

GENERAL SCIENCE

Need Information Center

The concept of bringing together all the knowledge of the world is very old, but the creation of a "world brain" is still unfulfilled in this modern scientific world.

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Testimony before the Ad Hoc Subcommittee of the House Committee on Education and Labor, July 18.

► THE WORLD has urgent and continuing need for the marshalling, arranging, filing and retrieval of scientific and technologic facts upon demand. It is a sad anachronism that this is not possible now. In this modern, scientific and intelligent world the limited number of creative scientists, who are remaking the future by their novel ideas, should have promptly at the tips of their brain fibers the accumulated record of past knowledge.

The proposals for a National Research Data Processing and Information Retrieval Center (H.R. 1946 introduced by Rep. Roman C. Pucinski [D-Ill.]) give an opportunity to look at this situation.

The conception of bringing together all the knowledge of the world so that it can be found and utilized is very old. It goes back to the famous libraries in Alexandria, Bacon's *Novum Organum* and the *Encyclopedias*. More recently there were such ambitious and unrealized projects as the Royal Society's *Index of Scientific Literature* and *Concilium Bibliographicum*.

Modern Abstracts

Today we have the specialized and limited, but extremely useful, modern abstracting efforts such as *Chemical Abstracts*, *Biological Abstracts*, *Engineering Index*, *Index Medicus*, etc.

The great libraries of the nations including in America the Library of Congress, the National Medical Library, the National Agricultural Library and the great depositories at Harvard, Yale, and other such centers in a very real sense are partial attempts to collect, order and make available the world's knowledge.

Conventional books on shelves and card indexes (essentially a great American invention) are and will continue to be prime data tools. There are now available microfilm, facsimile copying and the complex and evolving mechanisms for filing and retrieval based upon the electronic computer and similar mechanisms.

Intellectual Hardware

We have the hardware and the mechanisms to bring together the information of the world for scientific, technologic and administrative use. The problem is to make what we have available and to fill in the uncovered areas, and concurrently to make this material available promptly to scientists

and technologists, engineers, students, administrators. Do not forget the general public and anyone who wishes to know. For the broadcasting of information through newspapers, magazines, radio-TV and even gossip is amazingly effective.

It may not be realistic and the best procedure to attempt to do the whole task of world information, even in the field of science, in any one place. So many of the parts of the operation already exist somewhere with considerable completeness.

Speed and versatility of computers and their ramifications, various systems of classification, the many forms of recording information and making the output available, can be blended into what will amount to one large system from the standpoint of utilization.

Common Goal

Care must be exercised to discover what already exists in the way of information gathering and processing, how it can be fitted into an overall plan. There should be used the dreams, encouragement and enthusiasm of many thousands of dedicated individuals and institutions all over the world for the accomplishment of the common goal, for the creation of what H. G. Wells in 1937 called engagingly a "world brain." This must be the concern of all peoples, governments and organizations throughout the world.

We need to enlist the efforts of our friends and foes alike. The information activities of Moscow and Peking must eventually be made a part of the world plan, and the sooner the better. If there can be utilized non-American brains, resources and manpower to do part of the great operation, this will be overall gain. If we can persuade the Russians not to poison the atmosphere, it should be even simpler to convince them that cooperation in enriching the human information sources on a world basis would be possible.

The first approach to the objective of the proposals upon which this hearing is being held would seem to be a hard look at what is and is not being done, unencumbered by preconceived ideas as to how the overall and essential objective is to be achieved.

To aid this objective, I suggest possibilities, as I have on numerous occasions since the 1930's when *SCIENCE SERVICE* took the conceptual and operational initiative in what is now called documentation. It would seem that some of the possibilities would be obvious and easily accomplished without a large financial expenditure.

My impatience causes me to wonder why it takes so long to materialize four ideas which had their promising beginnings three

decades ago. These are: 1. What I have called "one big library." This does not contemplate moving a single book or consolidation as the term might imply. 2. An unpatentable invention (of which I am very proud) that is called auxiliary or demand publication, which can solve the publication jam and save millions. 3. The idea of "one big journal," a conception that I wish to develop further a little later. 4. The "world brain" which in a sense is the objective of these hearings.

Ultimate Consumer

Because the public is the ultimate user of all the scientific information and knowledge of the world, it is essential that there be interpretation, reporting, and popularization of the old and the new scientific discoveries and applications.

Another field in which immediate and low cost accomplishments can be made is that of language. There has been created, out of a regularizing and simplifying of existing languages, a world language, called *Interlingua*, which has been demonstrated as practical as a bridge or auxiliary language.

It could save millions of dollars in translation costs and immediate accessibility of foreign science information, if we can persuade scientists writing in other languages to append, as we are doing, summaries in *Interlingua* to their original articles. Summaries in *Interlingua* allow the specialist direct access to the literature without intervention of translators. This has been demonstrated in over a score of medical journals and many international congresses.

"One Big Library"

The concept of "one big library" has not been fulfilled widely and adequately. It is still not possible for the scientist or scholar to order in facsimile microfilm from the nearest library the literature he desires with assurance of receiving it promptly and at reasonable price.

It was perhaps actually easier than now to do this just before World War II when the American Documentation Institute was operating copying cameras in four major Washington libraries and exchanging orders with other libraries. The "one big library" concept does not involve any physical consolidation or change in libraries or the creation of new libraries.

Is cooperation between librarians and organizations so difficult that "one big library" cannot be accomplished? A little organization, cheerful argument, and gentle pressure from users and financial supporters like government and foundations would make it possible. The know-how exists and we only need the let's-do.

Auxiliary publication as operated since the late 1930's is a successful documentation invention that has not been utilized as widely as it should be. It has been extensively utilized to deposit thousands of documents so that copies of them can be had

on demand. It needs continuous explanation and promotion, particularly to editors of scientific scholarly and learned journals.

So long as money for slick and obese journals is obtainable from government, foundations, libraries and even the producers of research, auxiliary publication will not be used as it should be. Money is being wasted on unnecessary conventional publication and it is time that those setting policy by money control realize that auxiliary publication can be used to reduce publication costs.

The technique of auxiliary publication has happily been used to make other large masses of documents available, notably the World War II enemy documentation and current government research reports through the Office of Technical Services of the Department of Commerce and theses through University Microfilms, Inc.

Could the facilities and techniques developed for auxiliary publication be urged upon professional societies, journal editors, and research organizations? The necessary participation of the professional journal in auxiliary publication must be realized and not overlooked.

The announcement by notice through published summary or condensed article of the availability of the deposited document is essential. The specialist can only learn of the existence of the document he may need by reading about it in the journal of his specialty.

The perpetual availability of the document at the announced price should be guaranteed.

"One Big Journal"

The concept of "one big journal" perhaps cannot be realized but the idea should be expounded and explored. There are admittedly too many journals. For economy of publication the largest press runs and the least costly printing methods are needed. This would seem to require low price and use of newspaper printing with linotype setting, rotary presswork on newsprint.

Before microfilm, printing nonephemeral material on newsprint was unthinkable, but with the permanency of microfilm not using newspaper printing, a great complex of inventions, is unthinkable.

When the National Science Foundation entered upon a gigantic program of translating Russian literature, the possibility of saving millions by using newspaper techniques was pointed out, but ignored. A fresh look should be taken at this and other publication efforts to determine the part that better distribution and printing methods might play.

Birth control of journals is prevented by need for journals by organizations and the prestige of being an editor. We may be forced to hope that financial adversity will apply the brakes.

"World Brain"

Organizing the knowledge of the world into a "world brain" is still the prime need that could be filled by documentation.

The great computer and information systems, added to advanced microfilm, devel-

oped in recent years makes this more technically possible. But has the vision perished and the desire dulled? Is preoccupation with minutiae preventing the big view and broad effort? If the mechanisms are so wonderful can we encourage the kind of human brains and aspirations, that gave birth to them, to assume the greater task of ordering and arranging for use the magnificent creation of the intellect? Shall we read the plans of past decades and then proceed to build them with the tools that were not then fashioned?

Life Expectancy of Reports

While knowledge is immortal and human beings have a fondness for imagining that ultimate truth can be achieved, there is a life expectancy that can be estimated for most scientific papers and reports.

Most of the scientific publication of more than a decade or two ago, if it is important, has become infused in later reports and found its way into citations in later scientific papers. Important scientific advances move into general knowledge even faster, although the period of development of many devices based upon scientific research requires many years, far more than the period of the gestation of an elephant.

This makes it probable that magnitude of the "world brain" creation can be kept within comprehensible limits by handling the current output of publication and working backward so far as found necessary.

In our fascination with electronic gadgetry, marvelous as it is, we should not over-

looks the wonders of the human brain which still is the most wonderful "computing" mechanism that has ever been created.

The electronic variety of computer may work faster, but for the purpose of bringing to bear upon a problem an immense multitude of details and relating them when they seemingly are unrelated, the human brain is unparalleled and probably will remain supreme in the foreseeable future.

An expert with years of training in a particular field, equipped with the rare insight which is a gift not given to many, is a supreme scientific tool essential to creative work. The gathering and arranging of facts, which is the purpose of the project about which we are talking, will only be useful as it fits into these great creative human mechanisms.

Scientists are such modest and undemanding individuals that they overlook the possibility of utilizing the marvelous communication devices that science and technology have created.

When a researcher is "hot" after an idea, he should search for the facts and information that he needs wherever they might be found. He should pick up the telephone and if necessary talk across the continent or across the oceans to the three or four colleagues who know what he is trying to do and who could possibly help him in his research. The total cost would be small compared with the possible results.

The military quite properly has extensive communication lines of telephone and teletype connecting its installations. Great research laboratories, on the battlefield of man's fight for more knowledge, should be given equivalent facilities. "Hot" lines between research laboratories may well be as important as between the White House and the Kremlin.

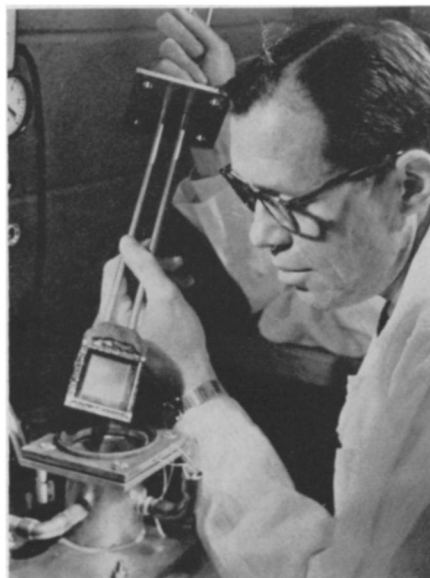
Great Communicators

We must not overlook the mass media which are the great communicators of ideas and facts to the intellectual world as to the public at large. It was not out of character for SCIENCE SERVICE to be interested in documentation for it is the institution for the dissemination and popularization of science.

The fundamental task of informing the public through newspapers, magazines, radio and TV is as important as primary scientific publication and the filing and finding that keeps the technical record in order and useful. To both the creative worker and the applier of new knowledge, the everyday information that everyone reads in newspapers is more effective than a thousand general indices. This kind of browsing is the way many ideas are synthesized.

The human brain can store and retrieve billions of bits of information, combine them in often almost unbelievable ways, and create concepts and knowledge that never before existed. To do this, the most diverse and detailed input is needed. If any justification is needed for general communication, it is that it is perhaps the most powerful ingredient of the information formula.

• Science News Letter, 84:70 Aug. 3, 1963



Radio Corporation of America

COMPUTER MEMORY—*This experimental thin-film superconductive memory unit that can store 16,384 bits of computer information is smaller than a playing card and 120-millionths of an inch thick. The device, developed at RCA's David Sarnoff Research Center, Princeton, N. J., is being lowered into a flask of liquid helium by Leslie L. Burns of the RCA Laboratories.*