NATIONAL ENDOWMENT FOR THE HUMANITIES

NEH's Support for Humanities, Science, and Technology:

Accomplishments and Future Prospects

**A Report of the
NEH Working Group on
Humanities, Science, and Technology**

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INTRODUCTION

In the nineteenth century, as science was expanding our capacity for understanding the world and as technology demonstrated its ability to deliver what we wanted from the world, some scholars and literary figures registered their discomfort with the social and cultural changes that accompanied the growth of science and technology. Other writers, such as Walt Whitman, welcomed and generally endorsed the advance of science but still retained a degree of ambivalence about its capacity to explain the ultimate mysteries of the universe and human existence. Whitman's lines from 1865 seem to evoke this uncertainty:

> When I heard the learn'd astronomer;
> When the proofs, the figures, were ranged in columns
>   before me;
> When I was shown the charts and diagrams, to add, divide,
>   and measure them;
> When I, sitting, heard the astronomer, where he lectured with
>   much applause in the lecture room,
> How soon, unaccountable, I became tired and sick;
> Till rising and gliding out, I wander'd off by myself,
> In the mystical moist night-air, and from time to time,
> Look'd up in perfect silence at the stars.

By the second half of the twentieth century, despite the enormous benefits wrought by the scientific revolution, there was still much discomfort in some quarters over the power of science and technology. In the years following World War II, many people in America began to argue that a serious imbalance existed—in terms of influence, power, and access to funding from private and public sources—between the sciences, on the one hand, and the humanities and the arts, on the other and that this inequality might, over time, contribute to a dehumanization of American society.

The apparent imbalance between the humanities and the sciences in mid-century America can also be understood in the context of C.P. Snow's influential and controversial 1959 publication, *The Two Cultures and the Scientific Revolution*. In this essay, Snow argued that the humanities and the sciences were distinctive "cultures" and that, in comparison to scientists, humanists were becoming increasingly less important to modern society. Identifying what he saw as two polarized systems of thought, Snow lamented that "there seems to be no place where the cultures meet" and concluded that "closing the gap between our cultures is a necessity in the most abstract intellectual sense as well as in the most practical. . . . When those two senses have grown apart, then no society is going to be able to think with wisdom."

NEH, the Humanities, and the Sciences

The perception that the humanities and the sciences existed in a state of tension was a major concern of the scholars, educators, and political leaders who helped to establish the National Endowment for the Humanities (NEH) in 1965. These leaders called attention to the federal government's decision a decade and a half earlier to strengthen the nation's scientific knowledge base by establishing a National Science Foundation (NSF) and pointed to Washington's dramatically increased support of NSF and the scientific disciplines in the wake of the launching of Sputnik in 1957 and the advent of the "space race" between the United States and the Soviet Union. Noting the similarities between the sciences and the humanities as systematic approaches to knowledge and understanding, they maintained that the humanistic disciplines were thus a legitimate national concern and should not be neglected. Many supporters of the humanities also argued that the humanities offered something important to the American people that was in danger of being lost, due to the profound scientific and technological transformations of modern society and culture.

These ideas came together forcefully in the landmark 1964 study, *Report of the Commission on the Humanities*, which played a pivotal role in helping to win federal recognition and support for the humanities. The Commission found that "the state of the humanities today creates a crisis for national leadership. . . . The challenge is no less critical and direct than the one we have already met with our strong advocacy of healthy and generously supported science. It must be met in turn with equal vision and resolve." Moreover, the *Report* held that "science, as a technique and expression of intellect, is . . . closely affiliated with [the] humanities" and "the natural sciences, the social sciences, and the humanities are of their nature, allies." The *Report* postulated that "if the interdependence of science and the humanities were more generally understood, men would be more likely to become masters of their technology and not its unthinking servants." These viewpoints were soon to be echoed in the preamble to the National Foundation on the Arts and the Humanities Act of 1965, in which Congress declared that "a high civilization must not limit its efforts to science and technology alone but must give full value and support to the other great branches of man's scholarly and cultural activity."

For more than thirty years, NEH has helped through its grant-making and other activities to facilitate cooperation between humanists and scientists and to demonstrate that the humanities have important contributions to make in understanding the impact of scientific and technological change in modern American society.

The Endowment's support for projects that explore the relationships between the humanities and science and technology has encompassed grants for research, education, preservation, and public projects through the Endowment's core programs. The agency has also created discrete programs that promote humanities studies of science and technology and, on occasion, it has entered into formal partnerships with other agencies, such as the National Science Foundation, that would advance common interests involving the humanities and the sciences.

One of the objectives of this paper is to lay the foundation for future work in the humanities, science, and technology and to suggest collaborations that could be forged with other institutions and organizations to advance this effort. To increase our understanding of the impact that developments in science and technology have on our culture, to convey that understanding to students and the general public, and to promote public discussion of these topics has been—and should continue to be—an important priority of the National Endowment for the Humanities.

The Impact of the Computer

The Endowment has also been an influential national leader in championing and helping to shape the growth of the use of computer technologies in all areas of the humanities. At the time of the agency's creation in 1965, however, the impact of the computer revolution on the intellectual and cultural worlds of the humanities was scarcely foreseen. Indeed, as in the debate over the relationship between the humanities and the sciences, many commentators at the time regarded "computers" and "the humanities" as concepts that were antithetical.

Although the computer revolution was well underway by the mid-1960s and a small number of humanities projects were already employing this new technology, most people viewed the humanities disciplines primarily as an alternative of sorts to the "impersonal" world of "machines" and computers. Even the Chairman of IBM, Thomas J. Watson, Jr., who had served as a member of the National Commission on the Humanities, thought that this information technology was of little interest to the humanities. In March 1965, for example, in a statement prepared for a Senate committee then conducting the hearings that would lead to the creation of NEH, Watson examined "the impact of technological change in the humanities" and came to the conclusion that "[w]ithin our lifetime machines will hopefully remove burdens from men's shoulders and minds, freeing them for an increased use of leisure time." "To the individual," Watson continued, "the humanistic disciplines offer, in my opinion, the greatest possible promise for his own fulfillment and for the enrichment and constructive use of his hours of leisure." It is indicative of the times that not even the Chairman of IBM could envision how computers might be useful *to* the humanities or to its practitioners.

When the Endowment actually began making grants, however, the agency actively encouraged and promoted computerized humanities projects. Indeed, at the first meeting of the National Council on the Humanities in March 1966, the Council briefly discussed the fields in which computer research was then being used and the support that was available for such undertakings from other foundations and organizations. Members of the Council agreed with Interim NEH Chairman Henry Moe that "other experts on computer-oriented humanistic research" should be consulted before the Endowment developed its interests in this area.

Accordingly, in the summer of 1967, an Endowment-funded conference of scholars and computer experts examined the role NEH might play in encouraging

computer research and teaching. To the question—"At what stage should an agency, in making grants involving computer use, insist on some standardization of format so that projects are not isolated repositories but are subject to general access throughout the country?"—conferees agreed that standardization would be desirable ultimately but that it was not yet feasible. The Conference also addressed the question—"Will the computer call for a reorganization of humanistic knowledge, and will computer capacity make possible a significantly new kind of encyclopedia of humanistic knowledge?"—but could reach no agreement on this query. Thus, since its founding as a federal grant-making agency the Endowment has been addressing important questions concerning the humanities and computers. These questions are emblematic of the kinds of issues with which NEH and the humanities community are still grappling today, as electronic technology has evolved into CD-ROMs, the Internet, the World Wide Web, and other forms of digital technology.

In this report, the Humanities, Science, and Technology (HST) Working Group presents a survey of the ways in which NEH contributes to and encourages the use of advanced information technologies in the humanities. For the most part, we focus on the national picture—on developments in education, access to resources, and public programming—while being mindful that important developments are also underway locally and on the state level. NEH is uniquely poised at the opening of the twenty-first century to add to its long and distinguished record of support for humanities projects that use digital technology.

Early on in its discussions, the Working Group recognized that it must acknowledge and attempt to distinguish among the multiple connotations suggested by the term "technology." The perspective of "technology," of course, embraces a wide variety of subjects—such as, for example, the development of the steam engine, studies of changes in agricultural technology throughout history, and the history of hydroelectric power, as well as the development and use of digital technology. Also relevant are humanities projects that focus on the history, philosophy, and sociology of technology.

The Structure of the Report

Because science and technology have worked in tandem throughout history, we discuss the Endowment's support for humanities, science, and *non-digital* technology projects in Part I of this paper. However, because digital technology is a relatively new and constantly changing field and a vehicle with important implications for how humanities materials will be disseminated and stored, now and in the future, we treat digital technology as a separate case in the paper's second part. The Working Group understands that this distinction is somewhat arbitrary, but we think that it is needed to do full justice to each area of interest.

In Part III of the paper, the Working Group presents a range of recommendations for new NEH initiatives and partnerships related to the humanities, the sciences, and technology. The first set of recommendations—"NEH and Humanities, Science, and Technology Projects"—is drawn primarily from the group's preliminary report, "Building

Partnerships with the National Science Foundation," that was submitted to NEH's Chairman on May 24, 1999. A second set of recommendations—"NEH and Digital Humanities Projects"—draws on our examination and consideration of the Endowment's rich history of support for humanities computing projects.

To assist us in our deliberations, we also solicited ideas and advice about this important field from a select group of scholars and educators. These consultants were chosen either on the basis of their association with organizations and institutions related to science and technology, particularly the relevant constituent societies of the American Council of Learned Societies, or on the basis of their special knowledge of the field. In a letter from the Chairman of the HST Working Group, George Farr, outside consultants were specifically invited to identify the pressing needs in their fields of study and how NEH could better serve those needs, to provide advice on how NEH could promote more collaborations between humanists and scientists, to propose special initiatives that may be needed in this area, and to suggest how the Endowment's support for science and technology projects could reach wider audiences. The Working Group received comments from:

- Daryl Hafter, Professor of History, Eastern Michigan University and Vice President, Society for the History of Technology;

- Katherine Hayles, Professor of English, University of California at Los Angeles;

- Stanley W. Jackson, President, American Association for the History of Medicine;

- Richard Jeffrey, President, Philosophy of Science Association;

- Thomas H. Murray, President, The Hastings Center and President-elect of the American Society for Bioethics and Humanities;

- Daniel Pitti, Project Director, Institute for Advanced Technology in the Humanities, University of Virginia;

- Terry S. Reynolds, Professor of History, Michigan Technological University and President, Society for the History of Technology; and

- John Unsworth, Director, Institute for Advanced Technology in the Humanities at the University of Virginia.

In a separate communication, we also received valuable advice regarding significant trends in humanities computing from Rita Raley, Professor of English at the University of Minnesota. In addition, Albert Van Helden, Professor of History at Rice University and President of the History of Science Society, invited a representative of the Working Group to attend the November 1999 annual meeting of the History of Science Society,

where Van Helden and members of the Society's Council made suggestions about the needs of their field. These suggestions confirmed many of the recommendations that the HST Working Group included in its May 1999 preliminary report, "Building Partnerships with the National Science Foundation," and have also informed the additional recommendations we make in regards to "NEH and Digital Humanities Projects."

Finally, in the concluding section of the paper the Working Group provides a brief survey of some possible avenues that NEH could explore to build partnerships with federal and nonfederal institutions in the area of humanities, science, and technology.

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I

NEH AND HUMANITIES, SCIENCE, AND TECHNOLOGY

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Over the last 35 years, independently and in partnership and collaboration with NSF, NEH has supported projects in the fields of ethics and values, archaeology, history and philosophy of science, humanities and science education, linguistics, the social sciences, digital technology, and environmental studies. Applicants with projects in these fields can prepare proposals for both NEH and NSF; some, indeed, successfully compete at both agencies and receive parallel funding for their work.

From 1973 until the Congressional downsizing of the agency in FY 1996, the NEH operated a separate grant program that was initially called *Science, Technology, and Human Values* (the program was reconstituted as *Humanities Studies of Science and Technology* in 1983), which brought the knowledge, methods, and perspectives of the humanities to bear on the subjects of science, technology, medicine, and scientific and medical ethics. These programs stimulated and coordinated support for projects throughout the agency, funded a significant number of editions of scientific and technological texts, and published biographies of scientists as well as histories of scientific movements and events. The Endowment also administered a formal partnership with the NSF that provided opportunities for scholars in the humanities to work cooperatively with specialists in science, technology, or clinical research, and, conversely, for scientists to work with humanities scholars.

Scholarly Research in Humanities, Science, and Technology

The lives, writings, and papers of key figures in the history of science and technology have received important research and publication support from NEH. These include the biographies of Thomas Edison, André-Marie Ampère, Ivan Pavlov, Hugh Cabot, Joseph Henry, and Hermann von Helmholtz; the planetary theories of Ibn al-Shatir of Damascus, an early Islamic cosmologist; and the papers of Joseph Henry, the first secretary and director of the Smithsonian Institution. Other figures and works in the history of science on the roster of publications supported by NEH are the American philosopher and psychologist William James; the journals of the Lewis and Clark Expedition; and the papers of Benjamin Franklin, Thomas Jefferson, Henry David Thoreau, and Margaret Sanger. (These latter four figures are individuals who, although

better known for other endeavors, were each deeply involved in the scientific discourse of their times.) The Endowment has also provided parallel funding with NSF to produce such major humanities and science milestones as the edition of the *Correspondence of Charles Darwin* and the *Papers of Albert Einstein*.

A number of famous scientific writings, with commentaries and explanations designed for college-level readers, were supported in the fields of the history of science, history of medicine, history of technology, medical ethics, and the philosophy of science. The publication of authoritative editions or translations of such works as Newton's *Principia* and *Optics*, Aristotle's biological works, Galileo's *Dialogue on the Two Chief World Systems*, Edwin Hubble's writings on modern cosmology, Alfred Wegener's 1912 article on continental drift, Einstein's account of relativity theory, and the 1543 edition of Andreas Vesalius's text on human anatomy were all made possible through NEH grants.

Archaeology, anthropology, and their related research and publication fields have enjoyed long-term support from NEH; many projects received parallel funding from NSF. The Endowment's grants have supported both fieldwork and the publication of excavation reports. Archaeological projects in the United States, the Mediterranean, and the Near and Middle East have benefited the most from NEH funding, but the agency has also funded excavation and analysis on such subjects as: a circa 300 B.C. prehistoric village in northern Chile; on the habitation remains dating back to 125 B.C. on Nukuhiva Island in the Marquesas Islands (an archipelago about halfway between Hawaii and Easter Island); and on Vijayanagara, the imperial capital of a fourteenth- to sixteenth-century A.D. South Indian state. NEH has helped to make the fields of humanistic archaeology and anthropology more broadly interdisciplinary. Adjunct but vital as well to the history of early cultures has been NEH's long-term funding of such projects as the Sumerian, Akkadian, and Hittite dictionaries.

The Endowment's traditional support for dictionaries is also making possible important research and scholarship at the intersection of the humanities and the sciences. Because descriptive linguistics—the cultural, historical, and language development aspects of linguistics—is a field of the humanities, NEH has supported such complex collaborative research tools as the *Dictionary of American Regional English* and a study of dialect changes and patterns of language maintenance in North Carolina's Outer Banks, as well as other dictionaries, reference grammars, linguistic atlases, and linguistic corpora. The agency also funds the research of individual linguistics scholars who study such topics as bilingual code-switching, the rules that govern the alternation of languages, grammatical innovation and linguistic change in African American vernacular English, and the linguistic history of the Latin language. (NSF and NEH have jointly supported the *Dictionary of American Regional English* and the *Sino-Tibetan Etymological Dictionary and Thesaurus* for many years.)

The field of linguistics helps to illustrate the differences between the study of the *intersections* of the humanities and the sciences and scientific work *per se*. While descriptive linguistics is indeed a field of the humanities, the biological bases of language

and the physiological and psychological processes involved in the production and perception of speech—subject areas that fall squarely into the sciences—are not.

Science and Humanities Education

NEH has fostered the study of the humanities and the sciences at every level of formal education. The Endowment's educational efforts have been directed toward providing support for faculty collaboration leading to curricular change; for opportunities for teachers to deepen their knowledge of content areas in the humanities and to explore best teaching practices; and for the development of exemplary resources for classroom teaching.

In the late 1970's, NEH's Higher Education program responded to the national interest in strengthening the liberal arts component of undergraduate education. Dozens of projects focused on engaging faculty in the collaborative work of developing a common core of subjects to give greater continuity to the undergraduate learning experience. The impact on community colleges (where almost 50 percent of America's postsecondary students pursue coursework at some point in their careers) was particularly significant. The technical and career-oriented curricula of numerous junior and community colleges were broadened by the introduction of thematic approaches from such fields as ethics and the history of technology.

From 1992 to 1995, NEH coordinated a special interagency collaborative program that was the culmination of this funding pattern. NEH, NSF, and the Department of Education's *Fund for the Improvement of Postsecondary Education* (FIPSE) recognized that a broad array of complex issues and topics in the sciences and the humanities could benefit from a more integrative approach in undergraduate teaching. This special initiative, the *Leadership Opportunity in Science and Humanities Education* (LOSHE), made awards to 48 projects that represented a variety of topics and approaches. Primarily the projects were designed to stimulate institutional change by concentrating on such areas as general education, honors programs, new minor or major courses of study, or departmental change within an institution that focused on cognitive studies, regional studies, and environmental studies with global or regional emphases. They also explored issues of science in tandem with studies in technology, society, ethics, gender, and race.

The National Commission on Teaching and America's Future concluded in its 1996 report, *What Matters Most: Teaching For America's Future*, that decades of research on effective classroom teaching and learning indicate that "what teachers know and do is the most important influence on what students learn." The Endowment has a long-standing commitment to investing in rigorous, content-based projects that advance the professional development of teachers. Its summer residential programs for college and schoolteachers, known as NEH Seminars and Institutes, are perhaps the most visible and successful of the agency's efforts to provide opportunities for teachers to increase their knowledge of the humanities. In every year of their existence, seminars and institutes have included topics in science, technology, and the humanities. In recent years, these programs have supported projects on such subjects as the environment and literature, the history of the Industrial Revolution, the archaeological study of trade in the

ancient Mediterranean, and the history of technology. The writings of Freud and Lucretius and the journals of the Lewis and Clark Expedition have also been topics of seminars and institutes. Summer institutes jointly sponsored by NEH and NSF in the LOSHE initiative brought college and university faculty into classrooms and laboratories to examine a wide variety of complex issues and topics, including the cultural and ethical implications of genetic technology, the influence of biology on human behavior, and the geology, biology, geography, history, and culture of the U.S. Southwest.

The Endowment encourages the effective use of computers in humanities classrooms by ensuring that materials on this subject are being developed across a number of disciplines and areas of interdisciplinary studies. Providing exemplary educational materials, however, is only the first step in a process of using technology to strengthen learning environments at every level of the curriculum. Teachers need to know how to use those materials and they need a supportive school environment in which to explore these new approaches. The Endowment recently introduced a new program, *Schools for a New Millennium*, to help ensure that technological innovation and teaching excellence go hand in hand. (The Endowment's efforts to help teachers effectively use new technologies are described in greater detail in Part II of this report, *NEH and Digital Technology*.)

State Humanities Councils: "Nature, Technology, and Human Understanding"

Drawing on the ability of state humanities councils to reach broad public audiences effectively, NEH and NSF from 1993 to 1995 funded a joint program for projects focusing on the interrelationships among the sciences, technology, and the humanities. Held in schools, libraries, television and radio studios, and museums, these projects reached the public through symposia, reading and discussion groups, media programming, lectures, and workshops for parents.

Two examples help to convey the breadth of this initiative. The Massachusetts Foundation for the Humanities developed a project, "Knowing Our Place: Humanistic Aspects of Environmental Policy Making," which explored the relationships among science, technology, and democracy in the creation of environmental policy, primarily with reference to nuclear power; and, in Georgia, the Georgia Humanities Council launched a project, "Technology and the African American Experience," which dealt with the history and role of African Americans in the development of technology and the impact of technology on their expectations and the realities of their lives.

Humanities, Science, and Technology Projects for Public Audiences

Through the years, the Endowment has funded numerous projects that deal with the sciences and the humanities—documentary films, museum exhibitions, and library programming have provided effective means for reaching broad audiences. Since the practice of science is, at heart, a social activity, it should come as no surprise that the agency has frequently supported projects that bring historical or ethical perspectives to

bear on issues of general interest or that attempt to provide a larger context within which to consider questions that may arise from the use or misuse of technology.

NEH has primarily funded science projects that concern anthropology and archaeology, two specializations that themselves often bridge the divide between the sciences and the humanities. One outstanding example was the 1980-1981 *Odyssey* film series, which consisted of 27 separate television programs on topics that encompassed the early peopling of the New World, the prehistory of the Inca and the American Southwest, and critical questions of cultural change and survival in various parts of the world. These individual programs enjoyed wide distribution through PBS after their initial broadcast. Other media products have included a film biography of Margaret Mead that helped to place her contributions to anthropology within a broader framework and a retelling of the story of Ishi, the last surviving member of the Yahi tribe of California, whose life was eloquently documented by anthropologists Alfred and Theodora Kroeber early in this century. Perhaps the most recent example of support for a media project dealing with prehistory is a film in production that will encapsulate the fascinating story of the deciphering of Maya writing, an achievement that has essentially allowed us to become acquainted with that civilization's ruling families and to trace the rise and fall of various centers of power in the Yucatan area.

The Endowment has often offered support for projects that bring the perspectives of the humanities to bear on subjects connected to science, engineering, and medicine. NEH grants helped create television productions that brought the insights of artist and illustrator David Macauley on the construction and workings of cathedrals, pyramids, and the Roman city to audiences throughout the country. One of Ken Burns's earliest films, *Brooklyn Bridge*, placed that engineering achievement in a historical context that helped audiences more fully appreciate its broad significance, both as a triumph of construction and as an aesthetic icon. NEH has also supported media productions that grapple with ethical issues arising from the advance of medicine. Two films in particular, *The People's Plague: Tuberculosis in America* (1994) and *A Paralyzing Fear: The Story of Polio in America* (1997), deal with the impact of epidemic disease on American society and culture. Through nationally broadcast programs such as these, on both radio and television, the Endowment has reached audiences both at the time of the initial broadcast, through repeats and sales, and by national use of these programs in schools and libraries.

Museum exhibitions have also proved to be a highly effective vehicle for presenting archaeological and anthropological insights to the general public. One notable pioneering example of these was the NEH-supported "Treasures of Tutankhamen," a path-breaking exhibition on ancient Egyptian civilization that drew record crowds as it toured the U.S. in the 1970s. Although subsequent exhibitions funded by NEH have not necessarily drawn as much press coverage as that blockbuster, the agency has, through the years, supported equally impressive presentations on the archaeology of Mexico, China, the classical Mediterranean world, the Andes, and the United States. Coverage of contemporary or historic groups has been even more wide ranging and has included exhibitions on the culture and arts of the Kuna of Panama and many different groups in Africa. *Wrapped in Pride* is a traveling exhibition that explores the origins and changing

meaning of West African kente cloth, especially from the standpoint of the cloth's adoption by African Americans as a symbol of cultural affiliation. *The Heritage of African Music* is a coordinated series of exhibitions by three museums in Los Angeles that will explore the music of the continent from multiple perspectives.

Other NEH-funded museum exhibitions, mounted at the Anchorage Museum Association, the Computer Museum in Boston, and the Exploratorium in San Francisco have dealt, respectively, with the early exploration of the American Northwest, the history of computers in U.S. society, and the history and techniques of navigation. NEH also funded an exhibition on the cultural significance of mummies in Indianapolis's acclaimed Children's Museum, a museum that is chiefly dedicated to science. At the University of Pennsylvania's Morris Arboretum, the Endowment has supported exhibitions on the history of gardening as well as provided a Challenge Grant that will endow the Arboretum's humanities programming. NEH has also worked in collaboration with the Smithsonian Institution's National Museum of Natural History and the American Library Association to support the traveling exhibition on the age of European exploration of the New World, *Seeds of Change* (1994), and its accompanying library programming.

II

NEH AND DIGITAL TECHNOLOGY

The continuing evolution of digital technology promises to change the way we learn and the way we view the world. Even the most forward-looking technologist could never have predicted the speed with which information technologies like the Internet and the World Wide Web have grown in the past decade. In 1989, when Tim Berners-Lee of the European Particle Physics Laboratory first proposed the idea of the Web, he envisioned it as a tool for a small group of scientists to share data. Yet in little more than ten years, the Web has dramatically changed the means by which information is developed and disseminated—and the prospects are that it will continue to do so in the foreseeable future.

Today, at the opening of a new century, scholars, educators, public programmers, and students alike are turning increasingly to this powerful and still evolving technology both as a source for information and knowledge and as a vehicle for disseminating the results of projects and programs in the humanities. Humanists' use of computers in their work may range from the simplest tasks of using a word processor for the preparation of an article or monograph to much more sophisticated operations that are involved in creating, manipulating, and maintaining complex databases or archives.

A rich intellectual infrastructure is also evolving to help map and explore new areas of humanities computing. This is especially true on the nation's campuses where, according to an article in the July/August 1999 issue of *Lingua Franca* ("Academia's Twenty Most Wired Professors"), "the professoriat is one of America's most wired populations." Scholarly centers devoted to the study of humanities computing—such as

the Center for History and New Media at George Mason University, the Institute for Advanced Technology and the Humanities at the University of Virginia, and the Schoenberg Center for Electronic Texts and Images at the University of Pennsylvania— have proliferated at universities and other research institutions across the nation.

In addition, the Internet and the World Wide Web are greatly facilitating the exchange of academic ideas and scholarly work. For a number of years, for example, *H-Net*, which received funding from NEH and is hosted by Michigan State University, has been sponsoring over 100 interactive newsletters ("listservs") related to all aspects of historical research and teaching. The listservs are edited by scholars worldwide and now reach over 90,000 subscribers in more than 90 countries who test new ideas, discuss innovative methods and tools of analysis, share information on electronic databases, and comment on the literature of their fields. Recently, the *American Historical Review* and the *Journal of American History* have joined forces to begin offering both print and electronic versions of their publications as part of a new electronic publishing experiment called the History Cooperative. Adding hypertext and other electronic features will create new possibilities, as well as pose new challenges, for these two venerable journals.

Since the mid-1970s, when the Endowment organized its first panel meetings to consider humanities computer projects, the agency has helped to both lead and respond to developments in this field. Moreover by virtue of its long record of encouragement and support for such projects, the Endowment is well positioned to continue playing a leadership role in helping to advance electronic technology as it relates to the humanities. While many organizations and institutions, in both the public and private sectors, are involved with *connectivity* issues pertinent to the digital environment (wiring, hardware, band-width), NEH remains committed to ensuring that intellectual and cultural *content* in the humanities is available in digital form for our nation's citizens. The agency also has an important role to play in supporting projects that will examine and interpret the historical and cultural impact of this technology.

With the remarkable growth of the Internet, the Web, CD-ROMs, and other new information technologies in recent years, the Endowment has expanded its efforts to encourage projects that employ this technology to increase access to important humanities resources, as well as for projects that focus on education, research, and public programming in the humanities. In early 1995, for example, the agency requested $4 million in additional funds from Congress for the first year of a three-year *Technology and the Humanities* special initiative. The purpose of this initiative was to enhance the agency's ability to make humanities resources and materials available on the emerging digital information "superhighway" and to provide wider access to these materials for all Americans. Unfortunately, FY 1996 was also the year that Congress significantly downsized the Endowment's budget and this special initiative was not funded.

The Endowment has also made a special effort to publicize its important role in encouraging and supporting greater use of digital technology in the humanities. "The Humanities and Technology" was a special feature of a symposium held in September 1995 commemorating the thirtieth anniversary of NEH. In May 1997, the agency issued

a special report to Congress, *NEH in the Digital Age*, that summarized the Endowment's many accomplishments in this area and its prospects for the future. And, on November 13, 1998, NEH Chairman William R. Ferris delivered a major paper, "The Public Humanities in a Silicon Age," to the "Shape of the Humanities Symposium" at Stanford University in Palo Alto, California.

NEH's Support for Digital Humanities Projects

Before turning to an analysis of some current noteworthy trends in humanities-related computer projects at the opening of the twentieth-first century and a discussion of the HST Working Group's recommendations for the immediate future, we think it would be instructive first to recall some of the Endowment's many accomplishments in this area.

Access to Humanities Resources and Scholarship

The Endowment has been a pioneer in encouraging and supporting humanities research and scholarship involving computer technology. Since the early 1970s, the agency has supported a wide variety of computerized projects—such as dictionaries, encyclopedias, electronic archives, documentary editions, digital libraries, and databases—that have helped to broaden the access of scholars, teachers, students, and the general public to important cultural and intellectual resources. One early path-breaking project, the *Thesaurus Linguae Graecae* (*TLG*) project at the University of California at Irvine, which first received NEH support in 1972, was dedicated to amassing and maintaining in an electronic database all extant Greek texts from Homer to the fall of Byzantium in A.D. 1453, as well as related historiographical, lexicographical, and scholastic texts. Since its publication on CD-ROM in the mid-1980s, the *TLG* has been used by scholars and students affiliated with more than 2,000 institutions worldwide. By allowing more effective research of textual questions that are too laborious to pursue in printed sources and by providing unified access to over 10,000 works by more than 3,330 authors, the *TLG* has enabled classicists to concentrate on analysis and interpretation of these texts.

The advent of the Internet and the World Wide Web in the 1990s has opened up the possibility of making primary source materials in electronic form more readily available to users across the nation and around the globe. Moreover, the Internet also allows users to hear and see important audio-visual materials and to view images of documents. This imaging capacity is crucial to such NEH-supported projects as the *Papyri Project* of six research universities, under the direction of Columbia University. In addition to digitizing the important papyrus collections held by these institutions, the project is also creating an integrated information system via the Internet by developing common standards for digital imaging of papyri and formatting electronic data about this ancient writing material.

In addition to providing access to cultural resources, digital projects also stimulate further research and scholarship. For instance, NEH support for the *English Short Title Catalog* at the University of California, Riverside, a database of bibliographical records for all books published in English from 1473 to 1801, has transformed the study of

English history. Similarly, the data made available in the *Trans-Atlantic Slave Trade Database* project at Harvard will enable historians to assess the volume and demographic structure of that historical event. The juxtaposition of visual and textual materials provided by a project such as the *Shakespeare Electronic Archive* at MIT creates a common space in which to study diverse interpretations of the plays. Finally, the recent release of a complete three-DVD documentary edition of *The Law Practice of Abraham Lincoln*, published by the University of Illinois Press, makes available an enhanced facsimile edition of these important papers that combines an enormous corpus of digitized documentary images with a custom-designed database, a comprehensive index, and an array of reference and background sections. The DVD-ROM format greatly facilitates searches among the database's 5,100 cases and allows scholars to trace Lincoln's evolution from a small-town lawyer to one of the most important attorneys in Illinois.

Despite their promise for new advances in the humanities, however, electronic materials will be lost or become unreadable unless their creators and custodians take steps to ensure their longevity. As the Council on Library and Information Resources emphasizes in a recent report, *Selecting Research Collections for Digitization*, "the conversion of textual, visual, and numeric information to electronic form—from preparation and conversion to presentation and archiving—encompasses a range of procedures and technologies with widely varying implications and costs." Moreover, if access to digital resources is to be preserved, the materials require careful management from the moment they are created and continual attention to both the physical storage of data and their migration to new hardware and software environments. Over a period of time, however, different stakeholders with different interests may become involved in an electronic resource. For example, authors and publishers responsible for the creation of digital material may not manage it over the longer term, while libraries and archives that acquire digitized resources to preserve them and make them accessible have little influence over how they were created.

To alert the general public to the cultural significance of the advent of digital technology and to consider the public policy implications of this technology's continued development—in particular, the problem of preserving material in digital format—NEH awarded a grant to the American Council of Learned Societies in 1994 to produce a documentary film, *Into the Future*: *On the Preservation of Knowledge in the Electronic Age*. The Endowment's award subsequently generated matching support from the Alfred P. Sloan Foundation and the Xerox Corporation. This film has aired on PBS stations around the country; has been translated into Spanish, Chinese, and Japanese; and was the focus of major articles in *The New York Times*, the *Wall Street Journal*, *Business Week*, and *U.S. News and World Report*. The film is playing an important role in helping to educate the public about the need to preserve access to digital materials. It has also been featured in various scholarly and educational conferences and meetings and is being used in information science curriculums and in general information literacy courses that teach students how to find, evaluate, and use information effectively in problem solving and decision making.

Given the enormous complexities inherent in maintaining materials in digital form, humanities scholars, librarians, archivists, and information specialists have been trying to formulate policies that can be broadly adopted in the creation, management, and long-term care of these materials. To this end, NEH has supported several research and demonstration projects that are developing guidelines and establishing best practices for addressing the multiple issues involved in preserving digital materials. Beginning in the 1980s, for example, awards were made to support the *Text Encoding Initiative* (TEI) project, which has produced a set of guidelines for formatting humanities texts to ensure their most effective retrieval and their persistence in the face of rapidly changing technology. The TEI is currently used worldwide by over 60 electronic text centers, digital libraries, and individual projects in North America and Europe. These projects include the *American Memory* website of the Library of Congress and such NEH-supported projects as the *Women Writers Project* at Brown University, *Documenting the American South* at the University of North Carolina, and various projects sponsored by electronic humanities centers at the University of Michigan, the University of Virginia, and Indiana University.

A similar text-formatting initiative conducted by the American archival community has culminated in the adoption of the *Encoded Archival Description* (EAD), which is now the standard for creating Internet-accessible archival finding aids. Two projects supported by the Endowment that use the EAD standard to prepare databases of finding aids to archival collections in statewide repositories include the *Online Archive of California* at the University of California, Berkeley, and the *Online Archive of New Mexico* at the University of New Mexico. Finally, another NEH project, the Consortium for the Computer Interchange of Museum Information (CIMI), is helping to standardize the electronic exchange of information about museum holdings. Recent NEH grants also have allowed two institutions to test different ways of combining digital and microfilm technologies for preservation purposes: one explored digitizing materials from microfilm, the other investigated the production of preservation microfilm from digitized materials.

In 1998, the Endowment joined a number of other federal agencies in sponsoring the Digital Library Initiative, which is being conducted through the National Science Foundation, in support of computer research and demonstration projects on long-term access to information resources in the sciences, the humanities, and medicine. These projects are designed to resolve certain critical and distinctive issues posed by the digitization of humanities collections and to provide the leadership and support that is necessary for the effective development of the next generation of digital libraries. Grants made through the initiative in FY 1999 include support for the collaboration of librarians and computer scientists at Cornell University in the development of tools and procedures for ensuring the integrity, security, and preservation of digital collections. Another project, the *Perseus Project* at Tufts University, is supporting the creation of a digital library for the humanities that will contain literary, historical, and archaeological materials on topics ranging from ancient Egypt to nineteenth-century England. Intended for high school and college students as well as for humanities scholars, the projects will enable users to visualize data in new ways, including the use of multimedia presentation techniques for reconstructing archaeological sites or mapping the cultural geography of

urban areas. The response to this joint effort was so enthusiastic that NEH has continued the partnership in FY 2000.

Technology and Humanities Education

For many years, NEH has been at the forefront of encouraging innovative projects that make use of electronic technologies to teach history, literature, languages, and other humanities subject areas. Digital technologies are increasingly finding their way into the nation's elementary and secondary school classrooms and onto college campuses. Many educators believe that using digital resources such as the Internet and CD-ROMs has a positive effect on humanities teaching and learning by promoting the natural curiosity of students, a more active style of learning, a familiarity with primary sources (once available only in research collections), and a greater facility with comparative analysis, hypothesis, and synthesis. Along with these advantages, even proponents of the new technology acknowledge that serious obstacles still exist in the world of digital education. Most often cited are the troublesome inequality of access between well endowed schools and those that are less well-off; a welter of slipshod, inaccurate, and inappropriate materials on the Web; and the large number of humanities teachers who lack adequate time, training, preparation, and equipment to take advantage of the best digital tools available to enrich their curriculum. Indeed, recent data from the National Center for Education Statistics indicate that while 95 percent of American schools and nearly two-thirds of classrooms have computers linked to the Internet, 79 percent of teachers feel that they do not receive enough help in using the new technology. These are some of the problems and issues that the Endowment has been working to address and on which it will continue to focus in the future.

Making exemplary digitized resources available for teaching and learning has been and continues to be a high priority for the Endowment. After successful experiences with several award-winning programs such as *Who Built America?* and multimedia foreign language learning programs in Spanish, French, and German, the Endowment launched a three-year special initiative in 1994, *Teaching with Technology*. The initiative supported innovative program development that has helped propel advances in digital technologies for humanities education. Several themes or developmental strands emerged from these grants. First, the program expanded its support for pioneering Web-based programs such as the previously mentioned *Perseus Project* at Tufts University, which includes a wide variety of maps, texts, translations, photographs, and commentary on the ancient world. Another site with an unprecedented depth of rich, original resources is *The Valley of the Shadow* at the University of Virginia, a website and associated CD-ROMs that use primary materials (maps, census data, military records, newspapers, personal letters, and diaries) to illuminate the history of two communities, separated by only a few hundred miles, divided by the Civil War.

Other *Teaching with Technology* projects sought to exploit the multiple capacities of the new digitized medium. Two projects, for example, will give the spoken word a more central place among the range of primary materials that are available for classroom use. *Oyez, Oyez, Oyez* is a Supreme Court Web site developed at Northwestern

University that provides recordings of Court opinions and background information on major Constitutional cases. *Historical Voices* is Michigan State University's effort to bring sound recordings from the Vincent Voice Library, one of the most remarkable collections of its kind, to the history classroom through Internet technology. Another project underway at the University of Cincinnati is using video and event sequences (such as a "fly-over" of ceremonial mounds or navigation through reconstructed sites) to immerse learners in the landscape and life of ancient Adena and Hopewell peoples of the Ohio River Valley. *Earthworks*, as the program is called (and others like it with interactive capacities), promotes a rigorous pedagogy that engages students through doing, seeing, hearing, inquiring, and analyzing a rich array of documentation. These and other efforts to exploit the interactive capacities of the new media can promote a rigorous pedagogy that engages students through doing, seeing, hearing, inquiring, and analyzing a rich array of documentation.

A number of other *Teaching with Technology* grants have experimented with breaking down traditional barriers and boundaries among and between high schools and institutions of higher learning. They do this by more fully exploiting the social and spatial capacities of the new technologies. A group of school and university partners at four locations (led by Loyola University and the University of Maryland) are launching *Romantic Circles High School*. The project establishes an online environment for real-time activities facilitated by a JAVA-based MOO (multi-user object oriented) program. For example, the MOO makes it possible for students and faculty in different locations to read and discuss Samuel Taylor Coleridge's poem, "The Aeolian Harp," to link to images and a sound file of the instrument, and to work together on a project keyed to the poem. By enabling students to design a project cooperatively in this way, the MOO helps lead them to more significant levels of interest and understanding of literature. Among the many other NEH-supported activities are the development of online instructional materials on Russian language and culture, Web-based teaching modules on the American jury system, and a new CD-ROM on African art and culture published by the University of Iowa. These products have set a standard of excellence for technological applications in the classroom and are expected to have a long and valuable impact in our nation's schools and colleges.

In 1996, in partnership with MCI WorldCom, the Council of the Great City Schools, and the National Trust for the Humanities, NEH pioneered the creation of a meta-website for teachers and lifelong learners, called *EDSITEment*. Using NEH's multi-tiered peer review process that could draw on the advice of scholars, teachers, principals, superintendents, PTA members, and others, NEH culled 49 sites from among the tens of thousands of educational sites on the Web. Since that time, EDSITEment has grown to include over one hundred sites. Sites have been selected for the high quality of their content, design, and usefulness in the classroom. The meta-website includes learning guides for teachers that tackle such issues as how to assess a site for accuracy and how to use a search engine. The guides also include step-by-step lesson plans keyed to subject areas and skills acquisition. *EDSITEment* has been an exceptional success by many measures. The latest (October 1999) survey research conducted by MCI WorldCom shows that monthly user sessions totaled more than 56,000. In addition, the

site has over 700 external sites linked to it, which suggests the value of the site and its growing reputation.

The most recent NEH digital education emphasis, *Schools for a New Millennium*, is a multi-year initiative that draws upon all of the agency's previous experience with the development and use of digital resources for the humanities classroom. The new program takes aim at supporting improvements within the whole school, the site where school reformers have generally agreed change is most likely to flourish. This programming effort is designed to help elementary and secondary schools strengthen humanities instruction by supporting teachers in their efforts to become competent and comfortable with a wide array of humanities materials available in digitized formats. In its initial phase, the program awarded 34 small $30,000 planning grants in 22 states. For example, a public high school in Memphis, Tennessee received funding for a project on the oral history of the Civil Rights Movement in Memphis, and a school in California's central San Joaquin Valley was awarded a grant to develop and integrate new curricular materials on Steinbeck's California, the immigrant experience, and Hispanic culture in America. The program made 10 implementation awards in fiscal year 2000.

Thus, in recent years, Endowment-sponsored programs in the field of education have had a dual emphasis: They give high priority to making exemplary digitized resources available for teaching and learning and, at the same time, they recognize the importance of giving teachers opportunities to gain confidence and advance their skills in integrating new materials and practices into the classroom.

Lifelong Learning in the Digital Age

The Internet offers many new possibilities for public programming and the Endowment actively encourages applicants to pursue this means of dissemination. The recent report of NEH's *Teaching and Lifelong Learning Working Group* has documented the rich record of the Endowment's support in this area. The agency's support for humanities projects in museums, for example, routinely includes the development of websites that, in conjunction with traditional exhibitions, provide the public with a vehicle to explore topics in more depth. Through these websites, visitors often can examine objects from a collection in more detail by rotating three-dimensional objects in virtual space or by viewing items from museums' collections that may not even be on display. Websites offer users an opportunity to ask questions of curators or, through video or audio components comprising interviews with scholars, to learn more about the background of the objects and to listen to interpretive perspectives from various points of view. Most obviously, websites make it possible for people who are unable to attend an exhibition to experience it in their own homes, thereby extending the reach of exhibitions far beyond their original venues. Websites also enable museums with limited resources to go beyond their own walls and to devise virtual exhibitions drawn from several different collections. One recent planning grant to Mystic Seaport museum, for example, enabled several maritime museums to link resources for coordinated presentation to the public, thereby gaining a productive synergy from their collaboration.

CD-ROMs are also often important digital adjuncts to many museum projects. Frequently museums have found that they can offer a CD-ROM as a companion to an exhibition at lower cost than a comparable catalogue. Furthermore, through a CD-ROM, information and perspectives can be provided that expand considerably on a typical physical museum installation. One recent NEH project, an exhibition at the Strawbery Banke Museum in New Hampshire on the experience of immigration, included a CD-ROM as part of its presentation about the Shapiro House, an early twentieth-century immigrant dwelling in the city of Portsmouth. Through the CD, a user at home or a visitor to the actual site can view the various stages of the renovation of the house, take a virtual tour of the rooms, listen to oral histories of people whose families immigrated to the area, peruse historic photographs that relate to topics in American immigration in general, and read scholarly essays on immigrant life. The CD allows users to move beyond the local site conceptually and to appreciate ways in which its owners' experiences typified broad patterns as foreigners came to America in the early 1900s.

For media projects, especially those on television, websites have proven to be an important means of supplementing a traditional broadcast. The relative brevity of most media presentations, usually one or two hours in length, means that much of the background information is inaccessible to the public. However, a website can make that material available for leisurely perusal and can also add completely new information to supplement the original broadcast. For example, *Liberty*, a television series on the American Revolution that aired nationally in 1997, features a complementary website that allows users to explore topics related to the events and ideas in the original broadcast. Through this site, it is possible to learn more about the daily life and politics of the time and also to examine the international context of the revolution and the roles that other countries played as it unfolded. The website also extends the useful life of the production both for television audiences and students who can supplement classroom viewing of the film.

Digital technology is also an important feature of the new project, *My History is America's History*, which NEH conceived and designed. As a nation of immigrants, Americans are understandably interested in their ancestry. NEH seized the opportunity to exploit that curiosity and to help people relate their own family's particular experience to the larger historical events that have shaped communities, regions, and the country as a whole. One important component of this family history initiative has been the creation of a website that is enabling researchers, through various kinds of background information, to discover more about the historical context within which their ancestors lived. The site also encourages people to submit their own family's stories as a way of creating a database of lived experiences that will help augment the available written record. Since its launch in November of 1999, the site has recorded more than 3 million "hits." As is the case with many, if not most, organizations that maintain sites on the World Wide Web, the Endowment currently is planning to fine-tune the website to make it even more accessible to the nation's citizens. Additional materials will be added and new links provided to other relevant sites in the humanities.

Many state humanities councils also support a variety of digital projects that are facilitating lifelong learning opportunities for the nation's citizens. With funding from NEH, for example, the Massachusetts Foundation for the Humanities is developing a prototype for an interactive website that links Massachusetts history museums thematically. The prototype, "Growing Up in Changing Times," will encourage users to explore the experiences of childhood in different historical periods. The Arizona Humanities Council awarded a grant to Arizona State University to develop a bilingual website on the Latino heritage in Arizona as seen primarily through the eyes of Latinos. And, the Montana Committee for the Humanities provided crucial support for a website, "Discovering Lewis and Clark," which is already serving as a major resource in anticipation of the coming bicentennial observance.

Strengthening Cultural and Educational Institutions

Through its Office of Challenge Grants, the Endowment has provided new sources of long-term support for education, scholarship, public programming, and preservation and access that concentrate on digital technology as a new medium for communication and delivery of content in the humanities. Recent awards support the building of institutional endowments, to be matched with private funds, that serve a wide variety of purposes and audiences. At the University of Pennsylvania library, the Schoenberg Center for Electronic Texts and images is building a digitized collection of the library's rare book holdings, manuscripts, and other original sources to be made available on the World Wide Web. A World Media and Culture Center at Ohio State University will make non-English media on a global scale available to support teaching and learning about foreign languages and culture that is more exciting and immediate. George Mason University's Center for History and New Media will establish a doctoral program that builds on dual strengths in the development of websites and CD-ROMs (for example, *Who Built America?*) and extensive experience in the professional development of teachers by focusing on effective, innovative uses of the new technologies for the humanities. At the Electronic Text Center of the University of Virginia (whose archive of 45,000 texts is regularly accessed by over 50,000 online users a day), an NEH Challenge Grant will support enhancements to the technology infrastructure and address training needs that will enable this pioneering digital effort to enjoy continued growth.

NEH's Internal Use of Technology

Since the Endowment first began to computerize its operations in the late 1970s, the agency has from time to time upgraded and reengineered its internal technology systems. This pace has quickened in recent years as more of our grantees employ digital technology in their projects and as the digital world has undergone rapid and dramatic changes. It is critical that the Endowment's staff have the latest technologies at their disposal and the skills to use them. It is also important for NEH to be able to share data with our grantees, as well as with public and private organizations who may be interested in the agency's work. Recent improvements in NEH's internal technology have concentrated on three areas: 1) the installation of the most up-to-date hardware and software; 2) significant increases in the reliability of our systems; and 3) the reduction of

costs (both in dollars and in staff time).

A major project now underway has been the redesign of the NEH Grants Management System (GMS), which is currently running on an outdated Wang computer. The system contains extensive information about every application submitted and award made over the last two decades, as well as data relevant to evaluators who are selected to participate in the review of proposals. But, because this information resides in a very old, flat-file database, NEH's staff (and the public) are deprived of an excellent opportunity to use these materials in a more sophisticated way. We are currently in the final stages of a project to move all this data into a Structured Query Language (SQL)-compliant database. By putting the data into an open-standard database, we will have the ability to query and extract this information with a wide range of tools, including web-servers, spreadsheets, database programs, and report writers.

NEH also plans to make a search engine available to the general public on our website, so that they can study the grants we have given over the years. (Of course, security measures will be put in place to ensure that only information appropriate to the public will be accessible on the Web.) One other future advantage of this SQL-compliant GMS system will be the ability for applicants to submit their applications directly via the Web. Not only will this make the application process easier, it should also reduce the cost to NEH of processing applications.

In addition to the *EDSITEment* website and the agency's *My History is America's History* site, NEH has also developed a web-based database for the 56 state humanities councils to use for reporting information to the agency. Each council has its own unique information technology infrastructure. Using a traditional database was out of the question, however, since there was no way that the agency could support a software system that would be distributed to 56 locations in this country and the U.S. territories. NEH therefore decided that, in this case, it would be best to deploy a web-based system, which will allow councils to use any computer they choose, as long as they have Internet connectivity. This approach also does not require any purchasing or configuration on their end. The Endowment will control the database centrally and can make improvements and modifications without having to send out updates around the country.

Trends and Patterns in NEH-Supported Digital Projects

The HST Working Group has studied the Endowment's rich history of support for digital projects in an attempt to see if any broad patterns emerge in the types of projects that have received grants in recent years. It was our belief that such an informed analysis would help us come to a better understanding of where the Endowment might profitably concentrate its resources in the future. We are aware, of course, that digital technology is still in its infancy and that new developments seem to arise almost daily. We are also cognizant of the fact that many digital projects, however successful, are really provisional in nature and that even humanities scholars and educators who know the most about digital technology often view their work as exploratory and experimental.

Before beginning our assessment of NEH-supported projects, we posited a hypothetical range of humanities projects that could be considered in some way "digital," believing that such a typology would eventually allow us to suggest some useful priorities. In our discussion of this question, the following categories emerged: projects where digital technology is only a component of the work; projects whose main product or vehicle of dissemination is digital; ground-breaking digital projects that seem to open new horizons on humanities subjects or fields; and projects that are *about* digital technology and study the *impact* of computers on society in general or the humanities in particular.

Other scholars and educators are also attempting to come to terms with the mushrooming growth of humanities computing projects. A spirited e-mail exchange last fall in the online listserv *Humanist Discussion Group*, for example, illustrates the level of discourse about this question within the humanities community. The *Humanist Group* discussion, which involved a number of international scholars, researchers, and educators, revealed that there is a great of deal of controversy and debate among scholars regarding what actually can be regarded as a *humanities computing project*. This colloquy concluded with a suggestion from its moderator that projects be conceived as falling along a continuum, ranging from those that make relatively simple and straightforward use of digital technology to those that involve more complex and sophisticated undertakings.

We too have tried to sort digital humanities projects into generally recognizable types or categories. But, while it is possible in the abstract to envision a typology of digital projects, we have found that fitting actual projects into arbitrarily derived categories or displaying them along a continuum is a difficult, if not impossible, task. The digital projects NEH has supported in recent years, especially those that involve the creation and maintenance of websites and databases, simply display too many individual traits or characteristics to pigeonhole into distinct categories. On close examination, we found countless variations in how scholars, educators, and other humanists used digital technology to advance the objectives of their projects. Most digital projects are *sui generis*, adopting digital formats and strategies that best suit their individual needs and objectives, and thus defy easy categorization. Even at the most seemingly elementary level—say, the development of a simple website or a CD-ROM—there are no set formulas for how to proceed and the developers of these projects must put a great deal of thought and energy into creating something that works.

This being said, we thought it would be useful, nevertheless, to provide a small sampling of digital projects that we see as illustrative of some of the more important current trends in humanities computing. These are some of the kinds of projects that the Endowment may want to encourage in the near future as information technology continues to evolve. Because of the nature of this exercise, however, we regret that some of these projects may have been mentioned briefly in the preceding section of this paper. We apologize for this necessary repetition.

Projects That Create New Approaches to Studying the Humanities

Besides the many NEH projects that use digital technology to disseminate the results of their research and scholarship, there are other projects whose use of technology opens the possibility of new intellectual and pedagogical approaches to established humanities subjects. These are projects in which digital technology creates something more than would be possible with traditional forms of dissemination. They create new humanities content and new ways of thinking about the subject matter by virtue of their electronic formats. It would, of course, be possible to argue that simply by bringing together rich and diverse humanities materials in one place and by providing a variety of mechanisms by which to explore the material, many digital projects are already opening new vistas. Current scholarship and teaching in the humanities emphasize the importance of exploring multiple viewpoints, presenting a variety of narratives of important events, and allowing scholars and students to blaze their own trails through complex materials. Thus, while it is possible to view a project such as the University of Virginia's *The Valley of the Shadow*, mentioned previously in this paper, primarily as a straightforward "dissemination project," this site also more importantly provides an unparalleled opportunity to explore multiple sources and construct multiple stories relating to the experiences of two towns in the Civil War era, one on each side of the great conflict.

While the Endowment should continue to encourage such established uses of electronic media to increase the usefulness of humanities resource material in all its grant programs, the new media have other capabilities for enhancing humanistic inquiry that deserve increased attention from the agency. One of the most important of these capabilities is digital technology's capacity for interactivity. For example, a recent project at Stanford University demonstrates additional possibilities that digital technology can bring to traditional subjects in the humanities. A team at Stanford is producing a dynamic encyclopedia of philosophy that utilizes the interactive capabilities of the Internet to continually update contributions, as authors are provided with tools to revise their entries in light of readers' comments, a capability not possible in traditional media. The encyclopedia also allows the inclusion of entries on new areas of inquiry and the presentation of multiple points of view on controversial topics. Individual entries are cross-referenced to other entries and related to additional print and electronic resources through bibliographies and links to websites.

Another recent grant, to the California Institute of Technology, is supporting the creation of interactive environments for the study of astronomical models of the scientific revolution in the work of Ptolemy, Copernicus, Kepler, and Newton. This website, part of a larger project known as the *Universal Laboratory for the History of Science*, will offer simulations of past scientific work as well as historical contexts and sources for teaching the history of science. Linda Roberts, Director of the Office of Technology at the Department of Education, points to the possibility that technology may accelerate learning in areas where visualization and representational tools or three-dimensional

graphics, like the ones used in this project, offer a better way to present certain concepts. She believes that "Our world is increasingly going to be a multimedia world where the information that we have to interpret goes beyond just the printed word." A new age of information may be shaping a new set of skills, but as Roberts notes, we "have to develop new tools to measure the extent to which students are acquiring proficiency in those skills. And it cannot be a paper-and-pencil test or selected multiple-choice terms. It requires a measure of performance using the technology itself." The HST Working Group believes that it will be crucial for NEH to continue encouraging projects that creatively use digital media to enhance the power of humanities-based study and for the agency to evaluate their effectiveness.

In a closely related area, the Endowment should also foster innovative, digitally rich, and interactive film documentaries for public audiences. Broadcasters such as PBS are beginning to envision television broadcasts as only one component of a more substantial set of topically relevant resources made available via the World Wide Web. In order to help lead the way in this area, the Endowment and the Office of Education and Programming at the Corporation for Public Broadcasting (CPB) have recently entered into a joint initiative for *Digital Parallel Production Grants* that use digital technology to create interactive programs in the humanities for viewers. In the initial phase of this initiative, seven projects have recently received joint funding from NEH and CPB. One project, *Crucible of the Millennium* (a four-hour series that will examine the year 1500 and its impact on succeeding years and centuries) would be enhanced by the addition of a "virtual" exploration of an Aztec pyramid. Another project, *Woodrow Wilson*, a film biography of the nation's twenty-eighth President, proposes to use DVD technology and an interactive website to pose questions that will encourage users to "think like a historian." Ultimately, digital television such as this should enhance learning across the generations. As the broadcast industry moves quickly to develop digital TV for its commercial possibilities, the Endowment, along with its partners at CPB and PBS, should attempt to be in a position to lead the development of digital content of high quality for television, in a manner that is consistent with the spirit of NEH's mission of public education and service.

Projects That Approach Digital Technology as a Subject

As digital technology continues to evolve, supporting projects that explore digital technology as a *subject*, examining the broad impact of these developments on various fields in the humanities, as well as on modern society and culture in general, will become increasingly important. The Endowment has a decisive role to play in encouraging projects in the history, philosophy, and sociology of technology that will bring the perspectives of the humanities to bear on these transformations. It is useful to note that, while other projects discussed in this section of our paper are all digital in format, projects of this type can result in the publication of books and articles or the proceedings of scholarly seminars or conferences. Moreover, these projects are not dissimilar from traditional examinations of the history and philosophy of technology, which have been traditionally supported by NEH and were discussed in the first section of this paper— "NEH and Projects in the Humanities, Science, and Technology."

The study of digital technology as *subject* was the focus of a summer seminar for college and university teachers held in 1995 and 1998 at the University of California at Los Angeles. This seminar explored the impact of the new technologies on the creation, reading, and study of literature, with particular emphasis on digital fiction, a form of creative writing that allows readers and literary critics to interact with the text itself, following a variety of digital paths through the author's materials. In addition to the study and criticism of digital fiction, the seminar considered other important topics in the development of what might be called a new "electronic textuality," such as the relationship of electronic texts to oral and print cultures, teaching literature with the new media, and the impact of digital technology on professional practice. Another summer institute, at Pennsylvania State University, brought philosophical perspectives to bear on recent technological transformations. This project enabled twenty-five college and university faculty members from a variety of fields to explore a series of key humanities-based questions: To what extent can traditional ethical theories be applied to developments made possible by modern technology? Do digital technology and biotechnology raise issues about how to distinguish between the natural and the artificial? Can computers think? Finally, a recent recipient of an NEH summer stipend is examining the debate over the moral value and the potential harm or benefit of "simulation"—particularly simulations that are the product of computer-generated environments, such as those generated by Internet communities and virtual reality games. The goal of the project is to determine whether life and activity in simulated worlds are inauthenic and morally deficient or if in some cases they are comparable or even superior to life in ordinary reality.

The Endowment, with its long-standing mission of bringing the methods of the humanities to bear on important historical transformations in societies and cultures is particularly well-positioned to advance the understanding of the current transformations being wrought by digital technology. The HST Working Group believes that the funding of such work should be one of the agency's future priorities.

Projects That Develop Standards and Best Practices

Projects that are developing the software tools and testing various applications of computer science to research and teaching will continue to be critical to the deployment of digital technology in the humanities. These projects—such as the *Text Encoding Initiative* (TEI) and *Encoded Archival Description* (EAD) described in the previous section of this paper—are typically collaborative efforts among humanities scholars and educators, librarians and archivists, and computer scientists to find solutions to technical challenges posed by the digitization and use of humanities resources and materials. They are also almost always projects that cannot be done without the support of an institution with national reach and scope such as NEH.

Digital research and demonstration projects supported through the Endowment's participation in the NSF-administered Digital Library Initiative are currently helping to develop standards and best practices that will be critical to the effective use of digital

technology in the humanities. The *National Gallery of the Spoken Word* project at Michigan State University, for example, is creating a fully searchable, online database of historically significant twentieth-century voice recordings and will be addressing currently unsolved technical problems concerning the digital preservation of sound and its delivery via the World Wide Web. Another recently supported project, at Johns Hopkins University, is enhancing the usability of the Eisenhower Library's Lester S. Levy Collection of Sheet Music, which contains 9,000 pieces of American popular sheet music spanning the years 1780 to 1960. The project will create searchable audio and lyric files, develop software that will play the notes of the digitized sheet music over the Internet, and establish processes and tools that may be applied to similar large-scale digitization projects. As a national leader in supporting digital preservation and access projects such as these, the Endowment will be expected to play an increasingly important role in this area in the coming years.

As also noted previously in this paper, the ways in which digital materials are created, stored, and maintained over time are issues of enormous importance to librarians, archivists, government officials, and other concerned citizens. Indeed, it is the general sense of researchers and experts in this area that we are currently in the early stages of developing strategies and systems for ensuring that digital materials will be preserved and accessible for future generations. At present, it seems unlikely, however, that a single universal solution to digital preservation will be found, despite the fact that this problem affects not only humanities institutions, but all segments of society that rely on past records for their current work and long-range planning. It is important that NEH continue to monitor and support collaborative efforts that address the technical aspects of digital preservation and take into account the many complex legal, financial, and managerial questions that come into play. Indeed, as one of the Working Group's outside consultants, John Unsworth of the Institute for Advanced Technology and the Humanities at the University of Virginia, stated in his response to a solicitation from the Working Group, "if NEH doesn't do this, it's hard to imagine who will." Patricia Battin, founder and former head of the Council on Library Resources' Commission on Preservation and Access, has also stressed that humanities scholars must be involved in the development of such technology and that it not be left solely to engineers.

Other Important Trends and Issues

One of the most contentious issues in digital information today is intellectual property and fair use. This is an arena where commercial interests, scholarly communication, teaching, and the public good often conflict. The copyright laws that were developed in the context of print technology are being extended and emended to cover digital materials and products, but many seem inadequate for an environment in which the relationship between author, publisher, and user has changed, challenging the intellectual foundations of previous laws. In the digital world, for instance, authors can be their own publishers and authorship may be communal rather than individual. Academic institutions, on the other hand, which are both producers and consumers of electronic information, see the need to balance the rights of content providers and public users, particularly in the area of distance education. Organizations such as the

Association of Research Libraries, the Council on Library and Information Resources, and *EDUCAUSE*—a nonprofit association and advocacy group dedicated to exploring issues at the intersection of higher education and information technology—are bringing together academic institutions, libraries, archives, and information organizations that have been actively working to ensure that such a balance is maintained as changes are made in existing laws. The Endowment will need to continue to keep apprised of developments in this area as they affect humanities research, education, and public programming.

Among the many social and economic issues that have emerged along with the rise of computer technology is the inequality of access to electronic information and resources. Government and various other public and private sectors of society are concerned that a *digital divide*, which now exists between those who are information-rich and those who are information-poor, will continue to widen unless measures are taken to ensure universal access to all citizens. A report issued by the U.S. Department of Commerce in July 1999, *Falling Through the Net: Defining the Digital Divide*, discussed the nature and extent of this problem. As one of its recommendations for addressing the problem, it suggested that, in order to reach disadvantaged groups and individuals in American society who do not have access to computers at home or at work, computers should be made more accessible at "community centers" such as libraries, schools, and other public spaces. Citing data from this report, Henry Louis Gates, Jr., noted in an October 31, 1999 op-ed column in *The New York Times* that "we stand at the brink of becoming two societies, one largely white and plugged in and the other black and unplugged." Noting these and other failures of the digital revolution, in FY 1999 Congress enacted the Library Services and Technology Act to provide broader access to underserved citizens. The Clinton Administration has also issued two memoranda— "Electronic Government" and "Use of Information Technology to Improve Our Society"—that, among other things, instructs agencies to make electronic information more widely available to Americans. Most recently, on April 4, 2000, the Administration announced a "National Call to Action to Close the Digital Divide" that encourages the private and non-profit sectors to take concrete steps to bring digital opportunities to youths, families, and communities around the country. The HST Working Group thus believes that NEH should continue to urge its grantees to reach a broad array of users, so that the public at large may benefit from the Endowment's support for projects involving information technology.

III

RECOMMENDATIONS OF THE HST WORKING GROUP

The Working Group has identified a range of new initiatives and possible partnerships centered in programs and offices across the agency. The Endowment could either undertake these recommended program emphases directly, assuming the availability of funding, or propose them as joint initiatives with federal agencies, such as the National Science Foundation, or with nonfederal institutions and organizations.

The Working Group would like to observe, as a preface to its specific recommendations, that the downsizing of the agency and the significant budget reduction of FY 1996 have meant that the Endowment's support for projects involving humanistic studies of science and technology has fallen dramatically and that NEH's ability to fund innovative information technology projects has been unduly constrained. Although support for digital projects is a characteristic feature of grants made through most of our programs, it is unfortunate that the reduction of the agency's funding occurred at precisely the moment that the digital revolution began its extraordinary growth. Thus, restoring NEH's core programs to more adequate funding levels should attract more science and technology proposals, as well as additional applications involving digital resources. It would also, in the case of projects concerning the history and philosophy of science and technology, alter the current impression among some humanities scholars who study science and technology that such projects are not a high priority of NEH.

Following the division of this paper into the two major components of our mandate, the HST Working Group would like to present two sets of recommendations for the consideration of the Endowment. These recommendations reflect the capabilities of the agency's current programmatic structure as well as needs and opportunities of the humanities community.

Recommendations: Humanities, Science, and Technology Projects

Except for our first recommendation described below (to re-establish the Endowment's former *Humanities Studies of Science and Technology* program), the following set of recommendations of the HST Working Group is primarily drawn from our preliminary report, "Building Partnerships with the National Science Foundation: A Report of the Humanities, Science, and Technology Working Group," which was submitted to NEH's Chairman on May 24, 1999. (See the NEH Intranet for a complete copy of this report.) Because the Endowment as a grant-making agency has had a close affinity with NSF, as well as sharing a long and rewarding tradition of cooperation and partnership in areas of common interest to the two agencies, we present these recommendations as a model or test-case for programming emphases that could be explored with other partners. Although these recommendations are keyed to NSF, the Working Group regards this list of initiatives as a *template* that could be adapted and tailored to reflect the interests and priorities of other potential partners, both public and private.

1. Re-establish NEH's former *Humanities Studies of Science and Technology* program

   The HST Working Group believes that one of the best ways that the Endowment could greatly expand its support for humanities, science, and technology projects would be to resurrect a version of its former *Humanities Studies of Science and Technology* (HSST) program, which existed from 1983 until the Endowment's funding was dramatically reduced in FY 1996. This program and its predecessor— the *Science, Technology, and Human Values* program—helped coordinate agency-

wide projects in this area and spearheaded cooperative efforts with NSF and other federal agencies. The elimination of the *Humanities Studies of Science and Technology* program five years ago was a special loss to humanities scholars who work in this area.

A number of the Working Group's outside consultants, especially historians of science and technology, lamented the demise of this former NEH program. Therefore, regardless of whether or not the Endowment is able to re-establish a version of the former *Humanities Studies of Science and Technology* program or to implement the recommendations we itemize below, we urge the agency to send a clear signal to the humanities community that NEH does indeed welcome proposals dealing with science and technology, that our peer review system includes humanities scholars familiar with these areas, and that, funds permitting, we intend to continue supporting work in this area.

Impact: Humanities scholars and educators who study science and technology would see evidence of NEH's commitment to this area of study and the program's name would be very visible. Just as importantly, initial contact with the staff of this program could result in referral of inquiries to other programs of the Endowment. More applications relating to humanities, science, and technology would be submitted by this community of scholars to all the agency's programs. In addition, a discrete program in this area would also be appealing to other potential federal and nonfederal partners.

Cost: An estimated one million dollars annually would be required to support approximately 11 awards per year.

Staffing: An additional program officer and one half-time program specialist would be required.

2. Joint Initiative Involving the State Humanities Councils, NEH, and NSF

A new partnership could be forged based on the successful initiative NEH and NSF sponsored from 1993 to 1995 that provided funding to the state humanities councils focusing on projects for general audiences involving science, technology, and the humanities. Funding for this new partnership could be split 4:1 between NSF and NEH, with the Science Foundation transferring its portion to NEH to administer the initiative. Two possible options for distributing this money to the state councils would be: 1) to sponsor a special competition through the NEH Public Programs division, or 2) to distribute the money equally to the councils and encourage them to mount humanities, science, and technology projects in their states. The second option is the funding model the Endowment used to encourage the state councils to participate in NEH's 1994-1996 initiative, "A National Conversation on American Pluralism and Identity." Based on its experience with the earlier joint initiative, NSF apparently values the state humanities councils' network and its ability to deliver quality programs to public audiences.

Impact: This joint initiative would reach broad public audiences. A new initiative would have great appeal to NSF, an agency that does not have access to a mechanism like the state humanities councils for promoting broadly-based public education projects.

Cost: Using the funding ratio from the old initiative as a starting point and given the Endowment 's current and possibly continuing shortage of funds, it is recommended that NSF contribute $400,000 and NEH $100,000 respectively.

Staffing: If a special competition is administered through NEH's Public Programs division, additional staff would be required.

3. <u>Joint Support for Summer Seminars and Institutes in the Humanities, Science, and Technology</u>

Building on the experience gained from the former NEH-NSF *Leadership Opportunity in Science and Humanities Education* initiative of 1992-1995, the two agencies could again join forces in support of summer seminars and institutes for school and college teachers that focused on topics relating to the humanities, science, and technology. The Endowment currently is able to support only a handful of such projects each summer. (Prior to the dramatic 36 percent reduction of NEH's budget in FY 1996, the Endowment had been supporting approximately 125 summer *seminars* annually on a broad range of topics in the humanities. In FY 2000, however, we will be able to fund about 52 seminars *and institutes*.) Thus, a new partnership with NSF would increase the number of humanities, science, and technology projects that could be supported, as well as enable more school and college science teachers to avail themselves of these substantive and highly effective educational opportunities. This new initiative would also provide an opportunity for teachers of the humanities and the sciences to interact and to explore important subject areas that benefit from inter-disciplinary perspectives. Humanities scholars and science faculty could co-direct these seminars and institutes, which would be made available to both schoolteachers and college and university teachers. Some of these joint seminars and institutes could be targeted to specific outreach audiences that both agencies are interested in reaching, such as historically black colleges and universities and community colleges.

The need for increased collaboration between teachers of the humanities and the sciences was a suggestion made by several of our outside consultants. As Terry Reynolds, President of the Society for the History of Technology, pointed out, "I think such collaborations are more likely to start through joint teaching. Programs should thus focus on encouraging collaboration in this area as a first step towards broader scholarly collaborations between humanities scholars and their colleagues in the sciences." Professor Daryl Hafter also observed that NEH should plan annually to support "a few summer institutes for teachers, on whatever level, to learn about technology studies and to equip themselves to integrate the history of technology in their other classes."

Impact: Seminars and institutes have an impact not only on the teacher-participants but also on the students they teach over an extended period of time. Seminars and institutes also put research and teaching materials on the World Wide Web, reaching other teachers and students across the country. Other ways these programs can have an impact include research publications, in-service workshops by the participants, and presentations at conferences.

Cost: Ten NEH-NSF projects per year would cost approximately $1.8 million; $600,000 from NEH and $1.2 million from NSF.

Staffing: We estimate that the initiative would require the half-time services of one additional staff member to chair two panels and to do program development work.

4. Special Competition in Support of Exhibitions in Science Museums and Centers

The HST Working Group believes that the Endowment's support for humanities-oriented projects in science museums should be strengthened. In the 1990s, the Endowment supported only a small number of museum exhibitions on humanities, science, and technology themes, some of which have also received joint funding from NSF. At the same time, while the Science Foundation currently supports many other museum projects, it is the opinion of the Working Group that science museums are generally more interactive than interpretive. NEH and NSF should help to address these and other issues by joining forces to develop a special initiative that would bring more exhibitions on the humanities and the sciences to science museums. A competition on a special theme—such as, for example, "History of Science" or "Society and Science"—could be designed jointly and administered by NEH. Each agency would provide some funding for the initiative, but it is hoped that NSF could contribute a more significant portion by virtue of its much larger budget. The advantage to NEH of this type of collaboration would be a more extensive involvement with science museums. One of the advantages to NSF would be the promotion of exhibitions on science topics and issues that include rich interpretive material from the humanities. The special competition could be open to any interested museum and not just limited to science museums.

NSF currently funds museum exhibitions through its Informal Science Education program; the goals of this initiative would be consistent with the Foundation's effort to create a public that is well informed about all facets of the scientific enterprise.

Impact: Science museums and centers are some of the fastest growing and the most popular in the world of museums. Being able to add the context and depth provided by the humanities to their offerings would enable these institutions to reach many thousands of visitors with exhibitions that could interpret the social and historical dimensions of the scientific endeavor.

Cost: At an estimated expenditure of approximately $200,000 per exhibition, 5 NEH-NSF projects per year could be funded for one million dollars, appropriately split between the two agencies.

Staffing: Implementing a special competition specifically designed for science centers and museums would require about 1/3 of a program officer's time and would probably necessitate hiring a part-time person to handle the clerical workload.

5. Joint NEH-NSF Fellowships

The two agencies could share the cost of supporting a number of annual NEH fellowship proposals on subjects involving the history and philosophy of science and technology, linguistics, the social sciences, and environmental studies. The Endowment now funds approximately 5-10 fellowships in these subject areas each year. By sharing the cost of supporting such projects, the Science Foundation would benefit from being associated with our fellowship program and its rigorous and widely acclaimed system of peer review. It would also receive public recognition for helping to make these "NEH-NSF Fellows" possible. One way the Endowment would benefit from this cooperative arrangement is that it would release some program funding that could then be used to support additional fellowships in the humanities. If NSF chooses to participate in such a partnership, the HST Working Group recommends that funds be transferred to the Endowment to administer the grants.

Impact: This initiative would enhance the visibility of important areas of cooperation between the two agencies. Ultimately, approximately ten books and articles might appear each year acknowledging joint support from NEH and NSF.

Cost: Ten NEH-NSF fellowships would cost NSF $150,000. No increase in NEH expenditures would be anticipated; in fact, funds would be made available that would allow us to support five alternates for NEH fellowships.

Staffing: No additional staff would be required.

6. Support for NSF Fellows at NEH-Supported Independent Research Institutions

The Endowment's support for Fellowship Programs at Independent Research Institutions provides funds to institutions—such as the National Humanities Center—that enable them to offer additional annual fellowships in the humanities. NSF could be encouraged to help underwrite one or more "NSF Fellows" each year at these NEH-supported institutions. Both humanities and science scholars would benefit from the collegial exchange and intellectual interaction that would take place over the course of their fellowship year at these institutions. By using the Endowment's already established grant category in this area and our peer review system, NSF would not have to incur additional administrative cost to provide support for these

"science fellows"; the Foundation could simply transfer $30,000 to NEH for each fellowship.

Impact: Four NSF Fellows per year at an institution such as the National Humanities Center would enrich discussion and thought about subjects of importance to science and the humanities.

Cost: $120,000 to NSF; no additional cost to NEH.

Staffing: No additional staff would be required.

7. Joint Support of Research Conferences Addressing Topics of Significance to the Humanities and the Sciences

The Endowment now provides support for scholarly conferences from the Research Division's Collaborative Research program. In the past, this program has provided support for a number of conferences on the history and philosophy of science. A cooperative agreement could be concluded with NSF that would support such scholarly conferences.

Impact: This effort would be a highly visible example of cooperation between two important federal agencies. Redirection of research in some subject areas receiving support would be an anticipated outcome. This scholarly research initiative would be distinct from the major national conferences on the humanities, science, and technology that NEH hopes to convene in the near future, which will be larger in scale and broader in the audiences they will attract.

Cost: Two research conferences per year would cost NSF between $50,000 and $100,000.

Staffing: No additional staff would be needed.

8. Special Challenge Grants Competition to Endow Centers for the Study of the History and Philosophy of Science and Technology at Colleges and Universities

The NEH Challenge Grants program could announce a special competition for building endowments to support the activities of centers located at colleges and universities that focus on the study of science and technology.   NEH and NSF could share the costs of this three-year initiative, but the administrative costs to NEH for such a program would be minimal. NSF does not have a challenge program and thus might find this idea attractive.

Impact: The development of existing centers for science and technology studies would be nurtured and new centers could be established. A three-year initiative would yield about 7 endowments for these centers.

Cost: Four million dollars from NSF and about from $500,000 from NEH (spread over four to seven years).

Staffing: An estimated 1/2 FTE would be needed for the Office of Challenge Grants.

9. Enhance NEH-NSF Data Collection Activities

The Endowment has explored with NSF the possibility of renewing support for the humanities portion of the Survey of Doctorate Recipients, which was discontinued following NEH's downsizing in FY 1996. The survey of humanities Ph.D.s yielded important national data on the careers of highly trained humanists, data that are available nowhere else. The Endowment could also explore with NSF a variety of additional data collection activities, focusing on those science-related data relevant to the humanities (for example, student achievement, teacher preparation, graduate student support, academic R&D, and public attitudes).

Impact: The humanities community has long clamored for more and better data on the condition of the humanities. Just as importantly, program planning and evaluation at NEH would benefit greatly from a more systematic collection and analysis of a wide range of data on the humanities. And the Government Performance and Results Act is challenging agencies to document their programs' outcomes and measure success accordingly. Working in tandem with NSF to collect data on the humanities would assist us in these efforts.

Cost: One million dollars annually in Administrative funds.

Staffing: No additional staffing would be needed at this time.

Recommendations: NEH and Digital Humanities Projects

Based on our examination of the history of the Endowment's support for digital humanities projects and our analysis of some of the broad patterns or categories suggested by these projects, the HST Working Group presents the following set of recommendations for future NEH support in this important area. We think that these recommendations will enable the agency to continue and to strengthen its tradition of strong leadership. We understand that the Endowment's other working groups acknowledge the importance of technology in their area of interest and have suggested new initiatives and program emphases accordingly.

We are also cognizant of the mercurial nature of the digital world. Who can predict in what future directions the technological evolution will lead, and what the long-term prospects are for the Internet and other digital formats that are currently in ascendancy? Who could have envisioned less than ten years ago how pervasive digital technology would become in the nation's classrooms, in our homes, and in our work

places? Who can predict what successful humanities projects will look like five or ten years from now, or even, for that matter, in the immediate future?

With these caveats in mind, the Working Group recommends that the Endowment continue its traditional role of supporting projects involving information technology. At the same time, the Endowment should remain receptive to innovative digital projects in the humanities, even if they may be experimental or even somewhat tentative in nature. The Working Group also thinks that NEH should continue to encourage proposals in programs across the agency that will make the results of their projects available online via websites or other digital formats.

1. Expand Opportunities to Use Digital Materials in the Nation's Classrooms

   NEH should encourage more partnerships between the agency and nonfederal funders, such as the *EDSITEment* project, that develop and make accessible high quality digital humanities content for the nation's teachers and students. Also, expand opportunities for schools and humanities teachers to become more proficient in using digitized educational materials, such as by increasing support for *Schools for a New Millennium* and for seminars and institutes that involve digital formats.

   Impact: As the digital revolution continues to unfold and as more humanities materials are disseminated in digital form, NEH will continue to have an important role to play in helping to ensure that humanities content of high quality is accessible and that schools and teachers are availing themselves of opportunities to use such materials.

   Cost: For FY 2001, the Endowment is requesting approximately $1.8 million from Congress for the *Schools for a New Millennium* program, which would support approximately ten implementation grants. If Congress does not provide this funding, however, the Endowment would either have to reduce the number of grants supported or seek funding from another federal or nonfederal source. Similarly, NEH is requesting increased funding in FY 2001 for the Seminars and Institutes program, which would support additional projects, including projects that make use of digital technologies.

   Staffing: Additional staff would be needed to support the full funding requested for these programs for FY 2001.

2. Encourage More Projects That Approach Technology as Subject Matter

   These are projects that explore technology and its impact on the humanities and society in intellectually challenging and compelling ways. We recommend specifically that NEH create an initiative for a period of four years in the Division of Research Programs for grants to scholars in the humanities who are doing intellectually challenging research on *technology as subject matter*. In addition to reflecting the Working Group's analysis of some important current trends in the area

of the humanities and information technology, this recommendation has grown out of suggestions of several of our consultants, including Rita Raley, Katherine Hayles, and Daryl Hafter.

Applicants could propose research projects that would explore technology and its impact on humanities fields of inquiry and on society more broadly conceived. These projects could be conducted by individual scholars or by teams of scholars, and collaboration with scholars from the sciences and technology would be possible. Support could include salaries, research costs, and other expenses for periods up to three years. In addition to support for scholarly research, educational and public projects also could be designed to reach students and general audiences in engaging and creative ways. As always, such projects would draw upon the knowledge of scholars in their fields.

This is a subject area that currently receives little support from the Endowment, other agencies, or the private sector. Nevertheless, given the potential importance of such efforts, the Endowment could attract proposals for projects of compelling significance for the future of the humanities.

Impact: This initiative would lead to results of great interest to those employing the latest technologies and developing future technologies. The subsequent dissemination of the results to a broad public audience could be supported through existing Endowment programs.

Cost: Making approximately five awards per year, at an average of $133,000, these grants would require approximately $665,000 per year over four years.

Staffing: A special competition administered by NEH's Division of Research Programs would require one program officer and one program assistant/specialist.

3. Enhance Support for Projects That Establish Standards and Best Practices

The Endowment's formal partnership with the National Science Foundation for the second round of NSF's Digital Libraries Initiative (DLI2) has provided leadership and support for the research that is necessary for the effective development of the next generation of digital resources. The one million dollars that NEH has contributed to this effort in FY 1999 has leveraged over $9 million from NSF in support of research and development projects that promise to be highly significant for the creation, use, and preservation of digitized humanities materials. Several of the funded projects are also developing technical standards and best practices for digital resources in the humanities. Applications for the second and concluding round of the DLI2 initiative were recently evaluated and the National Council on the Humanities recommended that five proposals be jointly funded by NEH and NSF. The Endowment's investment of one million dollars in these projects is expected to leverage another $5 million from NSF.

Maintaining this partnership will offer the possibility of dealing more effectively with the problem of preserving access over time to digital resources. If it proves impossible to continue NEH's partnership in funding significant research and demonstration projects focusing on the use of digital technology in the humanities, then the Working Group believes NEH must find a way to support such projects itself or with help from the private and corporate sectors.

Impact: Representatives of humanities institutions and organizations across the country have enthusiastically endorsed NEH's participation in DLI2. The first round of the competition has already produced research and development projects of great importance to the humanities.

Cost: In FY 2000, NEH has transferred another one million dollars from the Division of Preservation and Access to NSF in support of five projects in the latest round of the DLI2 partnership. In future years, funding could also be set aside in support of a variety of research and demonstration efforts between the two agencies or other agencies, as appropriate.

Staffing: No additional staff is needed at this time.

4.   Continue to Seek Funding for an Initiative to Digitize Materials Important to the Nation's Heritage

As it has done for the last two years, the Endowment has again requested funding from Congress in FY 2001 to launch a special initiative that would encourage collaborative projects among museums, libraries, and archives to digitize major collections relating to a particular historical or cultural figure, subject, or idea. Through this initiative, a coherent body of important humanities materials would be created that would be available via the Internet to classrooms and homes across the nation. This effort would bring online tens of thousands of digital images of manuscripts, maps, photographs, artifacts, and other significant resources. Students, scholars, and lifelong learners would have access to materials of historical significance in geographically dispersed collections that would otherwise be difficult to consult without travelling to the sites where they are held.

Impact: Every classroom, cultural institution, and home in the United States with access to the Internet would be potential beneficiaries of this initiative.

Cost: An estimated $2 to $4 million (perhaps split 3:1 between NSF and NEH).

Staffing: This initiative could be implemented with existing NEH staff, if NSF agreed to follow the model used for the DLI2 partnership.

5. Support efforts to assess the effectiveness of digital humanities projects

While it is widely assumed that the new information technologies are having a major impact on teaching, learning, research, and public education in the humanities, to date there have been few attempts to analyze systematically the results and outcomes of such projects. The Endowment could support such assessment projects through the data collection efforts of its Office of Strategic Planning (OSP). In addition, supplemental grants could be provided to selected grantees to conduct evaluations of the outcomes of their projects. OSP would, of course, work in tandem with the Endowment's divisions and offices to plan and coordinate these evaluative efforts.

Impact: The humanities community would benefit from objective evaluations and assessments of digital humanities projects. Just as importantly, program planning and evaluation at NEH would be informed by a more accurate reading of the value and effectiveness of these efforts. This initiative would also respond to the mandate of the Government Performance and Results Act to document program outcomes and measure success accordingly.

Cost: If funded through the Planning and Assessment Studies program of the Office of Strategic Planning, an estimated $250,000 in Administrative funds would be needed to support 2-3 assessment studies. In addition, a small percentage of the award amount to selected digital projects could be provided for grantees to evaluate the results of their projects.

Staffing: No additional staffing would be needed at this time.

CONCLUSION

OPPORTUNITIES FOR PARTNERSHIPS

We wish to conclude this working paper with some thoughts and suggestions about forging partnerships with federal and nonfederal entities in the area of humanities, science, and technology. NEH makes unique yet complementary contributions to the pursuit of science and technology through its support for projects on the history of scientific institutions and ideas, explorations of these ideas over time, and analyses of ethical, philosophical, legal, and social aspects and implications of science and technology. The work the Endowment supports has the potential both to further the fields of study and to provide thoughtful outreach to a variety of public and educational audiences. Humanities scholars and institutions are also consumers and shapers of digital technology and digital products. These qualities make NEH a useful and effective partner for federal and private sector scientific and technological entities.

NEH's most obvious federal partner for its science and technology programs in the past has been the National Science Foundation, and that agency remains a fruitful prospect for the future. Other potential partners are the National Endowment for the

Arts; the Institute of Museum and Library Services; National Institutes of Health (especially the Ethical, Legal and Social Issues program at the National Human Genome Research Institute, according to one of the Working Group's consultants, Thomas H. Murray); the National Library of Medicine; and various Smithsonian museums, such as the National Air and Space Museum and the National Museum of Natural History. The National Aeronautics and Space Administration, the Department of Health and Human Services, and the Department of Energy can serve as examples of other federal agencies with partnership potential, although the potential within the vast array of federal agencies should also be considered.

NEH has successfully forged partnerships with technology companies to support the Web sites of two of its NEH-*generated* projects, *EDSITEment* and *My History Is America's History*. MCI WorldCom supports *EDSITEment* and includes this NEH site in its multi-disciplinary MarcoPolo educational website. Genealogy.com and PSINet provide major in-kind contributions to the online elements of *My History Is America's History*. These partnerships demonstrate the potential of NEH's Internet projects to gain in-kind support, funding, and dissemination from the technology sector of the economy.

Gaining partnership support for NEH *grant* programs is still in its infancy but anticipates a lively future. NEH is holding discussions with major technology corporations and with key foundations to support its *Schools for a New Millennium* program, a professional development program for K-12 teachers that fuses technology training with immersion in humanities classroom subject materials. Digital access programs as well as programs designed to develop the next generations of digital humanities applications are candidates for creative public and private partnerships. As one of the Working Group's outside consultants, John Unsworth at the University of Virginia, noted: "I think the NEH can and should find other entities, beyond the NSF, to work with in this effort--there are a number of private foundations (Mellon, Packard, Pew, Markle, to name just a few) that are or could be interested in the intersection of humanities, science, and technology." It will be crucial in the design of these partnerships for humanists to be exposed to the latest technological developments and, just as importantly, for those who are creating these new technologies to benefit from the unique kinds of questions and insights that humanists can provide.