AD722463

PROCEEDINGS OF THE FIFTH SCIENTIFIC AND TECHNICAL INFORMATION SEMINAR

Held at: Southern Connecticut State College
New Haven, Connecticut
April 9, 1970

Edited by: Bernard S. Schlessinger

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Cosponsors:

Southern Connecticut State College, New Haven, Connecticut
Olin Corporation, New Haven, Connecticut
Defense Documentation Center, Alexandria, Virginia

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INTRODUCTION

The Fifth Scientific and Technical Information Seminar, held at Southern Connecticut State College in New Haven, Connecticut on April 9, 1970 was a joint effort by the College, Olin Corporation of New Haven, Connecticut and the Defense Documentation Center of Alexandria, Virginia. It was designed to allow the attendees to 1) hear experts in the information field, 2) learn about future plans of major information sources, 3) exchange ideas with colleagues and 4) acquaint managerial and marketing personnel with newer techniques for forecasting the direction of future research.

Approximately 300 persons from 14 different states and 177 different organizations attended. They were widely distributed in information interests, job classifications, and subject areas, which made for stimulating group interactions.

The 16 papers which resulted from the Seminar are contained in these proceedings. They are informal in nature as was the Seminar, but a great deal of interesting information is included.

The editor would like to express his gratitude to the two persons who helped him with the setting up of the Seminar, Dr. Robert E. Maizell of Olin Corporation and Mr. Frances E. Hennessey of the Defense Documentation Center, as well as to the speakers, who graciously contributed their services. Many graduate students were involved, some of whom served as recorders in the discussion groups and are duly noted. The faculty and staff of the Library Science Division at the College were supportive, especially Drs. Evelyn R. Robinson and Evelyn I. Banning, Miss Patricia E. Jensen, Miss Kaumudi Parikh, Miss Elaine Lachapelle, and Miss Ellen M. Fusco. The informality of the seminar was greatly aided by the efforts of the editor's wife, June and three children, Rashelle, Jill and Joel, who were indispensable and tireless members of the Seminar staff.

Bernard S. Schlessinger

March 8, 1971

List of Organizations Registered for the Seminar

Aeronautical Research Association, Princeton, N. J.

Aerospace Medical Research Laboratories, Dayton, Ohio

Aerospace Research Laboratories, Dayton, Ohio

Agency for International Development, Arlington, Va.

Agricultural Experiment Station, New Haven, Ct.

Air Force Cambridge Research Laboratories, Bedford, Ma.

Air Force Materials Laboratories, Dayton, Ohio

Air Force Office of Scientific Research, Arlington, Va.

Air Force Systems Command, New Carrolton, Md.

Air Products, Allentown, Pa.

American Cyanamid Co., Boundbrook, N. J.

American Cyanamid Co., Stamford, Ct.

American Institute of Physics, New York, N. Y.

Anderson Laboratories, Bloomfield, Ct.

Applied Data Research, Inc., Arlington, Va.

Army Materials & Mechanical Research Center, Watertown, Va.

Atlantic Microfilm, Baltimore, Md.

Atlantic Microfilm, Hartford, Ct.

Atomic Energy Commission, Washington, D. C.

Avco Everett Research Laboratories, Everett, Ma.

Avco Lycoming Div., Stratford, Ct.

Avionics Laboratories, Dayton, Ohio

Battelle Memorial Institute, Washington, D. C.

Biological Abstracts, Philadelphia, Pa.

Brunswick Corp., Needham, Ma.

Cambridge Acoustical Associates, Inc., Cambridge, Ma.

Case-Western Reserve University, Cleveland, Ohio

Celanese Research Co., Summit, N. J.

Center for Materials Research, College Park, Md.

Central Connecticut State College, New Britain, Ct.

Champion Spark Plug Co., Detroit, Mi.

Chandler-Evans, Inc., West Hartford, Ct.

Chemical Abstracts Services, Columbus, Ohio

Cheney Library, Manchester, Ct.

Chesebrough-Ponds, Inc., Clinton, Ct.

Clarkson College of Technology, Potsdam, N. Y.

Clearinghouse for Scientific & Technological Information, Springfield, Va.

Colts, Inc., Hartford, Ct.

Combustion Engineering, Windsor, Ct.

Computer-Assisted Information Exchange, Cambridge, Ma.

Connecticut Regional Medical Program, New Haven, Ct.

Connecticut State Department of Education, Hartford, Ct.

Connecticut State Library, Hartford, Ct.

Cultural Information Analysis Center, Washington, D. C.

Dana Corp., Toledo, Ohio

Danbury Public Library, Danbury, Ct.

Data Communications, Inc., New York, N. Y.

Defense Documentation Center, Alexandria, Va.

Defense Metals Information Center, Columbus, Ohio

Defense Supply Agency, Alexandria, Va.

Demos, Inc., New Haven, Ct.

Department of Health, Education & Welfare, Rockville, Md.

Dow Chemical Co., Midland, [illegible]

Dynamics Research Corp., [illegible] ton, Ma.

Emhart Corp., Hartford, Ct.

Eon Corp., Brooklyn, N. Y.

Esso Research and Engineering Co., Shulton, N. J.

Federal Electric Corp., Paramus, N. J.

Ferroxcube Corp., Saugaties, N. Y.

Frankford Arsenal, Philadelphia, Pa.

General Dynamic Electric Boat Div., Groton, Ct.

General Electric Co., Philadelphia, Pa.

General Electric Co., Washington, D. C.

General Electric Co. Information Systems, Bridgeport, Ct.

General Telephone Co., Waltham, Ma.

Geos Corp., Hamden, Ct.

Goodyear Aerospace Corp., Akron, Ohio

Greenwich Hospital, Greenwich, Ct.

Gulf-Western Research & Development Center, Swarthmore, Pa.

Hartford Seminary Foundation, West Hartford, Ct.

Hazeltine Corp., Long Neck, N. Y.

Headquarters, Tactical Air Command, Langley AFB, Va.

Human Relations Area Files, New Haven, Ct.

IBM, Armonk, N. Y.

IIT Research Institute, Annapolis, Md.

Indiana Univ., Bloomington, Ind.

Information Service of Connecticut, Vernon, Ct.

Institute for Scientific Information, Philadelphia, Pa.

Institute of Electrical & Electronics Engineers, New York, N. Y.

Institute of Special Studies, Belvoir, Va.

International Nickel Co., New York, N. Y.

Leeds-Northrup Co., North Wales, Pa.

Litton Industries, Williamsport, Pa.

Merine Historical Association, Mystic, Ct.

Massachusetts Institute of Technology, Cambridge, Mass.

Mathematical Reviews, Providence, R. I.

Mattatuck Community College, Waterbury, Ct.

Middlesex Community Hospital, Middletown, Ct.

Milford Hospital, Milford, Ct.

Mine Safety Appliances Co., Pittsburgh, Pa.

Minnesota Min. and Manufacturing, New Haven, Ct.

Mite Corp., New Haven, Ct.

Natick Army Laboratory Library, Natick, Ma.

National Academy of Sciences, Washington, D. C.

National Aeronatics & Space Administration, Washington, D. C.

National Center for Health Sciences Research & Development, Rockville, Md.

National Institute of Mental Health, Bethesda, Md.

National Water Quality Laboratories, West Kingston, R. I.

Naval Air Development Center, Warmonth, Pa.

Navigation & Control Division, Peterboro, N. J.

Navy Clothing & Textile Research, Natick, Ma.

Navy Underwater Sound Laboratory, New London, Ct.

New Haven Free Public Library, New Haven, Ct.

Nicholus Library, Trumbull, Ct.

Norden Div., United Aircraft, Pound Ridge, N. Y.

Northrup Corp., Norwood, Ma.

Norwalk Hospital, New Canaan, Ct.

Office of Information Systems Planning Development, Oxon, Md.

Office of Naval Research, Boston, Ma.

Olin Corp., New Haven, Ct.

Owens-Illinois Inc., Toledo, Ohio

Park City Hospital, Bridgeport, Ct.

Perkin Elmer Corp., Norwalk, Ct.

Pfizer Diagnostics, New York, N. Y.

Phillips Laboratories, Briarcliff, N. Y.

Pitney-Bowes, Inc., Stamford, Ct.

Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

Pratt-Whitney Aircraft, East Hartford, Ct.

Progress Management Services, Arlington, Va.

Public Health Service, Derwood, Md.

Quinnipiac College, Hamden, Ct.

Raymond Engineering, Middletown, Ct.

Raytheon Co., Portsmouth, R. I.

Raytheon Co., Waltham, Ma.

RCA, Burlington, Ma.

Rennselaer Polytechnic Institute, Windsor, Ct.

Republic Steel Corp., Washington, D. C.

RF Communications, Inc., Rochester, N. Y.

Sanders Associates, Nashua, N. H.

Sealol, Inc., Providence, R. I.

Servo Corp. of America, Hicksville, N. Y.

Shock Vibration Information Center, Washington, D. C.

Simmonds Precision, Bergstrom, Vt.

Singer General Precision, Pleasanton, N. Y.

Southern Connecticut State College, New Haven, Ct.

Special Metals Corp., New Hartford, N. Y.

Squibb Corp., New Brunswick, N. J.

State Univ. of New York at Buffalo, Buffalo, N. Y.

Stevens Institute of Technology, Hoboken, N. J.

Syracuse Univ., Syracuse, N. Y.

Systems Research Corp., Washington, D. C.

TOD Program, U. S. Air Force, Andrews AFB, Md.

Travelers Research Corp., Hartford, Ct.

Trumbull Libraries, Trumbull, Ct.

Tufts Univ., Boston, Ma.

Uniroyal Chemical Co., Naugatuck, Ct.

United Aircraft Corp., East Hartford, Ct.

United Aircraft Corp., Glastonbury, Ct.

United States Air Force Laboratories, Andrews AFB, Md.

United States Army Electronics Command, Forma, N. Y.

United States Army Materials Center, Washington, D. C.

United States Congress, Washington, D. C.

United States Geological Survey, Hartford, Ct.

United States Geological Survey, Washington, D. C.

United States Navy, Alexandria, Va.

United States Navy Library, Washington, D. C.

Universal Oil Products, Des Plaines, Ill.

University of Delaware, Newark, Del.

University of Maryland, Silver Springs, Md.

University of Massachusetts, Amherst, Ma.

University of Rhode Island, Kingston, R. I.

University of Rhode Island, Narragansett, R. I.

Varian Solid State Div., Copiagu, N. Y.

Wallingford Public Schools, Wallingford, Ct.

Wesleyan Univ., Middletown, Ct.

West Hartford Public Schools, West Hartford, Ct.

Westinghouse Electric Corp., Baltimore, Md.

Westinghouse Electric Corp., Waltham, Ma.

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Xerox Research Division, Webster, N. Y.

Yale Medical Library, New Haven, Ct.

Yale Univ., New Haven, Ct.

TRENDS IN INFORMATION OPERATIONS

George Beiser
Battelle Memorial Institute
Washington, D.C.

The word "trend" in the title of this paper calls to mind a gradual movement such as might result from some modest force. I suggest instead that current trends in information operations are the results of relatively slight imbalances between many very large forces and counterforces -- acting in almost random directions.

What kind of forces are at work? The complete list is not really important and a few items will illustrate the point. The forces that are extending information operations include: 1) Expanding audience, 2) Increasing diversity of subject matter, 3) Multiple writing and rewriting of events for selected users, and 4) The freedom-of-information doctrine. Countering these forces are 1) improved selective dissemination techniques, 2) better abstracts, 3) new alerting services, and certainly on any list prepared at Battelle 4) the Information Analysis Center.

These are strong forces. The arraying of these forces can result in spurts or "squeeze-outs" -- more commonly illustrated by the squirt of a breakfast grapefruit under the pressure of a spoon. (Examples of these spurts in the information field might be the superfische or the ultra-fische.) These spurts in the information field can be projected in any direction and be of surprising magnitude and impact. Certainly their direction is not always directly relatable to any of the applied forces. These unheralded but dramatic spurts can be expected more often in future information operations.

As to more basic trends, these are illustrated in a film clip of a new Information Analysis Center (IAC) development that can combat, temporarily at least, the rapid increase in volume of information.

This film assumes a familiarity with IAC concepts. It assumes a knowledge that up to 80 percent of input flow might be eliminated by screening during acquisition and that this volume can be further reduced by 50 percent or more during the extracting process.

The clip shows how a user can be as selective as he wishes during retrieval of the condensed store -- and further it shows how clean drafts of selected material can be obtained without pencil and paper.

> NOTE: The film shown requires about 5 minutes and shows a capability for remote terminal display of retrieved information. This information can then be edited and stored temporarily until a hard copy readout of the selected and edited text is desired.

We are now committed to this concept at Battelle. Quantities of recent and current input information is now in computer-compatible form -- but it must be emphasized that it will still be several months before one of the Battelle Information Centers goes on stream in this mode as an operating service, due to that old tyrant ECONOMICS.

In summary -- I like to use a computer. It does many things that I <u>don't like</u> to do or <u>can't</u> do -- and it does them fast. What I am looking forward to is more help from the computer in doing <u>those important things that I like to do</u>.

A Panel Discussion

Present Status and Future Plans of Government Information Agencies

Dr. R. B. Stegmaier, Administrator, Defense Documentation Center
H. W. Sauter, Director, Clearinghouse for Federal Scientific/Technical Information
J. F. Stearns, Director, Science Information Office, National Aeronautics and Space Administration
L. F. Parman, Assistant Director, Technical Information, Atomic Energy Commission

1. Q: I noticed very recently that the Clearinghouse announced the availability of magnetic tape. In other words, the output of the Clearinghouse will be available on magnetic tape. Do you have any additional future plans beyond this?

Mr. Sauter: The magnetic tape that we're making available is simply a tape display of that information which is contained in our announcement journal. It contains all of the data elements, that is, the personal author, the title corporate author, the indexing terms and abstracts when we've been able to put them on tape. We do have a development program in the Clearinghouse which we hope will lead to an on-line retrieval system, but that's in the future.

2. Q: Are there any plans to work with ultrafiche?

Mr. Sauter: Perhaps that's a question that should be directed at COSATI (Committee on Scientific and Technical Information), with whose standards we're working. Industry is working with many other forms. We have no plans at the present time to change to ultrafiche. In fact, the equipment manufacturers and others have asked, at least indirectly, that we maintain the present standards. They are just now coming out with new equipment, that you'll see listed in the DDC publication, which uses the present standard, and I'm sure that if we were to change at this time, there would be screams of anguish from the equipment manufacturers. Mr. Stearns, do you have any other plans?

Mr. Stearns: No definite plans. All of us, I think, are looking at such possibilities as ultrafiche for possible future applications, but as Mr. Sauter has indicated, to try to change rapidly to ultrafiche at this time would probably produce a reasonable scale of chaos.

Dr. Stegmaier: I plead guilty. I have on my desk a microfiche we produced at DDC where each frame, i.e., what is each page in normal microfiche, is itself a reproduction of a 4 x 6 microfiche. The microfiche produced thus has the equivalent of sixty 4 x 6 microfiche on it. This is experimental. Mr. Sauter mentioned that he thought that if COSATI changed its standards, the equipment manufacturers would be disturbed. I worry more about the users, because I think that we could manage to get along in our business with some problems with the manufacturers, but if we had any problems with our users, we'd be out of business. The user is really most important. Sooner

or later, microfiche with greater reductions will be used. For example, in the automatic fiche handling equipment there is at least one piece of gear available which has a rotary file of 1500 microfiche. Think of the increased utilization of the equipment if each microfiche in the file contained the equivalent of 60 present-day microfiche. Although it will be difficult to develop the optics, the light source and the accessories for the equipment, sooner or later, it will come. I would say that sometime in the next 5 years, we will have both our present-day microfiche and some form of ultrafiche.

Mr. Sauter: Your point about the user is a very good one. I hope that I implied that the user was included in my comments about the equipment manufacturers, because the users obviously buy the equipment. If there is to be a change, it probably will have to come from the user. We at the Clearinghouse are looking at more efficient ways of handling the microfiche in our own operation and may be moving to greater reduction, automatic manipulation of fiche, etc. Whether the products developed for our needs become available to the user depends on the user's requirements and demands.

Dr. Stegmaier: There is a commercial system available which takes a standard 4 x 6 microfiche and reduces it to 35mm. frame size. This can be mounted in punched cards (aperture cards) where the image is the equivalent of a 4 x 6 microfiche. Equipment is also available with which you can duplicate the microfiche in reduced size or blow it back up to standard 4 x 6 size. The manufacturers are also working on equipment with which you could move from the aperture size microfiche to standard-size hard copy.

3. Q: Once there was talk about automatic distribution of microfiche to contractors, and we were asked to keep statistics on ordering and receipt of microfiche. What has been the outcome?

Dr. Stegmaier: The automatic distribution of microfiche is being tested with selected users. As part of the experiment and service to these selected users, they have been asked to maintain statistics so that we could evaluate automatic distribution versus other types of distribution. We are testing a "push system" versus a "pull system," which is what we traditionally used. The experiment is not completed. There have been some changes. For example, we changed the basis of the distribution of the microfiche. We previously used the COSATI fields and groups. This was expensive for DDC. Some of the customers realized it was expensive, because they were getting such gross volumes, and they had to sort through the volume to decide what to keep. It cost the user to sort, and it really cost DDC when he threw some of the output in the wastebasket. We revised the system to make the distribution based on individual descriptor terms or sets of descriptor terms. Most of the customers seem to be better pleased with this. The new system has reduced the automatic distribution in number of fiche by one third. This reduces our costs on reproduction of microfiche, but it also requires us to do some rather sophisticated programming for our computer systems to utilize descriptor sets and to provide an individual profile for each user based on individual terms.

4. Q: Will this program be expanded?

Dr. Stegmaier: Yes, it will probably be expanded within the next year, on a gradual basis, using the criterion of a user's normal demands for documents and microfiche from DDC. The larger the user to whom we give this service, supposedly the greater will be the reduction of the number of individual requests we will receive, and it costs us almost twice as much per unit to handle an individual request, as it does to distribute the same number of microfiche automatically.

5. Q: Perhaps we should order a great number of microfiche now, so that we can be put on the automatic distribution list.

Dr. Stegmaier: We're thinking in terms of possibly an eventual cutoff of a thousand requests per year. Any user not making a thousand requests per year would be ineligible for automatic distribution, although that figure is subject to change.

6. Q: What about microimages on thick film as a possible future development?

Dr. Stegmaier: I have seen demonstrations, but I shudder at the price of the equipment for viewing and reproduction of copies of such images compared to the methods we have today. For some specialized uses (such as color), this might be a possibility, but dollarwise, it's not competitive. DDC serves 6000 users. If we changed the format of our product overnight, it would have terrific impact.

7. Q: What about the readability problems of a significant portion of the copies received from the Clearinghouse?

Mr. Sauter: Obviously, there are problems. In any specific case, please get in touch with the Clearinghouse so that we can take a look at the document. Perhaps the document is from the older series and this is the best quality that we can make available. It's possible also that it is a production problem. We do have "quality control," but we can't check every single page that goes through. We spot check a document, and if those pages are satisfactory, we send the document to you. Again, for any specific problem, please contact us.

8. Q: I would like to ask about the economics of ultrafiche, especially in regard to readers, since the low-cost readers developed could not handle ultrafiche?

Dr. Stegmaier: For organizations such as any of us here represent, with collections of a million or more documents and demands on our services for a million or more copies a year in various forms, the smaller we can make our files the greater the advantages. We save a little bit on storage space, but even more important, we make the document much easier to manipulate mechanically. Larger organizations, like ours, and even large contractors and laboratories will maintain central collections in some ultrafiche form, but so far as the user who goes to his library is concerned, he will receive a standard 4 x 6 microfiche reproduced from the ultrafiche or, if requested, a hard copy reproduced from the ultrafiche. Only organizations with large

collections and high demand rates will utilize this type of storage.

9. Q: Are we moving too quickly into ultrafiche, especially considering the problems of educating our customers in the use of a form (microfiche) to which they are resistant?

Dr. Stegmaier: To repeat, it will be the large organizations with massive files and high rate of use of their collections that, because of economics will be led to the use of ultrafiche. For many, many years most users will be using the microfiche of today, with the 18:1 ratio. There will always be with us the small organization (20-30-40 people or less) who will always use hard copy, even if others are using microfiche, ultrafiche or even nanofiche. Even I like hard copy.

10. Q: What has been the effect of service charges of $3.00 for hard copy?

Dr. Stegmaier: The year before we introduced service charges, 80% of the requests we received were for hard copy. Today we receive only 20% requests for hard copy. Those figures are for over a million requests. The simple inducement of free microfiche vs. a charge for hard copy has produced that dramatic change.

Mr. Sauter: The experience of the Clearinghouse undergoing the same service charge change might also be of interest. The drop in orders with the small service charge was about 60%. 40% of the people still buy. The 60% loss was of people who were willing to accept the free document but not to pay for it.

Dr. Stegmaier: I want to point out that our experience showed no drop in the numbers of requests, just a change in the ratio, unlike that just noted by Mr. Sauter.

11. Q: When will NASA begin applying user charges?

Mr. Stearns: We already do, since February of 1969. As with DDC, we rely on the Clearinghouse to supply hard copies of documents at the service charge and we provide free microfiche. That will continue for the near future, although, of course, plans are always subject to change.

12. Q: What is going on in technical information at the Atomic Energy Commission (AEC)?

Mr. Parman: The AEC is already charging for its microfiche as those of you who have depository libraries know. Since we started charging this fall for microfiche, any college or university can buy the microfiche, where previously they had to go to the Clearinghouse.

13. Q: Is there any thought to making any part of the photoimage machine-readable?

Dr. Stegmaier: There is a portion of the film image that's readable in the DDC collection. Each DOD report has a one page form that includes the title, standard bibliographic information and an abstract.

14. Q: But are they optical characters that can be read?

Dr. Stegmaier: They are recorded as digital information in the computer records.

15. Q: Can one generate his own tape from his own document collection, rather than getting your tape?

Dr. Stegmaier: If the user wants to do his own optical scanning or keypunching, that is his prerogative.

16. Q: Is any part of your record (keywords or any other portion) going to be available in an optically-readable form?

Mr. Sauter: I would think that one of the things that might lead to this possibility is what we call the COSATI standard title page. It would be a simple matter to standardize the type fonts and other elements to provide optically-readable material but this has not been done thus far.

Dr. Stegmaier: It would seem satisfactory if such data were made available on film. It seems to me that the form taken by the material is not that important, so long as it is available in some form that can be easily utilized by the user.

17. Q: Is not the ultimate storage form, rather than microfiche, a computer magnetic disk file, with the ability to query by telephone and output on a television screen of all elements?

Dr. Stegmaier: No. The ultimate storage form is that each person should have all knowledge in his head. What you say is moving too fast. We must live in the world we have today. What you propose is technically feasible, but no organization today is willing to pay for it.

18. Q: Does DDC plan to distribute their tapes?

Dr. Stegmaier: Yes. There is a proposal to that effect in channels now.

19. Q: How soon will this happen?

Dr. Stegmaier: Within a year, if approved.

20. Q: NASA makes tapes available to certain centers such NERAC here in Connecticut. Are these equally available to other centers, and are these centers self-sustaining?

Mr. Stearns: The NASA tapes have been distributed for the past five years to about 30 organizations (major NASA contractors and regional dissemination centers or technology utilization centers). Like DDC, we are planning to make the tapes publicly, commercially available, this calendar year, possibly this summer. These will be the master index tapes of STAR, and International Aerospace Abstracts. As to whether the technology utilization centers have become fully self-sustaining, I don't know. They are moving in that direction as quickly as possible.

21. Q: DOD is supporting some centers too, are they not?

Dr. Stegmaier: There are some 20-odd information analysis centers supported by DOD. They have all been directed to introduce charges. The philosophy of DOD is that the center's collection costs up to the point of providing service (including cataloging, abstracting, extracting, indexing) should be subsidized. Beyond that, the center should operate on a reimbursable basis.

22. Q: Are there standards for tapes?

Dr. Stegmaier: There are now some U.S. standards (Z39.2). COSATI has endorsed these and DDC will comply.

Mr. Sauter: Our tapes also will follow the endorsed standards.

23. Q: Are AEC tapes compatible with Clearinghouse tapes?

Mr. Parman: No, at the present time they are not. The Clearinghouse is not programmed to use our tapes, although we send them regularly.

Mr. Sauter: Hopefully, this can be remedied, and we will work in that direction.

24. Q: We are bothered by the size of our hard copy collection from AEC. Do you plan to put these old reports into microfiche form, so that we can throw the hard copy away.

Mr. Parman: We do not plan at this time to microfiche that collection.

25. Q: What about timing of deliveries from the Clearinghouse?

Mr. Sauter: The system is designed so that fiche should be delivered at about the same time as the index. Please tell us if that is not the case.

26. Q: Will the NACA collection be available on microfiche?

Mr. Stearns: We hope that will happen. Two organizations are working on it, but we can't predict timing yet.

27. Q: What are the problems related to changes of interest with the automatic distribution of classified documents?

Dr. Stegmaier: Well, you're bringing up a number of problems simultaniously. Our experience is that users who are entitled to classified services do not change fields of interest very rapidly. With one small contractor working on one contract and preparing a proposal for another there may be a major change in interest, but for major contractors authorized access to certain fields, there are no rapid changes in fields of interest. Possibly one reason for this is the difficulty of gaining access to information in new fields of interest. In our selective distribution of microfiche, we operate on a consolidation of the individual organization's need to know.

28. Q: Is the fact that contractors do not seem to change rapidly from one field to another actually cause and effect?

Dr. Stegmaier: One thing reflected by changes in field of interest is how fast the contractor obtains new contracts, loses old ones, or changes the fields of technology in which he's involved.

29. Q: Documents are ordered by some sort of control number. Periodically, the wrong document is received, because of an error in the handling of the number. Could an additional redundance digit be used to reduce the number of such errors?

Dr. Stegmaier: If such a system could be devised, Sears Roebuck and Montgomery Ward would make the inventor a millionaire. The errors are made no matter how careful the clerks and the customers (both of whom share in the blame) are, but percentagewise the errors are very small. We keep a record of the number of complaints, and this number, representative of the number of errors, is very small.

30. Q: How would a small business best use the NASA data bank?

Mr. Stearns: The NASA data bank is our entire scientific and technical information collection of 750,000 documents. Access to it is provided in part by the announcement journals, the indexes, and the bibliographies that NASA produces. The technology utilization centers (there are six of them, one at Storrs, Ct.) have the data bank in tape form, and conduct current awareness service.

31. Q: What are the contractual relationships?

Mr. Stearns: The fees for the services vary, and I hesitate to generalize.

32. Q: What about the tape procedures at DDC, AEC, and the Clearinghouse?

Dr. Stegmaier: When our tapes are ready, we will have sets, one classified and one unclassified.

Mr. Parman: AEC tapes will be available at an indefinite, but fairly soon date. We do distribute to a limited number of our own contractors on an experimental basis. They are developing programs and uses for them now.

Mr. Sauter: We have announced the availability of tapes, which date back to the Jan., 1970 issue. The annual price of the tape is $1500 per year (1875 foreign), including air mail shipping for 24 issues along with USG. We will go back eventually to 1967, depending on the demand.

33. Q: What are the plans for screening input?

Mr. Stearns: There isn't a great deal that can be done. We are always going to be saddled with whatever the scientist contributes to us. In the NASA system which is pretty completely centralized, we do have a good opportunity to make sure that the material going through us into the system is more and more adequate, both physically and intellectually.

34. Q: Could you comment on standards for report formats, and quality, currency and timelines of major products and services?

Mr. Stearns: So far as the NASA formal series publications go (the technical notes, technical reports, etc. that NASA itself produces), these are already rather tightly controlled. With reports coming into the system from external sources, we can only hope that people will behave themselves.

Mr. Sauter: I might add that COSATI has put out a standard for formats for technical reports. Z-39 is reviewing the standard with thoughts of adopting it. So we do have standards for physical formats. A far greater problem is the intellectual content of the document. We all, at times, have doubts about the value of certain documents in our collection. If anyone has a good method of evaluating content without alienating customers, the Clearinghouse would be happy to hear about it. We have talked about a report grading system (a subjective evaluation), but have balked in considering the problems of implementation.

Dr. Stegmaier: In regard to the quality, currency and timeliness of our services and products. They can't be any better than the input from the contributors. We cannot stop duplication from laboratories, or reports based on poor research or instrumentation, or a 1 1/2 year time lag between research's end and report preparation. We can only control the timing and formats after the reports enter our organizations, only half of the problem.

THE CONGRESS AND RESEARCH AND DEVELOPMENT

CONGRESSMAN EMILIO Q. DADDARIO (D-CONNECTICUT)

You have seen a golden age of science come and go. It lasted a quarter of a century. It began with the great burst of national enthusiasm for the wonders of science and the promise of science immediately after the close of World War II. It began to wane when the public started to question whether science and its products were the unmitigated blessing they had seemed in 1945.

It was the U.S. Congress that set in motion the chain of events that made possible this golden age of science. The Congress created agencies, authorized programs, provided funds, and surveyed the results. If, as now seems likely, this golden age is drawing to a close, it will be because the Congress has decided that the results do not appear to justify the effort. A quarter of a century is a significant span of time. For most of that period, the public outlay for science and technology has increased on a steeper slope than has the gross national product. If the scientists, the public, and the Congress are frustrated and disheartened over the results of this scientific age, it is important that we take stock right now. What can be done to salvage the situation?

You will recall the beginning of the golden age of science. The events of World War II had abundantly confirmed the ability of science to contribute to meeting well-defined national needs for invention. What the large industrial laboratories of the Bell Telephone Company, General Electric, and others, had done in a relatively modest way was carried on to an enormous extent for the war by a network of scientific committees, boards, panels, laboratories, and individual scientists, working under the loose coordination of a funding organization, the wartime Office of Scientific Research and Development, directed by Dr. Vannevar Bush.

Out of that wartime experience came the generally accepted conclusion that scientists could contribute to national goals by inventing to order. It was the expectation of the Congress, reflecting the feeling of the people, that out of the encouragement of science would come a greater ability to meet specific national needs. But the scientists themselves insisted that for the future it was necessary to build a resource base of scientifically-trained manpower and potentially useful scientific knowledge. This meant concentrating public funds on support for basic scientific research.

Accordingly, the green light was given to the U.S. Atomic Energy Commission, created in 1946; the Office of Naval Research (also 1946); and the National Science Foundation (created in 1950), to invest funds in basic scientific research. During the administration of President Eisenhower, these were joined by the vastly expanded National Institutes

of Health in the newly created Department of Health, Education and Welfare. Then came Sputnik, and with it the great addition of NASA, and the institution of assistant secretaries for science and technology in almost every old-line department of the government. Science became the "in thing". Science offices cropped up all over. The Environmental Science Services Administration was set up. The Federal Highway Administration and the Federal Aviation Administration took on a scientific research character. The Advanced Research Projects Agency appeared and expanded as a basic research unit in the Department of Defense. A crime research agency was created in the Department of Justice, to enlist the resources of science and technology in the effort at crime prevention. Science and technology were enlisted in such programs as coal research, water quality, desalinization, marine sciences, information sciences, and many more.

In the Office of the President, science became a major concern with the appointment of a full-time Science Adviser to the President, whose function was supplemented by the President's Science Advisory Committee and, in 1962, by the establishment of the Office of Science and Technology. Earlier (1959) the Federal Council for Science and Technology had been created as an inter-agency coordinating mechanism. In the Office of the President, science was also intimately linked with the work of the National Security Council on such matters as new weaponry and weapons detection technology. A new National Council on Marine Resources and Engineering Development came into being only a few years ago, (1966). The National Aeronautics and Space Council was formed somewhat earlier, (1958). In the field of the social sciences, the President became equipped first with the Council of Economic Advisers, (1946); and then later with the Council for Urban Affairs, (1969); the Office of Economic Opportunity, (1964); the National Goals staff, (1969); and a Cabinet Council on Environmental Quality, (1969); in addition to numerous less formal scientific advisory activities.

The growth potential built into this series of research institutions and agencies was impressive. The goal of basic research was to locate public support for every worthwhile research proposal advanced by a qualified investigator. Since virtually every proposal for basic research that was funded resulted in the training of additional graduate students with competence, curiosity, and sophistication in the techniques of winning support, the numbers of proposals proliferated at a rapid rate. Even though appropriations for NSF-funded research increased from $9.7 million in the fiscal year 1955 to $187.2 million in the fiscal year 1965, it is reported that less than half of all proposals to NSF for research projects received support.

If the role of the President and his administration is to make proposals and offer plans to implement policies and programs, it is the responsibility of the Congress to make the law, authorize the programs, fund their execution, and appraise their results. A considerable and complex network of organizations concerning science and technology has grown up in the Congress for this purpose. Virtually every committee of the Congress is concerned with some aspect of the use of science and technology in support of its field of responsibility.

Thus, both House and Senate Appropriations Committees accepted the duty of reviewing science programs in order to decide at what level they should be funded. Administration of scientific programs by Government agencies had to be examined by the two Committees on Government Operations. The Joint Committee on Atomic Energy and the two Armed Services Committees are concerned with military research and development, and related matters.

On exploration of space and the development of aviation, the two Houses of Congress followed different courses: in the Senate, these activities have been dealt with by the Committee on Aeronautical and Space Science; but in the House of Representatives, the Committee was designated "Science and Astronautics" which both indicated its larger scope and also insured that matters of astronautics and aeronautics were to be considered within the larger context of national science policy, science resources, and other related broad national concerns.

An indication of the pervasiveness of the congressional interest in science and technology was presented several years ago in a report by the Senate Committee on Government Operations, that identified 1400 publications by Congress itself over a three-year period, that dealt with "science policy affairs." The report estimated that about 15 percent of all congressional publications fell into this category.

In support of their operations in the fields of science and technology, the Committees of Congress learned to look to a highly professional team of committee staff members who performed such functions as information gathering, identifying key questions, drafting of studies and policy statements, planning of hearings, suggesting policy concepts and approaches, and evaluating reports. Other support was increasingly provided by the Legislative Reference Service in the Library of Congress, whose resources were augmented by the creation in 1964 of a Science Policy Research Division, and in 1969 an Environmental Policy Division. Both of these were formed with encouragement by my Subcommittee.

I should also mention the important support for congressional decision-making in science and technology that has been afforded in recent years by the National Academy of Sciences and - more recently - by the National Academy of Engineering. Intensive use of the Academies by the Congress was signalized by the appearance in March, 1965, of "Basic Research and National Goals," a symposium of studies by the NAS Committee on Science and Public Policy, resulting from the "first contract ever entered into by Congress and Academy of Sciences" which was published as a report to the Committee on Science and Astronautics of the House of Representatives.

Meanwhile, technology was receiving comparable encouragement, private and public. In the private domain, science saw an ever-expanding array of applications of advanced science to television, synchronous and observation satellites, atomic power plants, the laser, the computer, microwave

and radar systems, solid state electronics, drugs, chemicals, pesticides, alloys, plastics, ceramics, composite materials, helicopters, jet engined aircraft, hovercraft and ground effects machines, and many more. Most of these new technologies also had military applications - and in addition we had developed atomic powered submarines able to launch intercontinental ballistic missiles with atomic warheads; we developed nation-wide command-and-control systems, intrusion detectors and nets; and many detailed pieces of hardware for offensive and defensive military purposes and communications.

In short, we have increased our technological capabilities enormously since 1945, and the growth of our scientific knowledge has laid the groundwork for countless further advances in many directions. We have done precisely what in 1945 we set out to accomplish, namely, the systematic application of publicly supported science and technology for public purposes.

Then, why is it necessary for this golden age to come to an end? Where did we go wrong? Were we at fault in our initial hypothesis that science could serve public purposes? Did we choose wrongly the technological goals we were to pursue? If society is better equipped technologically to accomplish its aims today than in 1945, why are we drawing back?

For we are drawing back.

Resistance to technology is taking many forms: local opposition to the construction of industrial plants and power generating stations, State prohibitions against pesticides and detergents, restrictions against automobile effluents, protests against the extension of freeways into urban areas, criticisms of many varieties of antibiotics and other pharmaceutical preparations, banning of cyclamates, and so on. Challenges to military technology take such forms as the withholding of approval of the F-111, attacks on the use of herbicides in Vietnam, criticism of the development of the ABM or testing of the MIRV system, cancellation of the military orbiting laboratory, criticism of the C5A, among others.

Resistance to scientific research is taking the direct and simple form of reduced public investment. Before this audience I do not need to dwell on the consequences of the cut-back in appropriations for basic and applied research. Nor do I need to assure you that the cut-back is real.

So I ask again: What went wrong?

I get the feeling, over and over again, that our technology has been getting out of hand. The flow of creativity from the scientific laboratory into industrial design and into the hands of the customer has been so rapid and uncontrolled that our institutions have proved themselves inadequate to deal with it.

The undoubted merits of the computer, for example, have not been fully exploited because of our uncertainties over such side effects as invasion of privacy, destruction of individuality, the gorging and

overloading of our institutions with data and information that has become unmanageable because of its sheer volume - as well as because of the complexity of our techniques for management of information. The current issues of two journals make the point that the language of the people who serve the computers has become so arcane and esoteric that they are no longer in touch with the people who need the computer services. In a way this whole impasse is reminiscent of the story of the Tower of Babel. And the results seem likely to be the same, too.

We have produced so many new techniques of education in the classroom -- technologies of teaching -- that we lack the means of judging which way to go.

The public and its representatives are voicing all manner of protests -- legitimate and articulate protests -- over the insults that technology has directed against the environment. There are so many of these I scarcely know where to start -- oil slicks, lead, ponds and lakes choked with algae, unsatisfactory food additives, the fear of escaped radioactive poisons from atomic reactors, public uncertainty over the safety and effectiveness of drugs and medicines, public outcries over air pollution, solid wastes, thermal pollution of our waterways, aircraft noise, dangerous pesticides, auto accidents, the rising costs of medical care in our hospitals, the cluttered radio frequency spectrum, failures and breakdowns of the costly new appliances in our kitchens...

In my opinion, the public dissatisfactions over the imperfections of our technology are real and valid. The dissatisfaction has reached the point at which, if we are to progress further in our uses of science and technology, we must begin to apply more and better criteria. The public has invested heavily in the brave new world of science, and has for its pains received a long list of fears and alarms.

I suggest that it is not enough for our innovators to devise new hardware. The hardware must meet new and better tests of effectiveness. These tests have not been defined precisely by the public. But the public has made clear that it expects better performance of the scientists and technologists.

The studies of technology assessment performed for our Subcommittee by the Academies sounded a warning. They pointed out that the first-order effects of any technological innovation might be wonderfully beneficial, but that they might also be accompanied by second-order effects that would ultimately prove disastrous. We cannot afford a breakdown of our technological society. Yet we are on the ragged edge in many ways. The brown-outs, the fish kills, the Donora smog, the thalidomide disaster, the "Silent Spring," are all warnings that must be heeded. If we intend to live with our technology, we must learn how to make it more reliable, more effective. We must develop institutions to do this. And we must make them work.

There is no point in throwing recriminations around. There is no need to blame each other for the defects of our systems of technology. It is futile for the scientists to blame the politicians for the misuse of their creations. It is also futile for the physical scientists to blame the social scientists for their failure to invent institutions and social mechanisms to control technology properly. There is no point in assailing our free enterprise system because it draws its profit from the exploitation of beneficial first-order effects with insufficient attention to second-order effects.

None of us is free from blame. But each of us has a share of responsibility for making things work better. I have tried to meet these challenges over the years by the development within the Congress of a better institutional capability so that the legislative process regarding the management and administration of our scientific and technical resources and the use of manpower in these fields can be improved.

The latest of these efforts falls within the concept of technology assessment. I want to see our country equipped with a reliable early-warning system to detect technological dangers and opportunities. It must be done early enough so that we can take action before catastrophe strikes.

The concept of "systems effectiveness" has for a long time been recognized as essential in the construction of large military and space systems. It is the idea of identifying all the important parameters of performance of each piece of hardware and of the total system, and then deciding what standards or levels of performance are to be achieved along each parameter. The goal is not perfection, obviously, but a series of trade-offs so as to produce a satisfactory - and effective - compromise among all of them.

In Government, in social services, in hardware, and in all human institutions, the same concept of systems effectiveness is applicable. In all of these, it is necessary that man abandon his search for perfection and learn to strive for balance. The balance is a dynamic one. On all the highways of civilization, man must steer a careful course between the technological dictatorship of flawless, accident-free behavior and the bloody and catastrophic freedom of irresponsibility.

The most important contribution that science and technology can make in the achievement of this balance is to identify irreversible trends toward catastrophic failures or incompatibilities, or unbalances. If man is slowly destroying the environmental viability of his own civilization by inventions or behavior, science should be called on to sound the alarm, and to arrest the course of the trend toward disaster.

The most important contribution that politics can make is to resist and inhibit technologies with attractive first-order consequences whose second-order consequences are irreversible trends toward loss of human freedom or safety. The task of politics is to establish and protect standards

of human freedom, marking the boundaries beyond which science may not transgress. In the last analysis, politics and science must work in uneasy harness, achieving their own balance of effectiveness between conflict and cooperation.

This cooperative relationship between science and politics, I hope and believe, can enable us to reconcile the fact that science inescapably causes change, with the fact that public security and welfare demands the achievement of some approximation of a "steady state." We must find out how to maintain a dynamic balance between these opposites, and I believe we can -- not only for our own country, but for all mankind. If we do achieve this goal within our democratic forms of government, it will be the crowning achievement of our century and perhaps of all time. For then, and only then, will man have demonstrated to himself that he is indeed a rational being.

The golden age of science may, as I have said, be drawing to a close. But in another and deeper sense, it is just beginning. We will know that it is underway when we have achieved success in designing our social institutions to admit and assess and exploit our technology rationally, with a conscious awareness of the importance of balancing dynamic change with a continuity of social organization and environment.

QUESTION AND ANSWER PERIOD

Q. Do you recognize any difference between the requirements on scientists and the requirements on technologists?

Cong. Daddario: The requirements are basically the same, except that the greater emphasis will be on the technologist. The knowledge-producing mechanisms at the fundamental research level are very difficult to disturb, and ought to be supported to the fullest extent. I do feel that, in the area of technology, as we begin applying this knowledge, the points I have raised become extremely important. I should add that I see some signs that attention is being paid to this. Some of the presidents of our major industries are now beginning to talk about second-order consequences. One major company approached me recently to make available to my subcommittee one of its facilities so that people can be brought together to talk about this and to help develop public opinion in its support. It is being recognized that the consumer does get agitated and concerned, and that the time will come when industry must develop the ability to handle in an internal way second-order consequences, rather than waiting for external influences to be brought to bear, such as fines levied for river pollution. In these internal decisions, both the scientist and the technologist must be considered.

Q. What type of legislation can we look forward to, as the government becomes involved in these matters?

Cong. Daddario: We already have some technology assessment capabilities in government, such as the Food and Drug Administration. In Congress, we have

developed advisory capabilities which have brought us to the point where I think we can take steps toward building broader technology assessment capabilities. After some five years of work through my own subcommittee and through advisory groups, I will submit, in the next few days, legislation to establish a technology assessment office in the Congress composed of four members of the Congress, the Comptroller General of the United States, the Librarian of Congress and six outside public members, from whom the chairman of the Committee will be appointed. This Office of Technology Assessment (OTA) will have the responsibility for developing for the Congress an assessment capability. The National Academy for Public Administration is also analyzing the way in which the Executive Branch can better define its technology assessment capabilities, and we will be making recommendations in that regard shortly. There is action, too, of a forward-looking nature, in the private sector, all of which shows good progress on this problem.

Q. Are there areas of lesser and greater vulnerability, for instance medical sciences?

Cong. Daddario: It would be hard to list and label all the areas involved. However, I would think that the medical sciences would be as vulnerable as any. I should point out that there is no desire here to slow down technology, but rather to use it better, to avoid regressive action leading from the side effects of the technology. Just consider the problems that we have today, and the progress made in the last two decades. If we take the advice of the forecasters, who predict advances in technology in the 20 years that will make the advances of the past 20 seem rudimentary, we can foresee, perhaps, even a greater proportionate degree of blight on our environment, and I think we can also recognize the tremendous restrictions that will be imposed on us. What we're trying to do in the proposal I have outlined is to insure continued ordered progress, so that man can use technology rather than technology use man.

Q. What will the pollution program cost the taxpayer on a yearly basis?

Cong. Daddario: You can take any figure you want. For example, the program on sewage and run-off water disposal has a price tag of 100billion dollars. This is inspite of the fact that nobody is really sure that we're approaching the problem in the right way. But, it is a problem that needs to be assessed. If you look at the programs in clean water and clean air, and add to them noise pollution abatement, pesticide control, and a multitude of others, the price tag is an enormous one.

Q. What would be the source of funding for these programs in the federal budget?

Cong. Daddario: The funding will come through the legislative process, rather than be hacked out as a simple percentage of funds. The programs must be analyzed and discussed. Those about which I've spoken have already moved through that legislative process and are funded by yearly appropriations, The bigger programs in solid waste disposal, river purification, etc. are still to come, but they will be built as they can develop support, and as our

abilities to handle them allow. Each of these must be developed and supported on an individual basis. What I have said here today is that we need to better understand the entire area, so that the results of what we finally do can be better prophesized. We don't need to know everything, but we need a good deal more information than we presently have.

Q. In terms of the irreversible damage done, what is the share of the responsibility borne by the intellectual producers, the scientific and technological community, and the users, the industrial community?

Cong. Daddario: I wouldn't dare to make such a judgement. I would hope that we have not yet reached the point where our society is not considered in total. I see our society bound together and operating in a democratic process, so that the knowledge-producing mechanisms at the conceptual level must be related to that which needs to be put together to provide for use by the consuming public. What we must do is not to try to find a place to point the finger of blame, but rather to look at the whole problem, and make judgements as to how better to solve that problem. Obviously, the scientist can say that all he does is produce the knowledge, and the problems result from the way it is used. We could then point the finger at industry generally. On the other hand, I feel that the scientist simply cannot divorce himself from a sense of responsibility for his discoveries, and I do find that there is, in the scientific community, an unfortunate lack of full participation in the political process. There should be, from that community which possesses many people of great wisdom and great compassion, a broader participation, which would be beneficial to all activities both in and out of government. Many of our committee advisers have come from the scientific community, and the type of help that they have given us does lead to a better legislation. I find also that these producers and the industrial users can work together, and that the product of their overall thinking is often extremely profitable.

Q. What about the responsibility if the secondary effect is due to personal misuse or abuse of the product, rather than to the product itself?

Cong. Daddario: That is an extremely difficult question to answer. In fact, this problem causes us considerable difficulty throughout our society, because the individual can and does say, "I am being affected by what you're doing." I can't give a precise answer, but I can say that, in developing a technological assessment capability, we should allow people who have this concern, early in the ballgame, to have their full chance to participate. Perhaps this could be through public hearings. But, we should try to reach these people first, rather than produce legislation, which is then reacted to in a highly emotional way.

Q. Should we not be concerned with a system approach to this problem i.e., an awareness of the quality of the data presented as well as the packaging of the data, so that it can be made maximally useable for all?

Cong. Daddario: You've made the point better than I could. We must take the overall product and, in using it, we must insure that there is greater

quality in everything that happens beneath it. We do have to use a systems approach in this area, as I indicated in my remarks.

Q. In backward countries, we have seen a situation where, as the rate of technological advance increases, it is balanced out by a corresponding increase in the rate of need. Do you see in the next 5-10 years, that the rate at which we will attempt to alleviate environmental problems (as expressed by congressional appropriations) will be outstripped by the rate at which we are degrading our environment? Will the boundary limits of what we can do in this way be budgeting? Must we again look to science for new solutions to new problems?

Cong. Daddario: I wish that I were wise enough to answer your question with all its many elements, but I'm afraid that I can't. I do agree with you that the answers to our problems lie in more knowledge, not less, and I sound the bells of warning here because I do believe that more support must be stimulated in this area. Whether or not we'll be doing enough to stay ahead of the degradation of our environment is something that each of us will have to judge, but an overall value judgement will probably be impossible. I do think that we must take into consideration a great many things. We need to use our technology much better. Within this context, the population growth is an extremely vital matter. We need to take a responsibility that goes beyond our borders, especially in the underdeveloped countries, and I do see signs that we can keep ahead. We are not at the peril point yet. There are a multitude of programs which are designed to develop better international solutions. The International Biological Program is one which is underway and will give us international information for our environmental programs of a kind that we haven't had. We have funded 15 million dollars this year for the International Decade of Ocean Exploration, again fulfilling a need related to what you asked. There is also international activity underway on world-wide meteorological forecasting. Overall, the needs of the future will require greater planning, better use of our knowledge and our technology, and better help to other countries.

Q. Is there any hope for Congress reinstating the State Technical Services program, which helped small business and the public?

Cong. Daddario: I was one of the persons in the Congress who was instrumental about starting that program in the first instance. It was proposed through the Undersecretary of Commerce, Dr. Herbert Holloman, who is now President of the University of Oklahoma. I think it was a very good and useful program, and I regret that it is not being funded this year. We are trying to develop support in the National Science Foundation for an activity which is somewhat analogous to that. The problem is to get sufficient funds at this time. I know that we have recommended ½ million dollars for a state-related science policy and planning program in this area. I think that program will grow. But one of the reasons that I strike the warning here is because much is going on in this direction. Not only is the Technical Services program being cut out, but a multitude of other programs are being eliminated in many of the agencies, on the order of tens of millions of dollars. So this is apparently a good time for cutting programs, not building new ones. But there is hope for the type of program with which you're concerned in the budding NSF science policy and planning program.

AIR FORCE SYSTEMS COMMAND COMMENTS ON TECHNICAL INFORMATION SYSTEMS

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INTRODUCTION

As you can see from my title, I represent the Director of Laboratories of the Air Force Systems Command. Therefore, my comments regarding Information Systems will be primarily oriented towards "technological" information, involving the early phases of research and development. This theme will then be consistent with the basic mission of the Air Force Systems Command which is the transfer of new technologies into defense systems.

We are responsible for the Air Force exploratory development (which is sometimes referred to as applied research) and the advanced development programs, and they can best be accomplished by an aggressive R&D program which:

a. Identifies new technologies from basic research.

b. Evaluates available technologies versus defense needs.

and c. Recommends to Air Staff in the Pentagon and to the Department of Defense those technologies which should be carried into advanced and engineering development.

With this charter and an organization of about 6000 people, involving a dozen R&D laboratories, and a budget of approximately $450 million annually, it becomes rather obvious that we not only use a lot of paper -- we help create it, especially since our basic products are technical reports documenting our efforts for the benefit of those people in engineering development or systems acquisition who acquire our aerospace hardware. We are inherently involved in technical information systems as a prime contributor as well as a prime user

whether we like it or not.

The basic aspects of technical information systems that seem to concern me the most happen to be the handling and processing of technical information, so I'd like to present my views:

In discussing technical information handling and processing within the Air Force Systems Command organizations, it will be helpful if I briefly describe the way we plan and report the results of our research and development (R & D). As you might imagine, this is accomplished with certain technical reports. The principal ones are the DD Form 1634, "Research and Development Planning Summary," and the DD Form 1498, "Research and Technology Work Unit Summary." The Form 1634 is used as a research planning document covering a fairly broad segment of technology which we define as the project and/or task level. Once these planning documents are approved, the project/task is sub-divided into more manageable and specific areas of work -- which are called the work units. Immediately upon initiation of any new effort, one of the first items required is a DD Form 1498, which describes and reports the effort and is forwarded to DDC to become part of the Work Unit Information System. Of course, we also have what is probably the best method of reporting the results of R & D, by technical reports. These reports are required to document the results of each Research, Development, Test & Evaluation (RDT&E) effort and/or work unit, including those terminated with incomplete, inconclusive, or negative results.

Now how do these three items -- planning documents, work units, and technical reports -- all interrelate? This will depend to a large extent upon your immediate problem and how pressed for time you are. Part of the intrinsic value of these documents and reports is their relationship to each other. For example,

prior to commencing a new piece of work -- whether in-house or by contract -- we require that a search be made of the Work Unit Information System, primarily to keep from re-inventing the proverbial wheel and to assess the state-of-the-art. By using this system, we are able to check and see if the Army, Navy, National Aeronautics and Space Administration (NASA) or even another Air Force Lab is doing work along similar lines. Not only do we find out who is already doing work in a specific area, but we are able to zero-in on the state-of-the-art by using the Work Unit Information System to help define the parameters for a literature search. The Work Unit Information System is querried by technical subject; and then using information items from those work units (e.g., contract numbers, principal investigators, names of companies, etc.), the literature search can be narrowed to the most current and relevant technical documents; eliminating much of the "noise" (nonrelevant reports) that usually fall out in a literature search.

At the present time, we are in the process of reviewing the 1634s and 1498s covering the exploratory development program. This has been necessary because of Section 203 of the 1970 Military Procurement Authorization Act, which requires that all Department of Defense research have a <u>direct and readily apparent</u> relationship to the DOD mission. While this requirement has created some additional workload on our Laboratories, I feel it has been a blessing in disguise in that it has high-lighted as never before the scrutiny received by the Work Unit Information System, both from Congress and other governmental agencies. Also, it has pointed out one of our major problems -- that of relating exploratory development being done today to specific defense systems. Generally, technology being pursued today will not be seen until 5 to 15 years from now. Experience has shown that this is usually the case; for

instance, a research item may be investigated for 2 to 4 years in exploratory development, 1 to 3 years in advanced development, 1 to 3 years in engineering development, and anywhere from 1 to 4 years in the acquisition or procurement cycle To overcome this lack of visibility, our planning people are now trying to develop a matrix based on the Air Force's long-range requirements, which will equate work units to potential defense weapons systems. One of the foreseeable uses for such a matrix is the following: suppose a particular type weapon system is cancelled for one reason or another. Immediately, all those work units which supported this system and no other could be readily identified and then reduced or terminated as the situation required.

But to get back to the Work Unit Information System -- we have also found it to be an excellent coupling device. Today, it is impossible for one individual to know across-the-board who is working in his particular field of endeavor or who is working on a particular technical problem. A quick search by subject matter will give -- depending upon how much work is being done or what has been done by Department of Defense (DOD) or NASA on the subject -- the names and phone numbers of one or more contacts -- which, in turn, may lead to many others. As you know, the value of person-to-person information exchange is without question the most effective medium of transfer today. Another frequently asked question is how many contracts/grants do we have with a particular academic institution? What companies have R&D contracts over a certain dollar value? A search might even be made to see what work is being performed by contract for each of our Laboratories. This information might then be used for comparison purposes prior to an Independent Research & Development (IR&D) Program Review of an industrial firm. These are just a few of the many and varied uses of the Work Unit Information System that are made daily throughout

the Air Force -- and it doesn't take much imagination to see that you could also have similar questions plus many more.

RECON CENTRAL

Another information processing system that may be extremely useful to you is our "RECON CENTRAL" operated by the Reconnaissance Applications Branch of the Air Force Avionics Laboratory. Recon Central is a technical information storage and retrieval system oriented to the reconnaissance, surveillance, and avionics technology, and consists of key personnel, a set of data bases; and an IBM computer with peripheral equipment. The data bases include over 50,000 documents applicable to the avionics community and all DD Form 1498s (which are the Research and Technology Work Unit Summaries I mentioned earlier) under the management control of the Avionics Laboratory. As an indication of currency and growth, I might add that approximately 8,000 new documents are being entered into this reconnaissance data base each year.

To better understand the Recon Central function, it is necessary to recognize that a definite interface takes place between technology and military systems within the Department of Defense. Within the Avionics Laboratory, this interface is maintained through the use of both people and data. One of the tasks of the Avionics Laboratory is to maintain cognizance over new and/or existing technology and to take action to implement the generation of new technology.

Another prime objective of Recon Central is to provide a systematic, real-time method for maintaining surveillance over the full spectrum of technology to ensure optimization of the technology-military systems interface. The volume of data involved in this task necessitates an automated, computerized approach.

What Recon Central is doing, in effect, is acting as a filter and as a center of excellence in a specific field. True, it closely parallels some functions typical of an Information Analysis Center, with which I'm sure you are all familiar, but it was developed over a period of time to fulfill a very special and important need for the Air Force. I won't go into details on the importance of aerospace reconnaissance to defense, suffice it to say that it is necessary. So as our sophistication with sensors -- optical, electronic, etc. -- and with sensor platforms grew, the information on these technologies increased on an exponential curve. It was therefore necessary that we develop an information handling system which would sort, quantify, filter, and store information. A prime consideration and one which I consider the most important is the information system's response to its users. Response must be rapid and contain meaningful information.

CIRCOL

Another important and useful information system within the Air Force Systems Command is our CIRCOL System, which contains foreign scientific and technical information. This system is operated by our Foreign Technology Division and is known as the "Central Information Reference and Control On-Line (CIRCOL) System." The Foreign Technology Division (FTD), Air Force Systems Command, has been designated as the executor or operational agent for the Department of Defense Scientific and Technological Intelligence Information Support Program. The purpose of this program is to encourage the development of a coordinated intelligence system addressed to the needs of the technical intelligence analyst, the R&D scientist and engineer, the industrial scientist and engineer, and the academic community engaged in government-sponsored work, with priority in that stated order.

The program receives its guidance from a policy committee composed of representatives from the DDR&E, Army, Navy, and Air Force; and it is chaired by the Defense Intelligence Agency. The Foreign Technology Division was chosen to be executor because of the advanced state of development of its Central Information Reference and Control (CIRC) System. The system is a semiautomated computer-based, information storage dissemination and retrieval system which provides bibliographic references to foreign scientific and technical documents in response to user requirements, on a need-to-know basis. Access to CIRCOL is normally provided through your contract monitor or Air Force Contracting Officer, who in turn queries the system through the Deputy for Foreign Technology located at our product Divisions and at some of our Centers and Laboratories.

Previously, "noise" was mentioned in relation to technical information. By this, is meant information which is not pertinent to specific questions, and is included of course those documents and reports supposedly written on a subject, but which really do not provide very much information because they are much too wordy, too garnished with filler material, and too poorly organized. This is the one reason we must be ever concerned with technical content and the need for adequate filters and centers of excellence on specific areas of technologies, such as our Recon Central which has proven so valuable.

I might state at this point that formal information dissemination centers, using the "warehouse technique," are rated among the least efficient programs. One reason these centers are rated so low is that they are usually based on a mandatory requirement to submit reports on all technical programs. This requirement frequently results in a glut of trivia; and unless extremely skillful and knowledgeable personnel act as filters, users of such a system are inundated with irrelevant and unusable data. And with the exponential increase in

the amount of new technology being generated and reported today, the problem will compound itself unless means are found to make the formal systems more effective.

As is well known, in management the decision-making process is fed by a multitude of inputs -- generally, no one report, document, or other bit of information stands alone. This is our attitude toward the Work Unit Information System. While it contains many data items, the system is not a panacea either for management or for the scientists and engineers. At the present time, we are aware of several glaring deficiencies in this system and are working to correct them. This is, however, a slow process as can be imagined.

Just to illustrate that people in the Air Force have their information problems and gripes, here are a few typical remarks and examples:

--Lack of quality in the tibs and work unit searches; generally too much nonrelevant material. We are also concerned with the slow response time on requests for searches.

--Impact of user charges and how they affect the individual scientist and engineer, such as: the nuisance factor of justifying need for hard copy -- a lot of people we feel are now doing without information because of user charges. Also, the possibility exists that, after paying for the document, it does not contain useful information.

--Microfiche equipment limitations.

a. Good portable readers are still bulky and expensive.

b. There is no longer the ease of tossing a report in your briefcase to study overnight, on a weekend, or on a trip.

c. Microfiche does not lend itself to scanning a document, or to the ability to make notes in the margin. No image rotation capability, except on

the more expensive readers.

d. Equipment as yet is poorly designed in respect to illumination and screen position -- imagine the neck strain on an individual wearing bi-focals trying to read a lengthy document.

e. During this austere budget period, our organizations experience difficulty in justifying their requirements for microfiche equipment.

The potential exists for deriving more benefits from R&D through improving the technology transfer process. While this may appear to be a "truism" type statement, numerous studies of various aspects of the problem tend to substantiate this remark. In general, however, none of these studies provides any "guaranteed" way of improving the process. With respect to the identification phase, improvement appears to be related to the resources expended, i.e., the more funds provided to contractors for identification, the more new technology items that will be identified. The dissemination process suffers perhaps from overstudy in the sense that all too frequently when a new dissemination method is established, "new" storage and retrieval procedures must be "invented." Most of the studies imply that greater standardization of storage and retrieval processes, along with more meaningful indexing and sorting methods, are areas for improvement.

The remaining parts of the transfer process -- evaluation, application, and utilization -- are areas where the greatest gains could be realized, but at the same time are the most difficult to achieve. Better evaluation techniques to indicate the more meaningful technology could simplify the whole process, but the significance of new technology may not be recognized until five or more years after its discovery. While widespread dissemination from the producers to potential users can aid the application process, a stated need by the user is considered

by most authorities to be the best way to insure utilization of the technology.

Consistent and clear high-level support for technology transfer is necessary but is difficult to justify because of the inability to demonstrate how well the system is working. This difficulty is partly caused by the passive nature of most systems, i.e., they supply information to users when requested, but with the exception of the DOD Information Analysis Centers, they do not "apply" technology to meet the user's needs. Another and perhaps more substantial reason is that an extensive part of the technology transfer process is of an informal nature and cannot be easily documented.

SUMMARY

This presentation highlighted the concern in the Air Force Systems Command to develop, identify and transfer new technologies into defense systems; and emphasized the concern over handling and processing aspects of the technical information system by showing the interrelationship of planning documents, work unit summaries and technical reports. Two information systems were discussed: Recon Central, which is operated by the Air Force Avionics Laboratory; and the Central Information Reference and Control On-Line (CIRCOL) System, which is operated by our Foreign Technology Division. All of these items are facets of our technology transfer process.

In conclusion, we are entering an era which will foster not only a more open exchange of scientific and technical information, but also one of easier access to our R&D planning information -- something long advocated by many of us in the R&D community. As a Nation, we are only as strong as our economy -- and tomorrow's economy depends to a certain extent upon new products and services based on today's technology. We believe that by making available to industry more of our planning information concerning Air Force technical problems and our technology needs for tomorrow, we will be accomplishing two things: first, more mileage on our defense dollars, and secondly, creating

the probability of more technology spin-off which can be used by industry for new products and services

*ABSTRACT OF TECHNOLOGICAL GATE KEEPERS

DR. PETER GERSTBERGER, SLOAN SCHOOL OF MANAGEMENT, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASSACHUSETTS

The rapid growth of science and technology has precipitated numerous problems in the storage, retrieval, and dissemination of technological information. Technical design is a synthesis of diverse pieces of information within a framework of market constraints. As such, the quality of a design effort is dependent upon the engineers' ability to access, retrieve, and synthesize relevant scientific and technological concepts. The role of written and oral channels as carriers of this technical information was appraised.

The complementary role of the technical literature and certain oral sources was examined. Specifically, key individuals have been identified in organizational communication networks who transport new information across the organizational boundary and translate it into a language understood by colleagues. Numerous characteristics of these key people -- the "gatekeepers" -- were presented and discussed.

*The full paper was not made available for publication.

AN INDUSTRIAL INFORMATION & RETRIEVAL SYSTEM

J. J. MAGNINO, JR., IBM, ARMONK, N. Y.

INTRODUCTION

After many years of developing, testing and analyzing information retrieval techniques and systems -- their benefits, shortcomings and the corporate needs, IBM organized the IBM Technical Information Retrieval Center -- ITIRC -- in late 1964. Its purpose was to service the information needs of IBMers, centralize information retrieval operations and reduce the costly duplication of input processing, computer processing and human effort that existed in decentralized operations.

We believe these goals were quickly achieved, and attention has turned to improved service, maximum efficiency and minimal costs. Normal text searching -- any or all combinations of words, numerics, sentences, phrases, indexes, codes, etc. using a computer -- has proven very powerful and precise. The services possible and implemented using normal text searching are retrospective searching, current awareness, computer indexes - publications. An important by-product for those planning an information system is our TEXT-PAC package. This is an IBM S/360 Type III program which is available to IBM customers.* However, it must be emphasized that ITIRC is an internal IBM system serving over 35,000 IBMers yearly on a total cost recovery basis.

To accomplish this total service and yet provide the service in a meaningful time, we have a sub-center in the SDD laboratory in La Gaude, France, equipped with TEXT-PAC and copies of master files which are updated via teleprocessing -- computer to computer transfer of magnetic tape records. It is a carbon copy center to service IBMers located in Europe. The total scope of ITIRC service is presented in Illustration 1.

To aid the reader in understanding the total process involved, Illustration 2, Information Flow Current Information Selection System, is referred to. The journals referenced are those trade and professional journals which we have received the publisher's permission to process into our system. The keying operation encompasses keypunching, Magnetic Tape/Selectric Typewriter (MT/ST), and the Administrative Terminal System (ATS), all of which are used in our input processing. We also process machine readable tapes such as those sold by Chem Abstracts, Engineering Index, U.S. Dept. of Commerce.

Abstract processing using the keypunch mode is exemplified by Illustration 3. The upper half illustrates the computer formatting -- no words broken, paragraph arrangement easy to read. The lower half illustrates the variable word length, variable paragraph text punching. Illustration 4 demonstrates the computer assistance in comparing all input words to a master list of correctly spelled words and indicating on the right side the list of those words that did not match and their position (paragraph and word) in the printout.

*TEXT-PAC S/360 Normal Text Information Processing, Retrieval and Current Information Selection System - 360D-06.7.020. Can be ordered from IBM Program Information Dept., Hawthorne, New York, USA 10532, Attention Program Control Desk.

INTRODUCTION (continued)

In addition to the input processing and the care exerted to assure faithful duplication of the original document and accuracy of entry, we also arrange our data for searching (current awareness or retrospective) in a very special form. All text (alpha and/or numeric) is put serially on tape or disk record by record. Each record contains the abstract or total text and the word arranged alphabetically by word length with reference information such as location of the word in the sentence, paragraph, whether it was upper or lower case, etc. Reference Illustration 5. Then all questions are run simultaneously, 1-200, against each record. Using word length, there is no need to compare a 5-letter word against words other than 5 characters.

CURRENT AWARENESS

To assist the professional in keeping pace with new ideas and information which enhances his career and his ability to perform, we developed and have had in operation for six years a computerized system to match IBMers profiles, or work descriptions, against the new documents being processed in the center. The match, or hit, notifies the users of those documents relating to their work. It is a Selective Dissemination of Information service, but named CIS -- Current Information Selection -- to differentiate it from the normal SDI systems that match only on key words or codes, since the text is searched in the CIS system.

The system is dynamic to reflect the constantly changing assignments, locations, technical interests and shifts in technology. There are approximately 4,000 profiles (a profile is a combination of words and search logic describing work oriented interests of an individual, project or grouping of individuals) in IBM Armonk, and over 600 profiles in IBM La Gaude, France. These profiles are compared to over 2,000 abstracts each month. To do this in a meaningful way, we provide search logic to permit us to search for individual words, combinations of words, word stems, word possibilities, etc. - Illustration 6, TEXT-PAC Normal Text Logic, provides a sample of this capability. An individual requesting our CIS service completes a form which requires him to briefly describe, in his own words, his assignment. This form is then countersigned by his manager. Then it is reviewed by one of our Information Retrieval Specialists, a professional who serves as the interface between the users and the computer, and through his knowledge of the data bases and his understanding of the work description constructs a computerized profile as exemplified in Illustration 7.

Feedback and a customized service are important to the system, therefore, we use the techniques that provide both. When a hit

(match between profile and document) is made, the document abstract is printed out on the left hand card of a double card, continuous card form. The document title, number, name of individual, his division and location are printed on the attached right-hand card which is the order and response feedback card.

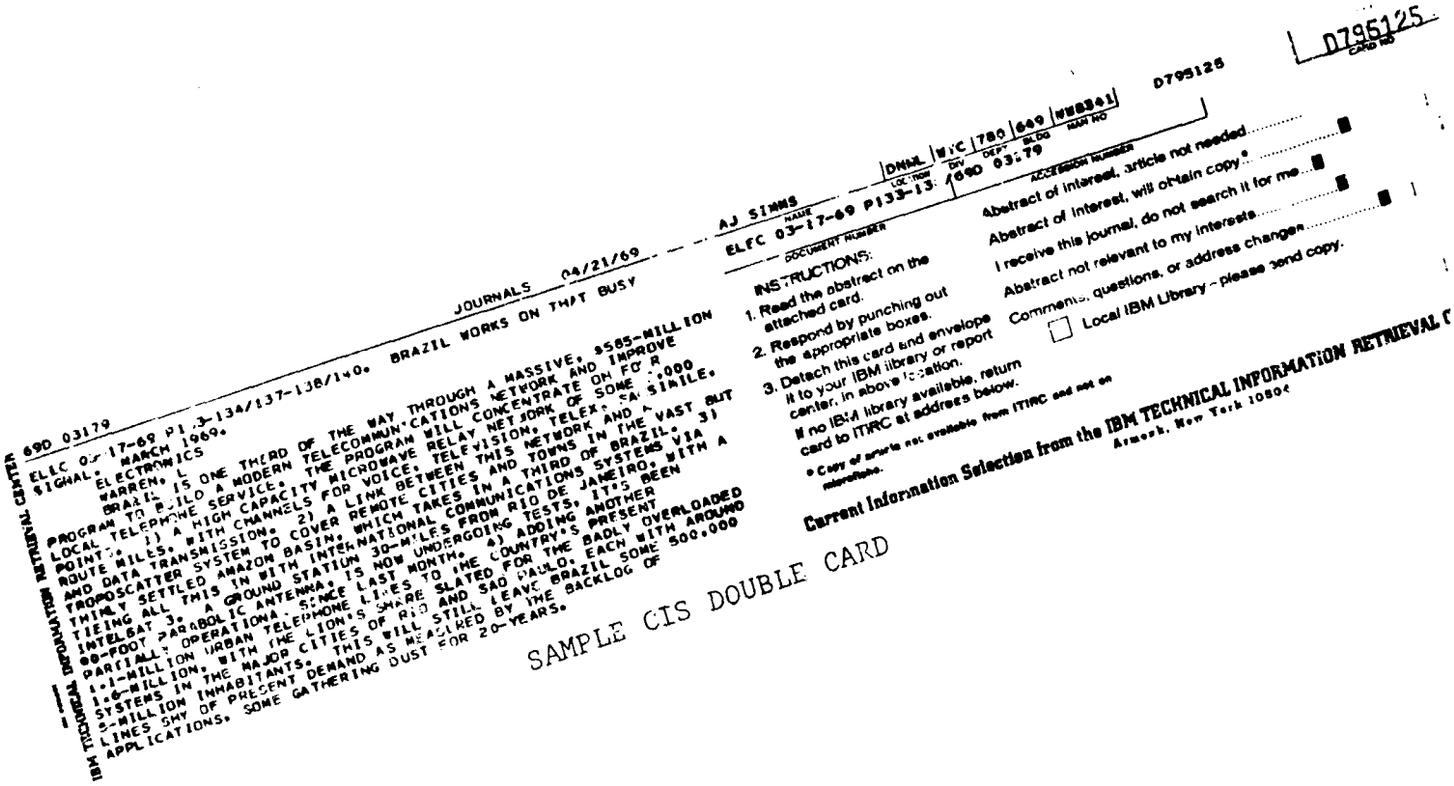
The feedback card is a pre-scored IBM Port-a-Punch R card which enables the users to select the desired line and indicate his response by pushing out with a pencil or ball point pen the pre-scored chip. We then have a machine readable record for processing. If the individual indicates he wishes to see the entire article - we have printed the author's abstract on the left-hand card which he receives - the local library to which the response cards are returned either circulates a copy of the document to him or secures a reprint for his use. Since we have provided libraries with their own master microfiche set of all those documents that, copyright permitting, are centrally microprocessed, they have the capability of fast response to his need.

Of interest is the growth within IBM of this service and the cost reduction capability due to improved batch processing and volume savings.

CIS HISTORICAL GROWTH

	1966	1967	1968	1969	1970 (est)
Profiles	1,720	2,450	3,420	3,810	4,500
CIS Notices	530,000	1,140,000	1,730,000	1,880,000	2,000,000
Notice Cost	$.88	$.32	$.26	$.24	$.24

CIS satisfaction indicated by users in is the 80% range
CIS search average/profile = 1.5 sec/profile/1,000 journal doc.
The cost of a CIS notice is $.24 or an average of $120 per profile.



SAMPLE CIS DOUBLE CARD

RETROSPECTIVE SEARCHING

When our professionals need a state of the art review, background for a new assignment, interest in a new technology or locating who is working on what/where, a complete search of the data base is made by matching the question against the abstracts or total text stored in the computer. The matching logic is that used in the CIS system. The nature of the request dictates which of the textual data bases are to be searched. Searches are batched and run daily to provide a low cost, but 24-hour service. The local libraries receive requests for searches, they can write the search logic and send it to the center, or the requester can phone or write the center directly. The system is easy to use, responsive and efficient. We have a 24-hour phone available to accept search requests.

An average of 40-50 searches are processed daily. There is an average of 64 answers per question. The cost is a very modest $14.00 per search. User satisfaction has registered in the average 90% factor, which we believe is due to the power of textual searching rather than category or classification searching.

MICROFORMS

Historically we used microfilm (microfiche since 1967) to capture the original document to supplement the often limited supply of printed copies, reduce the space required in the center and at each library location to store the original documents, and to reduce mailing costs. We are able to respond promptly to users requests for documents. The collection now is in the neighborhood of nearly 3 million pages of data and is available in the major IBM libraries for instant local use. Two tab card files contain this data, which would be equal to the equivalent of 130 five-drawer files packed with documents.

The CIS feedback card is used to fill requests; memos or phone calls are also accepted. Over 150,000 reports on microfiche have been sent to individual users since ITIRC's inception.

ITIRC PUBLICATIONS

To help expand the local resources of our IBM technical libraries and information centers, we use computer produced reference tools such as indexes and abstract bulletins. Of value is our KWOC (Key Word Out of Context) of titles, which is prepared monthly and cumulatively. We also distribute Author - Source - Report Number and other indexes, which establishes the library as direct interface between ITIRC and the local users.

We have prepared and issued special indexes for specialized groups such as IBM Standards indexes for use by designers, Standards personnel, etc. Computerized publications and computer to microfiche has found a significant use in IBM.

TERMINAL SEARCHING

We have an internal prototype terminal searching system that provides textual searching from remote video or printing terminals. We do not use the search format as indicated in Illustration 5, but had to use an inverted file -- all words alphabetized and carrying reference data concerning document occurrence, location, upper/lower case, etc. The text logic is used and to assist terminal users, another logic "ROOT" was added to display word roots and endings to these roots as they occur in the file. This is demonstrated in Illustration 8. This prototype Terminal TEXT-PAC system is in operation within IBM, but is not included in the Type III TEXT-PAC program package.

CONCLUSION

We have in operation a large scale information processing, retrieval and dissemination system that is constantly growing. For example, Illustration 9 shows the factorial growth of the major services. The CIS profiles have grown by a factor of 2.6 and the CIS notices show an increase in data by a factor of 3.7. Illustration 9 demonstrates the cost reduction we achieved at the same period of growth.

We service over 35,000 IBMers, but are available to the 250,000 IBMers. Our services are based on our normal text searching system which uses the computer to search every word of input, title, bibliographic data, index terms and the complete text or abstract. Logic is used -- and, or, not, adjacency, within same sentence, word roots, phrases, etc. As a result, the search capability is extremely flexible and precise. Your question answers can range from a bibliography to pinpointing a specific item. The shotgun or rifle approach is a choice of the logic available.

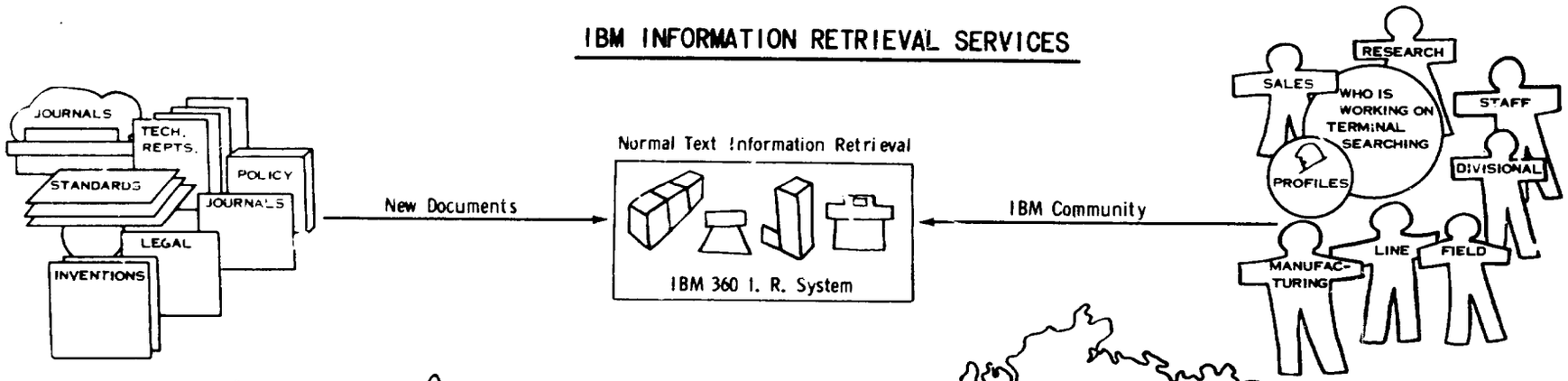
TEXT-PAC programs are written in BAL (Basic Assembly Language) and operate under OS/360 (MVT or MFT). The system requires a 256K System/360, a card reader, a printer, four 9-track tape drives and one direct access system. As indicated earlier, TEXT-PAC is available to IBM customers, but the prototype Terminal TEXT-PAC is not.

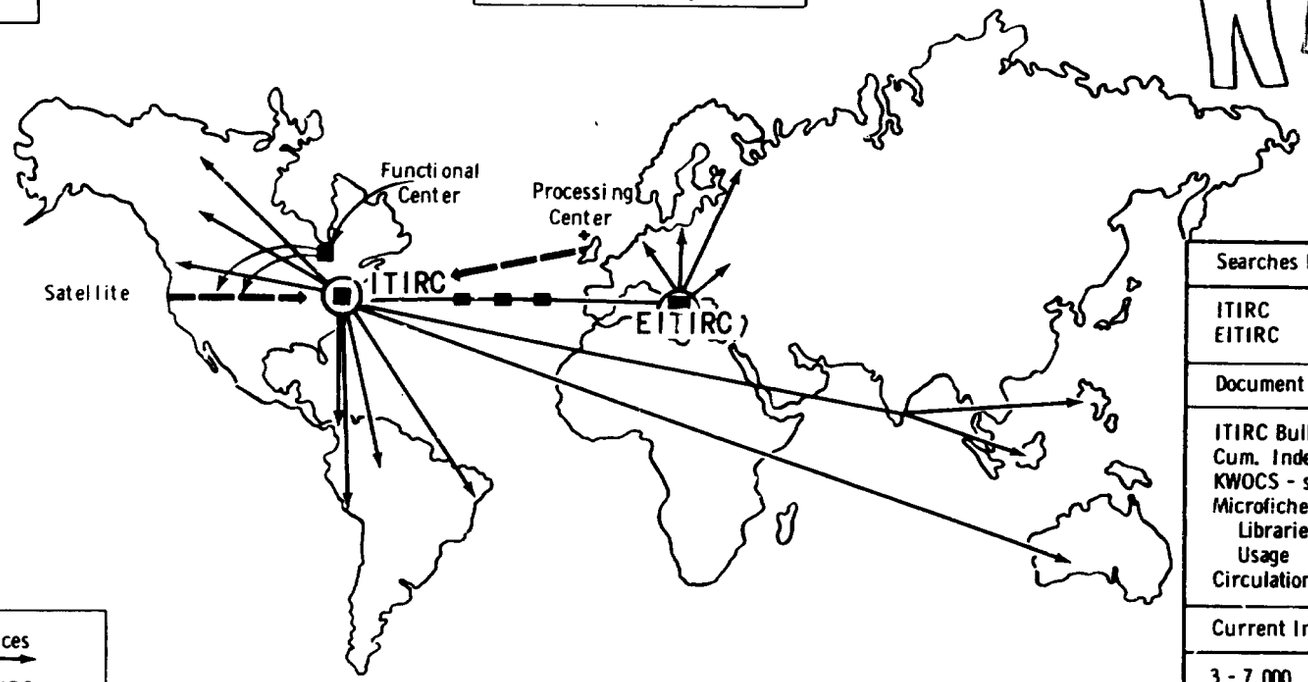
During the six years since its inception, ITIRC has grown in volume of data, number of personnel served and comprehensiveness of service. We have accompanied this growth with a very realistic

approach to cost center analysis. The center pays its way by complete cost recovery. Naturally all our financial analysis, controls techniques would not be meaningful except in the academic sense unless the services provided were wanted and the users satisfied.

Based on our experience to date, it would appear that the price is right, the service wanted, and the users are satisfied with the results.

IBM INFORMATION RETRIEVAL SERVICES





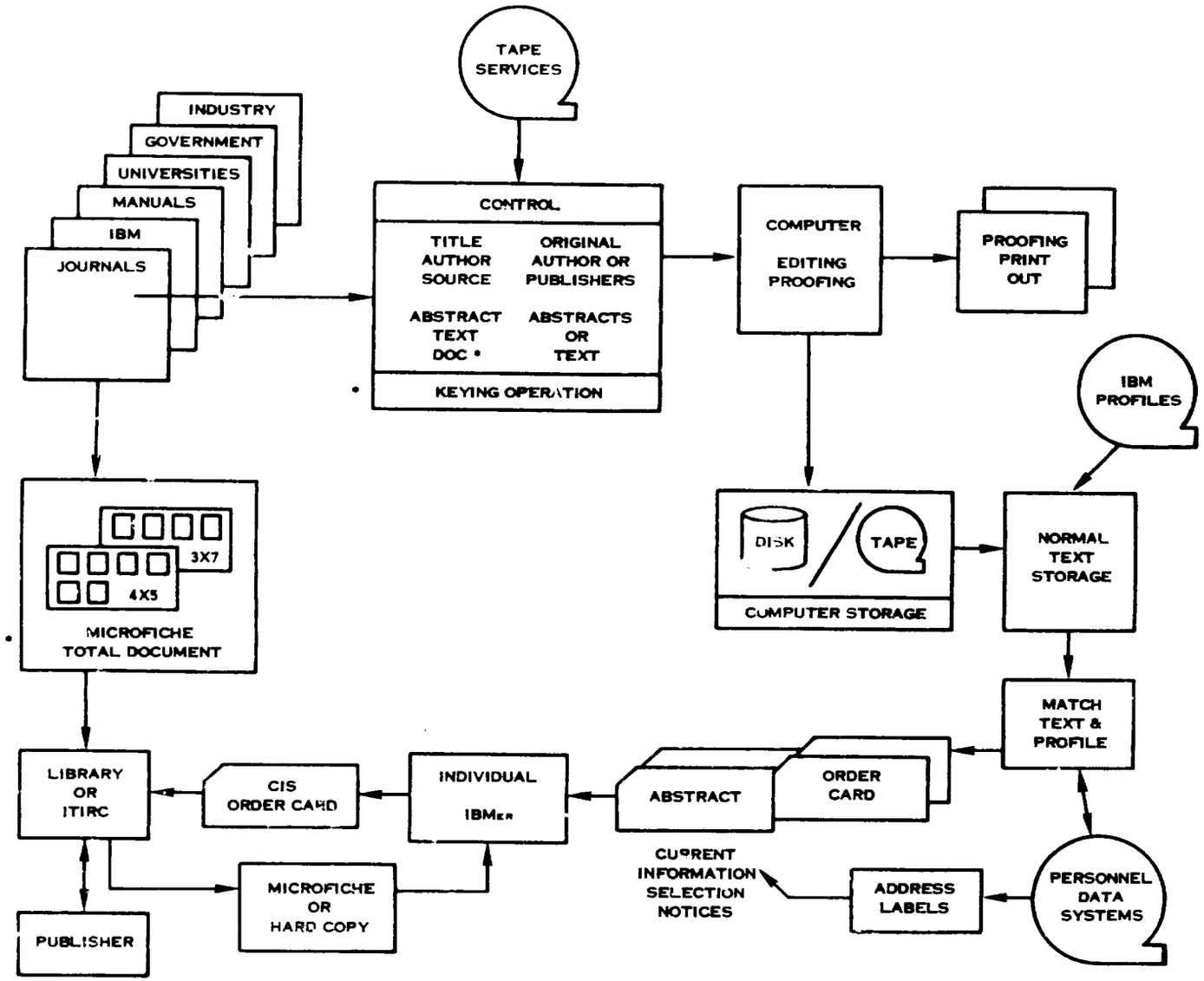
ITIRC Services
Input to ITIRC
Functional Services
Sub Center

Searches Retrospective	
ITIRC	9728/yr
EITIRC	2494/yr
Document Services	
ITIRC Bulletins	4,446/yr
Cum. Indexes	633/yr
KWOCS - specials	70
Microfiche	
Libraries	588,042/yr
Usage	49,735/yr
Circulation Ctr. Cards	23,000
Current Information System	
3 - 7,000	IBMers
23	Countries
1,900,000	Notifications/yr
IBM USERS	
1965	9,970
1969	31,100

Illustration 1

Illustration 2

INFORMATION FLOW
CURRENT INFORMATION SELECTION SYSTEM



* ONLY DOCUMENTS WHOSE COPYRIGHT IS NOT REQUIRED OR PERMISSION HAS BEEN RECEIVED.

AI MEMO-65. A Program to Play Chess End Games. August 1968.
Stanford Univ., Calif.

Huberman, BJ
Stanford Univ., Calif.

NOT REPRODUCIBLE

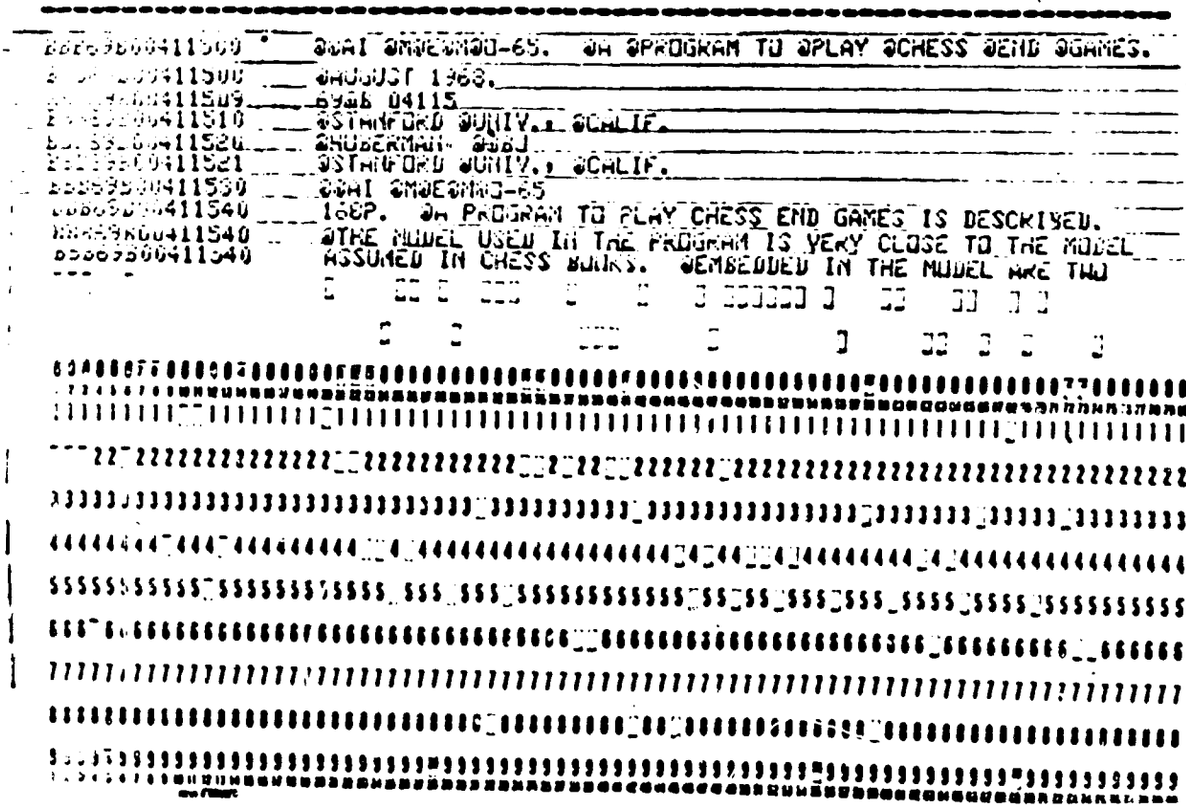
AI MEMO-65

168p. A program to play chess end games is described. The model used in the program is very close to the model assumed in chess books. Embedded in the model are two predicates, better and worse, which contain the heuristics of play, different for each end game. The definitions of better and worse were obtained by programmer translation from the chess books.

The program model is shown to be a good one for chess end games by the success achieved for three end games. Also the model enables us to prove that the program can reach checkmate from any starting position. Insights about translation from book problem solving methods into computer program heuristics are discussed. They are obtained by comparing the chess book methods with the definitions of better and worse, and by considering the difficulty encountered by the programmer when doing the translation.

Chess Problem Solving

693 04115



VII

BBB 6980 04115

00 AI MEMO-65. A Program to Play Chess End Games. August 1968.

09 698 04115

10 Stanford Univ., Calif.

20 Huberman, BJ

21 Stanford Univ., Calif.

30 AI MEMO-65

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41 The program model is shown to be a good one for chess end games by the success achieved for three end games. Also the model inables ENABLES us to prove that the porgram PROGRAM can reach checkmate from any starting position. Insights about translation from book problem solving methods into compoter COMPUTER. program heuristics are discussed. They are obtained by comparing the chess book methods with the definitions of better and worse, and by considering the difficulty encountered by the programmer when doing the translation.

60 Chess Problem Solving

01 •	00	1	1	AI
01 •	00	1	2	MEMO-65
01 •	10	1	2	UNIV
01 •	10	1	3	CALIF
01 •	30	1	1	AI
01 •	30	1	2	MEMO-65
01 •	40	3	8	PREDICATES
02 •	40	4	4	HEURISTICS
03 •	40	5	10	PROGARMMER
04 •	41	2	12	INABLES
05 •	41	3	6	PORGRAM
06 •	41	3	9	CHECKMATE
01 •	41	4	2	INSIGHTS
02 •	41	5	3	COMPOTER
03 •	41	5	5	HEURISTICS
04 •				
05 •				
06 •				
07 •				
08 •				
01 •				

NOT REPRODUCIBLE

Illustration 4

Illustration 5

NOT REPRODUCIBLE

THE DANGERS OF ELECTRICAL LIGHTING. NOVEMBER 1889. NORTH AMERICAN REVIEW.

EDISON, TA

THERE IS NO PLEA WHICH WILL JUSTIFY THE USE OF HIGH TENSION AND ALTERNATING CURRENTS, EITHER IN A SCIENTIFIC OR A COMMERCIAL SENSE. THEY ARE EMPLOYEED SOLELY TO REDUCE INVESTMENT IN COPPER WIRE AND REAL ESTATE.

LENGTH	WORD	PARAGRAPH #	WORD #	SENTENCE #	U/L CASE
1	a	400/30/1		North	100/8/2/1
	a_	400/33/1	5	sense	400/35/1
	in	400/29/1		There	400/13/1/1
	in	400/43/2		copper	400/44/2
	is	400/14/1		Edison	200/11/1/1
	no	400/15/		either	400/28/1
	of	000/3/1	6	estate	400/48/2
2	of	400/22/1		reduce	400/41/2
	or	400/32/1		Review	100/10/1/1
	TA	200/12/2/1-2		solely	400/39/12
	to	400/40/2		Danger	000/2/1
	and	400/25/1	7	justify	400/19/1
	and	400/46/2		tension	400/24/1
3	are	400/37/2		American	100/9/1/1
	The	000/1/1/1		currents	400/27/1
	the	400/20/1	8	employed	400/38/2
	use	400/21/1		Lightning	000/5/1
	high	400/23/1		November	000/6/2/1
4	plea	400/16/1		commercial	400/34/1
	real	400/47/2	10	Electrical	000/4/1/1
	they	400/36/2/1		investment	400/42/2
				scientific	400/31/2
			11	alternating	400/26/1
				1889	000/7/2

Illustration 6

TEXT-PAC

NORMAL TEXT LOGIC

LOGIC	DEFINITION	EXAMPLE
INDIVIDUAL WORDS	Any word may be searched	SCIENTIFIC TECHNICAL INFORMATION
OR	Equivalencies	INFORMATION OR DATA
ADJACENT WORDS	Juxtaposition	LIBRARY SCIENCE STATE OF CONNECTICUT
AND	Combinations	FAIR AND USE AND COPYRIGHT FAIR AND USE AND SPITBALL
SECURITY	Control	IBM CONFIDENTIAL SECRET
NOT	Negation	NOT DOW CHEMICAL
WITHIN	Positional	SCHLESSINGER 5th ANNUAL SEMINAR
MASKING	Truncation	MICROF$* finds: MICROFILM MICROFORM MICROFICHE <u>but</u> <u>not</u> MICRODOT
CONCEPTS	Logic Combinations	

Illustration 7

IBM

ITIRC CIS/Retrospective Question Sheet

WRITTEN BY: CHW PAGE NO.

	MAN NO.	MATCH	CLASS.	INITIALS	NAME	PF	LOC.	DIV.	DEPT.	BLDG.	ENTRY DATE	REVISION DATE		
CIS	839125	1		DJ	HALLERON		ARM	CHQ	777	75S	10/65	10/69	01	

	SEARCH NO.	MATCH	STAT.	CLASS.	INITIALS	NAME	LOC.	DIV.	DEPT.	DATE	MAX. NI?			
RETRO	PF													
	TR													
	ID	TITLE										C		
	NI					PF TR ID NI DATE							SEQ.	UPD.
		CON 1				CYBERNETICS* NOT-CONTROLLSS OR AUTOMATA OR CHESS OR HEURISTICS*							02	
		CON 2				GAMES WITH THEORS*							03	
		CON 3				ARTIFICIAL ADJ INTELLIGENCE							04	
		A 1				DECISION ADJ MAKING							05	
		A 2				RULES OR BOOLEAN OR RIGOROUS OR FORMAL OR MATHS*								
		CON 4				A 1 and A 2								
		CON 5				SIMON WITH HA								
		CON 6				NEWELL WITH A								
		CON 7				SHAW WITH C								
		CON 8				FOGEL WITH LJ								
		CON 9				MCCARTHY WITH JC								
		CON 10				SIMON WITH NEWELL OR A							13	
		CON 11				NOT CPAU							14	
	839125	END											15	

802 — 0219 — 0

2. JOB DATA (PLEASE PRINT OR TYPE)

Present job or project description and associated information needs:

I am a member of the INFORMATION SCIENCES Department, charged with developing advanced concepts in the following areas:
1) Cybernetics 2) Decision Making 3) Logic and Algorithms
4) Game Theory

I am interested in information about new applications and new theoretical advances in the above areas.

Illustration 8

SAMPLE TERMINAL SEARCHING

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SIGN ON, 03/12/70, 14:37
jjm,textpac.journals
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NOT REPRODUCIBLE

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0001 adj representative daddario

REPRESENTATIVE          61 OCCS,     60 DOCS
DADDARIO                 2 OCCS,      1 DOCS
   1 OCCS,      1 DOCS    PHRASE LEVEL

0003 or iia info-expo

IIA                  NO OCCURRENCES
INFO-EXPO            NO OCCURRENCES
NO DOCUMENTS

0004 with carterfone decision

CARTERFONE               3 OCCS,      3 DOCS
DECISION               243 OCCS,    131 DOCS
   2 OCCS,      2 DOCS    SENTENCE LEVEL

0005 and information industry

INFORMATION           1240 OCCS,    798 DOCS
INDUSTRY               563 OCCS,    391 DOCS
   36 DOCUMENTS

0004 root shari

SHARIF                   2 OCCS,      1 DOCS
SHARIKHIN                1 OCCS,      1 DOCS
SHARING                159 OCCS,     74 DOCS
SHARING'S                1 OCCS,      1 DOCS

0006 with carterfone decision

CARTERFONE               3 OCCS,      3 DOCS
DECISION               243 OCCS,    131 DOCS
   2 OCCS,      2 DOCS    SENTENCE LEVEL

0009 display all

0001 ADJ REPRESENTATIVE DADDARIO          1 OCCS,      1 DOCS
0003 OR IIA INFO-EXPO                                 NO DOCS
0004 WITH CARTERFONE DECISION             2 OCCS,      2 DOCS
0005 AND INFORMATION INDUSTRY                          36 DOCS
0007 OR TIME SHARING                   2988 OCCS,   1779 DOCS
0008 AND TIME SHARING                                  72 DOCS

0011 browse 0001

ENTER ALL OR ITEM NUMBERS SEPARATED BY COMMAS, OR ENTER EXPLAIN
explain
  1 TITLE        2 JOURNAL        3 AUTHOR        4 SOURCE        5 ABSTRACT
  6 INDEX TERMS
all
DO YOU WANT THE SYSTEM TO WAIT AT THE START AND END OF A DOCUMENT?  Y OR N.
no
DOCUMENT NUMBER: INTERNAL=    750        RELATIVE=     1
SCIE 12-13-68 p1249-1251.  Academic Science and the Federal
Government.  December 1968.
69D 00750
      Science (AAAS)
      Daddario, ED
      SCIE 12-13-68 p1249-1251
      The federal government and academic science are today engaged
as allies with the pressing challenge of the present.  America is
faced with many new physical, social, economic, and security
problems.  These problems and conditions will be neither removed nor
resolved without new tools, methods, and approaches.  Since we do not
have all the necessary tools, methods, and approaches, we must
develop them.  There is only one way to do that, and that is through
research, and people who have been adequately trained to do it.
      An address delivered 11 October 1968 by Representative Daddario
(Democrat Conn.) at the dedicatory dinner for the new Science Center,
Wesleyan University, Middletown, Connecticut.
      13-Management Sciences     Government     Education
END OF DOCUMENT.
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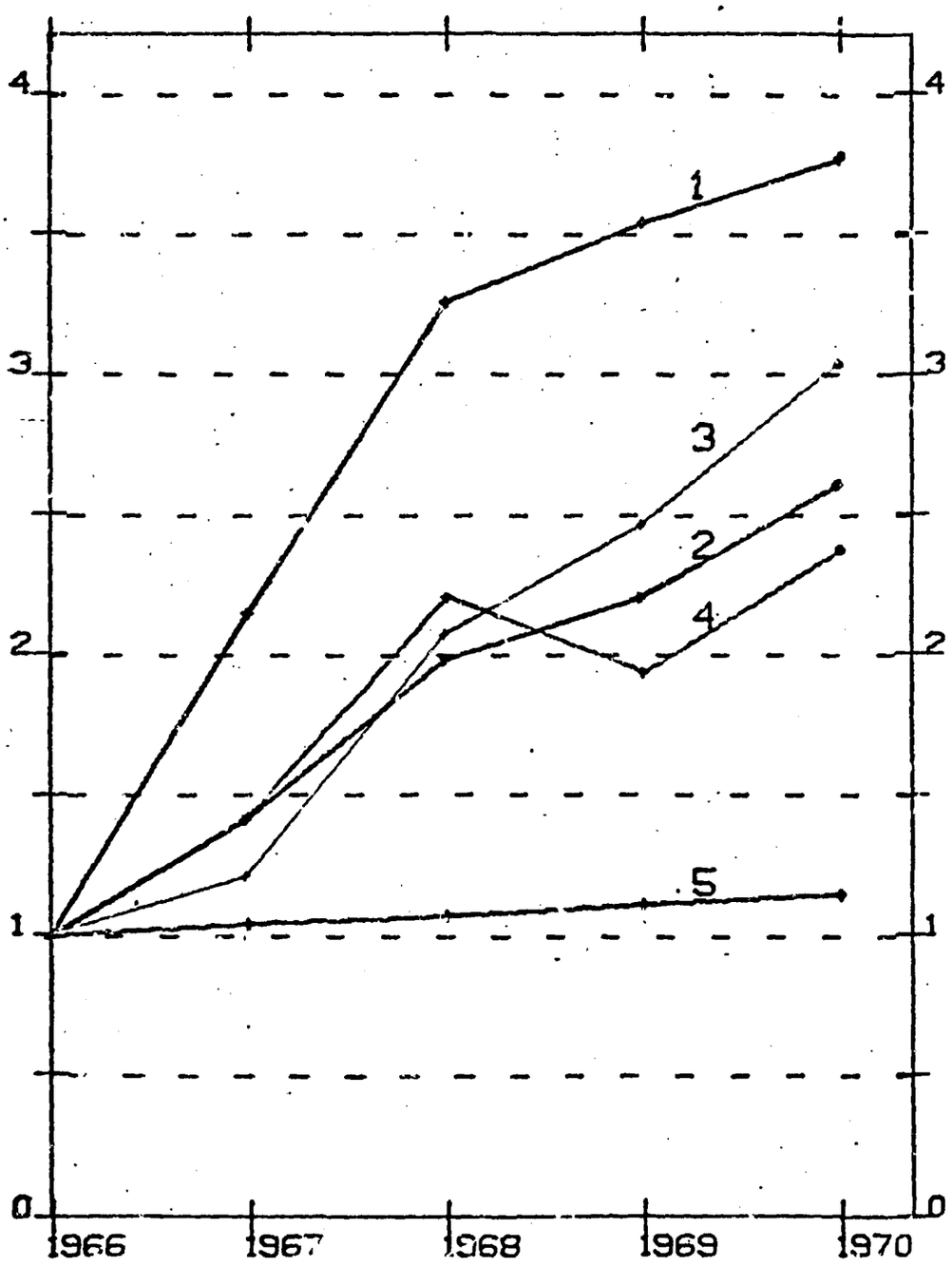
Illustration 9

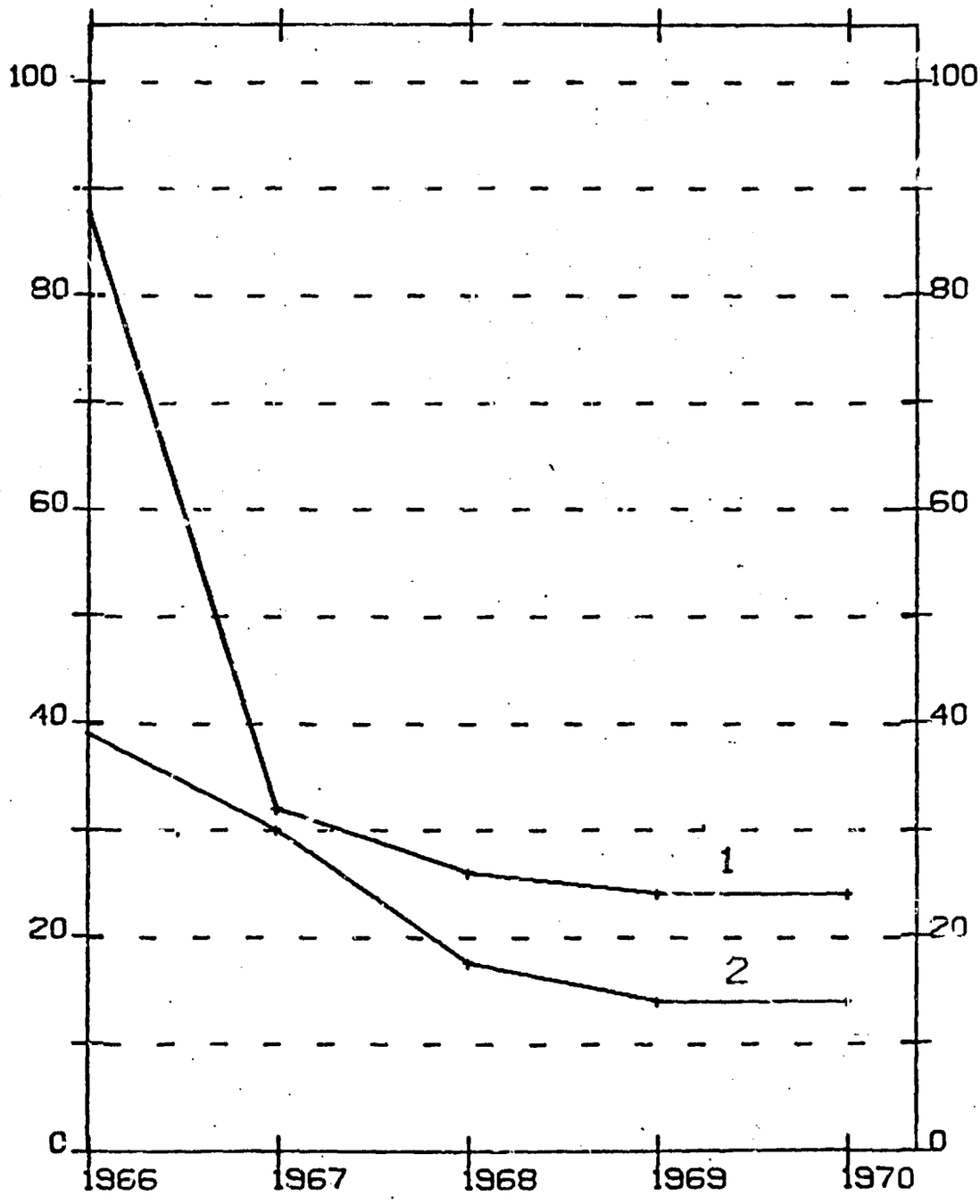
WORKLOAD RELATIONSHIPS FIVE YEAR ANALYSIS



1 CIS NOT.	1.0	2.15	3.26	3.54	3.77
2 CIS PROF.	1.0	1.42	1.99	2.21	2.61
3 SEARCHES	1.0	1.21	2.07	2.46	3.04
4 DOC.REQ.	1.0	1.43	2.21	1.94	2.38

Illustration 10

ITIRC SERVICES UNIT PRICES



	1966	1967	1968	1969	1970
1 CIS NOTICES	$ .88	.32	.26	.24	.24
2 SEARCHES	$39.00	30.00	17.60	14.00	14.00

The Needs of Information Science and the Training of Information Personnel

Dr. Charles L. Bernier,
Professor of Library Science
State University of New York at Buffalo

The need for greatly improved knowledge-transfer systems is obvious, as is the need for people to research, design, develop, and man them.

Analysis clearly indicated that intensive knowledge-transfer research and development of the last quarter century has been ineffective in producing superior information services. A perfect document-retrieval system, with instant response, of 100% relevance and 100% recall would only flood most users with even more paper that they would not have the time to read. A perfect information-retrieval system that gives terse, precise answers to questions cannot be built because we cannot predict all questions, do not have manpower to write the answers beforehand, and cannot program a computer to give terse answers from the original documents or their substitutes.

It turns out that information-retrieval systems are not actually information retrieval systems. No information is retrieved. No information is stored in the system -- only symbols for references or their codes are stored and retrieved. The system itself turns out to be not a system at all, but a crude method of indexing sometimes propped up with roles, weights, and links which really do not work very well. In information science, incorrect terminology has been almost hypnotic. A term is coined by a documentalist and everybody uses it as though there were some magic in the term and as though if you didn't use the term you couldn't communicate with him or with anybody else -- and worse yet, you weren't "with it." At best, the term 'information retrieval' up to now has been an unnecessary new term for 'key-word indexing.' I am not the first one to point this out. Bar-Hillel and Fairthorne have been thoroughly ignored for their pioneering efforts. I have said that, in information science,

you can get good mileage out of a neologism. I present this item not to disparage information scientists, but to show naivete of some on one point; some documentalists simply didn't know that they were reinventing a crude form of indexing that had been abandoned more than a century ago. Some didn't know this because they were untrained in librarianship and information science which always include a good course in abstracting and indexing.

Another trend of trivial research has been careful evaluation of information systems, where insufficient effort has gone into weighting the measures employed and evaluating the usefulness of such measurements for our very poor knowledge-transfer systems. The systems of today do not permit a professional to keep up in more than a few tenths of a percent of his broad field, such as chemistry, medicine, biology, engineering, weaponry, invention, and other multidisciplinary fields. He simply can't read more -- but our systems require that he read more, and there hangs the importance of information retrieval.

The librarians and library schools haven't been lily-white either. They failed to develop adequate knowledge-transfer technology although they knew about a century ago that they were faced with a rapidly rising and uncontrollable number of technical periodicals. After a century they still haven't solved the problem of promptly getting current information to those who need it. The abstracting-indexing services did realize the need to handle the flood of journals and have provided a vital service for that century. However, it is just recently that they have grown aware of the growing dissatisfaction with their magnificent efforts. We need new forms, and not the keyword approach which most have taken.

The primary journal has also come under repeated attacks because of its slowness and wordiness. Even the technical report is now found to be too slow and wordy. Imagine getting prices on the New York Stock Exchange several

months late. That's what we accept in report literature. Many librarians think of government documents (usually reports) as a world apart. They would rather ignore reports and hope that they will go away. They feel the same way about computers. I have heard one competent librarian (competent according to modern standards of librarianship) say that she couldn't care less about computers and another say that he didn't understand computer use and would therefore prefer not to get involved.

It is important for researchers of information science and technology to have a thorough grounding in librarianship so that they will not, for example, rediscover alphabetical order as a useful organizing device. It is equally important for librarians to be well grounded in information science so that they will not shun the word 'computer' and will understand the enormous problems ahead that include: lack of time to read all that professional people believe they need to read; lack of language facility in about 70 languages; lack of prompt access to documents; fractured economics, that is, dollars for research and cents for knowledge-transfer systems; and inadequate persuasive technical communication.

The new knowledge-transfer schools, including schools of librarianship and schools of information science, must include both librarianship and information science. Many library schools are combining with information science very gingerly; they hire an information scientist but they keep him pretty well under control. Some schools of information science are weak on the history of bibliographic control and tend to research trifles; i.e., research qua research. The importance of new and better knowledge-transfer schools is inestimable. They will educate the people who will invent, design, develop, implement, and staff the information systems of the future. Better knowledge-transfer systems can change our civilization very rapidly. As Santayana said,

"Those who cannot remember the past are condemned to repeat it." We are said to know enough in the field of medicine to reduce deaths from heart disease, stroke, cancer, emphysema, accidents, and cirrhosis by at least 25%, if we were to put all of our present medical knowledge into effect now. By our present recorded knowledge, we are said to be able to extend life-span by at least 50% if we could put that present recorded knowledge into effect now. We should have enough recorded information from thousands of years of history about peacemaking, war, riots, rabblerousing, propagandizing, subversion, group dynamics, etc., to make better progress than at present toward a better world. However, we don't have time to read history, psychology, and sociology, or inclination to employ what we can read. We need terse, persuasive literatures. There are thousands of inventions and developments dormant in industry, in government agencies, and other organizations because somebody found it safer to say 'no' rather than to take a little risk and say 'yes' to putting these new things to use. New information systems could make it equally dangerous for this somebody to say 'no' as to say 'yes.' The science of management is emerging from witchcraft slowly because managers do not have the time to read their own literatures of management. Middle management continues to sweep mistakes under the rug, although cybernetic systems are available to prevent this. We are not now taking advantage of what we know. The new kind of knowledge-transfer scientist will not only create better transfer systems, but he will also devise effective ways for making it exceedingly difficult for the new transfer systems not to be put into effect. The new systems will be compelling as well as informative.

It seems likely that, when the problems of cancer etiology, diagnosis, and therapy are finally solved, some capable historian of medicine will discover that we have had all of the pieces of the puzzle five, ten, or even

fifty years ago. It would have been the librarians and information scientists who failed to get the pieces of the puzzle into the heads of the geniuses who could have put the pieces together. And, in the meantime a million and a half to fifteen million people died in this country from cancer.

Our civilization is heavily oriented toward getting information from experience and experiments rather than from the record. People work with test-tubes, experimental animals, test engines, and meters rather than going into the library and getting the same information for a fraction the price. Our greatest hope in this direction are the school librarians (media-center specialists) who have a wonderful opportunity to change all of this and to reorient the citizens of tomorrow more equally toward the record and move into the twenty-first century of information.

Schools of knowledge transfer will probably continue to be highly individualistic because the field of knowledge-transfer is new and rapidly-growing, and the capable minds in it have widely differing views of it. One says, "Information science is computer science." Another believes that information science is a minor extension of what librarians have been doing all along. Yet another feels that most problems will be solved by a better indexing system or a mechanized card catalog. Still another believes that fractured economics ($ for research; ¢ for libraries) is the principal problem. This individuality, if encouraged, is stimulating and gives the enrolling student the opportunity of moving in quite different directions, depending upon which school he selects. This individuality will, I predict, continue well into the future until highly efficient knowledge-transfer systems emerge. Then teaching can become codified and stable. It is, in my opinion, extremely important that standardization be avoided for the present to favor development of new information sciences and knowledge-transfer schools.

I like to think of education as the principal function of these new knowledge-transfer schools. Training (rather than education) in librarianship and information science must, on the other hand, come specifically and on-the job because libraries and information services are, and must be, so very different. A hard core of the basics, such as abstracting, acquisition, cataloging, computing, extracting, indexing, linguistics, management, reference work, selective dissemination, and statistics should be taught. Add to these some specialization and, very important, the opportunity to create. These should constitute the curriculum of future knowledge-transfer schools.

Certainly, the knowledge-transfer scientists or specialists of the future will have educational backgrounds including selections among computership, librarianship, persuasive communication, user studies, information services, artificial intelligence, graphics, publication, writing, condensed literatures, education, and media use.

The schools of today do not entirely take care of what is needed and do not completely foreshadow what will come tomorrow.

Library Science Research at Southern Connecticut State College

Bernard S. Schlessinger, Ann Powell and Hanna Agonis
Southern Connecticut State College
New Haven, Connecticut

In an article in 1963, Schick and Frantz indicated a number of areas that needed research attention in the future. Not surprisingly, in 1970, the same general areas, as listed in Table 1, are of equal interest when one considers library science research.

The library science research program at Southern Connecticut State College (SCSC) is based, in large part, on the thesis program at the master's degree level. If funding and research time were more available, perhaps the faculty would involve themselves in more personal research. In the present situation, however, faculty research energies are devoted to support of student thesis research. It should be noted that, in library science, increasingly, trained research personnel, broadly based in subject and in professional areas, are entering the field. Encouragement to conduct research is necessary. Better allocation methods for available funds are required, especially to young personnel, beginning their careers and unable to draw upon funding agencies acquainted with their work.

Since the research program at SCSC is carried on by students, the majority of whom are also working in libraries, the program is user-oriented. This user orientation is desireable for library science research in general. Not enough library science research projects are directed to practical interests of people in the field.

Table 2 gives percentage figures in various areas for the 92 theses completed at SCSC between 1962 and 1969. The traditional interests of History and Children's Literature were well-represented (50% of the total), with other high interest areas being Special Services (14%), Administration (8%), Special Libraries (8%), and Public Relations (7%).

Table 3 presents the percentage distribution of the 72 theses presently in progress at SCSC. Children's Literature and History are at about the same level (53%), but a trend should be noted to new interest areas in statistical and evaluative studies in Information Science (7%), Reference Services (6%) and Technical Services (8%). Even in the high interest areas of Children's Literature and History, the attempt is being made to move from purely descriptive studies to studies which include an evaluative function based on the research tools of the social sciences and the sciences.

In the area of Information Science, the concentration is on design of small systems useful in the library school and the small library. It is the author's (BSS) belief that the information field has had enough development of large systems not applicable except in super libraries.

Illustrative of the type of research that can be carried on in a school like ours, are the two summaries below of work conducted by two graduate students, Mrs. Hanna Agonis and Mrs. Ann Powell.

Technical Reports - Identification in TAB and Subsequent Publication - Hanna Agonis.

The primary purpose of this work was to determine what percentage of reports identified in Technical Abstracts Bulletin (TAB) were later published in the external literature and the time lag between the appearance in TAB and the subsequent publication in the external literature. The availability of information generated in research at the earliest possible time is exceedingly important. Additionally, some of the major abstracting and indexing services have not felt an obligation to process report literature since, as far as they were concerned, this was later published in external literature and would be picked up at that time.

To obtain information for this study, questionnaires were sent out to 200 authors of technical research reports, randomly selected from Technical Abstracts Bulletin for the years 1962-1966, inclusive. 40 reports were chosen from each year, using a random number table to select the page and abstracts to be included. The questionnaires sent out were accompanied by a cover letter explaining their purpose. The selected authors were asked about external publication of their reports, and their opinion of the necessity for external publication after identification in TAB.

Table 4 presents an analysis of questionnaire returns of the 200 questionnaires sent out. 86 (43%) were returned answered. 55 questionnaires were returned unanswered, due to either insufficient address as given in TAB, a change in the place of employment, or addressee unknown at the address given by TAB (mostly at universities). All in all, 141 (70.5%) questionnaires were accounted for.

Two points should be made here:

1. The 43% return shows a continuing interest in information by research people.

2. The 27.5% returns unanswered indicate that the address provisions for TAB possibly should be overhauled to permit greater accessibility to the authors.

Turning to the question of external publication, it may be seen in Table 5 that for the time period studied, there seems to be an increasing publication in the external literature. In 1962, 1963, 1964 50% of the reports were published; in 1965, 57.1% of the reports; in 1966, 70.6%.

In the preliminary analysis of the questionnaires, the average time lag for the period studied between report publication and external publication was found to be 17.4 months. The figures for the individual years are shown in Table 6. It may be seen that in 1962 the time period between report publication and external publication was 32 months; in 1963, 16 months; in 1964, 22 months; in 1965, 9 months; in 1966, 8 months. Overall, the time lag seems to be decreasing.

It is interesting to compare these figures with the 1952-53 report of the

National Science Foundation. Their surveys revealed that about 70% of all technical research reports do get published (compared with 50-71% in this study). They found a time lag of 12 months (compared to an average of 17.4 months and range of 8-32 months in this study).

One more note that should be made was that 22 respondents (25.5% of all respondents) refused to answer any questions which dealt with TAB, remarked on the lack of their access to it, or indicated no knowledge of it at all. A need for better accessibility and possible publicity for TAB might be indicated.

The preliminary results of this study, then, seem to indicate:

1. researchers are interested in information
2. external publication of technical research reports is increasing
3. the time lag between report publication and external publication is decreasing
4. better addresses are needed for authors listed in TAB
5. greater accessibility and publicity for TAB are needed

A Survey of Teaching of Scientific Literature Courses -- Ann Powell

Each year, as the volume of scientific literature increases and the subject matter becomes more complex, the need for teaching the use of the literature grows more urgent. Chemistry of all the disciplines has been most cognizant of this need.

The purpose of my research was to determine whether a formal scientific literature course was being included in chemistry curriculums of selected state colleges and universities and to compare American Chemical Society-approved schools and non-approved schools with respect to the teaching of scientific literature courses. An attempt was also made to determine whether it was generally felt that a course in scientific literature was desirable and what retrospective searching tools had been included in courses of this type.

In order to obtain an equal geographical distribution of schools surveyed, the country was divided into five main areas: the East, Middlewest, South, Southwest, and the West. Five ACS-approved schools and five non-approved schools were selected from each area for a total of fifty schools surveyed.

In the preliminary screening of schools, it was found that the great majority of non-approved schools had a student enrollment of less than 10,000 and very few ACS-approved schools had a student enrollment smaller than 3,000. This was the basis for limiting the schools chosen to those with enrollments between 3,000 and 10,000.

In the final selection of schools, each of the five sections of the country was considered separately. First five ACS-approved schools were chosen from one section of the country. Then five non-approved schools with approximately the same enrollments were chosen from the same section of the country. This procedure was repeated for each area.

Questionnaires were formulated and sent out with a cover letter. Within twenty-five days, 47 of the 50 questionnaires had been returned. A follow up letter encouraged two more responses for a total of 49, or a 98% response.

Of the schools surveyed, as shown in Table 7, 20 (40.8%) offered a course in scientific literature. Only a slightly higher percentage of the ACS-approved schools offered the course than non-approved schools (44% opposed to 37.5%). This was rather surprising since the American Chemical Society, through its publications and symposiums, apparently places a great deal of emphasis on training students to use the literature. More disappointing were the statistics that only 13 schools (26.5%) were currently teaching the course, and only 16 (32.6%) had taught it in the past year. This was true, even though 30 schools felt that the course was desirable.

Additionally disappointing were the small enrollments in the course. The average enrollment for the course was eleven students, the largest class size reported was 24 students and the smallest was four.

Approximately 60% of the courses consisted of lectures, library problems, and term papers. Most of the other schools required somewhat less work by eliminating the requirement of a term paper.

Approximately 73% of the ACS-approved schools required their chemistry majors to complete a scientific literature for graduation. Only 44% of the non-approved schools made the same requirement of their students.

In order to determine which of the retrospective searching tools were being taught in the existing scientific literature courses, the following services were listed on the questionnaire: Beilstein, Science Citation Index, Mathematical Reviews, Chemical Abstracts, Physics Abstracts, Biological Abstracts, and Index Medicus. The respondents were asked to check which of these services were included in the scientific literature course offered at his school.

As seen in Table 8, all the schools reported that they included Chemical Abstracts in their courses; 95% also indicated that they included Beilstein. None of the other services listed were taught by even one-half of the schools surveyed. This would seem to indicate that schools are not introducing students to some of the borderline and newer information tools that are available.

In summary, the study showed that:

1) A scientific literature course was offered in 20 of 49 small schools surveyed, and taught in the past year in 16, although judged desirable by 30.
2) The course was taught to very small numbers (average enrollment 11) of students.

3) Teaching techniques were traditional and primarily lecture and library problems.
4) The course was primarily concerned with Chemical Abstracts and Beilstein, although Science Citation Index was also taught by close to half of the schools.
5) Very few significant differences in pattern existed between approved and non-approved schools.

Literature Cited

1. Schick, Frank L., John C. Frantz and staff. J. Educ. Libnship. Spring, 1963.

Table 1

LIBRARY SCIENCE RESEARCH AREAS

Academic Libraries

Histories

Information Science

Library Administration

Library Cooperation

Library Education

Library Manpower

Public Libraries

Reader Patterns

Reference Services

School Libraries

Special Libraries

Special Services

Subject Literature Analysis

Technical Services

Table 2

THESES COMPLETED 1962-1969 -92

Children's Literature	10%
Histories	40%
Library Administration	8%
Library Cooperation	1%
Library Education	7%
Public Relations	1%
Reading Patterns and Guidance	3%
Reference Services	3%
Special Libraries	8%
Special Services	14%
Subject Literature Analysis	3%
Technical Services	2%

Table 3

THESES IN PROGRESS - 72

Children's Literature	19%
Histories	34%
Information Science	7%
Library Administration	3%
Library Education	4%
Public Relations	2%
Reading Patterns and Guidance	2%
Reference Services	6%
Special Libraries	3%
Special Services	3%
Subject Literature Analysis	4%
Technical Services	8%

Table 4

Questionnaire Returns

Total sent: 200

Returns: 141 or 70.5%

Answered returns: 86 or 43%

Unanswered returns: 55 or 27.5%

Table 5

External Publication

1962

14 questionnaires answered

7 reports published or 50%

1963

16 questionnaires answered

8 reports published or 50%

1964

18 questionnaires answered

9 reports published or 50%

1965

21 questionnaires answered

12 published or 57.1%

1966

17 questionnaires answered

12 published or 70.6%

Table 6

Time Lag Between Report Publication And External Publication

Average Time: 17.4 Months

1962:	32 Months
1963:	16 Months
1964:	22 Months
1965:	9 Months
1966:	8 Months

TABLE 7

SCIENTIFIC LITERATURE COURSE OFFERINGS IN 49 SCHOOLS

	NUMBER OF SCHOOLS	PERCENTAGE OF SCHOOLS
DESIRABLE	30	61.2
OFFERED	20	40.8
TAUGHT IN PAST YEAR	16	32.7

TABLE 8

RETROSPECTIVE SEARCHING TOOLS

	ACS - APPROVED SCHOOLS		NON-APPROVED SCHOOLS		TOTAL SCHOOLS	
	#	%	#	%	#	%
CHEMICAL ABSTRACTS	11	100	9	100	20	100
BEILSTEIN	10	99.1	9	100	19	95
SCIENCE CITATION INDEX	7	63.6	2	22.2	9	45
MATHEMATICAL REVIEWS	0		2	22.2	2	10
PHYSICS ABSTRACTS	1	9.1	5	55.6	6	30
BIOLOGICAL ABSTRACTS	4	36.4	4	44.5	8	40
INDEX MEDICUS	4	36.4	2	22.2	6	30

20 SCHOOLS

Discussion Group: Current Alerting Services

Leader: Dr. R. Maizell, Olin Corporation, New Haven, Connecticut

Recorder: R. Levinson, Mattatuck Community College, Waterbury, Connecticut

Current alerting services were defined as methods of getting current (and older) information to users by any means possible, with an accent on speed.

Methods used by members of the group were discussed as they were mentioned. These included teletype, on-line video retrieval, ASCA, NASA, MEDLARS, STAR, NERAC, searching of data banks by University of Georgia, University of Pittsburgh and other large information centers. Some of the data banks mentioned were the Chemical Abstracts Condensates, Institute for Scientific Information, Defense Documentation Center and Derwent services. It was noted that these services and data banks were only representative of many.

A group member from Bendix Corporation discussed a teletype terminal system, which also provided for a print out of the information if necessary.

A member from the National Academy of Science discussed an on-line video retrieval system. A keyboard was used to send the questions to a data bank. The retrieved information was displayed on a television tube, and printed out if a printout was desired. The system has been in experimental use for six months. One of the advantages of this system was that it could be tied in with other data banks by telephone, thus giving the user a much wider base to search.

ASCA (Automatic Subject Citation Alert) was also briefly discussed by members from Yale Medical School and Institute for Scientific Information. It searches 2500 journals in all fields, behavioral and social sciences as well as chemical, physical, and life sciences, and it is hoped it will search over 4000 journals by the end of 1970. A user's profile of keywords is searched for him. Even with

the limitations of no thesaurus and great flak, the users found ASCA to be valuable.

Another topic of great interest to all participants was user reactions to the scanning services. Did the users look at the bibliographic information which was sent to them? Did they ask for the original documents for further reference? If they asked for the documents, what form did they want the document to take--hard copy or microfiche? Although these questions could not be definitively answered, they were aired.

The pros and cons of hard copy versus microforms and of various reader-printers were discussed. Some of the problems noted were the cost of the copy, the readability of the copy, the time involved in making the copies, and the type of copy. The point was made that readers could be asked to use microforms in the library and within the company where machines were available, but hard copy was necessary when one wanted to read during a trip or at a meeting.

One of the needs in the field of current alerting services was identified as referral services for specific types of information. An up-to-date compilation of organizations which will do demand searches, and the data banks which they use, is needed. Some of the new literature which is trying to fill this gap was discussed along with related literature on how to scan the material, both manually and automatically.

Another topic of interest to participants was information comparing manual and automatic searches. Many questions were raised. Which type of search yielded the greater number of documents? Which type of search yielded the greater number of relevant documents? How much did the two types of searches overlap?

The group felt that it would be valuable to explore many of these items in a longer time period with resources available.

Group Discussion: Computer Services in Technical Information
Dr. B.S. Schlessinger, Southern Conn. State College, New Haven, Ct.
Recorder: Miss Paula Thomas, Graduate Student

The group included six industrial librarians, eight academic librarians, four researchers, five students, two information retrieval experts, and five administrative persons, thirty people in all.

The discussion ranged over a wide spectrum of topics of concern to the participants. Among these were the following, with brief notes of the discussion trends.

1. Time sharing - The industrial representatives present were convinced of the importance of this in the future. Academic representatives also mentioned this in the area of communication and teaching.

2. TIP - This program in the area of physics at Massachusetts Institute of Technology was praised by Massachusetts attendees. It was hoped that this program could be expanded, possibly into other subject areas, as well as in the field of physics.

3. Optical methods - These methods were generally looked upon as potentially useful in larger organizations with large budgets, but not to the vast majority of users.

4. Library automation research - The need for library automation research was stressed, especially for the automation of smaller libraries with relatively unsophisticated equipment available.

5. Paper work - The need for involved paper work, both within libraries and between libraries and information processors was decried. The lack of adequate paper documentation for commercial computer programs was noted by several attendees.

6. Data banks - The heavy needs for availability and accessibility of data banks was agreed upon as was the fact these should be arranged so that tapes were available and could be searched on a regional basis. The lack of coordination between organizations developing large data banks, and the lack of uniform treatment of the various data banks were discussed as present problems, and even larger potential problems, unless some close cooperation between information processors is achieved.

7. Retrospective searching by computers - The economics of computer retrospective searching was discussed. The non-availability of data banks for doing this was pointed out. The small users present felt that any computer searching in large data banks was out-of-the-question for present budgets. It was noted again that information center managers should make a greater effort to use computers installed primarily for

7. business office use. Quick answers in conversation with the computer through data file searches was described as the ideal.

8. Document delivery and delivery time -- The group generally felt that people did not need information as quickly as they requested it to be delivered, and that they did not read what was delivered. The idea of a custom-made abstract journal compiled for the specific individual was discussed very favorably by representatives of large organizations present.

9. Computer graphics -- The coupling of microforms and computers was hailed as a notable future trend, which could be of great value to information centers.

10. System design economics -- It was noted that often, the fringe benefits of a designed system were of more value than the benefits for which the system was designed.

Representatives of four large organizations present described specific computer or indexing efforts in their information centers.

Connecticut State Library - A state-wide union list of serials is being compiled, using the state data center. A cataloging support system for libraries in the state is also being developed. The State Library as an interface between data bases and small libraries was discussed. Olin Corporation - A thesaurus is being developed for an index to internal reports and some external materials. This is not particularly computer - oriented. United Aircraft - KWOC indexes have been used internally. Retrieval was poor, resulting in a good deal of garbage. The indexing and retrieval were most successful in specific searches. A book catalog on tape also exists, easily transferrable to microfilm. Updating (weekly) is a problem of economics. Yale Library - Experiments with book catalogs have been carried out, using computers. This approach is not good for a long-range, dynamically - changing collection, since the updating results in several alphabetic lists to search. Ideally, there should be only two lists, a cumulative and the latest supplement.

Group Discussion: Medical Information

Group Leader: J. Timour, Director of Library Services, Connecticut Medical Program, New Haven, Connecticut

Recorder: Mrs. Beverly Goodman, Graduate Student, Southern Connecticut State College, New Haven, Connecticut

The network of medical library resources which now comprises the medical information system was described, as it presently stands, for the state of Connecticut.

Library	Approximate Annual Journal Subscriptions	Approximate Holdings-Volume
National Library of Medicine	18,000	1,000,000
Regional Medical Libraries	5,000	300,000
Area libraries	2,500	75,000 +
Local Health Science libraries	0 - 200	1,000

USERS

The formal components of the network consist of the National Library of Medicine (NLM) and the ten Regional Medical Libraries (RML) which are funded by the federal government. Below this level, the network is informal, with some of the area libraries funded by the RML and some by regional medical programs, as in Connecticut. The New England RML is in Boston at the Countway Library, while the Connecticut area resource consists of the University of Connecticut Health Service Library and Yale Medical Library.

The present system in Connecticut has been designed to provide document delivery to all legitimate users of bio-medical information free of charge. The users' requests are funneled through the area libraries to the Regional Medical Libraries, if the area libraries cannot fill the requests.

Most of the RML's have published their journal holdings and forwarded copies to the local health science libraries. Photocopies are obtained at no cost from the RML's.

The system of area and regional libraries has expedited service for the user, as has the use of electronic aids for expediting input into the

system, i.e., telephone to local hospital library, telephone to area resource, and TWX to RML or to NLM if RML does not have document. The document is delivered by mail.

In addition to document delivery, the RML's provide MEDLARS service, and the user can obtain 500 citations on a particular subject from the 2,400 journals indexed in Index Medicus, about 55% in the English language.

Questions: The average clinician does not want 500 citations from MEDLARS, but rather he needs 5 or 6 citations that are relevant to a particular clinical question involving patient care. What service can he receive? And more importantly, can he receive the information itself, rather than citations?
Answer: Library systems are far away from giving information rather than citations. Research is needed on the kinds of information MD's need and in what form they would accept it. The focus now is in the hospital library where the MD's spend their time. It is important to build the resources of the local hospital library to give better ready reference and to provide for continuing education of physicians. Perhaps one answer would be to have a telephone network to put MD's in touch with a university specialist who would agree to answer clinical questions in his field. The Connecticut Regional Medical Program wants to establish a base collection for each hospital, varying with bed size and number of staff. They have asked Washington for money to pull together two hospital libraries, to have them cooperate in acquisition and to build up retrospective collections, etc., as a demonstration project. The Connecticut program would train librarians in hospitals to make better use of the material at hand, but a problem has been that MD's are reluctant to accept assistance from non-MD's e.g. where librarians offer selective dissemination of information. Trying to interest hospitals in using microfilm for back-issues

of journals which are usually stored in the basement gathering dust is another large problem.

New Developments: In California, NLM is conducting an experiment using a TWX hook-up to a computer, which allows users to tap into 130,000 citations in all areas of biomedicine, with the print-out on the user's TWX.

There is a new Abridged Index Medicus, indexing approximately 100 English language journals that are clinically oriented. This will comprise a data base for direct on line searching for anyone with a teletype machine. Users are limited now, but eventually, if Connecticut had access to it, local users could get quick service through the TWX at the medical school libraries. It would take 15 minutes for an average search of the data base, and a print-out of ten or less citations would result.

Group Discussion: Information Analysis Centers

Leader: J. R. Price, Cultural Information Analysis Center, 5010 Wisconsin Ave., N.W., Washington, D. C.
Recorder: Joan Steffens, Human Relations Area Files, 755 Prospect St., New Haven, Connecticut.

The discussion began with a description of the Cultural Information Analysis Center (CINFAC), one of 26 information analysis centers sponsored by the Department of Defense (DOD) in 1964. CINFAC began as a counter-insurgency analysis center (i.e. analysis of the psychological, political, and economic measures taken by governments to counter subversive activities). Requests for information were not limited to military activities.

In 1966 CINFAC was recognized as a cultural information analysis center, part of the Center for Research in Social Systems, an interdisciplinary organization, interested in cross-cultural communication, with researchers grouped into geographically oriented teams.

CINFAC's information storage and retrieval system is basically an abstract system, but the organization is now developing a computer system (present use is of IBM cards, a sorter, punched tape, etc.). This system analyzes materials from four dimensions: subject, time frame, geographical location, and treatment (analytical, etc.) A social science thesaurus of two to three thousand terms is used.

The center is primarily a consumer of its own product. 95 percent of its clients are laymen: government, General Electric, etc. The emphasis is on analysis -- the abstracts prepared must be interpreted. The task is to make social science data available for application to specific problems.

The center is now under the sponsorship of American Institutes for Research in Pitsburgh, but until 1969 it was located at the American University, Washington, D.C. The staff now numbers 14 full-time members, although last year there were up to 30 members before budget cutbacks.

The levels of service provided by the center depend on the nature and complexity of service required. Examples of previous research were given as:

1) A study of tribal minorities in Thailand, North and South Vietnam -- resulted in publication of a tribal area handbook on 26 tribal minorities in Vietnam. (This is available as a Department of the Army pamphlet through the Adjutant General's Office.)

2) A study of codes for country abbreviations -- what codes were available and how were they being used?

The center has also done evaluations of political trends in the Middle East, and research for the health data handbooks of Walter Reed hospital.

Users do not usually know how to ask meaningful questions, so the first step is to negotiate with the user to phrase the research problem. Most of the research has been a synthesis of work done, not original work.

Discussion that followed centered around the problem of "user charges". Up to 1970, the Department of Defense had funded the center with $750,000 a year. Users have usually been from the government so there was no problem of user charges. However, the center had made an analysis of its operations so that detailed information on costs was available and could be the basis for estimating such charges. Also, users have been primarily from the lower levels of government, e.g. 95th Civil Affairs Co.

At present the Department of Justice is sponsoring a study on student dissent. Rand Corporation is also a user.

Representatives from other information analysis centers joined in the discussion:

1) Shock and Vibration Center (Navy) - output includes a monograph series, journal, conferences, etc.

2) Defense Metals Information Center (DMIC).

It was pointed out that these centers also have not charged for their services, since most of the users have been from the government, and their own financing

and sponsorship is by the government.

Other discussion concerned specific research and publication of results. CINFAC reports are available from the Defense Documentation Center and the Clearinghouse for Federal Scientific and Technical Information. Army area handbooks are also issued as Department of the Army pamphlets. A bibliography is now being compiled by the center of all its reports and these may become available directly through the center.

Group Discussion: Techniques of Market Forecasting

Leader: Thomas G. Augherton, Republic Steel, Washington, D. C.

Recorder: Helen G. Becker, Connecticut State Library, Hartford, Conn.

This discussion centered around the word FORECAST, each letter of which was used as a discussion point, with emphasis on forecasting U. S. Government market trends. Items brought out in the group included:

Friends - Friendships should be cultivated with people doing the same type of work but of different environments. Non-structured groups with low or no dues and newsletters or formal publications are best to join. Informality and ready exchange of ideas promote good forecasting.

Organizations - Structured groups with dues and organized agenda, including seminars and meetings with key figures and speakers, can be valuable. Examples of these are American Marketing Association, American Management Association, American Society for Metals, etc.

Reports - The Government Printing Office is an excellent source for reports through the Monthly Catalog and price lists (Attachment No. 1). Many agencies publish specialized lists, which would be more centralized and widely publicized.

Electronic Data Processing - Searches of the literature are available through various established government information centers, based on the need to know. Examples of these are the Defense Documentation Center, National Aeronautics and Space Administration, Atomic Energy Commission, and the National Technical Information Service. Particularly, the Defense Documentation Center is a

valuable source of electronic data processing searches on many subjects. This service is conducted free for individuals or firms with a Defense Documentation Center user number as an excellent primary marketing forecast tool.

Congressional Activities - Advance notices of open hearings are published in the daily District of Columbia papers and are often available after held free from congressional offices. The Federal Register and Congressional Record supplement the above reports with details. The U. S. Chamber of Commerce reports the status of particular bills to members as an additional service.

Agencies - Keep in contact with the Public Information Office of each federal agency. The small business advisors are also an additional source. Agencies have annual reports available to industry plus daily press releases. The Bendix Corporation publishes a list of Public Information Officers which is an excellent tool in locating the Federal Government office personnel needed to be contacted for help.

Seminars - There are many excellent seminars, institutes, and short courses conducted by American Management Association, American Marketing Association, and others. Some chapters are very helpful to those involved in government marketing; i.e., Washington, D. C., New York City, etc. Some are free, others charge a fee. Seminars are well advertised and many are listed in the Commerce Business Daily.

Telephone - This is a most effective tool. With training in telephone techniques, telephoning can be as effective as person-to-person contact. It is an adjunct, not a substitute. Have a "checklist" of points to ask when indoctrinating new employees which can then serve as (1) a memory "jogger", and (2) as a check on making certain major points are covered when conducting a research survey by telephone.

Attachment No. 1

PRICE LISTS of Government Publications

These price lists are issued free by the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. They describe each available book or pamphlet, embrace current topics as follows:

10 **Laws, Rules and Regulations.**
11 **Home Economics.** Foods and cooking.
12 **Geology.**
19 **Army.** Field manuals and technical manuals.
21 **Fish and Wildlife.**
25 **Transportation, Highways, Roads, and Postal Service.**
28 **Finance.** National economy accounting, insurance, securities.
31 **Education.**
33 **Labor.**
33A **Occupations.** Professions and job descriptions.
35 **National Parks.** Historic Sites, National Monuments.
36 **Government Periodicals and Subscription Services.**
37 **Tariff and Taxation.**
38 **Animal Industry.** Farm animals, poultry, and dairying.
41 **Insects.** Worms and insects harmful to man, animals, and plants.
42 **Irrigation, Drainage, and Water Power.**
43 **Forestry.** Managing and using forest and range land, including timber and lumber, ranges and grazing, American woods.
44 **Plants.** Culture, grading, marketing, and storage of fruits, vegetables, grass, and grain.
46 **Soils and Fertilizers.** Soil surveys, erosion, conservation.
48 **Weather, Astronomy, and Meteorology.**
50 **American History.**
51 **Health and Hygiene.** Drugs and sanitation.
51A **Diseases.** Contagious and infectious diseases, sickness, and vital statistics.
53 **Maps.** Engineering, surveying.
54 **Political Science.** Government, crime, District of Columbia.
55 **Smithsonian Institution.** National Museum, and Indians.
58 **Mines.** Explosives, fuel, gasoline, gas, petroleum, minerals.
59 **Interstate Commerce.**
62 **Commerce.** Business, patents, trademarks, and foreign trade.
63 **Navy.** Marine Corps and Coast Guard.
64 **Scientific Tests, Standards.** Mathematics, physics.
65 **Foreign Relations of the United States.** Publications relating to foreign countries.
67 **Immigration, Naturalization, and Citizenship.**
68 **Farm Management.** Foreign agriculture, rural electrification, agricultural marketing.
70 **Census Publications.** Statistics of agriculture, business, governments, housing, manufactures, minerals, population, and maps.
71 **Children's Bureau,** and other publications relating to children and youth.
72 **Homes.** Construction, maintenance, community development.
78 **Social Security.** Industrial hazards, health and hygiene, safety for workers, pensions, workmen's compensation and insurance.
79 **Air Force.** Aviation, civil aviation, naval aviation, and Federal Aviation Administration.
79A **Space, Missiles, the Moon, NASA, and Satellites.** Space education, exploration, research, and technology.
81 **Posters and Charts.**
82 **Radio and Electricity.** Electronics, radar, and communications.
83 **Library of Congress.**
84 **Atomic Energy and Civil Defense.**
85 **Defense.** Veterans' affairs.
86 **Consumer Information.** Family finances, appliances, recreation, gardening, health and safety, food, house and home, child care, clothing and fabrics.
87 **States and Territories of the United States and Their Resources.** Including beautification, public buildings and lands, and recreational resources.

Group Discussion: Microfiche - Necessary Evil or Evil Necessity

Leader: Dr. Harold Wooster, Air Force Office of Scientific Research, Washington, D.C.
Recorder: Thomas Falco, Yale Medical Library, Yale University, New Haven, Conn.

Dr. Wooster first discussed the report of a survey he had conducted on behalf of the government agencies to examine the needs and attitudes of microfiche users. The survey results were based on responses to letters to librarians (170 answers) and responses to an open letter to the editor in selected journals asking for opinions (130 responses). About 50% of the 170 librarians favored microfiche; of the 130 individual responses, 41 were in favor, 31 were in favor with reservations, and 64 were strongly negative.

Dr. Wooster indicated that the survey results were available in a publication which could be obtained from him and which included many topics (microfiche and the Department of Defense libraries, impact of Defense Documentation Center (DDC) user charges, government libraries, industrial libraries, university and non-profit libraries, individual attitudes, fiche quality, and microfiche readers).

Objections to microfiche were listed as poor quality of readers available; inaccessibility of readers; inability to read microfiche, except in fixed locations; and uncomfortable nature of use of available readers on standard desk heights.

Standards suggested for documents which would later be placed on microfiche included uniform size of pages, no sideways layouts, no foldouts, closer text relation to figures and tables, and negative art for negative fiche.

Further discussion concerned positive versus negative fiche (preference seemed to be personal with no definite major feeling), retrieval equipment (improvement necessary for older people), ultrafiche (should be postponed until microfiche was accepted), fiche versus hard copy (hard copy preferable for longer documents to cut down on reproduction costs), index design by

user testing, and arrangement of art work and text.

The need for a portable microfiche reader was emphasized.

Group Discussion: Regional Conferences for Users of Government Scientific and Technical Information

Leader: Miss Ruth McCullough, Westinghouse Electric Corp., Baltimore, Md.

Recorder: Mrs. Sylvia Larson, Graduate Student

The Westinghouse Technical Information Center in Maryland was first described. It serves a complex employing 12,000 people. The sole customer is the government, with research interests ranging from lunar T.V. cameras to communications to undersea acoustics. The information center encompasses a technical library and a documents center. It is registered with and a user of DDC (Defense Documentation Center) and NASA (National Aeronautics Space Administration) services, but does little with AEC (Atomic Energy Commission).

The library users are pleased with book material but non-conventional information presents problems. Some of these are: security precautions for confidential, classified documents; registration of users and filing of field of interest forms for each contract before documents can be produced; justification of orders for limited documents to the releasing officer whose address as listed in TAB may be incorrect; charges for hard copy vs. free microfiche; different formats for indexing of unclassified documents in Government-Wide Index and classified documents in TAB; retention of classified documents when contract under which document was obtained is phased out; time lags from 10 days to 5 months for receipt of documents with average lag for microfiche copies of 1 week and for hard copy of 3 weeks; and the four classifications of possible receivers for limited documents, even if unclassified.

Problems such as those mentioned stimulated a regional conference of users of documents from DDC and Clearinghouse for Federal Scientific and Technical Information (CFSTI). This was a strictly informal, self-appointed group which held a series of informal meetings during the summer of 1969. The purpose of

the group was to discuss mutual problems in dealing with suppliers of report literature, especially DDC and CFSTI. As a result of the meetings, a booklet[1] was assembled and a paper was published.[2]

Miss McCullough described the committee approach of the group and its meeting with the directors of DDC and CFSTI to discuss five recommendations:

1) improvement of abstract bulletins and indexes.

2) the standardization of selective dissemination of information.

3) the need for place in field offices for searchers to preview documents.

4) improvements in acquisitions procedures.

5) a DDC Users' survey related to delays in receipt of classified documents.

The meeting led to an improvement in DDC order forms, addition of a title index in TAB, briefings of contract monitors regarding release of documents, and improvements in express services provided. Future meetings were scheduled. Suggestions were made for other meetings to cover problems with the Superintendent of Documents, use of microforms and interlibrary loans.

It was suggested that other areas of the country assemble local users to determine common problems, and explore solutions on a committee basis.

References cited

1. Information Hangups: Problems Encountered by Users of the Technical Information Services of DDC and CFSTI, with Recommendations for the Future. September, 1969.

2. Smith, Ruth S. Special Libraries. 60(10), 672 (1969).

Group Discussion: Limited Document Procedures

Group Leader: F. Hennessey, Defense Documentation Center, Alexandria, Va.

Recorder: L. Kajuti, Olin Corporation, New Haven, Conn.

Twenty persons attended the session, discussion in which centered around the delays of from 30 days to six months in approval of Limited Documents (LDS).

A proposal was presented that the releasing agency be the sole factor in requesting and receiving a document, i.e., the request to the sponsor be eliminated. It was pointed out that variations in justification statement length on the DD Form 55 (Limited Document Request) did not affect the disposition of the request. It was further indicated that the pattern of denials and approvals were remarkably uniform, and probably reflected the fact that the releasing agencies know in advance what requesters are going to be approved. If this is true, then these requesters should be included on the initial distribution by the Limiting Agency and eliminate the role of sponsors and the Defense Documentation Center (DDC).

One Government Agency representative noted that request through the Form 55 route was not as successful a method as a direct application to the author for an initial distribution of hard copy.

The problem was posed of return of the Form 55 disapproved because of the nonavailability of the listed releasing authority due to the high turnover of military personnel. It was suggested that a permanent office be established to approve Form 55's, with authority over the lower level releasing agencies, and that a priority stripe marked "EXPEDITE" be placed diagonally across the forms to assure prompt handling.

Form 55, it was further suggested, should be forwarded directly with the Form 1 to DDC to save time, instead of returning it to the sender. The omission of the Form 1 was also advocated, but this was thought to be of limited value, since it was pointed out that the coupon, the subscription account, etc. are also valid means of document orders provided the request is approved. If disapproved, return to the sender is necessary anyway.

A survey of documents in one quarter of Technical Abstracts Bulletin (TAB) was referred to by one of the industry representatives, showing an increase in LDS. The figures quoted were

1964	Unclassified LDS	- 9%
	Classified LDS	- 36%
1969	Unclassified LDS	- 53%
	Classified LDS	- 55%

An inquiry into the cause of this increase was requested. Mr. Hennessey pointed out that a service-wide review of LDS is now required at regular intervals, and that this results in much downgrading. He reminded the group

that limitation does not affect classified status.

In response to a question about unnecessary limitation of already classified documents, Mr. Hennessey noted a distinction between classified "need to know" and access to LDS, whether classified or unclassified.

It was indicated that translations from Russian documents in open literature are made LDS, although no definite example was given.

The attendees commented on the success of the seminar and the value of communication of this sort.

Group Discussion: Technical Objectives Documents (TOD) Program

Leader: H. Lippsie, TOD Manager, Andrews AFB, Md. (USAF)

Recorder: K. Korkaala, Graduate Student

Mr. Lippsie explained how present participants in the TOD program would be extended on June 30, 1970. All who requested the extension for the same TOD's in response to a letter from Mr. Lippsie would be continued (in the 34 areas of 36 still available). Mr. Lippsie's office would no longer serve as a central approving authority after July 1, 1970, so that each organization would be forced to maintain a central office to process TOD requests from the 1971 index. The list of extended organizations would be used by the Defense Documentation Center (DDC).

New applicants were advised to file with the issuing laboratories and with the Computerized listing at the Avionics Laboratory, Wright-Patterson AFB, Ohio.

Mr. Lippsie pointed out the purpose of TOD's is not to obtain access to DDC, but to alert competent organizations with scientific and technical capability to research projects of interest to the Air Force, in the hope that they would respond with unsolicited proposals offering proposed solutions.

It was also pointed out that, assuming the correct procedures are followed, access to prior art contained in DDC documents is achieved by approval of Form 1540, authorizing the required level of access. All present contracts should be registered with appropriate authorities, because of the variation in "need to know" and access levels with different contracts.

A discussion was included of "Technical Needs," prepared by the product divisions of the Air Force and included in the 1971 TOD program, but not necessarily identified as such. It was pointed out that when branch companies get distribution by the parent, this must be noted to the Air Force TOD office for approval.

Unlimited Unclassified (U^2)

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY *(Corporate author)* Southern Connecticut State College	2a. REPORT SECURITY CLASSIFICATION Unclassified 2b. GROUP

3. REPORT TITLE

Proceedings of the Fifth Scientific & Technical Seminar

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

Proceedings, April 9, 1970

5. AUTHOR(S) *(First name, middle initial, last name)*

Editor, Dr. Bernard S. Schlessinger

6. REPORT DATE March 8, 1971	7a. TOTAL NO. OF PAGES 96	7b. NO. OF REFS
8a. CONTRACT OR GRANT NO. N/A b. PROJECT NO. N/A c. d.	9a. ORIGINATOR'S REPORT NUMBER(S) N/A 9b. OTHER REPORT NO(S) *(Any other numbers that may be assigned this report)* N/A	

10. DISTRIBUTION STATEMENT

Unlimited

11. SUPPLEMENTARY NOTES N/A	12. SPONSORING MILITARY ACTIVITY DOD

13. ABSTRACT

Sixteen papers concerned with scientific and technical information are presented. Trends are discussed for information in general and specifically in government agency operations. Congressional, industrial and Air Force approaches to research information are treated, as is library science training for information processors. Results of discussion groups are presented dealing with current alerting services, computer services, medical information, information analysis centers, market forecasting, microfiche, regional conferences, limited documents, and the technical objectives document program.

DD FORM 1 NOV 65 1473

Security Classification

Unlimited Unclassified (U^2)

Security Classification

14. KEY WORDS	LINK A ROLE	LINK A WT	LINK B ROLE	LINK B WT	LINK C ROLE	LINK C WT
Information Operation Trends						
Government Information Agencies						
Congress and Research						
Air Force Information						
Communication in Information						
Industrial Information						
Information Personnel Training						
Education of Information Personnel						
Library Science Research						
Current Alerting						
Computer Information Services						
Medical Information						
Information Analysis Centers						
Market Forecasting						
Microfiche Problems						
Regional Information Conferences						
Government Information Users						
Limited Documents						
Technical Objectives Documents Program						

Unlimited Unclassified

Security Classification