FEDERAL INFORMATION POLICY -PUTTING IT ALL TOGETHER

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Good morning and thank you for the honor to present this lecture in the memory of Miles Conrad, first president of NFAIS and one of its original founders. The lecture series is a fitting memory to a man of vision, strength, devotion to scholarly pursuits, and one dedicated to achieving cooperation amongst information services. Art Elias probably said it best: "Miles stamped 'quality' on everything that he did; to lecture in his name requires that characteristic."

Interestingly enough, when the lecture series began in 1968 it was a banquet address, and soon thereafter it was a regular part of the conference program consisting of a 20-minute talk and a seven-member responding panel. Well, my talk won't be limited to 20 minutes, nor is there a seven-member panel, but I did the next best thing. I posed a series of questions in advance to my own panel of seven, namely the remaining original NFAIS members (American Institute of Aeronautics and Astronautics, American Psychological Association, National Agricultural Library, BIOSIS, Chemical Abstracts Service, American Meteorological Association, and Defense Technical Information Center).

My topic, which these informed panelists have contributed to, is entitled "Federal Information Policy-Putting It All Together." I must tell you my original title sounded much more sophisticated. It was "Federal Information Policy-Shaped by Technology, Powered by Knowledge." That seemed to have a nice balance to it. So why did I change it? Well, in preparing my remarks, I was perusing Science magazine, and there in an editorial concerning the 21st century were the words, "Imagine a new century, full of promise, molded by science, shaped by technology, powered by knowledge." Can you believe it? President Clinton had used my very words. So this morning, under whatever title you like, we will briefly look at some of the people and classic reports that have made STI history in the past four decades. We will discuss the road less traveled, but of prime importance, in the evolution of Federal information policy; the issues that have created both hope and anxiety in public/private relations; and a possible framework for information policy development in the future.

Yet, while we want to look to the future, it is imperative that we also understand the past lest we make the blunder articulated so well by the philosopher George Santayana, namely: "Those who cannot remember the past are condemned to repeat it."

Where shall we begin? We could begin with Stone Age cave drawings, with Egyptian hieroglyphics, the monastic copyists, or the introduction of the Gutenberg pres--for throughout time there certainly are early examples of scientific and technical communications. Or we could begin our exploration with what Andy Aines, one of the deans of modern STI, claimed was the first technical journal published in 1665, Journal Des Savants. It contained three kinds of information: criticism of published books, obituaries and eulogies, and descriptions of original work in physics and chemistry. Or we could jump ahead nearly three centuries and begin with Vannevar Bush's report to President Roosevelt in 1945 entitled "Science - The Endless Frontier." Following the lessons of World War II, the theme emerged from that report that scientific progress was essential for the good of the country, and science was a proper concern of government. This led later to the creation of the National Science Foundation in 1950, an agency that was initially very important for the STI industry.

But to preclude any permanent glazing over of the eyes, I will pick a more recent milestone in this century to begin our travels and we will see if you can guess the year. Are you ready?

Boris Pasternak, author of Dr. Zhivago, received the Nobel Prize for Literature; and C. Northcote Parkinson blessed the world with his satirical exposition of the growth of the bureaucracy better known as "Parkinson's Law." Elizabeth Taylor burst forth on the screen in Cat on a Hot Tin Roof, the Cha Cha was the new dance vogue, and popular music gave us the "Chipmunk Song" and "The Purple People

Eater." The Guggenheim opened its doors in New York, and across town the Yankees won baseball's World Series over the Milwaukee Braves.

In the realm of science and technology, the USSR launched a 3,000 pound Sputnik into space and the United States countered with its first moon rocket, one that failed to reach its target by some 200,000 miles. To great fanfare the U.S. Government established the National Aeronautics and Space Administration to begin the quest of space exploration.

But perhaps the most singular event in that famous year was the founding meeting of the National Federation of Science Abstracting and Indexing Services in Philadelphia on January 29th. The year was 1958--so happy 40th anniversary, NFAIS.

This was the same year that Senator Hubert Humphrey declared for all to hear that a "new age of science had dawned and it was an Information Age." The "Happy Warrior," as he was known to many, was clearly one of the great heroes of the information science community. He, like the whole free world, had been jolted by the dramatic launching of the Soviet Sputnik, for this seemed to presage Soviet dominance in military and space technology. The launch was clearly a wake up call to the Nation's science enterprise, and it spurred a great awareness of the value and importance of scientific and technical information management.

From the pulpit of the Senate Subcommittee on Government Reorganization, an emotional and eloquent Hubert Humphrey grilled official Washington demanding to know what the Executive Branch was doing to manage the masses of information being generated by billions of Federal research and development dollars. The crusading Senator said it clearly and plainly: "the scientist should have at his fingertips the knowledge of prior experiments. He should have access to research elsewhere which may still be in progress and has not yet been published." I ask you: doesn't that simple statement of 40 years ago resonate as well today as it did then? Yes, the technology driving the information age has changed dramatically, but the search for knowledge remains a constant to improve our way of life.

Following closely on the footsteps of Humphrey's call to order, the sixties blossomed into a decade of unprecedented development of STI programs and initiatives. National goals and objectives in science and technology called for coordination and genuine cooperation between the Federal government, universities, and the private sector. A Special Assistant to the President for Science and Technology was appointed who doubled as the Chairman of both the President's Science Advisory Committee (PSAC), made up of scientists and engineers from the private sector, and also as Chairman of the Federal Council for Science and Technology (FCST), made up of governmental science managers. From this new structure grew the famous Weinberg Report and the Committee on Scientific and Technical Information (COSATI).

The 1963 Weinberg Report entitled Science, Government, and Information, was named after Dr. Alvin Weinberg, Director, Oak Ridge National Laboratory. The report proclaimed loudly that the transfer of information was not only an integral but also an inseparable part of the research and development process. The technical community was essentially being told that they, the scientists and engineers along with the conventional information handlers, were now bonded in a new information community, in a new era of "Big Science." The report also commended the National Science Foundation for supporting private information services and promoting uniform abstracting and indexing practices through collaboration with our own association, NFAIS.

Although the report clearly was a call for each Federal agency concerned with science and technology to assume its responsibility to foster information activities within its field, it also called for an appropriate balance with the private sector. As the report eloquently states, "We must always seek to insure ... that the Federal information system remains adequate but does not overwhelm the existing non-Government systems and that they together continue to develop into an effectively interwoven instrument that is always responsive to the changing needs of our science and technology."

Acceptance of the Weinberg Report was not unanimous in the Federal structure, but certainly Defense, Energy, and Space were soon flying at full throttle and CAS, BIOSIS, ISI, and others in the private sector were involved in innovative large-scale information transfer experiments. In biomedicine the

situation was somewhat different, for there was a long-standing tradition of "publish or perish." NLM had been creating indexes to the literature of biomedicine since 1879 to accommodate this dictum. But in the 1960s, with the direct assistance of the private sector, NLM ventured into the world of automation. The computerized MEDLARS was born, but in its rudimentary stages, it moved at post-office speeds, that is to say, glacial.

I would be remiss if I didn't mention that the Weinberg panel was only one of numerous ad hoc panels commissioned in the sixties. For example, the Baker Panel explored both the government and non-government information communities, and the Crawford Panel called for a central authority to manage STI within the Federal Government.

During this decade, COSATI was born with the responsibility to develop among the Executive Agencies a coordinated but decentralized STI system for scientists, engineers, and other technical professions. Additionally, it sought to foster an improved national system for handling STI, and it was made clear that if the blueprint didn't include the private sector there was little chance of an orderly growth of a national information system. COSATI became the national focal point for coordinating the development of a national network of independently operating but, at the same time, cooperating STI systems. The key factor responsible for the success of COSATI was its organizational placement in the Executive Office of the President-essentially above the level of the Federal agencies themselves. There was great ferment in the field--the best and brightest were involved--and I believe it is fair to say that as a whole the Federal STI programs in the 60s were the technology leaders in the STI field. They worked closely with the private sector STI organizations and even funded the computerization of a number of not-for-profit abstracting and indexing services. This mutually beneficial alliance ensured the continuing leadership of U.S. STI services.

As we entered the 1970s, most Americans finally recognized that the Information Age had truly arrived. Although the Nation was deeply concerned about the depletion of oil reserves and escalating prices as a result of the Arab embargo, a new and inexhaustible and ever-expanding national resource had arrived. It was clear that STI was an essential ingredient of the scientific enterprise, and crucial to the effectiveness of government and the very growth of U.S. industry and commerce. In the early 1970s, Congressman Dadderio continued to carry the torch for STI calling for the strengthening of COSATI which he viewed as a structure that was performing heroically "under incredible odds to bring order out of disarray."

Despite these pleas for reason, the early 1970s saw the dismantling of the key mechanism for coordinating the government-wide STI efforts. COSATI was removed from the Office of the President and transferred to what some referred to as the graveyard of STI programs - the NSF. But STI alone wasn't being unfairly targeted; in the early 70s the entire Federal science apparatus was in disarray as President Nixon not only removed his Science Advisor but abolished the Office of Science and Technology. Nixon seemed to hold little respect for what he called the "fractious scientists" whom he found both irritating and clearly overly independent. Although they were political opponents, Nixon no doubt sympathized with Senator Ed Muskie who grew tired of scientists testifying, "well, on one hand ... but then on the other." What I need, the Senator complained, "is some one-armed scientists."

While Federal support for science and its information support structure began to wane in the 1970s, the flame of desire for a coherent national information policy, in some quarters, could not be extinguished. At last year's Miles Conrad Lecture, Toni Carbo reported on one of the classics in our field that was compiled in that decade, the so-called Rockefeller Report. Vice President Nelson Rockefeller's Domestic Council took on the task of discussing the issues and structure needed to develop a coordinated National Information Policy.

In a most sobering assessment, the report states that it is pointless to debate whether there should be a National Information Policy for "it will exist whether or not it is arrived at consciously or unconsciously, by commission or omission, carefully or haphazardly, in a comprehensive or in a piecemeal fashion." The report enunciates that information policy has a variety of connotations, but that it will inevitably, however it is arrived at, have a great effect on our society.

The Rockefeller Report reaffirmed the importance of the public and private sector jointly developing information policies, and concluded it was critical that a new Office of Information Policy be formed in the Executive Office of the President with internal and external advisory mechanisms. Although the position of Science Advisor to the President had finally been reestablished by the Congress as part of the 1976 National Science and Technology Policy, Organization, and Priorities Act, the Rockefeller Commission saw the Office of Science and Technology Policy's (OSTP) role in STI as only a part of the information policy arena. In fact, in laying forth some broad principles, it observed that scientific information had often in the past crowded out other more general information policy concerns. The truth of the matter, of course, is that STI and general information policy are inextricably linked.

If by the early 1980s you still didn't think we were in the Information Age, you got a slight jolt when Time Magazine in 1982 declared that the "Man of the Year" was a computer. However, the country did heave a collective sigh of relief, pleased that the bleak predictions of Orwell's 1984 had not come true. But public confidence in America's institutions, be they government or business, was hardly at a high point. "Productivity" was the byword as competition from other industrial nations, including the rising sun of Japan, Inc., was a major consideration. There was a genuine concern that a better mechanism was needed to funnel government-generated information to the private sector without losing it to foreign information collectors. The Office of Management and Budget (OMB) became the de facto information manager for the Executive Branch, cranking out one circular after another dealing with a variety of information policies. Disarray seemed to be everywhere--the Commerce and Defense Departments battled over whether and how to restrict the export of U.S. know-how and high tech equipment, and the professional societies just as vehemently argued that the uncertain benefits of controls were more than outweighed by the loss of scientific progress that would result from inhibiting the free flow of information. Meanwhile, the U.S. STI agencies were left to improvise on their own during this general era of protectionism, while other nations around the globe were engaged in developing national information policy and placing a high premium on the value of managing and disseminating STI.

While some characterized Federal STI policy in the '80s as a veritable "wasteland," or at best in disarray, Congressman George Brown was diligently examining the impact on science of what everyone was now calling the Information Age. Brown forcefully reminded OSTP that it did have a role in the stewardship of U.S. scientific and technical information whether it wanted to assume it or not. Few listened to these appeals, but Brown's oratory kept hope alive. In Ralph Waldo Emerson's words: "then, in a moment, and unannounced, the truth appears. A certain wandering light appears, and is the distinction, the principle, we wanted."

That light shone upon the STI community in two ways. First, a 1989 report of the National Academy of Science entitled Information Technology and the Conduct of Research showed there was a reawakening within the research community that technology could enhance significantly the communication of information and knowledge. The report acknowledged serious impediments: network access was limited; network incompatibilities abounded; software was often unsuited to research needs; and there were legal and ethical concerns in need of resolution. The major recommendation from the report, and a precursor of things to come, was "that the institutions supporting the Nation's researchers, led by the Federal government, should develop an interconnected national information technology network." Analogies to the interstate and national highway systems began to emerge, and a commitment by the NSF to develop a national research network utilizing the NSFNET backbone was on the drawing table. There were behavioral impediments, as well as technical, to the use of the new technologies. The seemingly simple things like access to computers, customized software, and learning how to use these new services; all required more attention. The Federal agencies, professional societies, scientific associations, and private profit-making groups all had roles to play.

The second ray of light was the Helping America Compete study conducted by the Office of Technology Assessment (OTA). The report by Fred Wood called upon the Nation to take full advantage of Federal STI as part of its blueprint to renew the U.S. competitive edge. Whether it was technical reports on aerospace propulsion, solar thermal electrical systems, oceanic and atmospheric satellite data, or bibliographic indexes to medical and agricultural research the message was clear that STI, used efficiently, pays off handsomely. This report, like many that had preceded it, called once again for a

framework for leadership of STI programs and specifically for OSTP to strengthen its role in that regard. But, like a reluctant groom, OSTP still couldn't find its way down the aisle to the altar. It flirted with the idea of embracing STI issues but, in the end, balked at articulating an overall STI program or policy.

One of the truly bright lights over the past seven or eight years since these seminal reports were issued has been the maturation of a group of STI managers, collectively known as CENDI. This group of Federal managers met informally during the mid-1980s as they waited in vain for the rebirth of COSATI or an equivalent. With no miracle in sight, in 1990 a stronger CENDI interagency mechanism was put in place with Bonnie Carroll as its competent Secretariat and Kurt Molholm as the effective chairman of the group. The CENDI acronym stands, imperfectly, for Commerce, Energy, NASA, NLM, Defense Technical and Intelligence agencies, Interior, and now most recently, Education. It has a unified mission of improving the productivity of Federal research and development through efficient and responsive information management systems. Combined, these seven agencies represent more than 90 percent of the $70 billion Federal R&D budget.

CENDI has served as a forum for discussing and exchanging information on various STI-related activities, and as a mechanism for presenting agency views to OSTP, OMB, Congressional committees, and other STI policymaking organizations. Finally, CENDI has fostered a sense of cohesion and community among the Federal STI agencies, and helped to focus a common view on the needs of the user community.

I don't know how many of this crowd remembers Arthur Clarke's short story "Dial F for Frankenstein" published back in 1963. 1 think the only reason I do is because NLM currently has an exhibit in its lobby entitled "Frankenstein Penetrating the Secrets of Nature." In any event, the story as I recall it tells of the launching of the final satellite required to complete the connection for an international telephone system. Shortly thereafter, all the telephones on earth rang at once. It was described as a "horrible cry of an artificial supermind, born out of the global network of 80 billion individual switches in the world's automatic exchanges." In essence, so many computers got hooked together that they began to comprehend and react autonomously.

And how many of you trooped to the cinema to see War Games in the mid-'80s. It had a simple plot-- namely some young teenage "geeks" using a PC broke into a secured computer system in the Pentagon's war room and in the process nearly started World War III.

Science fiction? Perhaps, but as we now know, behind the scenes a giant was lurking, one that would change the way we all live, work, and communicate. The Defense Department's Advanced Research Projects Agency (ARPA) was busy constructing a network for communications for use after a nuclear attack. That system formed the model for the Internet we know today. This was a major leap forward in communications technology, but there still remained a need for a more efficient and easy way to retrieve data before such networks would be widely used.

In this regard, one of the great unsung heroes has to be Tim Berners-Lee, the man who invented the World Wide Web. It is rumored that because Berners-Lee had a personal neural glitch, namely, an inability to recall names and facts (something I can easily identify with), he set out to invent a memory substitute. That is why today on the Web you can spot a photo, click on it, and get a biography of the individual portrayed, and then keep randomly connecting from one hyperlink to the next. But Berners-Lee is also to be admired because he created the Web Consortium and dedicated himself to making the Web a public resource rather than a source of personal enrichment.

So technology marches on and with it we all desperately try to stay up with its implications and its opportunities. The High Performance Computing and Communications Initiative and the National Information Infrastructure (NII) efforts have made it clear that the Federal government has taken the electronic road with gusto. There have been many successes in developing an infrastructure from which both the public and private sectors have reaped the benefits. The advent of the Internet and the WWW, combined with the central role of information technology in reinventing government, has moved the bureaucracy from being a somewhat hesitant partner a decade ago, to becoming a willing

partner today in the electronic information dissemination revolution. The Web has dramatically improved user access to a wide range of Federal STI, often at low or no cost to users.

The value of STI to research, development, and competitiveness is nevertheless not well appreciated, and there is no clear focal point for coordination, issue discussions, and decision making. STI receives sporadic attention from OSTP and OMB, but most often when it does occur it is in the context of the NII initiative, not because of a focus on STI, per se. Thus, the Federal STI agencies find themselves somewhat schizophrenic; they are actively involved in the technology revolution, yet the low status of STI policy combined with fiscal constraints has left some traditionally strong Federal STI groups adversely affected. Some would argue that despite the lack of any comprehensive government information policy, the Web has established a new baseline for government service with which the private sector is somewhat more comfortable.

As the old tale has it, the blind person's image of an elephant is definitely dependent upon what part of the beast he has encountered. So let me bring my panel in a bit closer and have them train their magnifying glasses on the information issues most important to them. Maybe then the elephant of scientific information policy and organization will come into focus.

Issues
The panel identified 12 issues requiring policy consideration: copyright, intellectual property, and database protection; security and privacy; information integrity; digital archiving; open and universal access to government information; standards for accessing data; international standards; pricing; information resource management; protection against unwanted delivery; role of libraries in the electronic age; and GPO and depository libraries. Five of these received mention by four or more panelists. Not surprising, certain fundamental information policies that remain the foundation of our government were right up front. These included intellectual property, free and open access to government information, and personal privacy considerations. The latter is particularly sensitive as technology makes it easier to collect and correlate personal data. The thought that private information, including medical records, could be instantaneously distributed anywhere over the Web is disconcerting. The new electronic media also raise issues associated with integrity of data, standards for organizing and accessing data, with preserving the record of our heritage and the archiving of large scientific databases. But of general concern to all panelists was information policy surrounding the interaction and responsibilities of the public and private sectors.

Public/Private Sector
Over the last several decades, the relationship between the Federal government and the private sector regarding information dissemination activities has generated its share of controversy. As Carl Sagan said, "If organizations devoted to technological innovation are not challenging (and perhaps even offending) to at least some powerful groups, they are not accomplishing their purpose." Much discussion has occurred over appropriate roles and how to strike a "balance" in the provision of Federal information to the public. The Rockefeller Commission's review and also a major U.S. National Commission of Libraries and Information Science (NCLIS) public/private sector study dealt extensively with these matters. This certainly is one arena where cries for a national information policy have been most prevalent.

As many of you know, NLM has not been a stranger to such controversy and upon occasion has been actually in the eye of the storm. In fact, I specifically addressed this matter at NFAIS's 25th anniversary conference. Those were the days in the mid-1980s when the question frequently posed was "is information a commodity or a public good?" The private sector argued that just as people have rights to access information, so too does a democratic society recognize the rights of a free and competitive market. The market system, which is subject to the forces of supply and demand, should determine which products are developed and at what price they are sold. The argument was that information should be provided to the public by Federal agencies only when the private sector was unable to provide the service.

The public sector view, often espoused by the people's elected officials, was that there is a need to ensure open access by the public to information which has been created by taxpayer funds. This same argument that the government is obliged to provide citizens with easy access to information created

by government is as strong as ever. Americans have a clear belief in the principle that an informed citizenry is essential to democracy.

But as one panelist put it, "What has been more elusive is how our basic principles are implemented in public policy. Public/private sector interaction is a moving target that continues to require attention and fine tuning by policy makers." Most panelists believed that OMB Circular A-130 and the Paperwork Reduction Act had helped somewhat in better defining the respective roles, but all still felt that we remain in a state of flux.

Kurt Molholm from DTIC offered that "The private sector, largely because of the cost associated with the function, seems to recognize the public sector's role in acquiring, organizing and archiving information. What is in a state of flux is the announcement and selective distribution of information, namely, those areas perceived to be the ones of 'added value.' "

Panelist John Anderson was a bit more direct, stating "it is absolutely impossible to generalize and predict the future role of the government in information. This is because, absent a policy, each step in the evaluation is hit-or-miss, based on personalities of the moment, strength of a given agency, electoral politics, even the weather, etc."

Many of the panelists did agree that what constitutes "value-added" needs a new look given the advances in computer and communications technologies, the NII, and the explosion of the Internet and the World Wide Web.

This certainly raises some questions:

   1. Do Federal agencies have a responsibility to preserve business opportunities they have fostered or directly supported?

   2. Or should the agencies be concerned mostly with how best to serve the general public?

   3. For example, was it right for the Patent Office to take advantage of new technology and develop a system that would serve both its internal needs and patent searchers outside of PTO? After all, previously, outside searching was done primarily through the commercial sector.

   4. Was it right for the SEC to put its EDGAR system up on the Internet cutting out some commercial brokers?

   5. Was it right after more than 30 years for NASA to stop its previous arrangements in gathering STI information through commercial sources?

   6. Does NTIS's quasi-commercial activities foster or impede the dissemination of government STI?

   7. And one a bit closer to home, how does one view NLM's offering MEDLINE free over the Web? Even if Vice President Gore said in introducing it: "this development, by itself, may do more to reform and improve the quality of health care in the United States than anything else we have done in a long time."

I can tell you that vendors of MEDLINE were not happy and predicted that business failures were imminent, and CAS commented that it would "undoubtedly have the effect of reducing diversity by undercutting private sector information services." To my knowledge, this hasn't materialized. In fact, many innovative vendors have repackaged their offerings, providing more imaginative and excellent services. Some have now directly linked to NLM via the Web. And the NLM PubMed system's linkage to primary publishers so that users can have access to full text has opened a whole new era for NLM relations with publishers. Most important, the general public can now have free, no registration, completely private access to our databases. MEDLINE usage at NLM is now up ten-fold.

The panelists have said that difficulties will arise. It is certainly a fact that the Internet/Web technology has dramatically altered the landscape. Some felt it really would be inappropriate for agencies to ignore the capability to put their information up on the Web and thus provide better public access. Does this constitute providing "value added" services? If so, as one panelist said, "I think it just raises the bar for what might be considered 'enhanced services.' "

Denny Auld was particularly provocative on the issue stating that the "public sector should make its information as accessible as possible including incorporating 'value added' capabilities." Recognizing there wouldn't be unanimity amongst NFAIS members he said, "Weighing the economic good of society, I'll come down on the side of society. If the companies' value added is that 'thin' they should find more significant value, beyond what the government agencies can do."

I believe that, compared with a decade ago, there seems to be a better balance between the public and private sectors, and the conflicts generally are much less intense and visible. The approach to our mutual problems must continue to be more catholic and less parochial. In this new electronic era I believe that the two sectors can operate in an environment of mutual respect that will be in the best interest of the Nation. The cynics among you (and I hope there aren't too many) will note that I also believe that in my lifetime the Boston Red Sox will win a World Series. But surely in order for us to create a more collegial atmosphere, we must deal openly with perceived fears and anxieties. Some will say there is currently a government trend to overreact to agency missions by creating essentially commercial services to respond to the clamor of interest groups for new products and services. If this trend is true, what fate awaits the private sector information services? How can a voice in the wilderness be heard without a proper forum?

With this in mind, I asked my panelists to consider the special nature of STI policy and the appropriate role OSTP might have in formulating such policy. As our look at history revealed, assigning responsibility for the management of STI has been a moving target. All agree that STI is an inseparable part of the R&D process. Yet, despite many efforts, including the Rockefeller Commission's pleading for a coherent national information policy, it has never materialized. Unless one is willing to subscribe to the French philosopher Henri Bergson's mysticism that "disorder is an order that we cannot see," then we must concede there isn't such a policy document, certainly nothing like one sees on the Western European scene. Perhaps the American tradition, which one panelist characterized as a "fragmented, checked, and balanced government," requires one to look beneath the surface of confusion to get a sense of policy.

One might argue that if you want an information policy, just look around you and choose what you like: the Paperwork Reduction Act, OMB Circular A-130, NCLIS's "Principles of Public Information," FOIA, various other Congressional legislation and Federal agency statutes, and the scores of white papers and policy statements surrounding the NII. As CAS stated correctly, "there is no guarantee of any consistency," and Ron Dunn said even though the Paperwork Reduction Act has some reasonably clear provisions, "practice has not followed behind the policy." Nor, I might add, is there a proper balance or focus on STI policy. It certainly seems to me that OMB and OSTP are more concerned about Information Technology than Information Management.

So let's review where we are: The PSAC report of years ago clearly saw STI as a critical part of the Nation's science and technology structure; numerous studies since have reiterated this seeming axiom; there is a law on the books designating OSTP to coordinate and provide oversight in the effective management and dissemination of scientific and technical information; and yet there is no adequate structure or a champion for such a framework.

The framework I envision has two components:

> 1. A high level Advisory Committee made up of leaders in science and technology and information science drawn from industry, academia, and government to advise OSTP on how STI can more effectively support S&T policy and the R&D process; and

> 2. A committee of Federal STI leaders to advise on policy for STI.

What I am suggesting is a revitalized COSATI-type policy-level committee associated with OSTP, and some sort of variation on a CENDI-type of interagency group. Whether one puts in place such a structure or not, it is fair to say that the panelists felt that OSTP would have little interest in looking at STI as an isolated issue and would only respond to STI as a component of major S&T policy issues facing the Nation. As one panelist put it, "we often have more impact when we deal with the role of S&T in major public policy areas, such as health care or defense, than when we deal with policies for STI alone."

Many panelists felt that there is today a greater understanding of the value of information per se, both in the public and private sector. This is evidenced by the growing emphasis on "knowledge management" and what is popularly referred to as "data warehousing and mining." Persuading higher authorities that STI can yield significant economic benefit could enhance the importance of its role in the discussion of national goals.

On a more practical level, how could such a structure, if it had been in place, contribute to solving a problem that many in this room have faced - namely, the issues surrounding database protection and their implication for copyright and fair use?

Whether one embraces the principles in the Weinberg Report, the Rockefeller Report, or in more recent reports like that issued by the National Research Council entitled Bits of Power, the message is clear. The public good is served best through the free flow of scientific data. The Academy report is, however, quite realistic in observing that the traditional balance of private and public rights that once dominated intellectual property laws is breaking down in the computer age. More and more information is stored and distributed in computer databases, and there are dishonest users who think nothing of copying and distributing it widely without compensation or attribution. It is understandable that database vendors want to protect their investment, but it is also essential that scientists not be unduly restricted from having access to scientific and technical information that may be the underpinning for tomorrow's breakthroughs.

Let us not forget that the purpose of copyright in encouraging access to scientific and technical data is to promote the arts and sciences. Thus, the expression of the data, but not the data itself, is protected. This was done deliberately to encourage others to use the data to create new products and scientific advances. Our copyright practice carried with it, until relatively recently, in case law two additional codicils. The first, the notion of "fair use" for research, education, and various other purposes, was codified in the 1976 revisions of the Copyright Act. The second, protection for "sweat of the brow" investment, was overturned by the Supreme Court in 1991 when copyright protection for a white pages telephone book was denied because it lacked the level of creativity required to qualify for such protection.

Over the past two years, the "NFAIS Notes" with Dick Kaser's eloquent comments have kept the membership well informed about the European Commission's directive, the U.S. WIPO treaty proposal, and current legislation on the protection of databases. WIPO, as you know, stands for World Intellectual Property Organization. As you will recall, the draft treaty offered protection not only for the compilation, but also for the content of a database even if that content might be a series of facts such as nucleic acid sequences. Thus, while copyright law expressly forbids the protection of facts, this proposal would have allowed database producers control over the contents solely on the basis of their investment in the compilation.

In mid-October 1996, in great part because of the revelations of the ongoing Bits of Power study, the appearance of a letter from the presidents of the three academies (NAS, NAE and IOM) to the Secretary of Commerce became known to the science agencies. It is safe to say that, prior to that letter, few U.S. scientists or science administrators had been aware of the proposed WIPO treaty. Because no COSATI-like deliberative body existed to monitor such matters, when the alert was sounded an ad hoc mechanism sprang into being. The crisis atmosphere had markedly polarized the stakeholders so that general meetings became confrontations and tended to generate much heat but little light. Fortunately, coordinated action by the science agencies, reinforced by the science and library communities, forced a tabling of the proposed WIPO database treaty, and a more studied and timely approach to the issues was adopted. One result was a change of venue from Geneva to

Washington, perhaps reflecting the wisdom that often we "think globally but drink locally." After much discussion, the position of the science agencies and much of the science community has been set forth in various documents such as the "principles" paper of the American Association for the Advancement of Science. This position may be summarized as follows:

1. While there is little evidence that database producers need such additional protection to assure their investment in creating new databases, such protection if afforded should adopt a minimalist approach and limit protection to database piracy and subsequent creation of a competitive commercial product.

2. The protection afforded should be limited to the compilation and not extend to the content, i.e., facts and data should not be subject to private ownership.

3. Nothing in this protection should be allowed to interfere with the unimpeded flow of scientific and technical information and data for research, educational, or public safety purposes.

As you know, last October Representative Coble introduced H.R. 2652, the Collections of Information Antipiracy Act. Among his introductory remarks he noted "this bill differs dramatically from H.R. 3531, introduced in the last Congress. This bill is a minimalist approach grounded in unfair competition principles as a complement to copyright ... it strikes a balance as the information age arrives.... It provides incentives and protection to companies without inhibiting members of the scientific, library and research communities." To a large extent, I believe Mr. Coble did in fact strike a more balanced bill.

However, if you were at the hearings you would hardly believe that balance and compromise were in the air. It wasn't as vicious as Holyfield vs Tyson in the ring, but Reichman vs Tyson in the halls of Congress was full of uppercuts and even a few biting remarks. Here the opponents were Jerome Reichman, a Vanderbilt law professor, and Laura Tyson, a former Chairman of the Council of Economic Advisors. Reichman essentially said the bill would create perpetual liability; Tyson said information is not free.

Unfortunately, Coble's minimalist approach adopted by H.R. 2652 was not minimalist enough to have produced a satisfactory compromise in one step. It is, however, a constructive move in that direction that should be applauded. A more rational forum for this matter, the COSATI-like entity we have been talking about, I believe would have enhanced the opportunity for mutual understanding between private sector and governmental managers.

Opportunity for STI Advancement
As we have seen in the last 40 years, increased investment in science and technology and accompanying structural change often is connected to galvanizing events and charismatic leadership. The launch of Sputnik, the oil embargo, and the cold war threat of the Soviet Union were key events that directly influenced information activities and policies. The latest influence is more evolutionary, namely, winning the cold war. Defense spending, for example, is about 60 percent of what it was in the mid 1980s, and that, combined with increased tax revenues in a healthy economy, helps engender Administration and Congressional support for science and technology investment. There appears to be bipartisan support for dramatic increases in Federal R&D budgets over the next decade. There is, of course, the normal disagreement within the scientific community as to who should benefit from the new largess. The President himself raised a few eyebrows when he commented approvingly that the past 50 years will be seen as the age of physics and space exploration, and the next 50 years of science will be dominated by biology and the exploration of human organisms. But the sciences are not easily separable. Progress in the health sciences is often the result of sophisticated instrumentation and research technologies developed in the physics and chemistry labs. One has only to look to lasers, computers, and electron microscopes to immediately get the point of the integral and multidisciplinary nature of scientific discovery. Nevertheless, there is a need for a clear statement delineating our national science goals.

I believe that NFAIS should wholeheartedly endorse the House leadership's recently announced year-long bipartisan study of U.S. science and technology policy, not to mention the bipartisan efforts of

Senators Gramm, Lieberman, and Bingaman who introduced S. 1305, the National Research Investment Act of 1998. That bill calls for doubling the Nation's R&D budget by 2009. Led by the American Chemical Society, more than 100 scientific and engineering societies have already closed ranks to support this increased R&D budget and the formulation of a national science policy. The President's so-called 21st Century Research Fund espoused in this year's budget also calls for a strong, stable, multi-year source of funding for research.

The Congressional S&T study will be chaired by Congressman Vern Ehlers of the Science Committee-- the same Committee that tackled a major policy review back in 1986. As Jane Griffith reports, "while the previous effort produced a nice series of reports on science policy, it had a minimal impact on Congressional decision making." Newt Gingrich has sensed that problem, calling for the Committee to provide a mission which will mobilize a nation. We can all join in hoping that this current effort will result in concrete proposals that will benefit American science. Most of my panelists felt that this is an opportunity for the STI community to drive home the importance of scientific and technical information to the research process.

Although the ten agenda-setting questions do not explicitly mention STI, Mr. Gingrich's direction to the Committee clearly encompasses it. Gingrich describes the future for America as if it were a triangle: one side the Information Age; one side the world market; and the base the American civilization and culture. He has told Ehlers's Committee that their job is to make the three sides of the triangle reinforce each other. He has said that we need to determine our information systems requirements and how to organize knowledge so that ordinary people have some reasonable ability to acquire it.

This sounds like an invitation that the information science community, as individual organizations and collectively as an association, should not let pass us by. If we can have our users, that is, the scientific community, also do some advocacy for us, so much the better, for surely the level of credibility will be higher.

In conclusion, as we gather here on the verge of the 21st century, we continue to observe the, breathtaking growth of the Web, and a proliferation of advanced technologies that make it possible to move ideas, data, and images around the world almost instantaneously. The Information Marketplace that MIT's Michael Dertouzos envisioned in 1981 has come to pass. A 21st century village marketplace where people and computers buy, sell and freely exchange information is now a reality. But discovery does not stand still; advances in technologies will continue to envelop us like breaking ocean waves. While the media will continue to flash old news about information highways, about the Vice President's e-mail prowess, and virtual reality, newer evermore dramatic technologies are being prototyped. Ideally, advanced technology and communications will soon make possible what we often claim our systems can now do--namely provide needed information where you want it, when you want it, and without your needing to manage it. In the MIT Media Laboratory's vision statement, they have said it rather cleverly:

In the past, shoes could stink
In the present, shoes can blink
In the future, shoes will think

But, my friends, technology alone cannot do the job. It is the information that ultimately matters, and the people who generate it and use it. After all, neither technology or science has a soul. We, the information scientists, must help apply the ethical standards and deal with the important issues we have mentioned this morning. What better time than now as we approach the new millennium for us all, public and private sector alike, to close ranks as a community for the common good. Thank you once again for the distinct honor and privilege of presenting this Miles Conrad Lecture.

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