Scientists Called Upon to Take Actions

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Abstract

Once again, scientists were called upon to take greater role in the political process. And this time, they did! We report on the continuous debate on the nation's R&D policy. We also cover funding opportunities from DoD and NSF.

1 Responsibilities of Scientists

"...if the needs and opportunities for publicly supported science and technology are so apparent, why the budget threats?" That is the question posed by the Deputy Secretary of Energy Charles B. Curtis at the 50th Anniversary Symposium of Associated Universities, Inc. We excerpt from his address below.

"I believe the answer has two foundations. The first is the more obvious—as a nation, we need to reduce Federal spending and restore fiscal discipline.... The second explanation...goes to the willingness of the Nation to make this investment. And that explanation is that the public's trust in the institution of government, its faith in science and technology, and its perception of benefit have all eroded perceptibly since the days of Vannevar Bush."

"To restore public confidence in the Nation's investment in science and technology, we must build back trust in science and technology itself and in the public institutions responsible for administering that investment. The first trust building challenge for science and technology may be easier met than the challenge to restore public trust in the work of its government—though both will be difficult."

"...the reality of our times is that the public whose dollars we propose to use for this investment (and the public representatives for that matter) need convincing. And it is the scientific community that must make this case. Government officials cannot carry this advocacy responsibility as well or as convincingly (or some may say 'at all')."

"...for our Nation to be willing to sustain its investment in science and technology, the scientific community must be willing to define and explain its work better in terms of public benefits. Perhaps I should say that somewhat differently, so that I not be misunderstood to be urging more of a shift from fundamental to applied research. I am not. Rather, I am urging that the scientific community needs to do a better job of articulating the relevance of its work in terms that the public can understand and relate to."

"You have the credibility to discuss science, to speak effectively about the complex relationship with technology, and to explain how advances in one field often produce unexpected insight into another."

"We in Government cannot do it without you. To paraphrase a familiar expression: 'Now is the time for all good scientists to come to the aid of their country."'

2 Letter from Nobelists

In response to the Administration's and the Congress' budget plans that may call for over 20% reduction in non-defense R&D by FY 2002, 60 Nobel Prize winners have written to President Clinton and the Congress, calling for the maintenance of federal funding for university-based research. Excerpts from the letter follow.

"Americans have been awarded more than one-half of all Nobel Prizes in physics, chemistry and medicine since 1945. This impressive success is no accident, but the result of a firm and consistent commitment by the federal government to basic science research at our universities. Our nation's policy makers and public have been prudent investors because their support has paid off in tremendous ways."

"America's investment in research over the last fifty years has been a vital source of our economic and political strength around the world, as well as the quality of life Americans enjoy at home. The polio vaccine, computers, jet propulsion and disease resistant grains and vegetables are some of the thousands of advances pioneered at our universities that have had dramatic benefits for our health, economy, security and quality of life."

"The engine of scientific innovation and discovery cannot fuel itself. Our own achievements and the benefits they have brought would not have been possible without the government's 'patient' capital. Discoveries are rarely made instantaneously, but result from years of painstaking work by scientists in a variety of fields. With competition forcing industry to focus research investments on returns over the shorter term, the government is left with the crucial role of making the longer term investment in discovery."

"America's future prosperity will depend on a continued commitment to producing new ideas and knowledge, and the people educated to apply them successfully. They will be central to our economic opportunity in the face of intense global competition, to our protection against renewed threats to our security and environment, and to ensuring the health of Americans. Federal funding for university-based research is an investment in our future that should be maintained."

3 DoD's Multidisciplinary Research Program

The Department of Defense (DoD) announces the FY97 competition for the Multidisciplinary Research Program, one element of the University Research Initiative (URI). The URI is a DoD initiative to enhance universities' capabilities to perform research and related education in science and engineering areas critical to national defense.

Each award will be made for a basic period of 3 years with the possibility of extending another 2 years. On the average, each award will be about $1M per year. White papers are due 09/04/96, and full proposals are due 12/10/96. Awards will be made in 11 research topics, two of which are of particular relevance to SIGMOD readers.

3.1 Intelligent Agents for Wireless Computing

The objectives of this program are:

1. to determine how to build intelligent, mobile agents and use them in the creation and evolution of secure, highly reliable networks for use in command and control systems;
2. to determine how artificial intelligence technology inherent in the design of such agents can be used in the management of these dynamic networks;
3. to define appropriate coordination structures for mobile agents in a wireless networking environment;
4. to develop techniques to assure security and fault-tolerance in wireless networks using intelligent agents; and
5. to devise a unified, comprehensive framework for using intelligent agents in wireless network operation.

Research in this topic will be concentrated in several areas, 3 of which are listed below.

Artificial Intelligence "Considering the overwhelming amount of multimedia information expected in the command and control systems of the future, knowledge representation and approximate planning will be key concepts in the design of intelligent agents for wireless computing. Autonomy and coordination will also be important given the intermittent connectivity of wireless networks. Intelligence built into the agents should enable them to maintain a context in which to request and provide information. Agents should filter information to reduce the load on human users and support the decision-making and data-gathering tasks carried out by those users."

Digital Information Environments "Data management will be a key concern in the command and control systems of the future. Research should concentrate on how intelligent agents can contribute to the organization, distribution, transportation, and fusion of massive amounts of data available from a wide variety of information sources. Other research issues include assurance of data integrity and caching strategies for managing information flow."

Computer and Information Security "Besides the obvious issue of protecting network nodes from malicious agents, there is also the issue of how agents can be used in the defense of wireless networks. Research concerns include equipping agents so that they can 'lay low' when they detect malicious activity, determining how agents could contribute to low probability of detection or intercept, and providing agents with the ability to do damage assessment and control after a security violation."

More information about this topic can be obtained by contacting Major David R. Luginbuhl of AFOSR/NM at (202) 767-5028 or david.luginbuhl@afosr.af.mil.

3.2 Semantic Consistency and Heterogeneous Information Systems

The objective of this program is to "develop fundamental principles to ensure semantic consistency of data and applications across interfaces in open distributed environments, to develop algorithms and data structures facilitating semantic analysis, and to validate theoretical results empirically with respect to scalability, portability, performance, and connectivity to existing/emerging standards."

Research in this topic will be concentrated in the following areas.

- Partial Information. "Research on innovative ways to structure and interpret partial information as an organizing principle, to characterize open interfaces based upon the degree of partial information, to classify kinds of partial information for data types such as multi-media, images, and sound."
- Type/Metadata support. "Research into means to share and evolve program type information that support the partial interpretation concepts, and into preserving semantic consistency of data types under algebraic and other transformation operations especially for symbolic-numerical data consistency."
- Hyper-Link concepts. "Research into organizing structures extending current uninterpreted WWW hyperlinks."
- Aggregation of Information. "Research into linking, combining, and synthesizing data with semantic consistency."
- Lightweight protocol concepts. "Research to support advanced service capabilities in an open distributed Web environment for types and shared information and for non-WEB legacy information."
- Client tool concepts. "Research into innovative tools to manage process, deploy mediators and intelligent agents, organize local data, etc."
- Experimental validation. "Demonstrate concepts on tools to enable organization of information from such diverse sources as search engines, mail profiles, intelligent agents, and image and signal databases, into useful institutional information."

For more information about this topic, contact Dr. Ralph Wachter at (703) 696-4304 or wachter@itd.nrl.navy.mil.

4 Battlefield Awareness and Data Dissemination

In February, DARPA issued a BAA soliciting proposals in the simulations, analysis, and technology enhancement for the Battlefield Awareness and Data Dissemination (BADD) program. The goal of BADD is to "empower warfighters at echelons from Task Force Commander down to Battalion, and possibly below, and especially mobile warfighters, by providing them with advanced battlefield awareness applications that are driven by near-real-time data that is delivered by advanced data dissemination methods."

"The goal of the 'BA' part of BADD is to provide warfighters comprehensive awareness of the battlefield, including the status and intentions of red, blue, and white forces, beyond what they have today, based on greater accessibility to near-real-time data to drive these applications. The goal of the 'DD' part of BADD is to use advances in direct digital broadcast satellites and tactical and backbone point-to-point communications to support a dissemination concept that delivers data to the warfighter's workstation in the background, selecting out of the wide broadcast stream only that data useful to the particular area of interest and mission of the warfighter, so that it is already available when and according to the battlefield awareness applications' needs."

Under this BAA, one or more technology enhancement contracts will be procured for a basic phase of 2 years with an optional phase, to develop techniques and methods for potential inclusion in the BADD baseline. White papers were due 03/27/96, and full proposals were due 06/11/96. More information about BADD and this BAA can be found at URL: http://www.arpa.mil/baa/#iso.

5 Collaborative Research on Learning Technologies

NSF has announced in April a cross-disciplinary program on Collaborative Research on Learning Technologies (CRLT). The objective of this program is to "stimulate research on the integration of technology with learning at all levels of education–from K-12 to college and University, and from learning in the classroom to self-directed and lifelong learning". Projects supported through this program will involve a significant research component in the information, computer, communications and computation science and engineering aspects of learning technologies.

"Information technology will have a major impact on the structure of all forms of education in the 21st century. The purpose of this solicitation is to promote research on the tools that will be available to enhance students learning and creativity in the next century, and to explore and develop ideas which could have a major impact on how education is structured." Examples of the focus of research projects in this program include:

- Computational Tools in Learning–visualization, simulations, and other computationally intensive methodologies.
- Collaborative Learning Across Physical and Virtual Communities.
- Facilitation of the Networked and Technology-rich Classroom.
- Tools for Building Educational Technologies and Technology-enabled Applications.
- Understanding Learner-System Interactions.
- Collaborative Human-Machine Learning.
- Application of Digital Libraries to Learning.
- Technology Design for Effective Learning–individual learning styles; adapting to the evolving needs and expertise of individual learners.
- Supporting Teachers and Educational Systems in Adapting Technology-based Pedagogies.
- The Integration of Education and Workplace Technologies.
- Theoretical and Experimental Contributions to More Effective Intelligent Tutors.
- Knowledge-on-demand pedagogies.

CRLT awards will be for up to 3 years with a total amount of funding from $300K to $600K. Preliminary proposals were due 06/01/96. Deadline for full proposals is 07/15/96.

6 Announcements from Rome Laboratory

Adaptive Fault Tolerance Rome Laboratory has announced a program on adaptive fault tolerance. The goal is to "investigate, design, develop, assess, demonstrate, and deliver a software system for implementing fault-tolerant object-oriented applications." Middleware software will be developed under this program that "can achieve increased system fault-tolerance by monitoring and adaptively controlling the behavior of components within an object-oriented distributed computing environment. The fault-tolerance of object-oriented applications will be improved by transparently layering an adaptive control system onto the underlying Object Request Broker (ORB). Compatibility with ORBs which conform to the Object Management Group (OMG) Common Object Request Broker Architecture (CORBA) is required. The approach is to integrate a set of tools with a CORBA-compliant system to provide an adaptive fault-tolerant development and run-time environment. Specific system and application monitoring and control mechanisms will be developed within this environment to support implementing adaptive fault-tolerant behavior." Proposals were due 04/01/96. For further information, contact Jerry Dussault at (315)330-2067.

Advanced Geospatial Update Proposals are solicited by Rome Laboratory to "evaluate, develop, implement and test ANS technologies to support maintaining the currency and consistency of geospatial data which is to be used in an operational environment. The geospatial information will be updated in near-real-time using intelligence and safety of flight information which may not contain the parametric data commonly used for updating. Appropriate algorithms will be developed to derive and verify the inferred data prior to its use in the update process. Extensive capabilities in utilizing ANS technologies to large Spatial on-line data bases is required for successful completion of this effort." Contact Jim McNeely at (315)330-2110 for more details.