

Setting Research Agendas at the National Level

Dr. Erwin Gianchandani
Director, Computing Community Consortium
Computing Research Association

UVA Sources for Scholars
Sept. 10, 2010, Alumni Hall



Today's topic

"The place of research at R1 universities in their mission as educators as well as creators and discoverers of new knowledge from your perspective directing CCC."

My background...

A Triple Hoo goes to Washington



B.S., computer science, 2005
M.S., biomedical engineering, 2007
Ph.D., biomedical engineering, 2009



AAAS Science & Technology Policy Fellow
Directorate for Computer & Info. Sci. & Eng. (CISE)
"Smart health & wellbeing" initiative
Fall 2009 & spring 2010

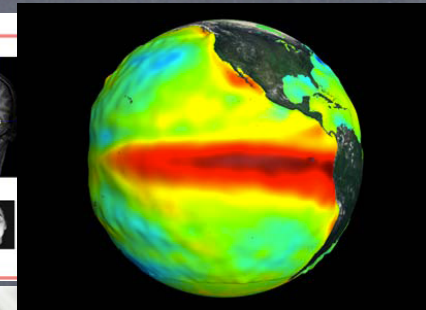
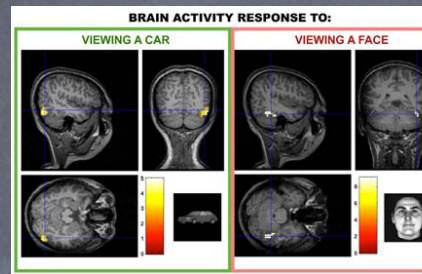


Director, Computing Community Consortium
Since April 2009

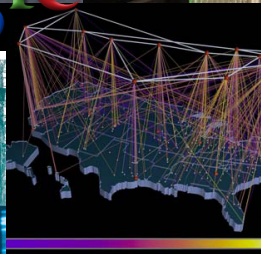
Basic research is the
bedrock of our future

Advances have changed the world...

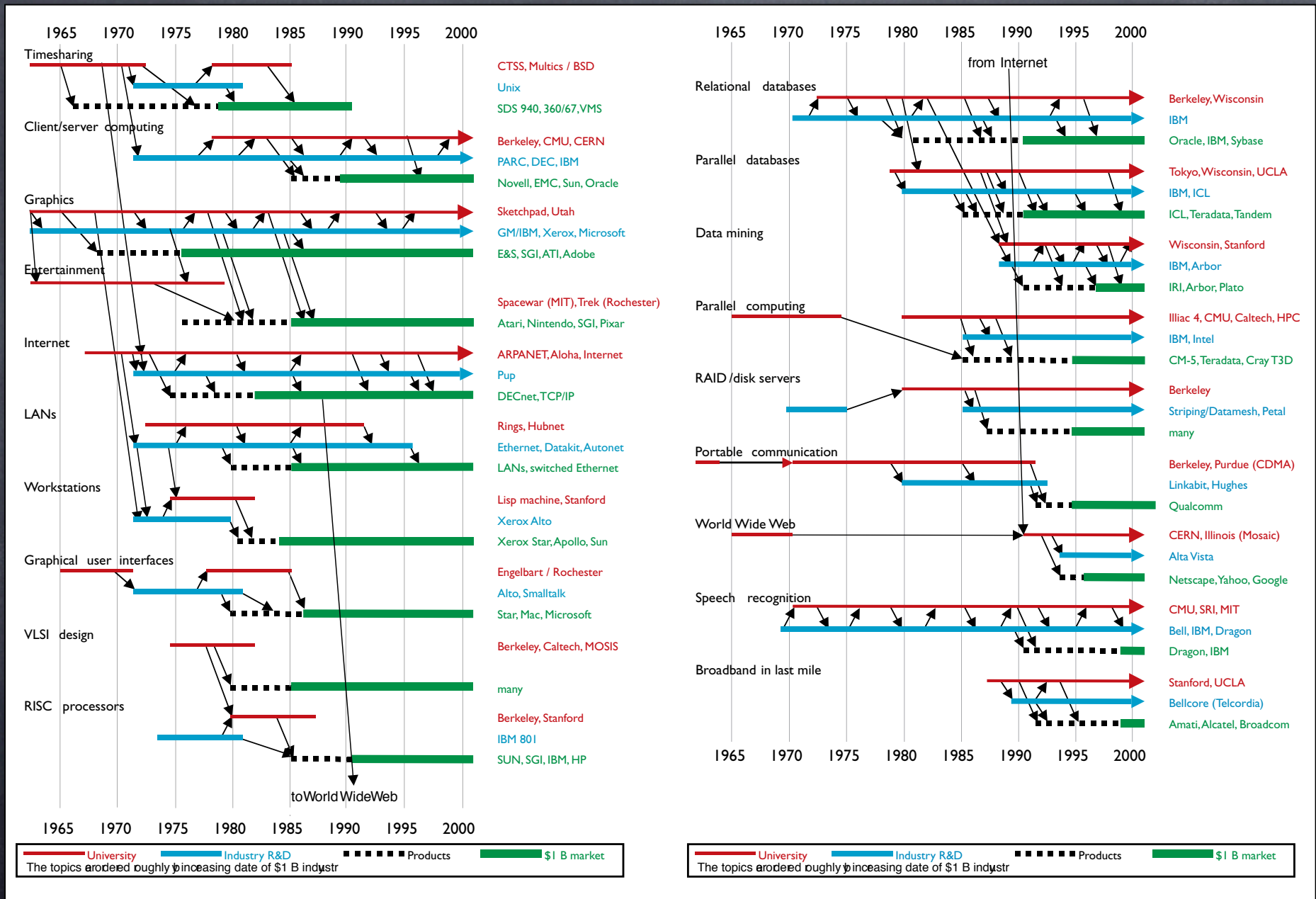
How we live,
work, learn, and
communicate.



Google

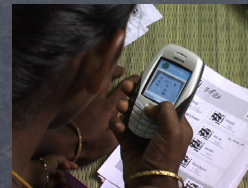
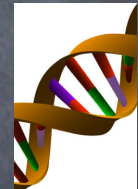
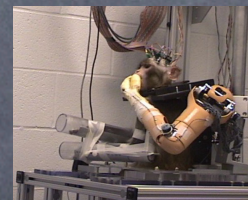
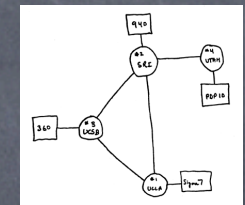
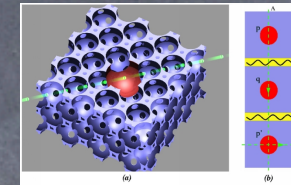
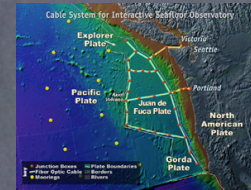


...Research has built the foundation...



...And the future is full of opportunity

- Driving advances in all fields of science and engineering
- Pursuing digital scholarship
- Improving quality of life through personalized health monitoring
- Revolutionizing transportation
- Personalizing education
- Creating a smart grid
- Assessing and mitigating the effects of climate change
- Empowering the developing world



But we must work together..

to establish, articulate, and pursue audacious visions

- The challenges that will shape the intellectual future of the field
- The challenges that will catalyze research investment and public support
- The challenges that will attract the best and brightest minds of a new generation



So how do we do it?

Audacious visioning requires...

- Aligning ourselves with Federal government interests
- Being agile and flexible
- Bringing leading researchers together
- Being willing to take risks & fail
- Let's take a look at a couple examples...

Computing was at a crossroads...

- In the mid-2000s, NSF leaders and computing research leaders had similar deep concerns
 - The Federal commitment to research in general, and to computing research in particular
 - Public and policymaker perception that “computer science” is “yesterday’s news”
 - Failure to articulate and coalesce around exciting research visions in computer science that could galvanize the public, policymakers, researchers, and students
 - Need to groom the future leadership of the field
 - Decrease in student interest

...So something was done about it

- Increased focus by NSF leaders and computing research leaders in academia & industry
- A Computing Community Consortium solicitation & proposal
 - “[NSF] will support the CCC as a community proxy responsible for facilitating the conceptualization and design of promising infrastructure-intensive projects...”
 - “The purpose of the CCC is to provide a voice for the national computing research community. The CCC will **facilitate** the development of a bold, multi-themed vision for computing research and education... [communicating] that vision to ... major stakeholders.”

NSF asked CRA to create a "CCC"

- To catalyze the computing research community to consider such questions
 - To envision long-range, more audacious research challenges
 - To build momentum around such visions
 - To state them in compelling ways
 - To move them towards funded initiatives
 - To ensure "science oversight" of large-scale initiatives
- A "cooperative agreement" with NSF
 - Close coordination

The CCC Council: a broad slice

- **Director:** Erwin Gianchandani
- **Chair:** Ed Lazowska
- **Terms ending 2013**
 - Randy Bryant
 - Lance Fortnow
 - Hank Korth
 - Eric Horvitz
 - Beth Mynatt
 - Fred Schneider
 - Margo Seltzer
- **Terms ending 2012**
 - Stephanie Forrest
 - Chris Johnson
 - Anita Jones
 - Frans Kaashoek
 - Ran Libeskind-Hadas
 - Robin Murphy
- **Terms ending 2011**
 - Bill Feiereisen
 - Susan Graham (**vice-chair**)
 - Dave Kaeli
 - John King
 - Bob Sproull
- **Ex-officio**
 - Andrew Bernat
- **Rotated off**
 - Dick Karp, 2010
 - Andrew McCallum, 2010
 - Dave Waltz, 2010
 - Greg Andrews, 2009
 - Peter Lee, 2009
 - Karen Sutherland, 2009

Major continuing activities

- Presentations
- Articles
- CCC Blog
- Computing Research "Highlight of the Week"
- Community visioning exercises

The Computing Community Consortium

viewpoints

CCC BLOG

Computing Community Consortium

Computing Community Consortium
We support the computing research community in creating compelling research visions and the mechanisms to realize these visions.

HOME YOUR VISION PLANS ACTIVITIES RESOURCES ABOUT CRA GO

What questions shape our intellectual future?

What attracts the best and brightest minds of a new generation? What are the next big computing ideas, the ones that will define the future of computing, galvanize the very best students, and catalyze research investment and public support? The Computing Community Consortium (CCC) seeks to mobilize the computing research community to answer these questions by identifying major research opportunities for the field.

Click on the tabs below to see some of these activities.

»» NetSE Cyber Physical Systems Robotics Big Data Computing Theoretical CS
FOSS Online Education XLayer Global Development ACAR HealthIT

Computing Research that Changed the World

This invitation only symposium, "Computing Research that Changed the World: Reflections and Perspectives," was organized by the Computing Community Consortium in collaboration with Congressman Bart Gordon (D-TN), Congressman Ralph Hall (R-TX), Congressman Daniel Lipinski (D-IL), Congressman Vern Ehlers (R-MI), Congressman Rush Holt (D-NJ) and Sen. Jay Rockefeller (D-WV). It was held in the Library of Congress on March 25, 2009.

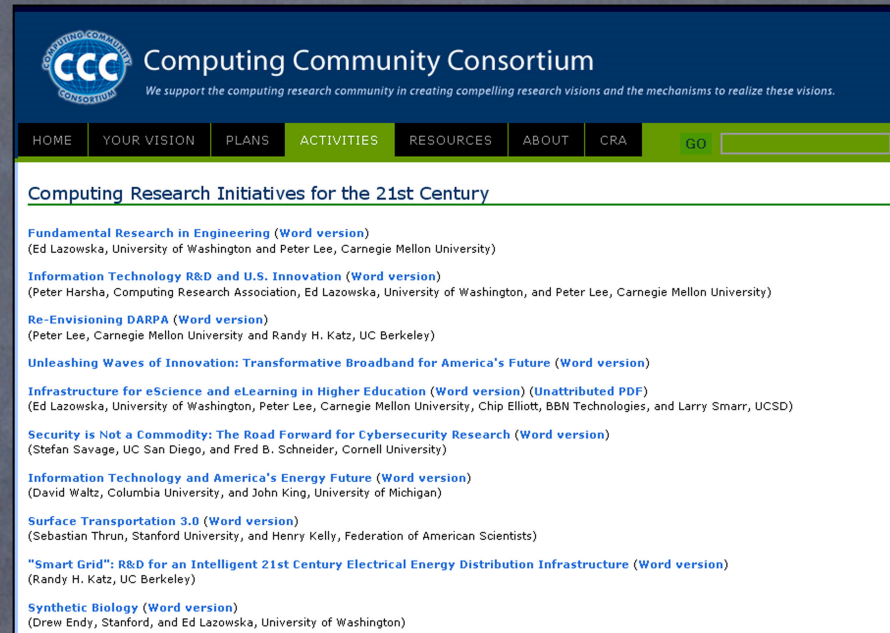
Highlight of the Week

New Search Technique for Images and Videos

University of Washington computer science undergraduates have developed a system that lets up to four students share a single computer to do interactive math problems. Early tests show that students using

Major special initiatives

“Transition Team” white papers



The screenshot shows the homepage of the Computing Community Consortium (CCC). The header features the CCC logo and the text "Computing Community Consortium" with the tagline "We support the computing research community in creating compelling research visions and the mechanisms to realize these visions." Below the header is a navigation menu with links for HOME, YOUR VISION, PLANS, ACTIVITIES, RESOURCES, ABOUT, CRA, and a GO button. The main content area is titled "Computing Research Initiatives for the 21st Century" and lists several initiatives with links to their respective documents.

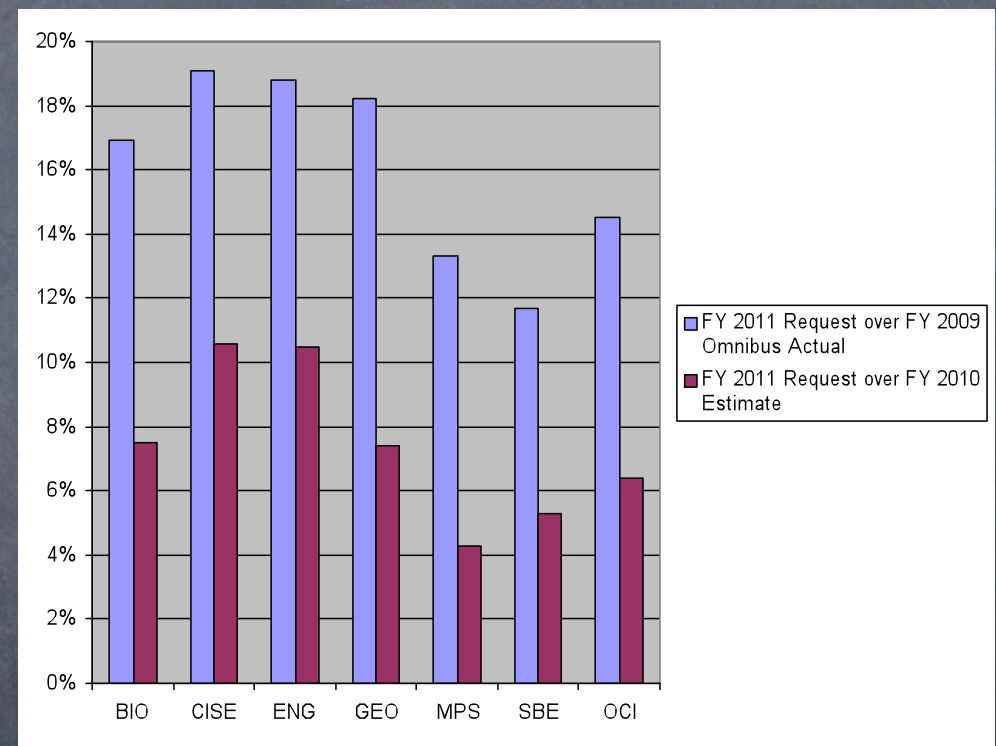
Computing Research Initiatives for the 21st Century

- [Fundamental Research in Engineering \(Word version\)](#)
(Ed Lazowska, University of Washington and Peter Lee, Carnegie Mellon University)
- [Information Technology R&D and U.S. Innovation \(Word version\)](#)
(Peter Harsha, Computing Research Association, Ed Lazowska, University of Washington, and Peter Lee, Carnegie Mellon University)
- [Re-Envisioning DARPA \(Word version\)](#)
(Peter Lee, Carnegie Mellon University and Randy H. Katz, UC Berkeley)
- [Unleashing Waves of Innovation: Transformative Broadband for America's Future \(Word version\)](#)
- [Infrastructure for eScience and eLearning in Higher Education \(Word version\) \(Unattributed PDF\)](#)
(Ed Lazowska, University of Washington, Peter Lee, Carnegie Mellon University, Chip Elliott, BBN Technologies, and Larry Smarr, UCSD)
- [Security is Not a Commodity: The Road Forward for Cybersecurity Research \(Word version\)](#)
(Stefan Savage, UC San Diego, and Fred B. Schneider, Cornell University)
- [Information Technology and America's Energy Future \(Word version\)](#)
(David Waltz, Columbia University, and John King, University of Michigan)
- [Surface Transportation 3.0 \(Word version\)](#)
(Sebastian Thrun, Stanford University, and Henry Kelly, Federation of American Scientists)
- ["Smart Grid": R&D for an Intelligent 21st Century Electrical Energy Distribution Infrastructure \(Word version\)](#)
(Randy H. Katz, UC Berkeley)
- [Synthetic Biology \(Word version\)](#)
(Drew Endy, Stanford, and Ed Lazowska, University of Washington)

"Transition Team" white papers

- Sensed and seized an opportunity to influence Federal science policy through the Presidential Transition Team
 - 19 papers produced in late 2008 & early 2009
 - 30 separate authors
 - Many highly influential:
 - **Re-envisioning DARPA** -- Peter Lee, Randy Katz
 - **Infrastructure for eScience & eLearning/Unleashing waves of innovation** -- Ed Lazowska, Peter Lee, Chip Elliott, Larry Smarr
 - **Security is not a commodity** -- Stefan Savage, Fred Schneider
 - **Synthetic biology** -- Drew Endy, Ed Lazowska
 - **Big-data computing** -- Randy Bryant, Randy Katz, Ed Lazowska
 - **The ocean observatories initiative** -- John Delaney, John Orcutt, Robert Weller
 - **Cyber-Physical Systems** -- Janos Sztipanovits, Jack Stankovic

A role in FY 11?



NSF budget numbers, by Directorate

Major special initiatives

- "Transition Team" white papers
- Library of Congress Symposium
- Computing Innovation Fellows (CIFellows)
- Landmark Contributions by Students
- NetSE Research Agenda
- Health IT

The screenshot displays the CCC website with the following content:

- Header:** Computing Community Consortium logo and tagline: "We support the computing research community in creating compelling research visions and the mechanisms to realize these visions."
- Navigation:** HOME, YOUR VISION, PLANS, ACTIVITIES, RESOURCES, ABOUT, CRA, GO
- Section:** Discovery and Innovation in Health IT
- Text:** "This invitation only workshop, 'Discovery and Innovation in Health IT,' is sponsored by the National Science Foundation, the Office of the National Coordinator for Health Information Technology, the National Institute of Standards and Technology, the National Library of Medicine, the Agency for Healthcare Research and Quality, the Computing Community Consortium, and the American Medical Informatics Association. It will be held at the Parc 55 Hotel in San Francisco on October 29 and 30, 2009."
- Text:** "The talks and plenary discussions will be videotaped and a web presence will be developed to make the workshop material broadly available."
- Text:** "The goals of the workshop are to:"
 - Explore and define fundamental research challenges and opportunities in healthcare IT in both the near- and long-term;
 - Provide opportunities for relevant academic and industrial researchers, healthcare practitioners and IT healthcare suppliers to identify mutual interests in healthcare IT, as they relate to both near- and long-term challenges and solutions;
 - Identify a range of "model" proof-of-concept, integrative systems that might serve as motivating and unifying forces to drive fundamental research in healthcare IT and accelerate the transition of research outcomes into products and services;
- Text:** "The workshop will have four half-day sessions. Each of the first three sessions will have two plenary talks followed by small-group breakout discussions to define particular research challenges, multiple lines of attack, and possible test-beds or demonstration systems. Each of these sessions, which are further described subsequently, will end with short reports from the..."
- Alert Box:** "Content is still being added to this site. Please Check back periodically. The last change was made on: December 16, 2009."
- Section:** Session Videos
- Video:** HIT - Thursday Morning Op... (YouTube player showing a man speaking)
- Section:** Reply/Registration
- Text:** Link to Reply/Registration Form
- Section:** Logistics
- Text:** Date: October 29-30, 2009

Encouraging participation

Community visioning activities	Participants	Organizations
NetSE	109	44
Cyber-physical systems	100	47
Robotics	141	79
Big data computing	81	46
Theoretical CS	39	26
Global development	56	37
Education technology	55	30
Health information technology	121	102
Cross-layer reliability	121	45
Free and open source software	42	35
Advancing computer architecture	New in 2010	
Interactive technologies	New in 2010	
Selected other activities	Participants	Organizations
Library of Congress Symposium	128	71
CIFellows Project (2009)		
Selection committee	36	28
Applicants	526	145
Prospective mentors	1209	198

OSTP's FY 12 priorities...



THE DIRECTOR

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

July 21, 2010

M 10-30

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

FROM: Peter R. Orszag *Orszag*
Director, Office of Management and Budget

John P. Holdren *Holdren*
Director, Office of Science and Technology Policy

SUBJECT: Science and Technology Priorities for the FY 2012 Budget

Scientific discovery, technological breakthroughs, and innovation are major engines for expanding the frontiers of human knowledge and are indispensable for promoting sustainable economic growth, improving the health of the population, moving toward a clean energy future, addressing global climate change challenges, managing competing demands on the environment, and safeguarding our national security.

This memorandum follows up on OMB Memorandum M-10-19 by outlining the Administration's science and technology (S&T) priorities for formulating FY 2012 Budget submissions to the Office of Management and Budget (OMB). These priorities for research and development (R&D) investments and other S&T investments build on priorities already reflected in the American Recovery and Reinvestment Act, the FY 2010 and 2011 Budgets, and key Administration policy guidance such as the President's *Strategy for American Innovation*. This memorandum also provides program guidance for S&T activities in Executive Departments and Agencies.

Prioritizing key S&T activities

"In the 2012
focus on ...

- Economic
- NIT

- Achieving
- Moving to

- Impacts of
- Improved

- National

• Cybersecurity

job creation

"inferences from
enormous quantities of data"

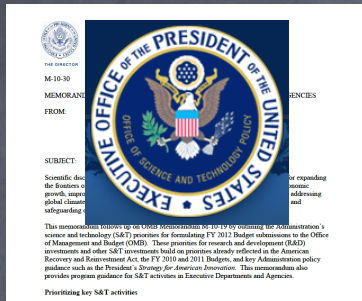
better health outcomes

clean energy future

climate change

sustainability

...Aligning our activities



“In the 2012 Budget, agencies should focus on ... six challenges.”

- Economic growth and job creation
 - NITRD -- “inferences from enormous quantities of data”

Data analytics WPs

Big data visioning activity

NSF CDI

- Achieving better health outcomes

Health IT workshop

ONC discussions

NSF/CISE SHB

NIH discussions

- Moving toward a clean energy future

Multiple WPs

- Impacts of global climate change

NSF CRI

- Improved sustainability and biodiversity

NSF SEES

- National security

Multiple WPs

- Cybersecurity

Where can we contribute?

Signs of a health IT R&D initiative?

Computing Community Consortium
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HOME | YOUR VISION | PLANS | **ACTIVITIES** | RESOURCES | ABOUT | CRA | GO

Discovery and Innovation in Health IT

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The talks and plenary discussions will be videotaped and a web presence will be developed to make the workshop material broadly available.

The goals of the workshop are to:

- Explore and define fundamental research challenges and opportunities in healthcare IT in both the near- and long-term;
- Provide opportunities for relevant academic and industrial researchers, healthcare practitioners and IT healthcare suppliers to identify mutual interests in healthcare IT, as they relate to both near- and long-term challenges and solutions;
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The workshop will have four half-day sessions. Each of the first three sessions will have two plenary talks followed by small-group breakout discussions to define particular research challenges, multiple lines of attack, and possible test-beds or demonstration systems. Each of these sessions, which are further described subsequently, will end with short reports from the

Content is still being added to this site. Please Check back periodically. The last change was made on: **December 16, 2009**.

Session Videos

HIT - Thursday Morning Op...

Reply/Registration
[Link to Reply/Registration Form](#)

Logistics

Date: October 29-30, 2009

On Feb. 17, 2009, Congress passed the American Recovery & Reinvestment Act.



The legislation included language specifically calling for Health IT research.



And program staff at NSF immediately sought to run an interdisciplinary workshop.

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- (A) interfaces between human information and communications technology systems;**
(B) voice-recognition systems;
(C) software that improves interoperability and connectivity among health information systems;
(D) software dependability in systems critical to health care delivery;
(E) measurement of the impact of information technologies on the quality and productivity of health care;
(F) health information enterprise management;
(G) health information technology security and integrity; and
(H) relevant health information technology to reduce medical errors.

SEC. 3. PURPOSES AND PRINCIPLES.

(a) STATEMENT OF PURPOSES.—The purposes of this Act include the following.

San Francisco, CA

Workshop to white papers

Information Technology Research Challenges for Healthcare: From Discovery to Delivery¹

Susan Graham (University of California, Berkeley)², Deborah Estrin (University of California, Los Angeles), Eric Horvitz (Microsoft Research), Isaac Kohane (Harvard University), Elizabeth Mynatt (Georgia Institute of Technology), Ida Sim (University of California, San Francisco)

Wellness and healthcare are central to the lives of all people, young or old, healthy or ill, rich or poor.

“NSF’s investment in healthcare research is essential in order for the opportunities [to enhance wellness, healthcare, and the clinical sciences] to be realized.”

subtle but important causal signals in the fusing of clinical, behavioral, environmental, genetic, and

“The importance of collaboration between information technology researchers, social scientists, and biomedical researchers is an essential component of the research agenda we have laid out.”

to strengthen the uses of information technology that are already underway in healthcare and in other domains.

From Data to Knowledge to Action: Enabling Evidence-Based Healthcare

The National Academies’ Report “Computational Technology for Effective Health Care: Immediate Steps

The SHARP program

- Announced in December 18, 2009, with a late-January deadline for submission
- Run by Office of the National Coordinator for Health IT in HHS, not NSF
- Focused on “breakthrough advances ... to the adoption and meaningful use of health information technology”
- Four awards totaling \$60 million announced in March 2010

But the seeds had been planted...

The screenshot shows the NSF website with the following elements:

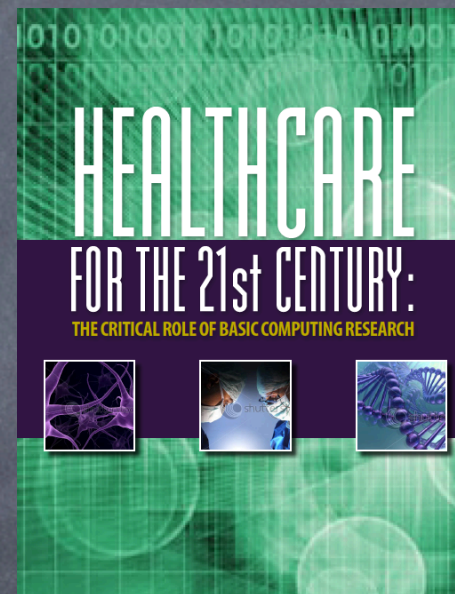
- Header:** NSF logo and "National Science Foundation WHERE DISCOVERIES BEGIN". A search bar contains "NSF Web Site".
- Navigation:** A blue bar with links: HOME | FUNDING | AWARDS | DISCOVERIES | NEWS | PUBLICATIONS | STATISTICS | ABOUT | FastLane.
- Left Sidebar:**
 - Funding** section with a graphic showing numbers 1, 2, 4.
 - Find Funding
 - A-Z Index of Funding Opportunities
 - Recent Funding Opportunities
 - Upcoming Due Dates
 - Advanced Funding Search
 - Interdisciplinary Research
 - How to Prepare Your Proposal
 - About Funding
 - Proposals and Awards** section:
 - Proposal and Award Policies and Procedures Guide
 - Introduction
 - Proposal Preparation and Submission
 - Grant Proposal Guide
 - Grants.gov Application Guide
 - Award and Administration
 - Award and Administration Guide

- Main Content:**
- Share icons: Email, Print, Share.
- Smart Health and Wellbeing (SHW)** title.
- CONTACTS** section: "See program guidelines for contact information."
- SYNOPSIS** section:
 - Information and communications technologies are poised to transform our access to and participation in our own health and well-being. The complexity of this challenge is being shaped by concomitant transformations to the fundamental nature of what it means to be healthy. Having good health increasingly means managing our long-term care rather than sporadic treatment of acute conditions; it places greater emphasis on the management of wellness rather than healing illness; it acknowledges the role of home, family, and community as significant contributors to individual health and wellbeing as well as the changing demographics of an increasingly aging population; and it recognizes the technical feasibility of diagnosis, treatment, and care based on an individual's genetic makeup and lifestyle. The substrate of 21st century healthcare will be computing and networking concepts and technologies whose transformative potential is tempered by unresolved core challenges in designing and optimizing them for applicability in this domain.
 - The goal of the Smart Health and Wellbeing program is to seek improvements in safe, effective, efficient, equitable, and patient-centered health and wellness services through innovations in computer and information science and engineering. Doing so requires leveraging the scientific methods and knowledge bases of a broad range of computing and communication research perspectives.
 - Some illustrative examples are described here. Protecting patient privacy while providing legitimate anytime, anywhere access to health services will require new security and cryptographic solutions. Personalized medicine will require advances in information retrieval, data mining, and decision support software systems. Continuous monitoring and real-time, customized feedback on health and behavior will rely on remote and networked sensors and actuators, mobile platforms, novel interactive

A program within NSF/CISE on "smart health & wellbeing" for FY 11.

...And there's hope for more yet

- A cross-cutting initiative within NSF (including ENG, SBE, and CISE) for FY 12?
- Involvement of other relevant agencies, such as NIH, AHRQ, CDC, FDA, and the Office of the National Coordinator for Health IT?



HEALTHCARE FOR THE 21st CENTURY:
The Critical Role of Basic Computing Research

The United States currently spends more than \$2.5 trillion on healthcare a year. These costs could double by the end of the decade — making healthcare unaffordable for all but the wealthiest Americans and increasing the debt load of every taxpayer. The government can reduce these staggering cost burdens by encouraging the development of technological advances that reduce waste and eliminate unnecessary procedures. Federal agencies can help achieve these scientific breakthroughs and meet the administration's goal to reform by investing in basic computing research that gives both doctors and patients the tools to better manage healthcare.

The U.S. healthcare system is facing tremendous cost and quality challenges due to an increase in chronic diseases such as cancer, heart disease and diabetes brought on by an aging population and unhealthy lifestyles. The U.S. spent nearly \$8,000 per person on healthcare in 2009, which represented approximately 17 cents out of every dollar spent in the U.S. economy last year. This is simply unsustainable.

Computing researchers in universities and research laboratories around the country have dedicated themselves to lowering these costs by helping doctors to better collect and understand healthcare data. Advances in data collection and analysis will allow doctors to design patient-centered treatments that consider genetic, environmental and behavioral factors — in ways that are impossible today. This patient-specific knowledge will prevent unnecessary procedures, reduce waste and save time by helping doctors get diagnoses and treatments right the first time. Moreover, mining of population data could one day enable researchers to conduct immediate, large-scale clinical trials that eliminate the need for repetitive, time-consuming research.

The development of sophisticated sensors will track patients or groups to provide early warnings signs of potential health problems. This will allow doctors to recommend behavioral or preventative treatments before the onset of disease. Sensors embedded in smart phones or in other places around the home will make self-health tracking a part of everyday life. By stopping heart attacks, strokes and cancer before they take place, doctors can save countless lives and prevent avoidable procedures.

Self-monitoring and telemedicine will allow patients suffering from chronic diseases to receive quality care in the comfort of home without the need

for costly and time-consuming visits to the doctor. For example, a doctor could monitor vital signs, speak with patients by videoconference and provide advanced care at anytime throughout the day. These advances will help elderly patients or those suffering from chronic disease to be more independent than ever without the need for assisted living facilities or hospitals. This transformation to home-centered care using new technologies will reduce costs, save patients' time and free limited resources for other medical needs.

Basic research in computing and information technology will give both doctors and patients the tools to better manage healthcare.

Advances in computing research will deliver a patient-centered system that is affordable, reliable and effective. This system will take advantage of increasing amounts of medical data to better understand the causes of disease and design personalized treatments that work for individual patients — all at a fraction of today's costs.

Now is the time to focus on basic computing research that delivers cost savings and improves quality of life for patients and their families. The passage of the Affordable Reform provides government agencies with the opportunity to invest in advanced research and develop a comprehensive program that makes a difference. By working together, we can achieve the dream of reducing costs, improving quality and increasing patient satisfaction in America's healthcare system.

Advances in computing research will deliver a patient-centered system that is affordable and reliable.

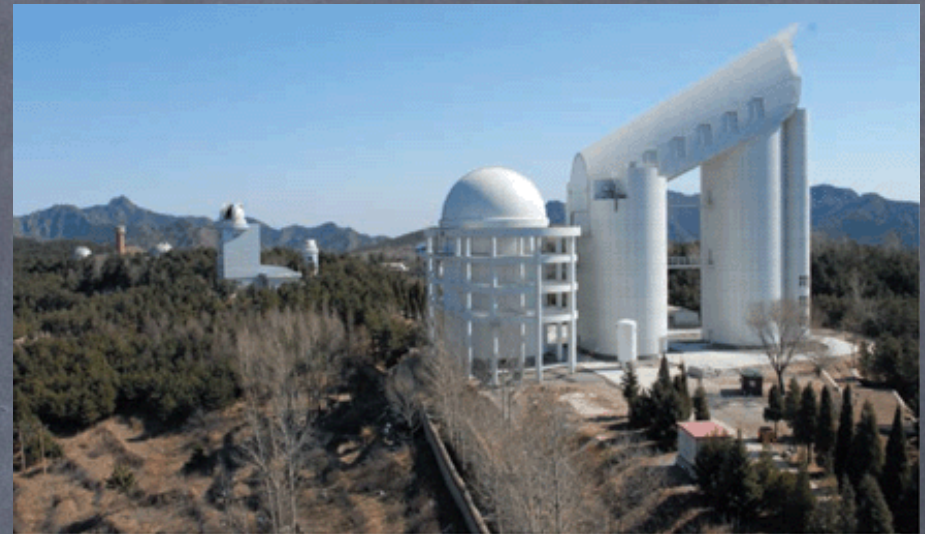
Astronomy's decadal survey...

- Every 10 years, astronomers release a "decadal survey" recommending which astronomy & astrophysics projects should be funded by the government
- The 2010 survey was the result of 9 appointed panels, 17 town hall meetings, and 324 white papers



...Speaks with a unified voice...

- 2010 report not merely a "wish list"
- Identified 8 projects, all focused on the study of dark matter & dark energy
- Included independently vetted estimates of project costs



...And serves as another model

NEWS

NATURE | Vol 466 | 19 August 2010

US survey sets cosmic priorities

Dark energy rises to the top in decadal report ranking future astronomy and astrophysics projects.

Recently, a colleague of astronomer Claire Max jokingly told her that, come 13 August, half her friends would love her and half would never want to speak to her again.

That is because Max, of the University of California, Santa Cruz, has for the past two years been helping to craft US astronomy's latest decadal survey, an influential report prepared for the National Research Council that recommends which astronomy and astrophysics projects NASA, the National Science Foundation (NSF) and the Department of Energy (DOE) should fund over the next ten years.

Using input from 9 appointed panels, 17 town-hall meetings and 324 white papers from individual research groups, the survey's aim is to assess opportunities and set priorities for US astronomy and astrophysics, while balancing scientific goals with fiscal realities. The report is now out, and although Max isn't aware of losing any friends, there are some in the community who have more reason to thank her than others.

Topping the list of the pleased and grateful is Anthony Tyson, an astrophysicist at the University of California, Davis, and director of the proposed Large Synoptic Survey Telescope (LSST), which ranks highest among the ground-based facilities considered by the survey committee. When completed in 2015, the 8.4-metre telescope will regularly sweep the entire visible sky in three nights with a 3.2-gigapixel camera, capturing short-lived phenomena ranging from fast-moving near-Earth asteroids to the flashes of supernovae in distant galaxies.

Over ten years, the US\$465-million observatory will also build up an unprecedented 100-petabyte database for astronomers trying to discern the nature of two mysterious factors that shape the Universe. One is dark matter, thought to be an unknown particle or family of particles beyond the standard model of physics. Hidden in vast quantities among the galaxies, dark matter generates a gravitational pull that has shaped the evolution of the Universe. The other factor is dark energy, the pervasive but mysterious phenomenon that is causing cosmic expansion to accelerate. Crucial data on both

factors can be derived from a three-dimensional survey of the surrounding Universe that the LSST is well suited to provide.

"Increasingly, we are able to ask new questions by querying huge databases," says Tyson. "The key is to populate those databases with calibrated and trusted data."

The LSST is expected to help US astronomers regain some momentum in ground-based

Such data would contain subtle clues — in the distance-brightness relationships of supernovae, the bending of light (microlensing) from background galaxies and the three-dimensional clustering of matter in space — that can be used to independently measure dark energy.

WFIRST is effectively a rebranding of the Joint Dark Energy Mission, a NASA-DOE collaboration. The new name, says one survey

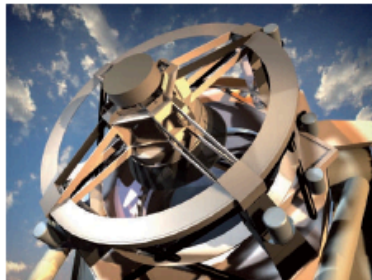
reviewer, signals that the \$1.6-billion telescope is not a one-trick pony, but a way of serving other astronomical needs as well. The survey committee stresses, for example, that WFIRST could spot microlensing events caused when exoplanets — planets outside our Solar System — pass briefly in front of background stars in the Milky Way. Although the method is unsuitable for studying individual solar systems in detail, it promises, through its sheer number of discoveries, to provide an unbiased sample of the kinds of planetary systems prevalent in the Galaxy.

This may not be enough to satisfy those who study exoplanets. "I don't think the report reflects that activity and the amount of young people going into exoplanets," says Sara Seager, an astrophysicist at the Massachusetts Institute of Technology in Cambridge. Seager notes that the survey abandons support for the Space Interferometry Mission, a project that would have detected planets slightly larger than Earth through their gravitational effect on the stars they orbit. However, Seager applauds another recommendation: a \$100-million to \$200-million allocation for the technical development of a future exoplanet mission.

Exoplanet researchers were stung when the Terrestrial Planet Finder, a mission endorsed by the previous decadal survey, was later cancelled owing to cost overruns. So they welcome the chance to continue pursuing other approaches to observing Earth-like planets.

"Last week, I was worried," says Webster Cash, who is working on an exoplanet-mission concept at the University of Colorado, Boulder. "Now, I'm feeling like my career is going to be a lot of fun for the next ten years."

Adam Mann
See Editorial, page 908. For a full list of ranked projects, see go.nature.com/8VYV1u.



The Large Synoptic Survey Telescope will capture short-lived cosmic events.

astronomy at a time when European facilities have begun to dominate the field. To that end, the survey stresses the need for a swift decision on which of two competing mega-telescopes should receive federal funding.

The proposed Thirty Meter Telescope, on Mauna Kea in Hawaii, and the Giant Magellan Telescope, envisioned for Las Campanas in Chile, are both supported by significant private money, and would have many times the light-gathering power and resolution of today's largest telescopes. Realistically,

only one project will receive federal funds, which the survey recommends should be between \$257 million and \$350 million. Given that Europe has also prioritized a 42-metre telescope, the European Extremely Large Telescope, a choice needs to be made now to avoid a counterproductive stalemate.

In space, the decadal survey proposes the Wide Field Infrared Survey Telescope (WFIRST), a 1.5-metre instrument that will map the whole sky at near-infrared wavelengths.

"Increasingly, we are able to ask new questions by querying huge databases."

910

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"...other disciplines planning their own reviews should follow [astronomy's] lead, as [its report] promises to be a steady guide for a bumpy decade ahead..."

Some lessons learned



1. We need to be vocal

- Funding agencies rely on the research community's voice when creating new funding programs
 - Does the community want to work on this problem?
- Workshops are important (not "just another workshop")
 - Bring people together
 - Allow us to understand the issues
- White papers have a role
 - Language makes its way into solicitations!
- It's not always about a new funding program, but rather fostering new links and connections

2. It's about the next generation

- We have to educate today's students to be tomorrow's leaders
- Scientific process, research, scholarship, innovation -- all very important
- But so is policymaking and decision-making
- Service and P&T cases

3. Service is important critical

- There's value to serving as a program officer
 - Some fields view this role in higher regard than others
- Learning how DC works can make us better scientists, researchers, and educators
 - We know what to propose and how to propose it
 - We know the skills set required of our graduates
- We must make sure there's a constant stream of people heading to DC -- they become "advocates" for a field
- Stay involved -- even if you can't make it to DC

We must work together today...

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Science scorned

The anti-science strain pervading the right wing in the United States is the last thing the country needs in a time of economic challenge.

The four corners of deceit: government, academia, science and media. Those institutions are now corrupt and exist by virtue of deceit. That's how they promulgate themselves; it is how they prosper." It is tempting to laugh off this and other rhetoric broadcast by Rush Limbaugh, a conservative US radio host, but Limbaugh and similar voices are no laughing matter.

There is a growing anti-science streak on the American right that could have tangible societal and political impacts on many fronts — including regulation of environmental and other issues and stem-cell research. Take the surprise ousting last week of Lisa Murkowski, the incumbent Republican senator for Alaska, by political unknown Joe Miller in the Republican primary for the 2 November midterm congressional elections. Miller, who is backed by the conservative 'Tea Party movement', called his opponent's acknowledgement of the reality of global warming "exhibit A' for why she needs to go".

The right-wing populism that is flourishing in the current climate of economic insecurity echoes many traditional conservative themes, such as opposition to taxes, regulation and immigration. But the Tea Party and its cheerleaders, who include Limbaugh, Fox News television host Glenn Beck and Sarah Palin (who famously decried fruitfully research as a waste of public money), are also tapping an age-old US political impulse — a suspicion of elites and expertise.

Denialism over global warming has become a scientific cause célèbre within the movement. Limbaugh, for instance, who has told his listeners that "science has become a home for displaced socialists and communists", has called climate-change science "the biggest scam in the history of the world". The Tea Party's leanings encompass religious opposition to Darwinian evolution and to stem-cell

and embryo research — which Beck has equated with eugenics. The movement is also averse to science-based regulation, which it sees as an excuse for intrusive government. Under the administration of George W. Bush, science in policy had already taken knocks from both neglect and ideology. Yet President Barack Obama's promise to "restore science to its rightful place" seems to have linked science to liberal politics, making it even more of a target of the right.

US citizens face economic problems that are all too real, and the country's future crucially depends on education, science and technology as it faces increasing competition from China and other emerging science powers. Last month's recall of hundreds of millions of US eggs because of the risk of salmonella poisoning, and the Deepwater Horizon oil spill, are timely reminders of why the US government needs to serve the people better by developing and enforcing improved science-based regulations. Yet the public often buys into anti-science, anti-regulation agendas that are orchestrated by business interests and their sponsored think tanks and front groups.

In the current poisoned political atmosphere, the defenders of science have few easy remedies. Reassuringly, polls continue to show that the overwhelming majority of the US public sees science as a force for good, and the anti-science rumblings may be ephemeral. As educators, scientists should redouble their efforts to promote rationalism, scholarship and critical thought among the young, and engage with both the media and politicians to help illuminate the pressing science-based issues of our time.

"The country's future crucially depends on education, science and technology."

A destabilizing

Public allegations threaten the misconduct inquiries.

Investigations into charges of scientific misconduct are for all concerned. Emotions run high and the stakes are high. As a consequence, it is crucial that all those involved, directly and indirectly, behave with dignity and integrity. But events around such an investigation can take a troubling and damaging turn from such a promising start in a matter of months. An unknown agitator using the pseudonym of 'Berns' is engaged in an e-mail and Internet campaign to discredit medical researchers whom he accuses of scientific misconduct. Berns's libellous messages are targeted at immunologist Silvia Bulfone-Paus, who holds joint positions at the University of

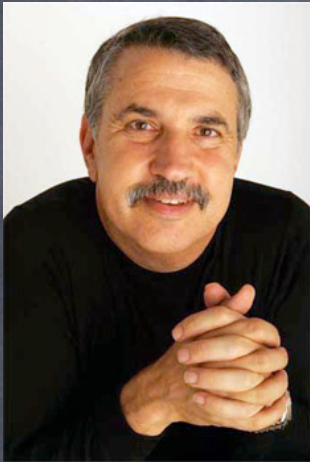


many. Disturbing a formal investigation, organized by the Max Planck Society in Germany and begun in July, into the activities of Berns, who has sent e-mails to those involved in the inquiry shortly after it was opened, has widened his reach to researchers, politicians and the public. Berns provides links to an untraceable website that contains more material. The investigation is rightly appalled by the distractions and the accusations could cause. Claims of scientific misconduct in confidence to protect both accused and accusers that could prejudice the inquiry. Anonymity, it seems that little can be done until the investigation is over. Uncertainty will remain until the investigation is over. Involved must be presumed innocent until proven guilty. It should report as quickly as possible without delay and normal procedure. That is the unfortunate affair.

"As educators, scientists should redouble their efforts to promote rationalism, scholarship, and critical thought among the young, and engage with both the media and politicians to help illuminate the pressing science-based issues of our time."

"Science scorned." Nature 467(7312): 133 (2010).

...To ensure a brighter tomorrow



Thomas Friedman
Pulitzer Prize-winning
author, reporter, and columnist

"People always say Britain took the nineteenth century, the United States of America took the twentieth century, and China will take the twenty-first century. Well, to those people I tell the story that my grandma used to tell me beside the fireplace in her tiny, inner city Detroit home:

"Grandma Friedman used to say, 'Son, never cede a century to a country that censors Google'."

Questions?

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