the evolution of information systems

Man must dream to achieve progress. That this applies to the complex task of making scientific information easily and rapidly available to scientists was the clear message of ıpporteurs summing up an Agency symposium held in Vienna during February on the handling of nuclear information. It was attended by more than 150 specialists in the work.

More than 100 000 new reports and articles relevant to the workof the nuclear scientist are published annually, and information is flowing from journals, scientific meetings and publications at an ever-increasing rate. The symposium, held in the Hofburg Congress Centre, Vienna, was organized with this in mind. Experts from more than 30 countries and from seven international organizations heard papers presented and took part in discussions on them; the papers described information centres, manual and mechanized information services, the use of computers to help the information specialist, the organization and co-ordination of scientific conferences, and so on. At the end, three rapporteurs summed up their impressions.

Each looked to the future: G.P.L. Williams, of Canada, spoke on the future of information services; Y.N. Sorokhin, of the USSR, on primary and secondary publications; and R.K. Wakerling, of the United States, on indexing methods.

INIS Expectancy

Mr. Williams reminded participants that they were meeting on the eve of the inauguration of the International Nuclear Information System (INIS), to be run by the Agency in collaboration with and on behalf of Member States. A detailed summary of its aims and method of operation had been presented by the Director of Scientific and Technical Information, John Woolston. "Everybody is, I think, waiting expectantly to see what happens during the next few months", Mr. Williams commented.

Developmens in many information services would be tied in with INIS. "I don't think anybody has suggested anything much more than five years ahead", Mr. Williams went on. "But besides planning schemes - and we must have planners - we must also have dreamers."

"I would like to have heards more dreams of what the perfect information system might become in say 25 years' time. I can remember information conferences about 25 years ago when people were dreaming what marvellous things could be done with computers or some kind of mechanical equipment. Those dreams are just now being put into effect. I would like to have heard some dreams of today, that will be put into effect after I have retired.

Mechanizing Human Judgment

"With this current emphasis on mechanization, what would be the improvements that we might see in that direction? The most obvious one that I can see will be the introduction into mechanized schemes of the sort of judgment that a human can apply when supplying a service. Perhaps in the future instead of selective dissemination of information (SDI) schemes we will have personalized dissemination of information (PDI). The profiles for the user will have to include not only special fields of interest but such things as how quickly the inquirer needs the information, what are his time limits and what languages he can read. It is no use giving a number of references to papers in Czech, German and Russian to a man who can read only English and needs the information today. There is no time for translation.

"The profiles could include other conditions, too, possibly the level of understanding required by the user, and in addition to the development of profiles the data file itself could be augmented and the records show not only the reference to a piece of information but where that information can be obtained, in a form that makes it clear how long it will take. Very often one runs a programme for an inquirer and gives him a list of 50 references, then when he goes to look for them you have only 25 in the library and, of the other 25, ten of them are the ones he wants to read and it takes three months to get them. I think a computerized system that would first of all tell people what they can have within the time limits would be quite an improvement."

Solving Problems of our Time

The second rapporteur was Y.N. Sorokhin, of the Viniti Institute, Moscow, who termed INIS "an excellent example of how through the wide use of scientific and technical means it is possible, step by step, to solve the greatest problems of our time - not only scientific but also social problems, the problem of the information explosion, the growth of the flow of information and how to regulate it."

Papers presented at the symposium had illustrated clearly how contemporary technology was making it possible to issue information quickly, reducing publication delays and costs. But computer techniques could not do everything, and in the immediate future at least the primary publication would remain an important instrument for distributing the results of scientific work. And, regardless of the successes of the computer in the next few years, secondary publications such as journals of abstracts would still have great importance.

"At the same time, we cannot close our eyes to the fact that a scientific and technical revolution, whose witnesses we all are, also is beginning to encroach on the field of scientific and technological information", he said. "Old traditional systems of information are becoming obsolete. We may regret to give up old forms such as the primary publication, but even if we feel very sorry to say goodbye to books and other forms of information transmittal, life will go on, and new types of information transmittal, both of primary and secondary publications, will be used. It is life itself that brings forth new systems."

Worthless things usually did not last long, commented the speaker. "Whether we want it or not, new forms of information techniques will come up, and we must take them into account. We must not be afraid of them, and we must not be terrified of the information explosion. In practice there is no such explosion. We should certainly not be scared by that."

Some very interesting papers had described the techniques of preparing pre-prints. A new title for this type of publication might be devised in time. Also, in primary journals attempts were being made to introduce new forms of publication of articles. "The scientific article itself changes form and appearance. We have depositing of articles, which has been discussed at length. All these various forms and types of publication are designed to achieve the same object, to give our reader the news about new inventions and discoveries as fast as possible.

"What is our main task? In my opinion we must generalize all these phenomena and study them in depth and set up definitive recommendations to scientists and institutes, to the whole community, so that these recommendations can lead to a definite result. We should have international standards that will clearly define the meaning and the form and contents and appearance of each new means of information transmittal."

Expanding International Co-operation

A number of papers had mentioned the need for a more thorough study of world scientific literature. "This could be a very important task, and new possibilities that we have as a result of computers make it possible to expand international co-operation in this field. We have seen that the majority of countries participate in increasing measure in the development of science at the world level. Our joint task is to contribute to the development of the developing countries, and to help them so that their achievements will also enter into the general flow of information."

A case in point was the state of scientific development in Japan. Sorokhin reckoned that only 10 to 15 per cent of the corpus of Japanese scientific literature became known to readers in other countries. "I think we should all try to help, so that the potential of all countries in the world be better used, he said. "As Russian is a very difficult language for people who do not have it as a mother tongue, in our country we try to familiarize everybody in the world with our work by one very simple way: a number of abstracting journals and bibliographies we are now publishing are written not only in Russian but also in English. We have had a lot of letters from abroad in which scientists thanked us for this not unimportant measure. Because of this new introduction. Soviet work has now become very quickly known to many countries. I think that Japanese scientists should also think about this question - we are ready to help them - and will create the conditions that will make it possible to enable the potential of Japan to be better used in the development of science in the whole world."

The Future of Indexing

R.K. Wakerling, of the Lawrence Radiation Laboratory, California, also speculated about the shape of things to come, in the realm of indexing methods. During the last few years, he recalled, the use of computers has had a marked impact on this work, and in some rapidly moving fields of science - especially nuclear science - code-word or co-ordinated indexing had emerged as a powerful and convenient tool.

"Using this system Euratom has had remarkable success in developing machine retrieval in nuclear science", he said. "Some of these developments we have heard about in more detail during the last week, and I am sure that INIS will profit greatly from this work. However, I do not think any of us believe that we have yet achieved the ultimate in indexing.

"We might ask, is human indexing only a phase that will be replaced sooner or later by machine indexing ? I am inclined to think so, for large general purpose systems. I believe that much work needs to be

Dr. Henry Seligman, Deputy Director General for Research and Isotopes from 1958-1969 and for the last year special scientific consultant to the Director General, has left the Agency as a full-time staff member. He was largely responsible for creating a research system which included a laboratory unique within the United Nations system, research contracts with national centres, collaboration with the Food and Agriculture Organization, a Laboratory for Marine Radioactivity in Monaco and the International Centre for Theoretical Physics at Trieste, as well as stimulating many scientific meetings. He has for 11 years been secretary to the Scientific Advisory Committee.

done before it becomes practical; however, I believe it is something which is going to happen in time.

"I believe that machine indexing will in turn perhaps be replaced by complete text analysis, on line. Technology is currently available. I have seen demonstrations of retrieval of complete documents, but the cost is apparently very high. However, with the remarkable developments in computer technology, equipment which we now regard as powerful will become obsolete, will be replaced in time by something larger, faster and cheaper.

Computer Aids

"We could do more to provide aids for indexers, to improve speed, accuracy and consistency. We might use computer aids to indexing, for instance by on-line displays of term relationships. At the same time, the indexer might have on-line display of the indexing of similar items in the file, which would aid him to maintain consistency from document to document. We might go a little further along this same line and visualize the next step as being some kind of automatic indexing, presented on-line to the indexer for the human indexer to make the final choice. These are, I think, intermediate steps to complete automatic indexing."

"Then we might consider variations and improvements in even the current system. People have talked about using a weighting of index terms as assigned by the indexer. As far as the machine is concerned, all code-words have an equal importance, but we know that this is not the case. Then we might use such devices as citation indexing. Some people have been experimenting with this.

"There might be other devices for establishing a link between documents citations, or common references, to aid the researcher in tracing his way from one set of pertinent documents to another.

"Since I have had a good deal of experience in trying to provide an information service at a large research centre, I am conscious of the user's need to have direct access to the retrieval system. That means aids must be provided to allow the user to find his way along the paths traced by the indexer... I would like to see a system which the user can approach directly at least for fairly simple kinds of responses. To do this you are going to have to provide him with aids perhaps similar to those given to the indexer, so that he knows how the indexer put his information into the system. This would be easier with on-line systems, where you can build into the computer a training or directional programme which would allow the user to go along the steps to formulating his question and putting it to the system."

During the symposium 57 papers were presented from 14 countries and two international organisations. Summing up on behalf of the IAEA, John Woolston commented: "Many of us (while the symposium was being organized) wondered whether we were doing the right thing. I believe that the attendance at this meeting, the quality of the papers and the clarity of the discussion that followed them have proved that it was a worthwhile thing to do once; and I am encouraged by the remarks that have been made to think that perhaps this is something that, some day, the Agency should do again."

forthcoming conferences

Date	Subject	Place
8-12 June	FAO/IAEA Symposium on Plant Protein Resources: Their Improvement through the Application of Nuclear Techniques	Vienna
6-10 July	Symposium on Progress in Safeguards Techniques	Karlsruhe, Germany, Fed. Rep. of
10-14 August	Symposium on Environmental Aspects of Nuclear Power Stations	New York USA
17-21 August	Symposium on Recovery of Uranium from its Ores and Other Sources	Sao Paulo, Brazil
31 August - 4 September	Symposium on Dynamic Studies with Radioisotopes in Clinical Medicine and Research	Rotterdam, Netherlands
7-11 September	ENEA/IAEA Symposium on Developments in the Management of Low and Intermediate-level Radioactive Wastes	Aix-en-Provence, France
14-18 September	FAO/IAEA Symposium on the Sterility Principle for Insect Control or Eradication	Athens, Greece
22-?29 September	IAEA General Conference	Vienna