of India, Central Complex, Trombay, Bombay 85.