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What the Next Decade Is Going to Bring

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GOING TO BRING (National Aeronautics and
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Panel

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Drobka:

We're going to do something a little bit different this morning. It's an unrehearsed discussion among a number of the major managers of information systems within the government. None of the panel members need introduction, but let me do it anyway. We all know Red Rowsome; we all know Van Wente. I'd also like to introduce Dr. Joseph Caponio, the Director of the Environmental Science Information Center of NOAA; Mr. Hubert Sauter, the Administrator of the Defense Documentation Center; Mr. Melvin S. Day, Deputy Director of the National Library of Medicine; and, of course, Dr. John Duberg, Associate Director of the Langley Research Center. I've asked each of them to take a few minutes to give you a backgrounder. After that, we will get into the discussion.

Sauter:

Thank you, George. The injustice of it all - two or three minutes to talk about the Defense Documentation Center services. Before the clock starts, George, I do want to point out that I do have a brochure that you might be interested in. It talks about the Defense Documentation Center, and the program products and services.

May I have slide (1). What I thought I'd do in the few minutes that have been allotted to me this morning is to both talk about the program and point out some trends that we see happening in the next few years ahead. The programs that DDC is involved in are really three major programs.

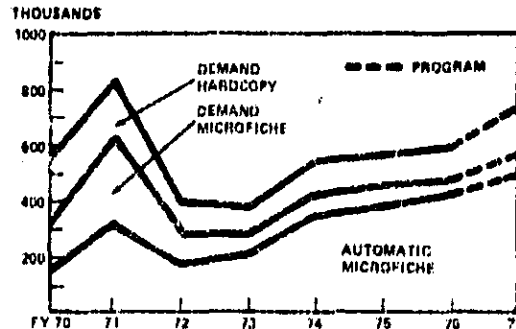
One is the document services program, and, of course, that's the reservoir of technical reports; the collection now numbers about 1,200,000 technical reports dating back in time to about 1945. The second major program involves what we call the information data banks, and that is actually the bibliographic record for both the technical reports and also the management information. We have, of course, the work unit data bank, which is the ongoing work, and which I believe compares to the NASA RTOP program. Then we have an R&D program planning data bank and also what I think is somewhat unique, an independent research and development data bank. This is where contractors working for DoD are able to use some government funds, supplemented with their own funds to their independent research. This is not contracted specific pieces of work. It's work that they think is important to future DoD efforts. Then, of course, it's unnecessary to mention the technical report data bank.

To give you some quick feel for the sizes of these. The work unit is 100,000 records - 20,000 of these are active. The rest are either completed or terminated work: Program planning about 25,000 records. The independent research and development about 20,000

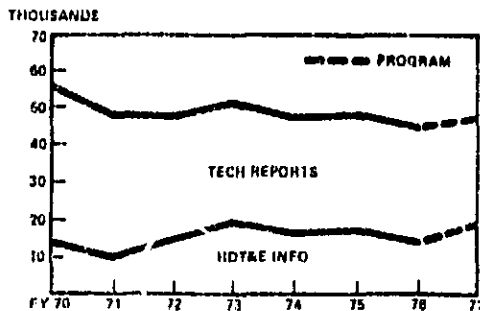
(1) MAJOR PROGRAMS

- DOCUMENT SERVICES
 - ▲ INPUT
 - ▲ REQUESTS
 - ▲ AUTOMATIC DOCUMENT DISTRIBUTION
- RDT&E INFORMATION DATA BANKS
 - ▲ WORK UNIT INFORMATION
 - ▲ R&D PROGRAM PLANNING
 - ▲ INDEPENDENT R&D
 - ▲ TECHNICAL REPORT
- DoD RDT&E ON-LINE SYSTEM

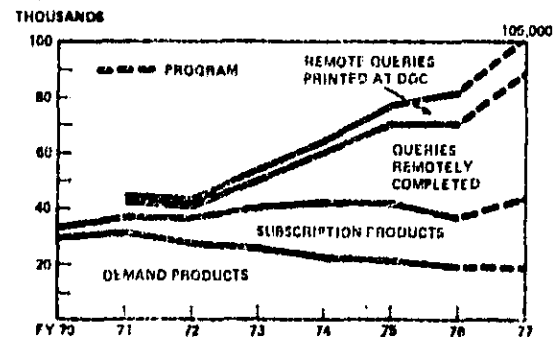
(2) DOCUMENT SERVICES



(3) DATA BANK INPUT (NEW RECORDS)



(4) DATA BANK USE



(5) MAJOR STUDIES RELATED TO NEEDS OF DDC USERS

FORMAL CONTRACT STUDIES

DoD USER NEEDS STUDY, PHASE I, AUERBACH CORP., MAY 65

DoD USER NEEDS STUDY, PHASE II, NORTH AMERICAN AVIATION, INC., NOV 65

DDC 10 YEAR REQUIREMENTS AND PLANNING STUDY, AUERBACH ASSOCIATES, JUN 76

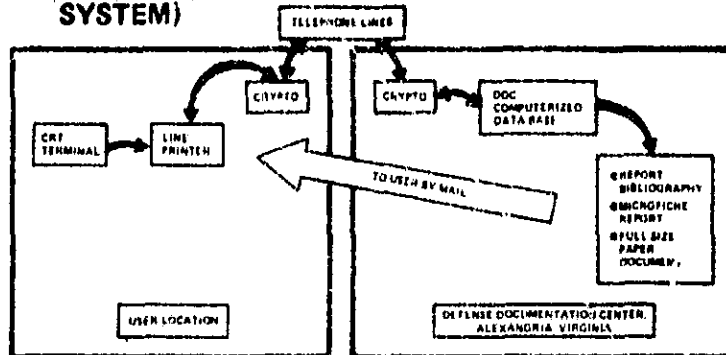
INFORMAL REPORTS

USER PROBLEMS ASSOCIATED WITH THE SERVICES OF FEDERAL AND QUASI-FEDERAL TECHNICAL INFORMATION PRODUCING AGENCIES, LOS ANGELES REGIONAL TECHNICAL INFORMATION USER COUNCIL (LARTUC)

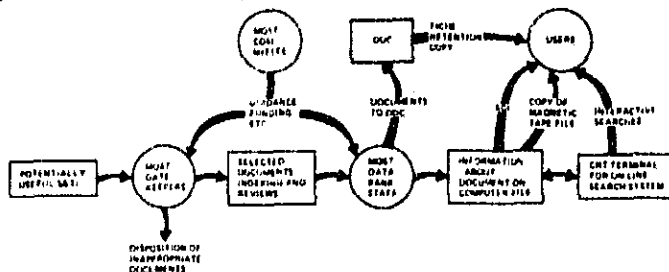
REPORT NUMBER 1, DEC 71
REPORT NUMBER 2, SEP 75

"ESPECIALLY DDC," COMMITTEE ON INFORMATION HANG UPS, JAN 75

(6) MOST DATA BANK (DEFENSE RDT&E ON-LINE SYSTEM)



(7) MOST DATA BANK (BLOCK DIAGRAM AND FLOW CHART)



(8) DATA BASE SERVICES - PLANS

- ONE DATA BASE
- COMMON DATA ELEMENTS
- DoD AUTHORITY-STINFO STANDARDS DED
- DoD THESAURUS
- F/G STRUCTURE ALL DATA BASES
- ON-LINE AUTHORITY FILES
- SHARED BIBLIOGRAPHIC INPUT EXPERIMENT
- EASIER CHANGE PROCESS
- REVISED REPORTING DIRECTIVES DD FORMS 1473
- ACCESS TO IAC DATA BASES
- SPECIALIZED COLLECTIONS
- DoD ON-LINE CATALOG

records, and then in the technical report, we mentioned that we had 1,200,000 technical reports - about 900,000 of those are actually records that we have in the computer. The rest, believe it or not, are still in card file. And, then, finally, the last major program is the on-line system, where we now have 87 terminals, 17 of these being in-house.

Slide (2), please. Just to kind of show you what's happening in the document services, the major peaks and valleys show when service charges were implemented and I think the most significant thing on the chart is the fact that the automatic distribution products are on the increase, and, of course, because of increasing prices for both paper copy and microfiche from organizations like NTIS and others, we anticipate that the trend in automatic distribution of microfiche will continue to go up. Again, you can see that when we imposed charges, the demand drops way off, but then gradually starts coming back up again.

Chart (3) please. In terms of the data bank input, we have found that while our total input to all data banks, both the technical report and management, has been staying fairly constant (slight decline, but staying somewhat constant), the major problem that we're anticipating and actually experiencing is in the technical report input area. We have dropped from about 60,000 high, but most recently about 55,000 reports per year down to about less than 30,000 a year now. The management information data banks are growing somewhat more slowly. I'll talk just a few seconds about what we're doing to offset that downward trend in technical reports.

Slide (4) please. Another chart shows what's happening and what we're anticipating will continue to happen. Again, you'll see that the demand products, very similar to the demand of both paper copy and microfiche, are on the downward trend. By the way, these are bibliographies - requests for searches of the data bank. Those services that are on demand are decreasing. The subscription products, like the SDI, are on the increase, but the thing that's really growing and really bringing about use of the data bank, is the on-line system, and that's reflected at the top of the chart.

I mentioned earlier that we do have 87 terminals for the on-line system at the present time. We anticipate that the number will grow as we implement dial-up service and tie into communications networks and will increase very conservatively to about 300 in a short time range and probably well over 1,000 over a longer period of time. At the present time, the Army, Navy, Air Force, and other government agencies are included in the system. NASA has a terminal, as do the CIA and the Library of Congress. We also have 10 contractors hooked into the system.

For those of you who don't know it, DDC is a mission-oriented agency and our services are limited to people who are actually

registered with us. This includes, of course, Department of Defense, Department of Defense contractors, other government agencies, and their contractors. At the present time, we have about 3,000 organizations registered with us, but what is disturbing is that about 300 of these 3,000 use about 80% of all the services.

We also interface with some of the other federal agencies. We, of course, provide copies of all the unclassified, unlimited technical reports to the National Technical Information Service for distribution and availability to the general public. To NASA, I think most of you know, we do provide a magnetic tape every two weeks, and from that you select the documents that are of interest to your users. With DOE, we have a very similar arrangement. With the Smithsonian we make available the work unit information that is unclassified and that which is limited to government agencies only. And the Library of Congress receives copies of all our unclassified microfiche.

Slide (5), please. To help us in determining what we ought to be doing, we have had a number of formal studies. I think most of you know about the first Auerbach study. The North American study was concerned with identifying our in-house users, (DoD people) as well as those in our contractor community. And, more recently, we finished a 10-year requirement study, again by the Auerbach Corporation. If any of you would be interested in the latter, drop me a note and I'll be glad to make a copy available to you. I think there are some interesting but not surprising findings. I won't take the time now. Perhaps that will come in the discussion. Essentially, though, it pointed out that technology is not the problem. We have technology that we're not yet utilizing. The problem is to really take advantage of the services that we have now and do a better job of promoting them. I think we have a very useful input to our organization in the form of informal user groups. Ruth Smith is with us today and she heads I think one of the more effective organizations. They, working with us, have certainly come into it with a number of good suggestions on things that we ought to be doing, things we ought not to be doing, and how to get along with the program.

Slide (6), please. Now, looking down the road, I think this is an example of things that we'll see a lot more of, particularly in organizations like the Defense Documentation Center. The MOST is the mobile sonar technology data base, a concept proposed to us by the Naval Ocean Systems Center out in San Diego. Using the terminal at their location (of course ours is a classified system, so you do have the cryptal equipment, meaning we can handle classified information as well as unclassified) and, of course, interfacing with equipment at DDC.

Slide (7), please. The concept here that I think is really intriguing is the fact that we're going far beyond just DoD sponsored technical reports and DoD sponsored information. As you can see here, the concept does include records to both computer tapes, open literature, test results, memorandum, the whole gamut of information. Now, this is just beginning to get off the ground. About 1,500 records have been made available to us. I think all of us recognize that one of the real problems we have is the quality of the material that we input into the data bank. So, this concept, I think, has a lot of things going for it. In addition to this one, we also have what we call a bibliographic input experiment. Again, organizations like the one represented by Ruth Smith are working with us using the on-line system for direct input of bibliographic records. One major departure is that we would not necessarily supply the document. In the past, everything that we had a record to, we would in fact supply the document. In the concept of the bibliographic input experiment, and also in the MOST experiment, we would not necessarily supply the information. We simply give you a record as to where it might be available to you.

Slide (8), please. What we're thinking about over the next 10 years, as I mentioned before, based on the recommendations from the Auerbach study, is really to consolidate and capitalize on the things that we have going for us right now. So, we're going to be working on redesigning our functional processing systems. Right now, all of the data bases that I mentioned, all four of them, were designed separately and independently, so that if you want to interrogate one data bank, you use one set of rules, one hat so to speak. If you go to another one, you change the hat, and rethink your whole process and enter that data bank. We're going to redesign those so that you can enter the system with one set of commands, one set of terminology, one set of corporate sources, and so on. That, of course, leads us into an information processing system rather than a technical report processing system, or a work unit information processing system.

Then, the next major thing that we have going on at the present time is the replacement of our present ADP system, and that, as you well know, is a major undertaking in this day and time.

Caponio:

Very briefly, I'm associated with the Environmental Data Service which includes five data centers and one information center and is primarily concerned very similarly to what you folks are doing, acquiring a hell of a lot of data information, putting it into storage systems, and trying to disseminate it, so that we can perhaps solve some of the pressing problems of the day.

Let me mention - about 2 or 3 years ago the National Science Foundation conducted a survey of 200 top-level federal executives. The survey was concerned with how they were obtaining their scientific and technical information. Invariably, the answer was the daily newspaper. As a matter of fact, none has indicated obtaining scientific and technical information from the bona fide scitec establishments, either in the federal sector or in the private sector. So, what does that tell us? It tells us: 1) that perhaps we may not be satisfying the scientific and technical information needs and requirements of a new breed. That new breed includes the legislator, the lawyer, the public citizens groups. As you know, we have in the present administration numerous agency heads who come from these public interest groups. Vince Juliano just recently, in conducting one of his task force studies for the National Science Foundation, characterized the entire state of STI in three major phases: The phase number 1 that extends back to the 17th century, namely, the advancement of science for science' sake. And, that was: the establishment of the routine journals, abstracting of publications, and what have you, to take care of the scientist communication. During World War II, we had the second phase big science, namely the development of the atomic bomb; and, in your case, putting a man on the moon. But, you are now reaching phase 3 which is concerned primarily with solving some of the socio-economic problems of the day. How do we alleviate the global world food shortages? How do we, for example, protect the environmental quality? These are the problems that we're struggling with today. And, as I said before, we need to provide scientific and technical information to those decisionmakers, the policy makers, the public interest groups. Now, we have taken care of the communication needs of the scientist to scientist, scientist to engineer, engineer to engineer, but we're moving into phase 3, and I do not think that we have come upon a solution. In terms of making this plethora of scitec information and data, the same situation holds true with data available in both useful and understandable terms, the latter being most important. And so, I'm saying that the information challenge, not of the next year but the next five or ten years, is to develop some sort of mechanism or perhaps an information synthesizer that can take all of this information and data, interpret, translate, integrate and put it into useful form in a repackaging type that will satisfy the top manager, the legislator, or the administrator in their particular requirements for STI. We know that with the advancement of computer technology, telecommunications, satellite communications, we already have, as our previous speaker, Hugh Sauter, said, all the technology. And, I dare say that one could press the button of the terminal and obtain x-hundreds of references or citations or abstracts on any given topic, you name it - whether it's one of the hot areas such as DNA, or one of the chemicals; as we know there is a tremendous controversy raging today with respect to the increase in the concentration of CO₂. And, if this continues, we know it's going to have a tremendous impact on the fluctuation

of degree days. We know this, in turn, is going to have tremendous consequences in terms of the climatic anomalies on the growth of crops and what have you. The point that I'm making is that we cannot turn over these 100, 200, 300 citations or the backup reports to these administrators; we've got to translate, interpret, integrate, and put it into an executive summary whereby he can make intelligent decisions. So my plea today in terms of the information challenge (I think we have taken care of the requirements and the needs of the scientist engineer) as we move into phase 3, is to know that we can no longer rely on the tools and the techniques that we used for satisfying and responding to the scientists/engineers. This is where I say that we have got to come up with new approaches, new changes, to respond to this particular need.

Thank you.

Day:

Thank you, George. It's always good coming back and seeing so many old friends (so many young friends).

I'd like to respond to Joe a little bit later on, and I think that we'll have a chance to do that as a part of the panel discussion.

George asked me to mention just a little bit about the program, just in the way of background. The program that I'm associated with is one which, by NASA standards, is an old program. NASA is a new agency, relatively speaking, and the agency that I'm concerned with is an old agency. We initially were established as part of the military. In fact, many, many years ago in 1836, it was the library in the Office of the Surgeon General of the Army. And, we remained part of the military establishment until 1956. In 1956, as the result of a Hoover Commission recommendation, Sen. Lister Hill and Sen. John Kennedy introduced legislation to establish a National Library of Medicine. It calls for the establishment of a national biomedical communications network. It's a very, very broad charter, and within that charter we have established a number of activities and a number of programs.

I'd like to mention them very, very briefly. First of all, the Library, in many ways, is a traditional library but it goes far beyond being a traditional library. We do acquire and we do have housed the largest collection of health/science literature in the world. Our job, of course, is to place it under some kind of bibliographic control and we do publish an index in general called Index Medicus. Index Medicus has been published since 1879; it's almost 100 years old. It's the basic indexing journal in the field of medicine. It's published on a monthly basis, and

we include in each issue a little over 20,000 citations; in other words, the citations and indexing entries for about 20,000 articles. In the field of medicine today, there are about 26,000 current medical serial publications published around the world. We get them all. Yet, we're very, very fortunate in the field of medicine in that there is a hierarchy in terms of publications. In order for one's work to be accepted and to be used by others, it must be published in a professional journal. What's more, it must be published in one of those top journals, and this is about 3,000. So, this forces, essentially, the best literature to be published in those 3,000 journals.

The 250,000 articles that we place under bibliographic control each year comes from those 3,000 journals. Now, the literature that we handle is a little bit different than the literature handled by NASA, in that we are almost exclusively published-literature oriented. This is because, as I mentioned, in the field of medicine material must be published in a classical sense in order to be accepted. The system that we use to produce our publications (we have a number of publications) is similar to the system that you have here at the NASA Scientific and Technical Information Facility. It all goes into the computer; the computer drives photo-composing equipment; and we photocompose our journals. We do have a large on-line interactive retrieval system called MEDLINE, and I guess it's the largest of its type in the world today. The average response is somewhere between 3 and 5 seconds; the average question, in terms of number of queries going back and forth, is about 10 minutes. There are 1,000 remote consoles tied to our two computers out in Bethesda, Maryland, and this past year we ran 900,000 literature searches on the system. So, it's a big system. According to one estimate, last year there was a total of about 1,500,000 literature searches, run on all the systems here in the United States. Our system still had a major portion of those. The customer group we serve is not surprising in size, because the customer group we serve is much broader than your own. We're called upon to support health care delivery, medical education, and medical research. And, that is essentially pretty much the public.

Among other things, the charter calls for us to establish a library network, and in the United States there are 4,000 medical libraries. Most of them are pretty small and most of them are in hospitals. All of these are tied together into a network. We have 11 regional medical libraries, and the purpose of the network is to bring about the sharing of the medical literature resources so that a professional, regardless of location, at least in theory, will have equal access; he will have the same access as any other professional, be he in Alaska, Hawaii, or be he across the street from the National Library of Medicine at the Naval Medical Center.

The big problem that we see quite frankly as a single operating problem today is in document delivery. As has been pointed out by my colleagues, we have the technology to enable you in a matter of a few seconds and certainly in a few minutes to identify references to material that you may want. The problem, of course, is in getting that material. In your area, in the NASA program, you have a very effective microfiche program which essentially makes material available on a distributed basis. In other fields, we don't have this. Our material, of course, appears in 3,000 medical journals and these are not all available at all locations. So, the problem we have is that you can identify what you want in a matter of seconds, but it's still a problem in obtaining that material. Some of it is available locally; a lot of it is available on inter-library loan. In our network last year, there were 2½ million inter-library loans. So, that gives you a feel of the movement within a particular field.

Now, on-line, we have a number of bibliographic data bases. We have a MEDLINE data base. We've done something a little differently than you have done in that we have segmented our data base. And, we keep the most recent material in our data base called MEDLINE. The other material, in our MEDLINE data base is still available, but we keep that segmented primarily because we found that 90% of the queries were for material that was published in the last 2 going on 3 years. So, it's a matter of economics. If you have to run 900,000 searches and you have to search the references for 3,000,000 citations or possibly 60,000,000 references, it takes a lot more time than if you only have to search 500,000 citations. So, it's one of economics. It's still possible to gain access to the older material, but we've found that it's much more economical to keep that in a separate file.

We've set up a number of other files. We have CANCERLINE; we have one in the field of toxicology, called TOXLINE. But, we're now starting to build, and will be putting on-line in an operational mode within the next six months, two data data bases. And, the big movement, of course, is toward data data bases, where an individual can ask a specific question and get a specific answer. As all of us know, what we've been successful in doing over the last 20 to 30 years is essentially taking the classical approach which speeded it up, we've computerized, we can do things faster and hopefully a little bit better, but essentially we still do things pretty much the way we did before. If somebody asks a question, now we push a button and we say we think the answer you want is in these 15 or 20 articles. We're not sure and we don't know where, but you have to look yourself. The idea, of course, of data banks, is to be able to ask a specific question and get a specific answer. We're building such a data bank in the field of toxicology, and we're building another in the field of laboratory animal data bank baseline data. The movement in the field of

medicine now is to develop specific data banks to get specific answers.

The Library has two components, which I guess makes us a little different than most other libraries and organizations, in that we're concerned not only with ink print material but we're also concerned with audio-visual material. One of our major operating components is physically located in Atlanta, Georgia, and it's called the National Medical Audio-Visual Center. They are responsible for producing audio-visual learning and teaching packages for use in medical schools, nursing schools, and dental schools.

The last component I would like to mention is called the Lister Hill National Center for Biomedical Communications. We're very, very fortunate in that the Congress in setting up the National Library of Medicine called for the establishment of a research and development component. This component is responsible for either supporting or carrying on in-house research in the use of computer and communications technology in support of medical research, medical education, and health care delivery. We are in the process of constructing a new building, and the top five floors will be laboratories. We hope to be able to share those laboratories with fellow agencies, and also certainly with professionals out in the field.

The point I want to make, though, is that it gives us an opportunity in a non-operational environment, while associated with an operational environment, to apply research to the new technology. We're doing a lot of work with minis, we're doing a lot of work with microprocessors, we build our own, and we're beginning now to do work with a video disk. My own personal feeling is that the new intelligent terminals and the video disk technology probably have a major impact in the way we actually do business. In terms of being able to place in many remote locations on a distributed basis, duplicates of the files that we have on a centralized basis at a very, very low cost.

I was always very, very sensitive when I was with the NASA organization that the National Library of Medicine was tied into satellites, and it still kind of gripes me a little bit that the National Library of Medicine is tied into satellite communication and yet the space agency itself is not tied in as far as its information programs are concerned. If you come to the Library, you'll find we have three dishes - on the back of the building. One ties into the ATS 6; one ties into ATS 1; and one to the new CTS satellite. Here we're concerned with communications in a broader sense, not just in terms of the classical type of communications. We've been conducting an experiment now for a number of years up in Alaska where telephone communication is almost nonexistent. Many,

many, many hundreds of villages up there have contact with the world only through high-frequency radio communication. And, unfortunately, in that part of the world, it's pretty unreliable. It's only about 50% reliable. Here we use the ATS 1 and the ATS 6 satellites to tie in twenty-two Indian villages in the central part of Alaska with the Indian Health Service Hospital. The reason for that was to be able to bring the professional staffs of that hospital into those small villages where they don't have any doctors or any nurses. So, this, likewise is communications on a broader sense. My own feeling is that I would hope that sometime in the future, that NASA itself, in terms of its own scientific and technical information programs and its technical communication programs, will take advantage of some of the technology that it actually has developed.

Well, I'm going to stop now because I have a few ideas in terms of future directions that I want to share with my colleagues and the other members of the panel.

Drobka:

Thank you very much, gentlemen. I should point out that the role that Red and I play up here is a very, very passive one. These gentlemen have the floor. We may ask a few questions, and I urge you people in the audience to join in. If you have questions to put to any one of our managers or any one of our experts up here, please join in. Before we begin our informal discussion, Dr. Duberg has a few words for us.

Duberg:

I guess our last speaker reminded us of the old proverb that the shoemaker's children have no shoes. I want to make a few remarks here which fit in very well with Mr. Caponio's remarks. In fact, he, more or less, usurped my introduction.

From the viewpoint of a research center, the trend toward research activity being more focused and more relevant to society in general has had impact on the way centers operate and the way centers do business and perhaps should eventually have some impact on the way in which we release information and perhaps may even be changing the nature of the audience we have. If you look at what's happened in the last few years and what will no doubt intensify in the next decade, the fact is that research activity no longer is carried on in that sort of pre-World War II, almost spasmodic, ad hoc way directed by the interest of the individual but rather by focused multimillion-dollar research programs. These research activities are under the general management of program directors or projectized programmatic activities, all of which have to be advocated and developed and organized. And, organized not as an

in-house activity but as a total activity involving not only the traditional research organizations, such as the Battelle or SRI or universities, but also the companies themselves, so that activity such as for SST is organized under the general direction of a program called SCAR. What we're doing about our relation with the FAA concerning the landing of aircraft in more automatic modes is under the general program called TCV, and I could go on and on and name more and more such programs, and there is an increasing number of them.

The way the information is passed around among participants in focused programs having a duration of several years is via very well programmed exchanges of information that go on through conferences, informal meetings, and formal meetings of all of the participants, not just the NASA individuals who have some element of the team that's been put together, but all of the team which could be tens of peoples or maybe even hundreds. So, the impact then on information transfer is that for the people who really want to know, information is being transferred in real time, which to some extent says 'what does that mean about report writing.' Well, it probably means that a great deal of incentive is taken out of report writing on the part of the scientists or engineers engaged in research because they think the important people already have the information. So, what will be the ultimate impact of this? Well, I'll speculate on that in a second. He arrives at a number of interesting little minor problems. For instance, we have authors now, three to a paper, where each one is from a different Corporate Source. The Langley men, two universities; the Langley man, the university, and a private company. And, so, there's a confusion there. Who has contributed what, in fact, who wrote the report. We're having some troubles right at the moment trying to pin down who really did write that report.

It also gives rise to another interesting thing which I think indicates what it really means to transfer information. At the present time, OAST is responding to requests from Corporate Sources who are saying that we would like to get in on those programs; we were not in on them in the beginning.

We are now responding to corporate groups that are saying, we're not involved in those programs, we want to get in. We want to get in because we don't want to wait and get the information after everybody else has it. They also realize that the funds that go into these things are actually impacting how they're doing business inside their companies, which means the technology being developed in their companies to respond to these programs is already inherent in them. So, then we raise the problem, how do you get it out to others. The whole impact of what I'm trying to say is that the information, among those who really need to know it, is probably already transferred by the time the program comes to an end.

So, this raises the question in my mind, what do you mean by TU? What do you mean by FEDD? I think the program manager, the man who's responsible for this project, essentially feels he's an FEDD man - that's his business. That's a piece of his activity to engage in thinking about how we are going to spread the knowledge around as we go through this project which has a beginning, a middle and an end. So, what does it mean for data retrieval systems? Does it mean that by the time this project comes to an end everybody's informed and that it's only the casual, university type operating on a longer time scale who might be interested in the information. But, there's another thought that was triggered in my mind by the remarks that were made a little earlier which is what about the advocacy of these programs. What about the knowledge generated in these programs. More ideas are put down on paper in just as formal a mode as the final report to generate the program in the first place. So, the question was raised: how do we inform the decisionmakers. The decisionmakers have already been informed by more paper than is going to be in the final technical report, and this paper already exists. We are writing that, printing that, and spreading that around at the present time at a rate commensurate with the final reporting of the technical information. So, perhaps to some extent, we already have this information to give out to decisionmakers or to people who have an interest at that level. It already exists but it's not being regarded by anybody as technical reports in a sense which final reporting is generally regarded.

So, then, if you ask yourself: what ought to happen in the next decade, I don't see why those people who now have responsibilities for generating project or projectized research activities shouldn't include within their responsibilities that of the generation and the dissemination of all the information created within that project. Advocacy papers may, indeed, be one of them. Certainly, they ought to be mindful of the implications of their outputs on retrieval systems. Perhaps what can happen in the next decade is to respond to that suggestion we got yesterday of how do you apply taste to information, which some of you may have heard Dr. Frosch say; it seems to me that anybody who runs a project of this sort has to come up with those criteria as to the validity and the value of the reporting that goes out under the system. So, maybe we can inject some quality measurement in the reporting that goes out of these projects just as a mere formal part of the generation and execution of the project.

Wente:

I just have a couple of thoughts to throw in on top of what's been said here, particularly the first remark by Joe about the expansion of information into other worlds, legislative worlds, and so forth, and I have a suggestion on how we might start thinking

about doing that. Really it kind of ties in with the changing world of computer technology, the fact that computer storage costs are getting less with each passing year and processing costs are less. Instead of applying our knowledge of Thesaurus subject categorization, or specialized vocabularies in aeronautics in space, at the beginning of this processing cycle, when we take the information into our systems as it comes off the pens of the authors, we may want to apply that same specialized know-how at the end of the cycle. We could create user guides on how to get at what we would be storing, which would be full text as it is created by authors. Perhaps, even dictated notes, John. The retrieval assistance and expertise can be at the end of the cycle rather than at the beginning. This way in the indexing process we would not lose, we would not throw away, any information at all. We would have available to us, in the future, the words as they were initially created. Just a thought, and I think it's something that we'll be thinking about more and would appreciate your ideas, too.

The other comment has to do with Mel's remark about satellites. Finally, Mel, there is a real NASA experiment in the world of satellites, and actually it came out of Goddard, the National Science Foundation, and the American Institute of Physics. I think, just beginning in September, NSF awarded a grant to AIP to conduct a two-year experiment using the Goddard public service satellite, and also existing satellites, too, as a basis for communicating specialized information in aerospace; I believe the categories are astrophysics and astronomy. The idea would be to use the satellite to actually transmit full text information from the journals, the AIP journals, to about 4 or 5 NASA centers on an experimental basis that would last about a year. So, we're finally in the business.

Day:

I'd like to go back to Joe's comment, because I think he makes a very, very good point, and yet I'm not exactly sure how this is going to be done. Let me explain what I mean. Essentially what Joe was talking about, as I understand it, is that the type of operations that we operate today, as far as information documentation activities, would change and they would become more information analysis centers than documentation centers. The problem, of course, you have there is twofold: 1) Cost. As you know, information analysis centers have been quite successful in terms of the quality of the products they produce, but quite unsuccessful in terms of the cost per unit service and per unit product. It seems to me that we have a much more basic problem, selling the user/producer the idea that he has a greater responsibility to participate in the type of activities that we're talking about, and let me explain what I mean. Publication has been a way of life

in a scientific and engineering field for many, many, many years. It goes back I guess almost to the beginning of printing, certainly to the 1600's, 1700's. The reason it has been successful is because there has been a major involvement on the part of the user/producers themselves. They have considered this important, and they have actually inserted themselves into the total process, and they have made it work. Part of the problem that we have, quite frankly, with the type of programs we're concerned with, in terms of this particular problem over here, is that there is very, very little involvement. Our reward system is such that a man who is on the bench doesn't want to become too much involved. As you know, for a number of years, AEC back a number of years ago, and in NASA back even fewer years ago, the National Science Foundation and even the National Library of Medicine have been trying to get support of their professional communities in preparing critical reviews. You can't even get them to prepare a critical review. The point I make over here is this - somehow or other we have to get a greater involvement. Most of the technical and professional people feel that they have no problems in communicating with their colleagues, their peers. And, this is probably true. They have a pretty good idea of what's going on in their highly specialized area, and this is probably true. The problem we have goes back to the point I think that Joe is making and Van is making and others are making that as we become more and more specialized we get to know more and more about less and less. And, more and more the problems we work on become multidisciplinary problems. So, it is impossible for us as individuals to know everybody that is working in all areas that would be of importance and of use to us. This is why our programs should become more useful and become more important. Because, we should be the bridge between the disciplines. We should be the bridge that professionals can use in accessing information or information materials in areas that infringe on his own but are not 100% in his area of expertise. And, yet, I think the problem that we have is that most technical people just don't consider this type of business quite frankly of sufficient importance and the gains sufficiently returned for them that they really want to become involved. In terms of analysis, in terms of people sitting down and selecting what is considered the best material in particular report, you have to have an expert who is recognized in the field. In order for him to be recognized in the field, he must be working in the field. In order for him to be working in the field, he has to be at the bench. So, it has to be a part-time job, because once he gets away from that bench, 2 or 3 years, then he no longer is the expert in the field anymore. So, the point I make and I know I'm appealing to the wrong group over here, is that we, as professionals in the information field, must get a greater involvement on the part of the user/producer community that we serve and that we're supposed to support. We need a greater involvement on their part.

Duberg:

Mel, I want to respond to that immediately, because the implication that I wanted to get across is that research activity is becoming less an activity of any one individual but rather collections of them integrated together into relatively large teams, and some of the members of that team are not researchers, per se. They may have been, but they are now managers of the project and one of their responsibilities is advocacy, reporting, etc. The point I wanted to bring up was the fact that in a team, which means division of labor, clearly the function that we have been discussing here can very well be an element of that team. When you start spending \$10 million on a relatively small program (your center may have 10 or 20 of them) clearly one could afford in every one of them someone who is knowledgeable, on top of the information being developed, and assist somehow in getting that into the system in a way which is more useful than simply a collection of blocks.

Sauter:

This is, perhaps, overkilling a point, but I would certainly like to reemphasize a couple of points that were made. One is the inconsistency between the on-line delivery of a reference to the document and the actual delivery of the document. If you take a look at that, that, of course, is going to drive us more toward information other than in a documented form, such as we know today - technical reports, journal articles, and so on. But, then if you take a look at it, you also recognize that centers such as DDC are not going to be able to cope with that kind of work. There's just no way that we would be able to do that. As Mel points out, I think that has to get the involvement then of the people who input the information. And, I think they're going to have to start all the way back almost in the educational system, because we're still taught to write reports and the report is still a way of life. So, I think the thing will gradually evolve from what we're doing today to systems where we're really talking about facts, data and so on, but it's going to be a change of the whole thing right now rather than just a major revolution in it. And, again, as Mel pointed out, it's going to involve the total community. Organizations like ours will become more central processors in terms of supplying the ADP, providing, as Van pointed out, the language standardizing after the fact and so on, rather than the type of processing that we do today.

Drobka:

All three of you gentlemen have, as one of your prime products right now, an abstract journal printed traditionally. What do you see as the future of the abstract journal in terms of what you've said?

Sauter:

Again, I think that in order to prognosticate or predict the future of certain information services and products, one has to ultimately get back to the particular audience. Abstract journals presently serve an extremely useful purpose, but again primarily to scientists and engineers and perhaps not only within their particular field of endeavor. By way of illustration, let me say that 90% of the searches made of meteorological geostrophysical abstracts, the publications which we support, the searches actually, whether they be on-line or batch or what have you, are not coming from meteorologists, but coming from another segment of scientists, engineers, and related type individuals. With the introduction, of course, more on-line retrieval systems and the reduction in the price of terminals, of course, we hear there's going to be a point whereby the individual interrogator has his own abstract journal on the CRT of a terminal, and, therefore, will not require the use of the printed word. Again, speaking in terms of two types of audiences, we have a national audience here in the U.S. which is somewhat sophisticated; within 5 or 10 years everyone will have his terminal or her terminal, and you won't need the printed page. But, in the developing countries, I'm afraid that for the next 5 or 10 years the printed word is going to be extremely important. So, again, we have to consider the audiences. One last comment that I would like to make on that (and I'm being a devil's advocate here) abstract journals have the categorization of being current awareness journals. I think that Dr. Duberg pointed out that by the time the actual final report is prepared, that's probably anywhere from 1 to 5 years after much of the work and the results of that work have been disseminated, and by the time it is picked up by an abstracting journal, it's another 6 months to 2 or 3 years; so really the information that's being disseminated either in the journal or in the abstract journal is not current information. From my point of view, it's a misnomer. Again, how do we communicate the present state of the art or how do we communicate current knowledge - I think I would have to suggest that we still do that through the informal mode and the printed word is used primarily for archival and retrospective reference. Therefore, I think that we're going to see a decline in the use of abstract journals in the future, simply because we'll have it on-line in this country. But, we're going to have the printed word for a long time in many of the other countries.

Speaking primarily for DDC, I think the days of the abstract journal are numbered. Now, by numbered I don't mean in terms of months or days, probably years, but I think there are several things that will contribute to the eventual demise of the abstract journal as we know it today. Taking DDC again as an example, this is a very expensive publication to put out, and of course, ours is

further hampered by the fact that it's a classified journal. We put out about 4,000 to 5,000 copies of it. When we take a look at who uses it, we find, as I mentioned before, the number is very limited in terms of 100's rather than 1,000's. So, I see several things that will cause probably a change. Number 1, of course, as the on-line system is expanded to a dial-up capability and so on, people will be able to access the total file rather than just two weeks' worth of abstract journals, plus they'll have cumulative indexes and all the rest of it. Also, I see more of a trend towards the specialized announcement services, the SDI type thing where you give the individual the slice of information that he wants rather than the total pic. So, within the DDC, I suspect that over a period of years, we'll probably be doing away with the abstract journal as we know it today.

Day:

I can't disagree with my two friends Joe and Hugh, in total, although I would reemphasize what Joe says in that a lot of it depends on who your audience is. For example, in the field of medicine, where your abstract journal essentially is a basic tool used throughout the world, most of those people will not have access to computerized on-line information retrieval systems for many, many years to come. I just don't think that the abstract journal in the disciplinary areas, and maybe in your mission areas, is going to disappear quite that fast. I would like to introduce if I can another problem. Here I try to put myself into the private sector. That becomes one of who's going to pay the bill? Let me explain what I mean. The chemical abstract service today supports its whole activity almost totally through subscriptions to Chemical Abstracts. I think it's about \$3,600 per subscription. It's a \$20 million per year operation. If those abstract journals die, then, in order to support essentially the activity of acquiring the material and abstracting it, or at least taking abstracts of the material that appears and indexing it, some other source is going to have to pay for that. And, if the major source of income is going to have to be from on-line systems, at least initially, it seems to me that this is going to have a major impact on costs of those on-line systems. Right now, the cost of data bases that are available on-line relatively speaking are very, very inexpensive. The major cost is primarily the cost of communication and the cost of essentially someone setting it up and storing it and keeping it available for you to interrogate on-line. So, the only point I'm making here is that the cost of the data bases as we now see them and are available on-line will have to go up and probably by a major factor if the printed publication disappears which is the main source of income for the organizations putting out those data bases. In the government, of course, we have a different situation,

but in the private sector it's a very, very real problem. This may slow down, quite frankly.

Drobka:

I can only agree with the points that they've made. That this is a concept that is an old concept and that, after a certain point, we're going to have to have another way to access the data base. Again, the point that Mel makes, for the private sector - Who's going to pay for it in the government section.

Rowsome:

I'd like to ask the five clouded crystal balls here a specific set of questions. What will primary scientific journals be like in 1987? Will they be rich and fat and crammed with advertising? Will they be pale and malnourished on page charges? Will their pages be a month old or 18 months old? Will the big successful ones be multi-disciplinary or just a slice of appeal?

Caponio:

I dare say that I don't see much of a change in the next 5 or 10 years with respect to either the format, the content, maybe the pricing of primary journals. At one time, I'm sure that many of you in this audience recall when it was predicted by a number of eminent individuals, incidentally in the field of information and without mentioning names, we might see the demise of many of the primary journals. I think that this has been well refuted and I would dare say we might see a decrease but I even question that. As a matter of fact, despite the inflationary costs, I see many more primary journals coming onto the scene today than I see the demise. So, with respect to the currency, again I don't see any real change. My contention is that much of the information contained in a primary journal today is already known to the peers within that group. And, therefore, it serves essentially as an archival document and for retrospective and for audiences outside of the peer groups. Usually, the material contained in the primary journal, whether it's the journal of neurosurgery or whether it's the journal of biological industry, especially from a national provincial point, namely the U.S., the information content of virtually 85% of the papers has already been disseminated through the perennial annual meeting or the ad hoc conference or workshop. And, therefore, when it is put in print in its final form, it's a matter for the archival record and for retrospective. Let me give you one illustration, the former Director of the National Cancer Chemotherapy Center, indicated, and this was about 6 or 7 or 8 years ago, he could no longer rely on the primary journal for communicating the latest research results developed in the Cancer Chemotherapy Lab with respect to

new multiple drug approaches to the treatment of cancer. The best way to disseminate this information is to call quick ad hoc meetings calling together the pharmaceutical companies, the physicians in the practicing community, the clinical researchers, and what have you. Again, by way of the informal method, the informal communication route, you would disseminate. But, then this does not preclude this information being recorded into the journal, but again for archival posterity introspective.

Day:

I noticed that our good friend, Red Rowsome, said 1987 not 1984, and I suspect that there was a reason for this. It seems to me that journals aren't like old soldiers, they just don't fade away, and I'm inclined to agree that they're just not fading away. There are a number that are failing but they seem to proliferate faster than they fail. Yet, most of the new ones that are coming in are primarily specialty journals. They are essentially taking a cut out of something that appeared in a more generic type journal. Yet, it also seems to me that from an economic standpoint, there have to be some changes in our whole primary publishing publications process. It just doesn't make sense. A number of years ago, when I was with the National Science Foundation, they supported a study by the American Psychological Association. They found (I think the study went on for 3 years) that in their journal which went to 25,000 of their professional members, the average article was read by about 25 of them on the average. Some, of course, weren't read at all, and I'm sure that probably 500 people read some of them. And, yet, when you consider the cost, just the economics, of going ahead and publishing literally thousands and thousands of copies of articles and we send those articles out to thousands and thousands of people and if they landed in our library they'll never get thrown away, if they came to us as individuals we may throw them away, but the cost essentially of publishing, distributing, and maintaining those collections of lots of material that will probably have very little use to me has to change. Now, it does not mean that the primary publications will die. I don't think it will ever die, because I think it's part of the process. My own personal feeling is though that I think that we may end up with a hierarchy of types of publications. I think you've seen a movement already toward synoptics, digests, or something along those lines. I think economics is going to force more of this. I think that you'll find that right now there is pressure on most people in the technical field or the scientific field to publish. A lot of material is published that shouldn't be published. A lot of material, as you know, is published in lesser known journals that was rejected maybe for some good reasons by some of the better known journals. It just seems to me that the economics is going to force a change in the way we do business. As we all know,

libraries in general are working on level budgets. The budget makers are trying to keep up with inflation but they're not going up much more and most of them aren't able to keep up with inflation. As a result, at least in the medical field, most of the libraries are being forced to cut back first on books and monographs. Book and monograph sales are plummeting. And secondly they are starting to cut back on serials publications. And, as they start to cut back on serials publications, the ones that are going to get cut out are going to be the ones on the fringe, a lot of your specialty journals. I think that this will bring about a demise of many of these journals. I think it will bring about a change in the way they do things. Instead of publishing full-length articles, I think that some of them will survive by going to synoptics and providing the full paper on request. I do think that we're going to have to change the way that we carry on primary publications simply because of the economics.

Another economic factor is that as these change, the cost is going to have to go on to the on-line system. Just this year, the Engineering Index people have raised their rates beginning in 1978; they've raised the royalty they charge for every time you copy a citation off a terminal, be it a government terminal or a commercial terminal, the same rates apply. The Metals Index organization is charging something like \$1,000 per organization just for the privilege of having retrieval capability from the data base. In other words, you have to have a subscription to this journal. It's required. Eventually I see the subscription to this secondary journal dropping off and just the basic \$1,000 continuing. But, nevertheless, someone is going to pay and it's going to be the user. There's no way around it.

Question from the floor:

Mel, you implied that the National Library of Medicine utilizes approximately 3,000 journals. Do you see the research reports being included in NLM input?

Day:

Well, as I indicated, in the field of medicine we're somewhat more fortunate than other fields. Let me explain what I mean. The fact that there may be an 18-month or a 2 year or a 5 year delay in the publication of something in the best journal may be good for us as human beings. In fact, I think that as time goes on, we find out that you don't want people to stop doing these things right away. You want them to wait a while and see what the impact is going to be. So, what I'm saying is, that in the field of medicine, although something may be published initially in the form of a report, if it is to be accepted by that man's peers in the medical community, he has to publish it in a journal. In the field of medicine, you have to do it that way.

In other fields, that's not true, especially in engineering. This, as I indicated, has helped us in the field of medicine. It's made it much easier for us to essentially cover the important material in the field, and restrict that pretty much in cover-to-cover coverage of say 3,000 basic journals.

Duberg:

Mel, let me ask you a question about something for my own information here. You were implying that many of the journals survive on library subscriptions. Does this imply that most of them do not have individual subscribers? One of the intuitive feelings I have, judging by myself, and perhaps this is true of others - I continue to subscribe to professional journals even though I must confess I don't often read articles, but it's sort of a prestige factor and even though the costs have gone up for those professional societies in which I have an interest, I keep subscribing. You're then, I think, saying that many of them will go under because they depend on library subscriptions rather than on individual subscriptions.

Day:

I think, likewise, here we're caught in sort of a vicious circle. Many, many years ago when I first got out of school I used to be a chemist. And, in those days, I subscribed to Chemical Abstracts as individual. It cost me \$25.00 a year. It was a desk tool. Every chemist had Chemical Abstracts. Today Chemical Abstracts is no longer a desk tool, no individual can subscribe to it. It's just too expensive. It becomes an institutional tool, and, in many cases, there's only one copy in the institution. Unfortunately, the same thing is beginning to happen to many of the journals. The cost of production has gone up. As the number of subscriptions drops off, this gives it another kick in terms of increasing the speed of increasing costs and likewise becomes a vicious circle. Many of the journals today are becoming institutional tools. The average journal in the field of medicine I think now costs about \$40.00 to \$50.00, and most people aren't going to subscribe to \$40 or \$50 journals. There are many that can afford them in the medical field, I know, but they don't. It becomes an institutional tool. So, many of the doctors will rely on their hospital libraries. They're all associated with the library and with the hospital and they'll rely on the hospital library to get the journals for them. Then, they'll read them when they're at the hospitals. But you're right. I think that although many individuals will subscribe to journals by far and away the major category of subscribers are libraries. And libraries keep those journals in being. If the libraries cut off their subscriptions, you're going to find the journals going downward.

Duberg:

I belong to a number of societies, and I think if I were to check off all the boxes that come on my annual opportunity to pay annual dues and resubscribe again to journals, I think in one society it would be on the order of \$300 or \$400, and another one in the area of \$200, and some of the others I get the subscription with the annual dues, but for anybody to try to keep up with all of the journals that are now available, even from one society, I think is beyond - well, it may not be beyond the reach of us - but we're not particularly interested in subscribing for this 25 articles we may read over the course of several years. My own feeling is that economics is going to drive those types of society journals, say monthly issues of fairly heavy articles, essentially out of business in the time frame that Red has given to us. My own personal feeling is that the kind of journal that is going to survive is one like Science. I don't know how many of you happen to read that magazine. It comes out weekly. It has a mixture of two or three fairly sophisticated articles in fields which usually don't interest me, but the next part of the magazine is taken up with what you might call news of the day, which interests most of us. It takes more space than any one of the technical articles, and then the rest of the magazine is devoted to letters to the editor, of which they are a very heavy publisher. But, if you look at that whole magazine, it's a very timely thing. It's on a weekly basis. It keeps you current with a lot of things, not just science but science policies as well. And, I think that kind of short-term type document may survive because it will get customers and it will get a subscription rate that will maintain itself. Even that magazine is generally not the source of first publication of a major event. I think that if you recall within the last year the competition between the East Coast and the West Coast on discovering a new particle was really not published in that magazine but rather in the New York Times, where they fought to get in on an hour to hour basis. All of this seems to indicate that science is pursued at such a rate today that daily and weekly sources are better ones to look to get your information than monthly or quarterly journals, certainly not annuals.

Rowsome:

What do the five crystal balls show on the long-term future of books? I think Mel gave books a glancing blow a short time ago. Are your dancing green lines and connected networks going to put books out of business? They have a good 600-year history. They've done a lot in 600 years.

Day:

No, Red, I don't think books are going to go out of business, but I thought you might be interested in some statistics. As you know,

our library handles a large number of inter-library loans, and the number of requests for inter-library loans and books has gone up 300% in the last two years, and we're not announcing any more than we announced before, and when we went back to try to find out why we just found that, at least technical books, are very expensive (you know you can't buy technical books for \$25, \$35, \$40, \$50) and the librarian is cutting back on the technical books. If it's a choice between a technical book which may or may not be used, and against a journal that does get some kind of distribution and people do come in and browse through it, the librarian is making the choice for the journal. We've found that as librarians are being forced to cut back on their acquisitions, the first cut is on monographs and the second cut is on periodicals, serial publications.

Duberg:

I might amplify on what Mel has had to say. I would agree that eventually we're going to see the, perhaps not complete, demise of scientific monographs, but this is the area where economics has its greatest impact. As probably most of you know, it is very difficult to generate a scientific monograph and have it become a best seller. There are only a few publications irrespective of the scientific discipline or the applied mission oriented area. Therefore, in production of monographs as such, it's a very costly enterprise, and I dare say that you will note a decline already in many of the society and academic prices today. The only scientific monographs that are being published today, or at least the majority, emanate from the commercial publisher. And at that point where there is a diminishing return in terms of the profit, and this is already pointed out by individuals such as Curtis Benjamin and others who are in the publishing business, I would predict and forecast the demise or a tremendous reduction in the generation of scientific monographs in the future.

Drobka:

To change the subject - most everything you've said is going to require money. In order for managers of information systems, no matter what size, to get money, they have to get their management's attention and show that what they're doing has some value. Would any of you like to speculate on how best we get our management's attention to tell them that we have a good product and deserve support?

Caponio:

Well, being on the left end again, I'll attempt to respond to that. I think this is perhaps the major problem that many of the speakers have alluded to - How do we bring this whole area of

scientific and technical information to the attention of managers. How do we prevail upon them or influence them on the utility of what we produce, namely S&TI. I have a feeling that we haven't been too successful. I think that we're successful among our own peers, no question about that. But, as I indicated earlier, how often do the top managers turn to us for what I call, the understandable STI. And, the chances are, at least in my organization, that they're not going to be turning to me; they're turning to their top staff. We must develop for the top staff (some are scientists, some are non-scientists and there's a trend especially with respect to the incoming policy makers to be non-scientists) a mechanism for impressing upon them that we have something that is not only useful but will assist them in the decisionmaking. Mel referred to the role of IACs as a very costly enterprise, and I certainly would agree. However, I think the traditional information analysis center as we have seen it in the past, has been oriented to the scientist or to the engineer. Again, it fulfilled that particular role in terms of being responsive to scientific and engineering information needs and requirements. But, in order to make whatever we're doing useful and meaningful to the top managers, to the top administrators, so that we get our slice of the pie with respect to budget allocations, we have got to do a much better selling job. And, I'm not sure what the answer is, but I do know that we have not really made an impression with these people who are in the command post. Again, I would refer to just a typical example today. The role of carbon dioxide. There's no way, despite all of the scientific evidence that we have accumulated here at NASA and at NOAA, that we can put this information together and turn it over to Dr. Frank Press or to the President to make an intelligent decision. And, if it's not available through the cooperative effort of science, scientists and engineers, how are these decisionmakers going to make decisions? So, I think we have failed, but I'm not sure I have the answer of how to succeed.

Sauter:

I guess the answer to that is 'yes.' I certainly agree with Joe that with our peers we have a good reputation. They recognize the value of the service that's being provided. But, we were not surprised when recently as part of the Auerbach study, we went on up the chain of command within the Department of Defense, and you find that when you get one level above the actual operation that you're talking about, people simply are not aware of the scientific and technical information programs that exist. I think we've already said earlier today that the people in top management positions don't have an information problem, and they really have very little understanding or grasp how the information is provided to them. I know that within the DoD at the Assistant Secretary level, when they want information, they snap a finger, and then someone down the echelon gets the infor-

mation for them. They might, in fact, get it from DDC but the man who ends with the information has no understanding of how that information actually arrived at his desk.

So, I guess part of the answer, too, is that support from the programs quite often comes from external sources rather than from anything we, ourselves, can do. As Joe said, it's a problem I think we've been wrestling with for more years than I care to recall, and yet we simply do not have any good solution for it. The programs that survive, primarily survive because of a compassion or understanding that information is good and ought to be supported, rather than anything tangible that we can show in terms of so many dollars for the dollars spent for information programs.

Day:

Well, unfortunately, from my standpoint I don't have any magic answer. I think the problem we have is to convince top management that his investment in this particular activity is more important than his investments in other kinds of activities. That's pretty much what it boils down to. He has different priorities and the question is where he puts information on the priority scale. I think, unfortunately, that in terms of the Federal Government today that most information programs are essentially considered by top management as something their agencies should have, but something that they as individuals don't need. Information programs are something that they as individuals don't use, and to the best of their knowledge their immediate staffs don't use. If they do, this is certainly not known to top management. It just seems to me that in order to get increased support, you've got to be able to convince top management that his investment to that extra dollar in your activity is a wiser investment than his investment in something else. The only way that he'll be convinced is if he can see that it's going to do something for him that's important. I don't have any magic answer. I just think that you have to approach it in many different ways. In the field of medicine, we've been very, very fortunate. The budget for the organization I'm in (and I claim no credit for this because this was pretty much established before I came there) has gone up ten-fold in the last eleven years. And, that's been because the community out there, and I'm not talking about the medical librarians, I'm talking about the surgeons and the physicians and the heads of the medical schools and the heads of the hospitals and the heads of the clinics who have gone to their Congressmen themselves and have demanded more of an investment on the part of the Federal Government in providing them this type of service. The problem that we have with the space community is that it is essentially a closed community. The group that you serve is primarily within the contractor group or your own center group or your grantees and what

have you. The question is how can you get those people to champion your cause. The only way you can get them to do that is to make it important to them. Our job is, to somehow or other, to get to those people. I think that we've oriented ourselves primarily, and I don't want this to be misunderstood, toward our colleagues who are also either information or library specialists. We have not talked the language that management wants to hear, and we have not made our case with him. We talk jibberish as far as he's concerned. He could care less about on-line interactive systems because he doesn't understand what you're talking about. Somehow or other we have to put together a story that's meaningful to him. It's something that either saves his program money or speeds up the activity in getting the results he wants at a faster rate.

Chandler:

Don't you use the technique, Mel, of having advisory committees made up of deans of medical schools, and so on, so that these are the people that get to understand what you're doing. Isn't that your technique?

Day:

You're right. There's no question that people in the same discipline listen to each other; a physician, for example, listens to another physician or another surgeon. There's no question that it's very important in the medical profession, and I think it's important in other fields, too. You have to get a support group; you can do it through an advisory group or policy groups or regent-type groups. You have to get the type of people who can talk to the top people in management and who will believe and whose advice will be accepted.

Duberg: '

The only thought that occurred to me is one that I read in the past year in a felicitous series of articles which appeared in R&D. Some of you may get that magazine. Last year an individual had been writing an article about every month or so on how to succeed in R&D. One of the points he brought up a few months ago was that the way to succeed is not to do a good job all the time, which I think what STI is doing, but rather to have a crisis every now and then in which you involve management in the resolution. And, all of a sudden they feel important and get engaged with you and solve the activity and so you stop going down and your crisis actually goes up for involving them. So, that's about the only suggestion I can make.

Day:

I think this is something that all of us are well aware of. The government information programs got their strongest support when, as you just pointed out, John, we were accused of not being so very efficient because the Russians got way ahead with information. It was a crisis situation and we got support.

Rowsome:

I'd like to ask the crystal balls to comment on some observations that I found recently written by a wise man. "The one device for providing the semblance of great respectability is the carefully selected review committee, the group composed of eminent experts in the field. Very rarely will such authorities predict that they have become obsolete. The people least likely to produce successfully the next revolution are those who just precipitated the current one. History shows with relentless certainty that most of them will spend the next few years defending their decisions until they have solidified into technological stasis. Ironically it is during this period that they have the highest reputation of all as advanced thinkers. Then there's a rather macabre ending. If an organization is really going to be in the forefront with respect to technological progress, it must figuratively shoot the leaders of each successive revolution the morning after their greatest triumph." Any crystal ball comment on that?

Day:

I wouldn't argue with that, Red. I think it's very astute. I'd go back to what George pointed up here is that if I were responsible for running an operation and I wanted to get the best possible advice, I would bring the best people in the field in as consultants. By the same token, from a political standpoint, the people I would bring in as the senior advisory group would not be information types, they would be the user or producer types who have credibility with top management in their own installations and in Headquarters. I think, politically, you get much further ahead that way. I haven't answered your question. I think that a number of people who used to work at the Atomic Energy Commission knew Carl Holmes.

Carl Holmes told me that during World War I he got a job in a munitions factory, and he was working on the line, he was producing shells, and he said the first week he was there, the man came through and he said "our quota for this week is 50 shells a day for each person." And, so, they did 50 shells and they didn't get any more and they fired everybody. And, they brought a whole new crew in and said that the quota for this group is

100 shells a day. And, the point I make is that there's a lot to be said for this. Oftentimes, after we reach our particular goal, we just tend to relax. In this world, you just can't stop. You just have to keep pushing ahead because things keep changing. And, if you just stay at a level or if you keep a program essentially in the same form, and it doesn't look different as far as your management's concerned, he's going to think or figure that you're not going anything. You have to have continual changes and improvements.

A footnote to that - The hardest thing to bring about is change.

Day:

One comment - Yes, I still feel that we need the experts and in any given discipline-applied area, it's still the experts who usually make the advances in science and technology. I think it's a well-known fact that although we may have literally thousands and millions of scientists and engineers through the universe today, it's probably no more than a small fraction, perhaps 10% or 15%, who really pioneer in the advancement of science and technology. This is not to minimize the contribution of the other 75% to 90%, but it is usually the leaders who carry on the forefront of research, development, and applied technology. I'll give you an instance that may tend to illustrate. One of the most successful research-oriented programs in the field of neurobiology exists at MIT. As a matter of fact, NASA was one of the prime supporters. It's called the NRP - The Neurosciences Research Project. And, the basic objective and goal of this particular program is simply to advance the science of neurobiology and its applied areas with respect to memory retention, and the methods by which the mind stores in its data bank all of the physical and sense type data that the human mind receives and integrates. The membership of this particular program comprises of either Nobel prize winners or near Nobel prize winners; they're called associates. They form a club and it may be considered, and perhaps rightly so, somewhat of an elitist club; it consists of 30 members from all over the world. It's not restricted to neurobiologists, neurophysiologists, neurochemists - it cuts across and involves psychologists, mathematicians. It's a multidisciplinary approach in order to advance that particular science.

I think that this illustrates that much of the advances made in science and technology and in medicine do stem or emanate from the peer group. And that peer group is usually given the appropriate recognition. On occasion, however, the whole system has been criticized, and I'm sure that you've seen the whole role of peer review criticized over the past two years, especially with respect to the National Science Foundation and, in some

instances, the NIH. But, it has survived because it's the best system that we have in advancing science and technology, and I would admit, and others have, that occasionally some novel crackpot ideas have been rejected by the peer group simply because they didn't think of it first. But, I don't think that there's any other system that can replace it, at least as of this point in time. So, therefore, in response, I would say, yes, we're going to continue to rely on the experts for advancing science and technology.

Question from the floor:

I would like to know what you see in the future for linking your various services into a network that would be cohesive and interactive.

Caponio:

I think you've put your finger on the most promising area in terms of how we can sell our programs. I don't like to use cliches, but the in-word today is networking and sharing of resources. In addition to being a cliché, I think it is the means and the way to perhaps sell our programs. Especially in view of the fact that many of the agencies and the departments work so closely together, it seems to me that the networking and the sharing of resources is natural. Unfortunately, we haven't been doing enough of that in the past. I think we would go on to enumerate some of the specifics that are being carried on by both the information activity world and the library activity world, but I'm sure you're well aware of them. I have a feeling that there are many programs, and areas, and I'll mention one that's of interest to NASA, namely the LACIE, this is the large area crop inventory experiment which is a joint effort with the USDA and our own NOAA, to acquire data through the use of satellites and other remote computer technology for the basic purpose of assessing what the effects are of weather and climatological anomalies on the growth of U.S. and world-wide crops. Well, I dare say that these programs are working together, but despite the good intentions of George and myself, we really haven't gotten down how the information picture ties in to these cooperative or collaborative ventures. I would say, in the future, there's got to be much more networking, much more sharing of resources, the development of joint programs whether they be for on-line retrieval or for the document delivery using satellite technology or telefacsimile. We've got to be working more or less together rather than independently.

Sauter:

Well, I think all of us recognize the need and the desirability of doing this, but speaking again for DDC, I think it becomes a question of priority and I don't know if you know it or not, but we did have an experiment going with NASA where we exchanged terminals. The idea eventually was to tie the two systems together. And, technically, it's feasible, but there are certain problems in terms of costs and how do you do it today. I think my question is whether it's going to happen in the near future, because I think all of us have it as part of our longer range planning. When do we get there, is the question. I think it's going to happen sooner than that. It has to come through pressure from user groups. We recognize the desirability but it's a question of priority and resources to do the job now. As Joe pointed out, the way to go, I think, is through the communications network rather than a one-to-one connection, because certainly that's sort of a bottomless pit and you spend a lot of resources. I think all of us have to be thinking in terms of tying into a communication network so that it's accessible to anyone that ties into that network.

Wente:

Well, I'll just say that Hugh's perfectly right. We have the exchange arrangements that I talked of yesterday with NOAA and DoD, ERDA, Library of Congress, and there is another area of work that's being sponsored by the National Science Foundation, too. I think you're aware of the fact that MIT has spent quite a lot of time and effort in developing a standardized retrieval language to get into the major systems. MEDLARS is one, I think Lockheed is one, and I forget the others. But, anyway, with ERDA we are going to tap into the results of this work and try to begin the standardization of the language that is used to approach the on-line data bases.

Day:

I think it's too bad that in developing the on-line systems in this country that we didn't develop standard protocol. I mean I didn't say we ought to come up with one system. It is true that the people at MIT have done some very interesting work. My own personal feeling is that it will be possible either through software as they've done at MIT or through hardware, either a black box or even today with these new intelligent terminals (the power that you have in those intelligent terminals is phenomenal today). It will be possible, essentially, for you to tap into any of the systems and just use the protocol that you're used to using. In many cases, this will do the whole job. We are doing some interesting work in this area. Chuck Goldstein, who used to be

at Lewis Research Center, has a computer technology branch at our Lister Hill Center, and he's working just on this particular problem. There's no question in my own mind that the day will come when you essentially will learn one protocol and you'll be able to use that on any of them, because there'll be something that will be an intermediary, essentially that will do the translating for you.

Drobka:

I'm sorry to interrupt you, gentlemen, but we have run out of time. I thank you very much on behalf of George Chandler. I think that contrary to Red, they were not clouded crystal balls. Again, on behalf of George Chandler I invite you to stay on for as much of the remaining proceedings as your time will permit.

Day:

I'd like to get one last word in if I can. I'd like to pay respect to John Duberg, and this is completely unsolicited. You heard me complaining a little while ago about the fact that we really don't have the support of the program leaders, the technical people out in the field, and of course John believes that because John has essentially been a strong supporter of our information programs now for many, many years. It's just too bad we don't have a lot more John Dubergs.