

The Broadening of Computer Science

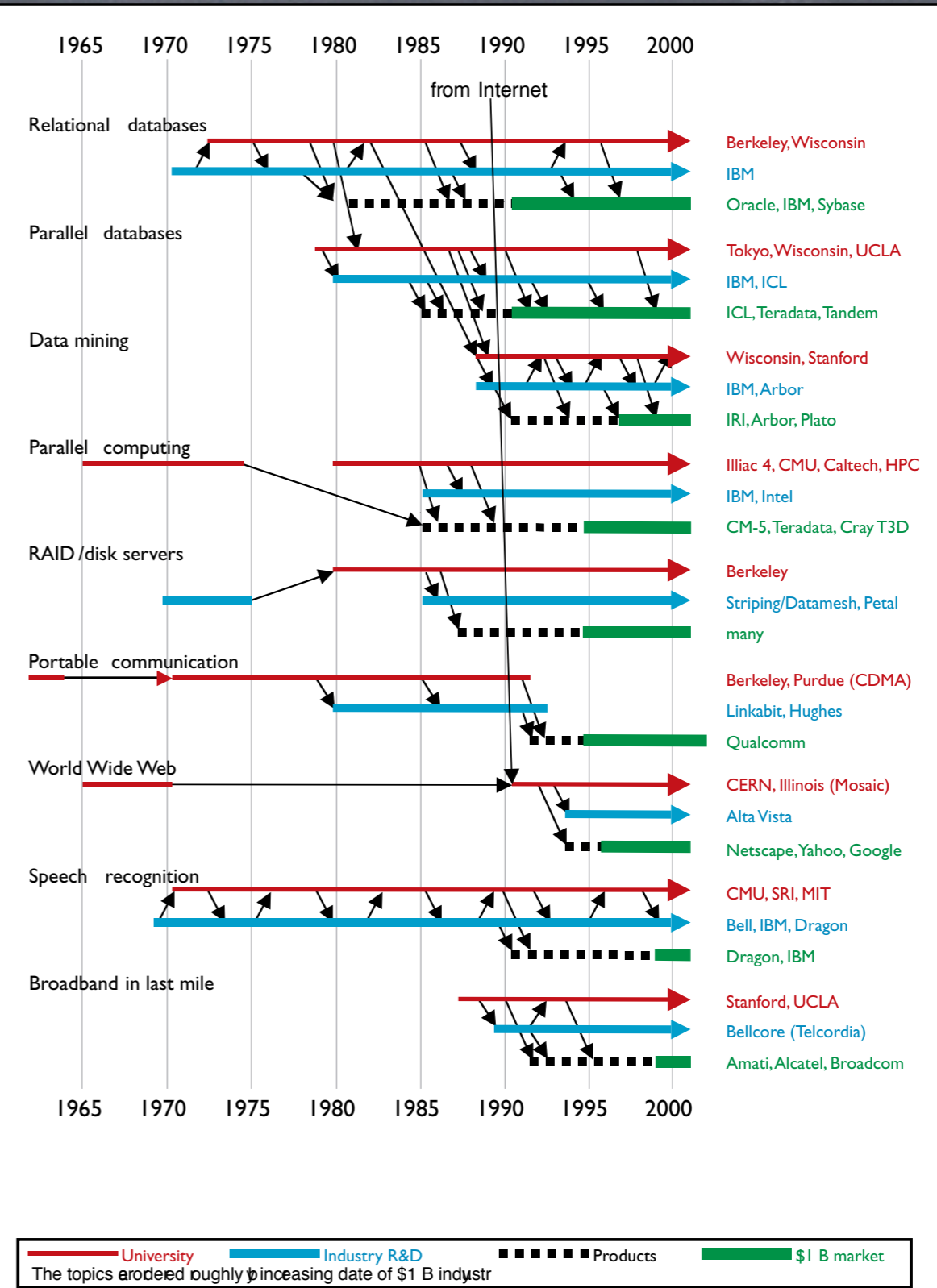
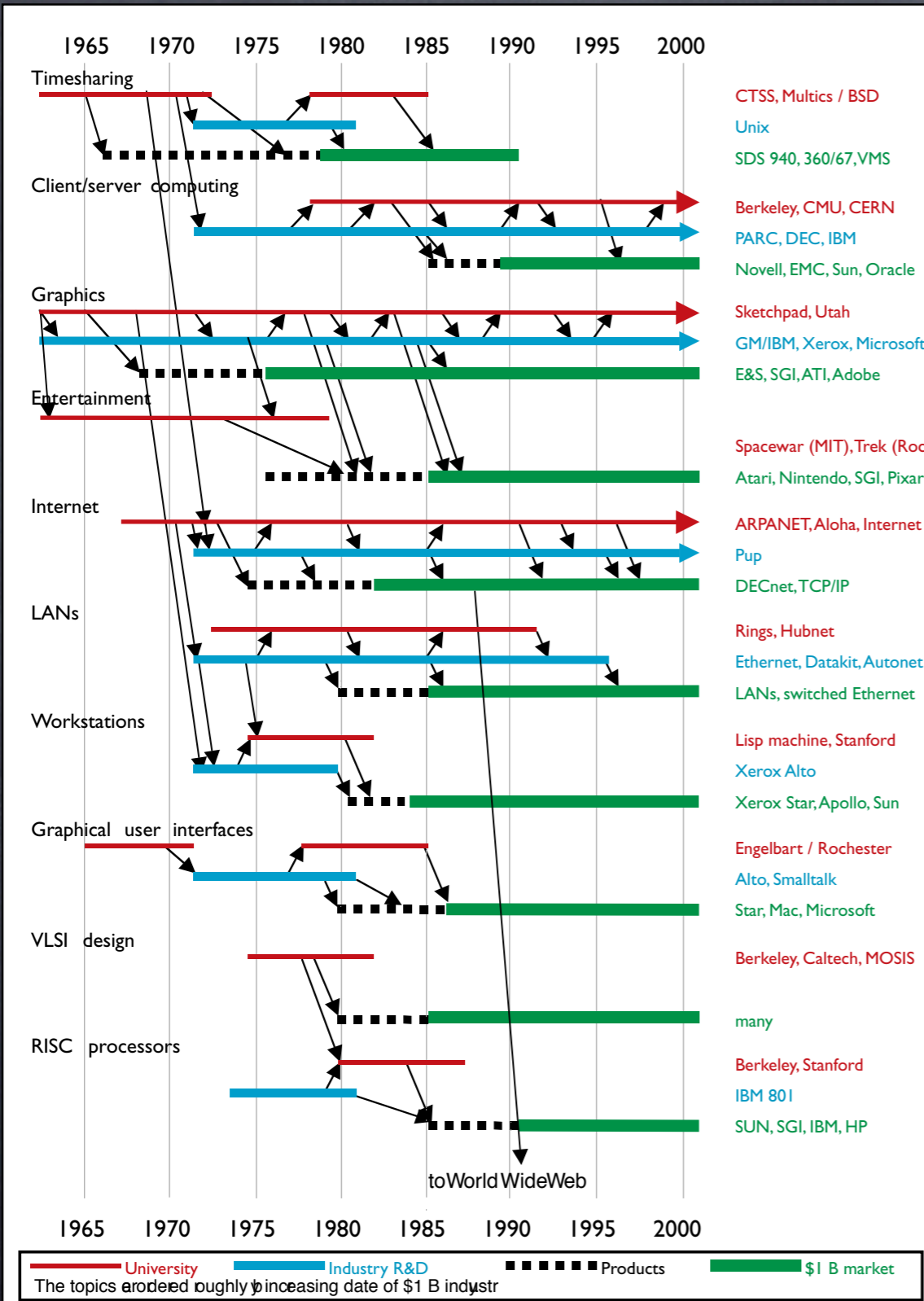
Dr. Erwin Gianchandani
Director, Computing Community Consortium
Computing Research Association

UVA Dept. of Computer Science
Sept. 10, 2010



The CCC & CIFellows Project

Research has built the foundation...



Source: From [6], reprinted with permission from the National Academy of Sciences, courtesy of the National Academies Press, Washington D.C. ©2003.

...We must work together to ensure that continues



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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 X 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 rumbblings 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 for all concerned. Emotions run high. As a consequence, it is crucial that all those involved, directly and indirectly, behave with dignity and respect.

But events around such an investigation can take a troubling and damaging turn from such months. An unknown agitator using the pseudonym 'Bernie' is engaged in an e-mail and Internet campaign targeting medical researchers whom he accuses of scientific misconduct.

Bernie'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 German government and begun in July, into the activities of Bernie. Bernie provides links to an untraceable website that contains more material. The investigation are rightly appalled by the destabilizing accusations could cause. Claims of scientific misconduct in confidence to protect both accused and accusers that could prejudice the inquiry. In the absence of any evidence, it seems that little can be done until the uncertainty will remain until the investigation involved must be presumed innocent until proven guilty. Bernie should report as quickly as possible without delay and normal procedure. That is the unfortunate affair.

133

"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).

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

The Computing Community Consortium: Stimulating Bigger Thinking

Ed Lazowska

Bill & Melinda Gates Chair in
Computer Science & Engineering
University of Washington

Chair, Computing Community Consortium

Tapia Conference Career Workshop
April 2009

<http://www.cra.org/ccc/>



Major continuing activities

- 👁 Presentations
- 👁 Articles

The Computing Community Consortium

Viewpoints

DOI:10.1145/1378704.1378714 Ed Lazowska

Viewpoint

Envisioning the Future of Computing Research

Advances in computing have changed our lives—the Computing Community Consortium aims to help the research community continue that lineage.

HOW CAN WE work together to establish, articulate, and pursue compelling visions for our field—visions that will shape the intellectual future of the field, that will catalyze research investment and public support, and that will attract the best and brightest minds of a new generation? The National Science Foundation

many Internet hosts. It was only 10 years ago that Deep Blue—a supercomputer by any definition—defeated world chess champion Garry Kasparov. Today, thanks more to progress in software than to progress in hardware, you can download for your PC a chess engine with a rating 10% higher than any human player. Most of the “futurist scenar

try: timesharing, computer graphics, networking (LANs and the Internet), personal workstation computing, windows and the graphical user interface, RISC architectures, modern integrated circuit design, RAID storage, and parallel computing. In each case, the role of federally sponsored research was clear. The panel conducting this study (I

Major continuing activities

- 👁 Presentations
- 👁 Articles
- 👁 CCC Blog

The Computing Community Consortium

viewpoints

CCC BLOG
THE COMPUTING COMMUNITY CONSORTIUM

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Recent Posts

- Computing Research that Changed the World: Reflections and Perspectives
- Computer Engineer Barbie!
- Where the jobs are ...
- "Exponentials R Us" – Seven Computer Science Game-Changers from the 2000's, and Seven More to Come
- A Report on the Cross-layer Reliability Visioning Study Group
- A Report on the Discovery and Innovation in Health IT Workshop

Where the jobs are ...
Filed Under Uncategorized, pipeline, resources

Employment growth within the 10 BLS major occupational groups, 2008-18

Occupational Group	Employment Growth (2008-18)
Total of 20 groups	10.1%
Management, business, and financial	12.0%
Professional and related	16.8%
Sales and related	13.8%
Data and related	6.2%
Office and administrative support	7.6%
Farming, fishing, and forestry	0.0%
Construction and extraction	13.0%
Installation, maintenance, and repair	7.6%
Transportation and material moving	4.0%

Every second year, the US Bureau of Labor Statistics provides a ten-year forecast of job growth in all fields of employment. The most recent forecast, released in November 2009 and covering the period 2008-2018, may be found [here](#) (pdf). Among the highlights:

- Among the 10 major BLS occupational groups, the "Professional and related" category (which includes computer science occupations) is projected to grow by the largest percentage between now and 2018, by 16.8%.

Employment growth within the 8 BLS "Professional and related" occupations, 2008-2018

Occupational Group	Employment Growth (2008-2018)
Economics	16.6%
Mathematics	22.2%
Programming	13.3%
Social science	19.0%
Visual arts	16.0%
Legal	15.1%
Arts and history	14.4%
Health care	21.4%

Major continuing activities

- 👁 Presentations
- 👁 Articles
- 👁 CCC Blog
- 👁 Computing Research "Highlight of the Week"

The screenshot displays the CCC Blog homepage. At the top, the navigation menu includes: HOME, YOUR VISION, PLANS, ACTIVITIES, RESOURCES, ABOUT, CRA, and a search bar with a GO button. The main content area features a section titled "COMPUTING RESEARCH HIGHLIGHT OF THE WEEK [January 14 - 21, 2010]". The featured article is "One Keypad per Child" Lets School Children Share Screen to Learn Math. The article text states: "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 the tool are able to share a single screen while working on problems at their own pace, effectively quadrupling the number of computers available for math exercises." Below the text is a photo of two young girls looking at a computer screen. A quote from Joyojeet Pal, a lecturer in UW Computer Science & Engineering, is included: "Computer sharing is quite common in much of the world," said Joyojeet Pal, a lecturer in UW Computer Science & Engineering who has studied technology adoption in rural India, Rwanda, and the slums of Brazil. Despite this, though, practically no learning technologies accommodate sharing, Pal said. The article continues: "This month the team will test the system, called MultiLearn, with 180 students who are attending two government-run elementary schools in rural India." Another quote from Pal is provided: "Children show dominance patterns when they sit in front of a machine," Pal said. "If there are three to five children, then the child who is the smartest and from the most affluent family controls the mouse." In 2006 Pal worked with Kentaro Toyama at Microsoft Research India helping to connect multiple mice to a single computer so that many users could... To the right of the article is a sidebar with "Relevant Links" (Press Release, Project Web Page, Research Papers, Media Contact), "Keywords" (educational technology, information technology for development, University of Washington), and "Buzz" (RSS SUBSCRIBE, EMAIL NOTIFY, EMBED CODE, SHARE). A video player is visible at the bottom right of the article content.

Major continuing activities

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

The image displays a stack of overlapping screenshots of the Computing Community Consortium (CCC) website. The top-most screenshot shows the main page with a navigation menu and a featured article titled "What questions shape our intellectual future?".

viewpoints

CCC BLOG

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.

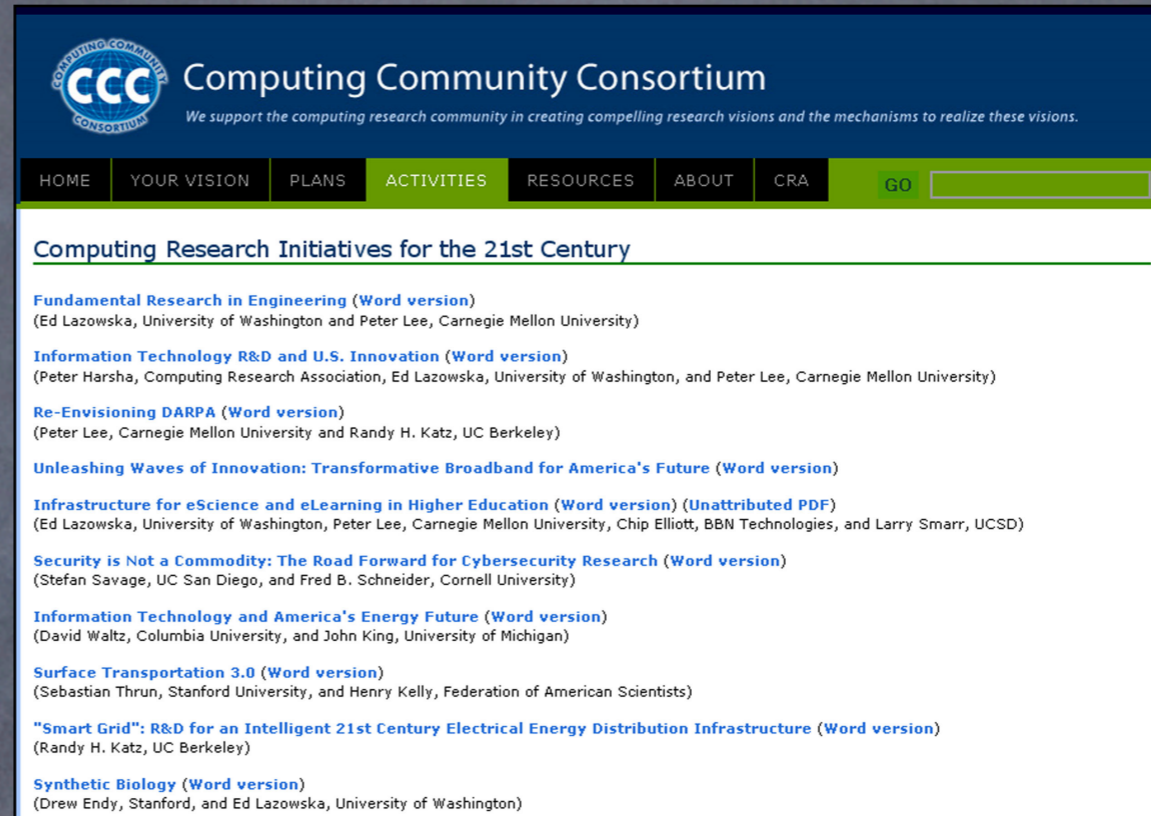
Highlight of the Week

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 website for 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 search bar with a "GO" button. The main content area is titled "Computing Research Initiatives for the 21st Century" and lists several initiatives with their respective authors and affiliations.

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

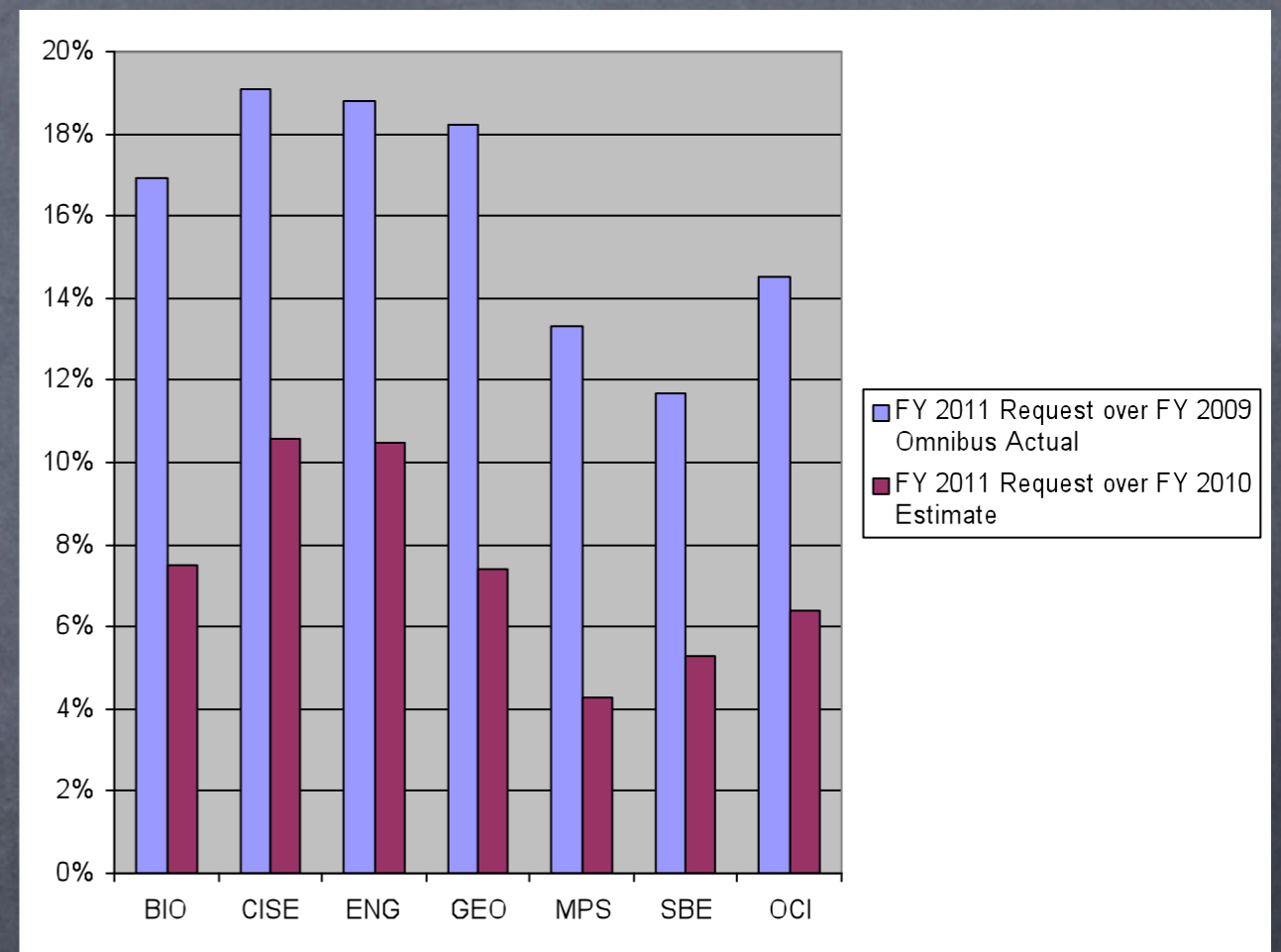
Computing Research Initiatives for the 21st Century

- 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

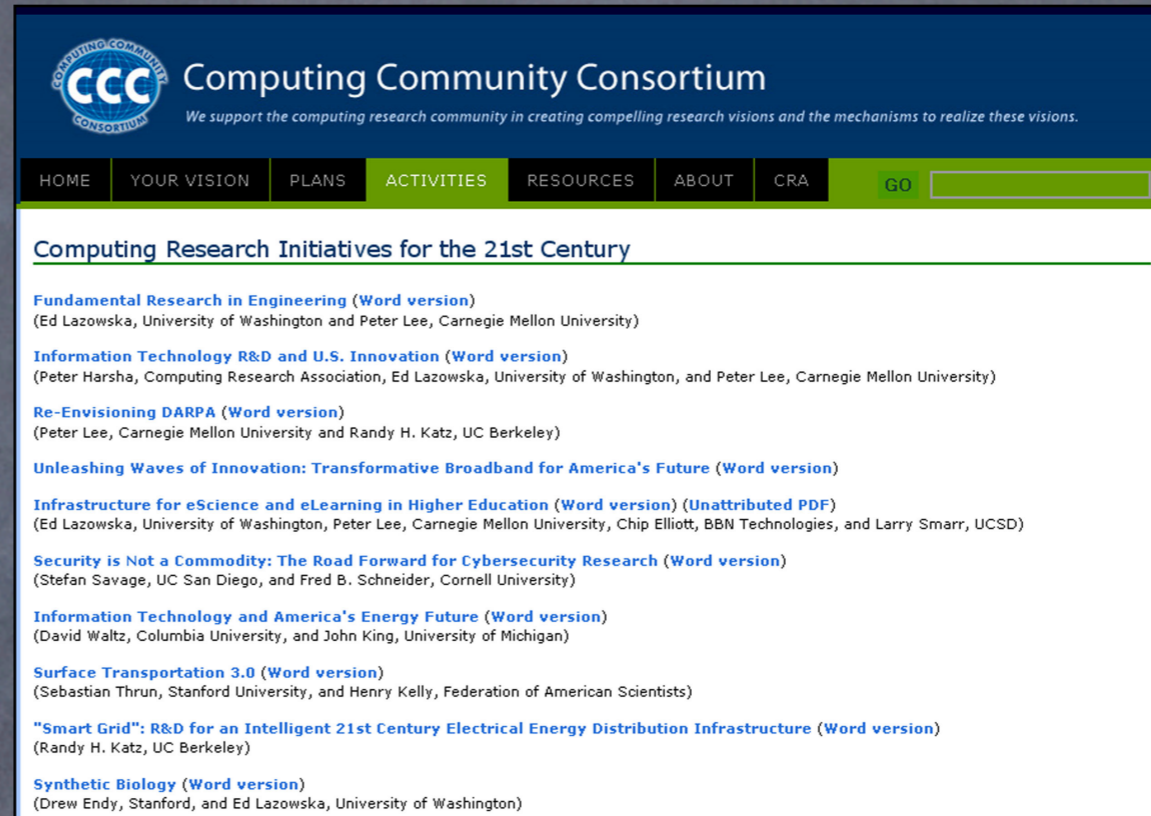
A role in FY 11?



NSF budget numbers, by Directorate

Major special initiatives

“Transition Team” white papers



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HOME YOUR VISION PLANS **ACTIVITIES** RESOURCES ABOUT CRA GO

Computing Research Initiatives for the 21st Century

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Major special initiatives

- “Transition Team” white papers
- Library of Congress Symposium



Major special initiatives

- “Transition Team” white papers
- Library of Congress Symposium
- Computing Innovation Fellows (CIFellows)

The LIBRARY of CONGRESS

COMPUTING RESEARCH ASSOCIATION (CRA) NATIONAL SCIENCE FOUNDATION (NSF) COMPUTING COMMUNITY CONSORTIUM (CCC)

Computing Innovation Fellows Project

Home CRA CCC CISE

The 2009 Computing Innovation Fellows have been selected!

[View the press release with the names of the 2009 Fellows and their Mentors.](#)

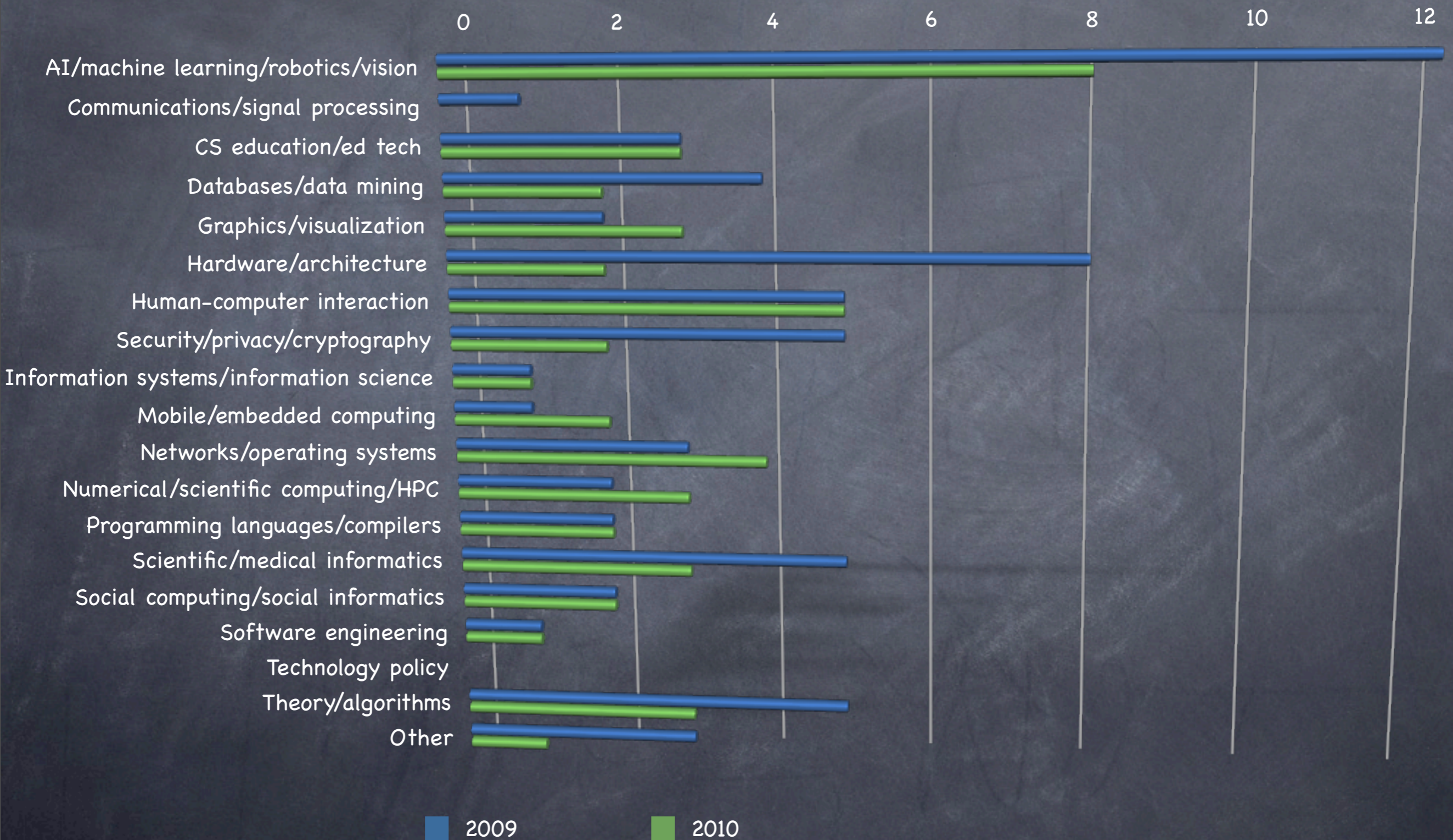
Congratulations to everyone who was selected for a CIFellow award!
Thank you for your interest in CIFellows. The response has been tremendous!
[For up-to-the-minute news on the progress of the selection process, check out the forum.](#)

In the light of the response that the CIFellows has received, we have set up a courtesy website where employers can post available positions suitable for new computing PhD's. This site is available at <http://cifellows.org/opportunities>.

An additional courtesy site has been set up for computing PhD's to post their profiles and availability. This website is available at <http://cifellows.org/profiles>. We encourage employers and candidates to make use of these complimentary services.

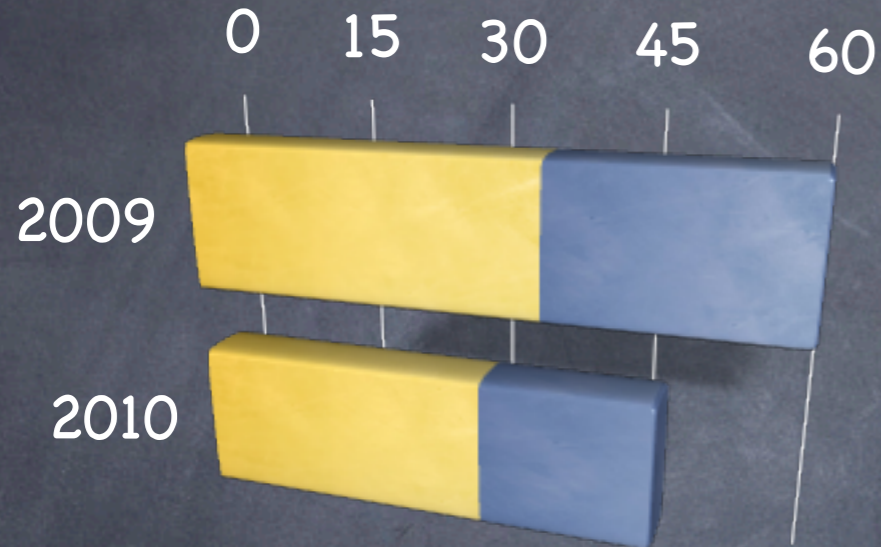
The Computing Community Consortium (CCC) and the Computing Research Association (CRA), with funding from the National Science Foundation, announce a program for new PhD graduates to obtain one-to-two year postdoctoral positions

2009 & 2010 CIFellows Projects

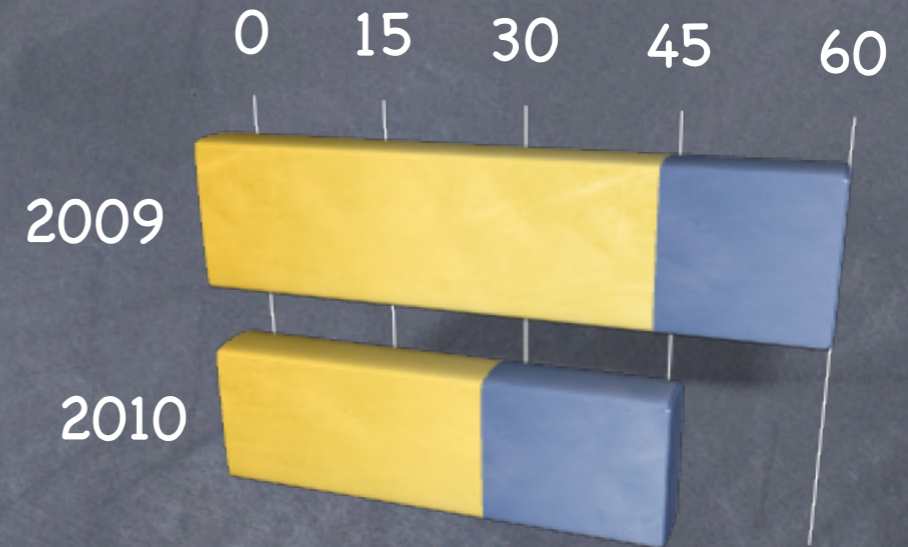


CIFellows Projects by the numbers

Male Female



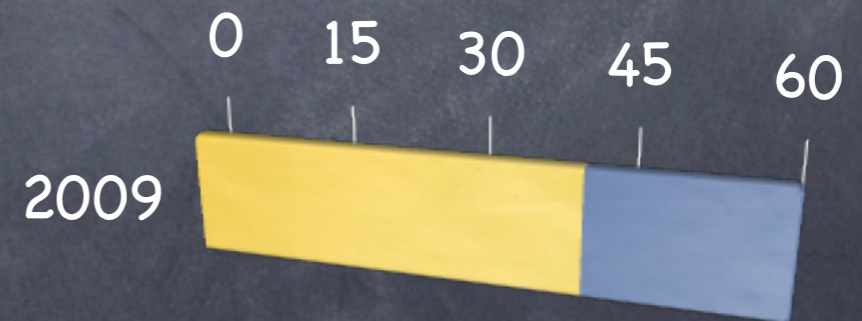
U.S. citizen or permanent resident Other



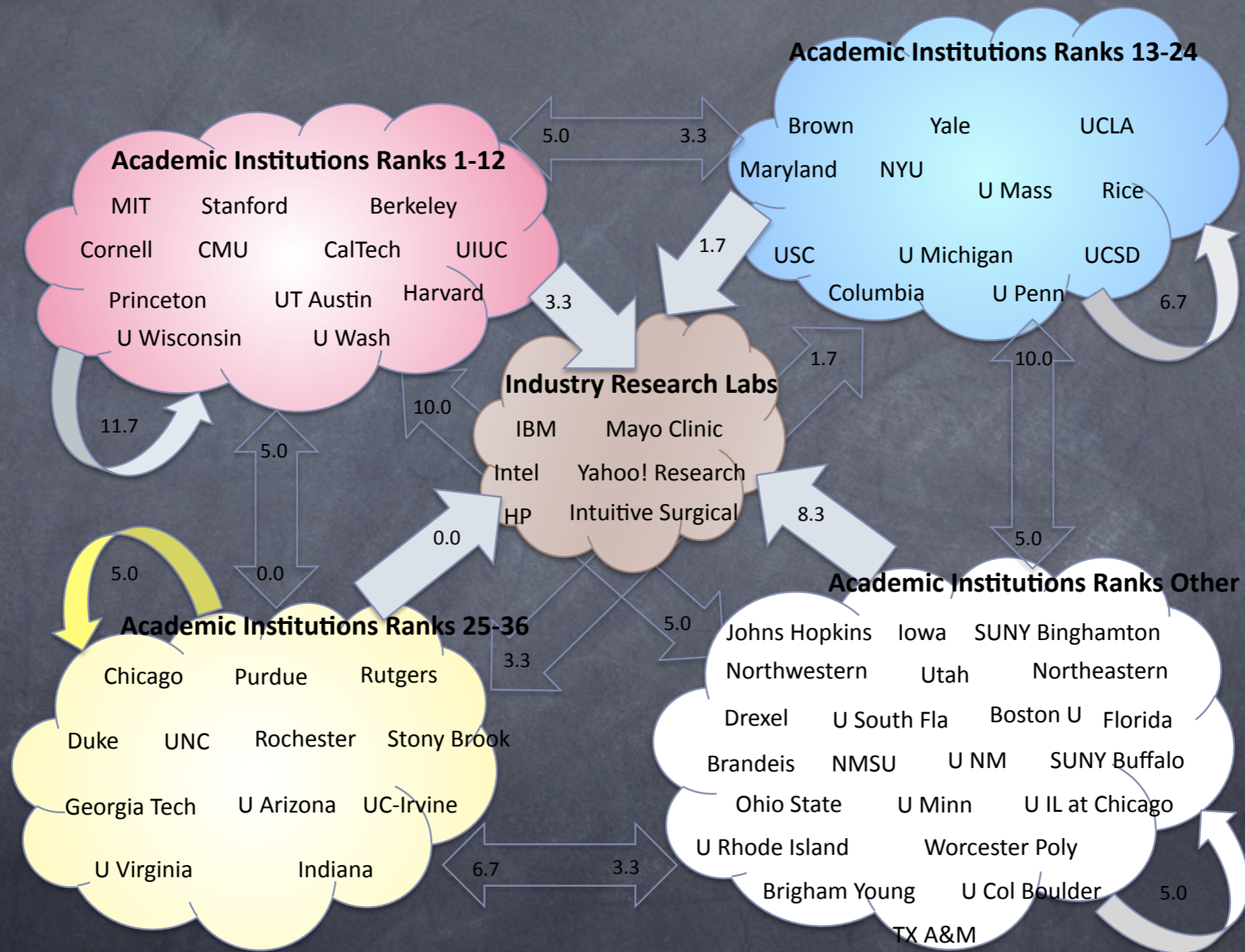
Ph.D. institutions Mentoring organizations



Renewing Continuing



CI Fellows Project I ('09) cross-flow



Major special initiatives

- “Transition Team” white papers
- Library of Congress Symposium
- Computing Innovation Fellows (CIFellows)

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COMPUTING RESEARCH ASSOCIATION (CRA) NATIONAL SCIENCE FOUNDATION (NSF) COMPUTING COMMUNITY CONSORTIUM (CCC)

Computing Innovation Fellows Project

Home CRA CCC CISE

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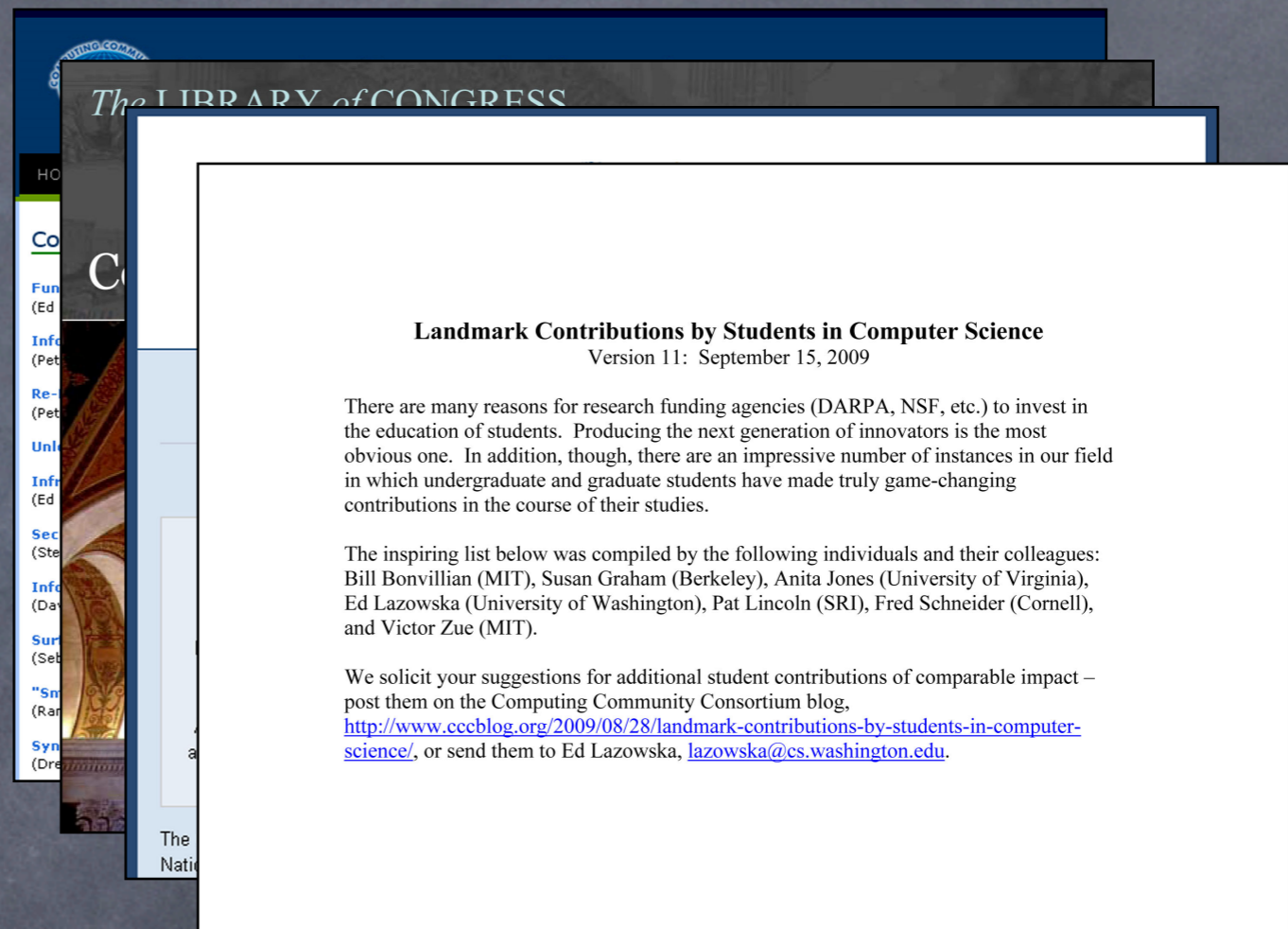
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Major special initiatives

- “Transition Team” white papers
- Library of Congress Symposium
- Computing Innovation Fellows (CIFellows)
- Landmark Contributions by Students



Landmark Contributions by Students in Computer Science
Version 11: September 15, 2009

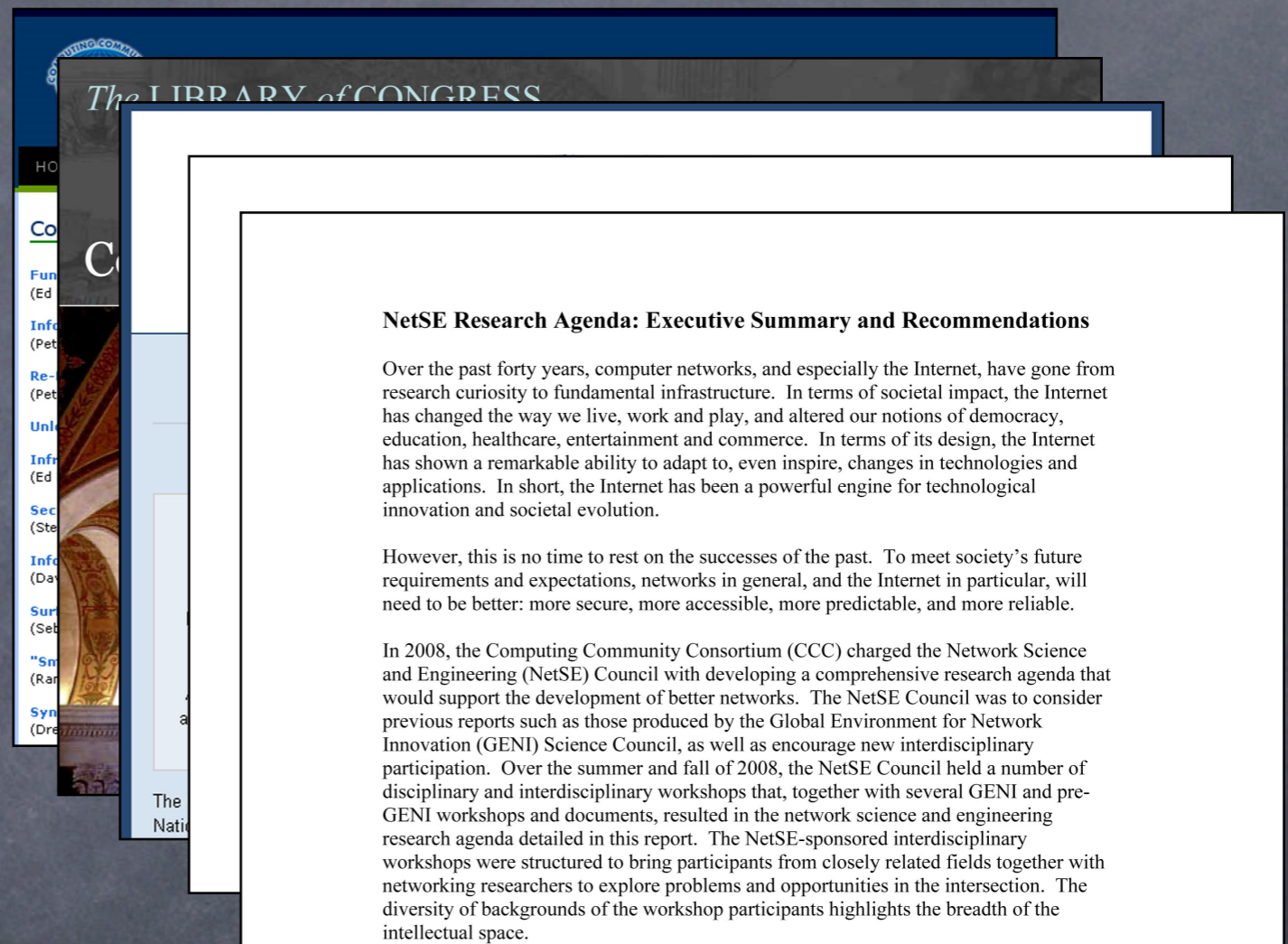
There are many reasons for research funding agencies (DARPA, NSF, etc.) to invest in the education of students. Producing the next generation of innovators is the most obvious one. In addition, though, there are an impressive number of instances in our field in which undergraduate and graduate students have made truly game-changing contributions in the course of their studies.

The inspiring list below was compiled by the following individuals and their colleagues: Bill Bonvillian (MIT), Susan Graham (Berkeley), Anita Jones (University of Virginia), Ed Lazowska (University of Washington), Pat Lincoln (SRI), Fred Schneider (Cornell), and Victor Zue (MIT).

We solicit your suggestions for additional student contributions of comparable impact – post them on the Computing Community Consortium blog, <http://www.cccb.org/2009/08/28/landmark-contributions-by-students-in-computer-science/>, or send them to Ed Lazowska, lazowska@cs.washington.edu.

Major special initiatives

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



Major special initiatives

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

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The main content area features a section titled "Discovery and Innovation in Health IT". The text reads: "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." It also states: "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 listed as follows:

- 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;

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 participants.

On the right side of the page, there is a yellow box with the text: "Content is still being added to this site. Please Check back periodically. The last change was made on: December 16, 2009." Below this is a section titled "Session Videos" with a video player showing a man speaking. The video title is "HIT - Thursday Morning Op...". Below the video player is a "Reply/Registration" section with a link to the "Reply/Registration Form" and a "Logistics" section with the date "Date: October 29-30, 2009".

...And lots of visioning activities

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	

What other topics should we cover?

Tell us!

OSTP's FY 12 priorities...



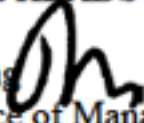
THE DIRECTOR

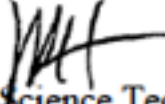
EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

July 21, 2010

M-10-30

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

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

John P. Holdren 
Director, Office of Science 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

...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

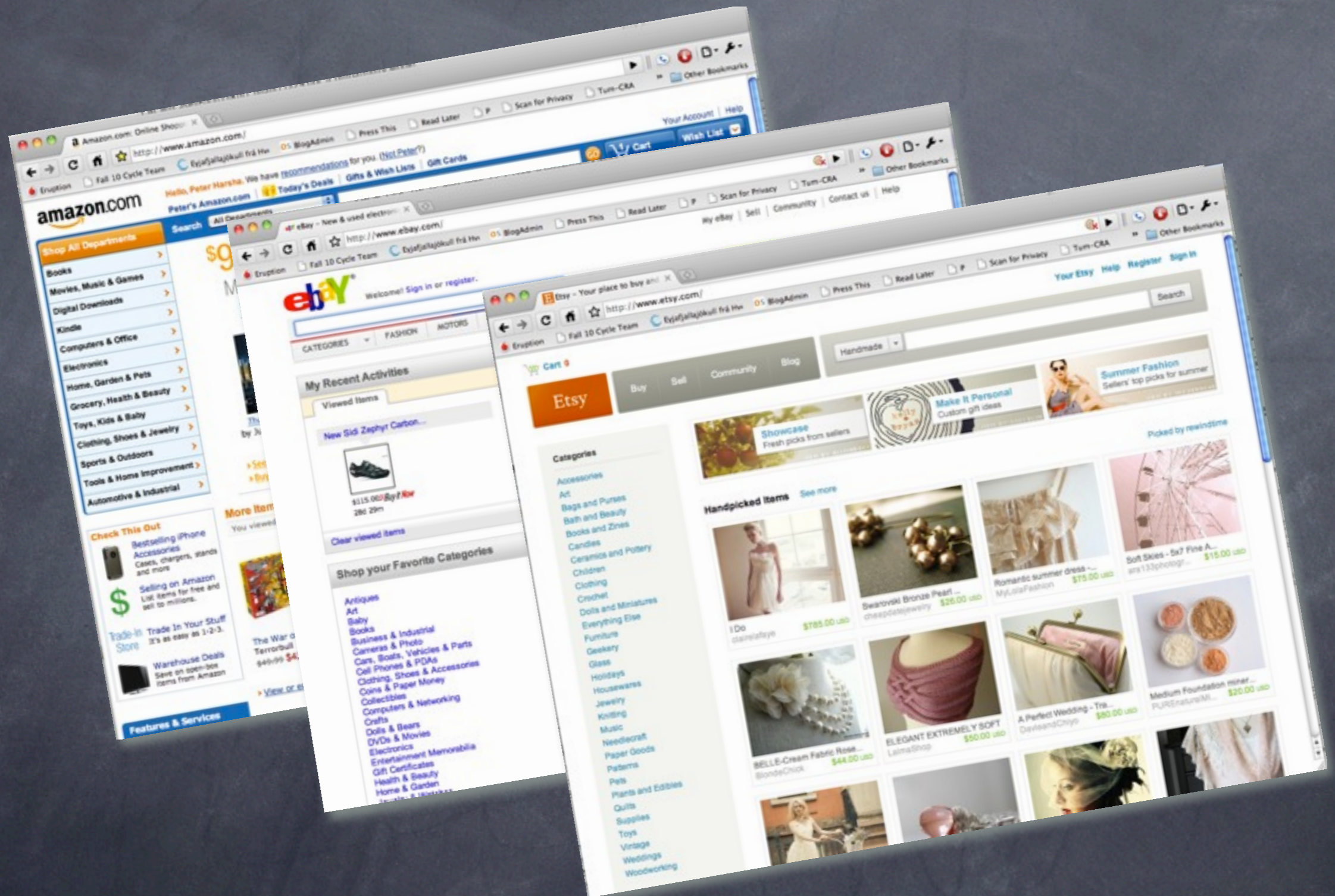
NSF SEES

- National security
 - **Cybersecurity**

Multiple WPs

Ultimately,
basic research drives...

...how we conduct commerce...



...how we learn...

Problem 1

How do different payload masses affect the altitude of a helium balloon?

Design Experiment Run Experiment Interpret results

Altitude (feet)	Balloon Volume (cubic feet)	Time to Final Altitude (minutes)
12174	3083	122

Payload Mass (pounds)	Amount of Helium (cubic feet)
90	2275

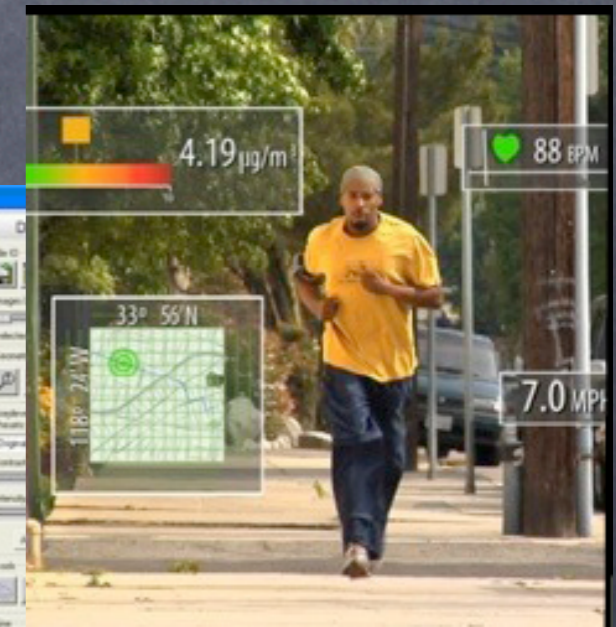
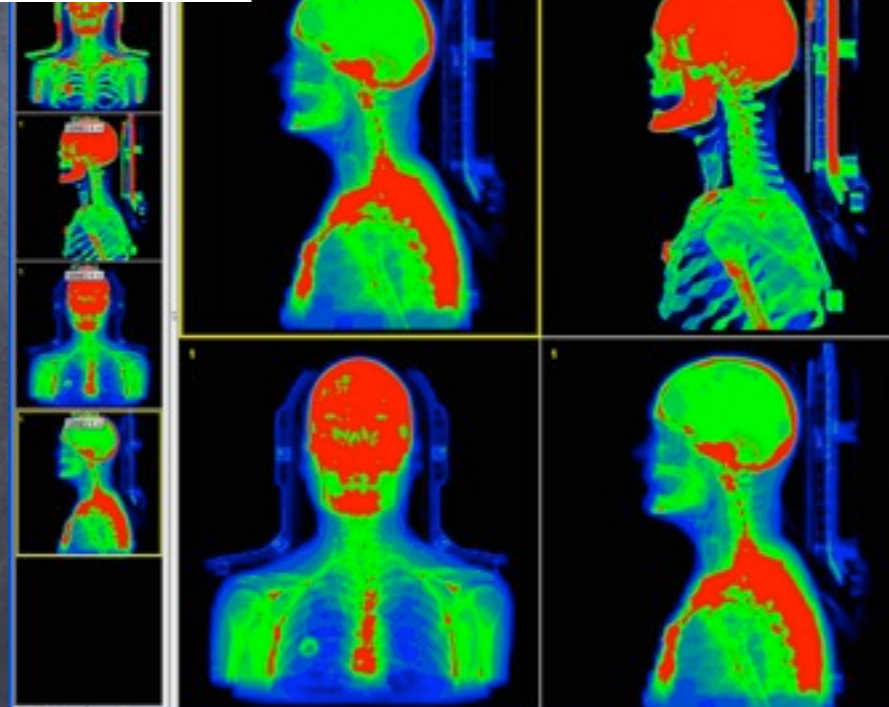
Payload Mass (pounds)	Final Altitude (feet)
10	35,000
50	22,000
90	12,000



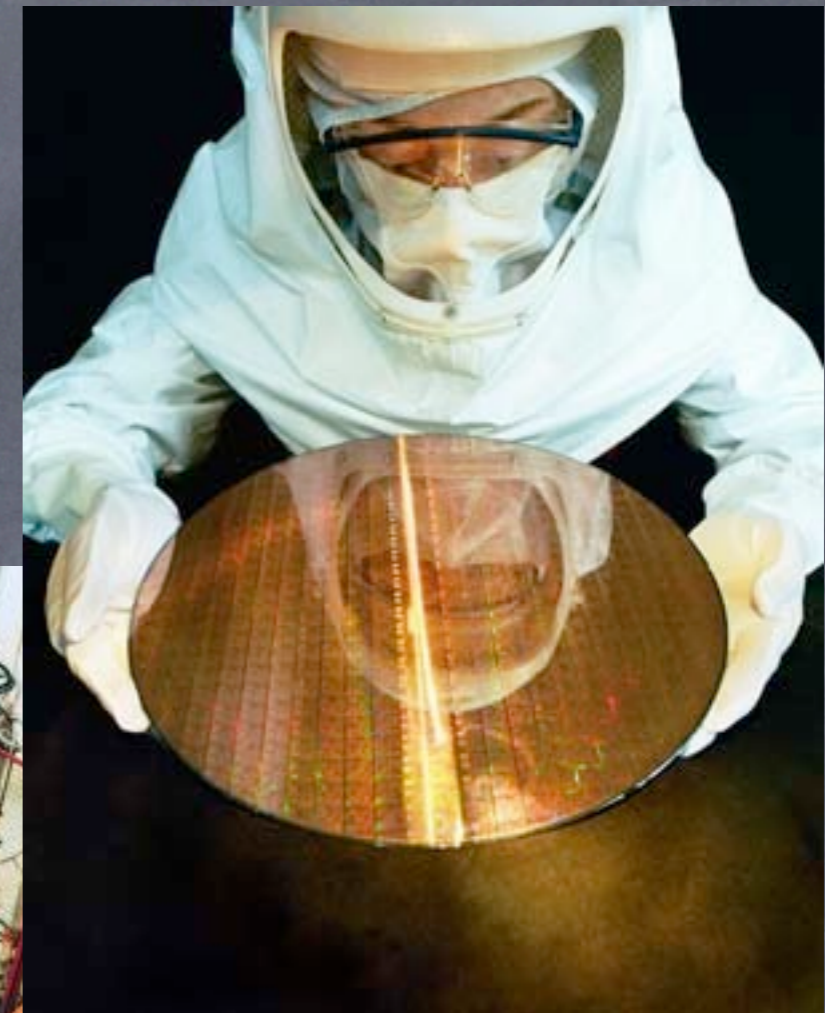
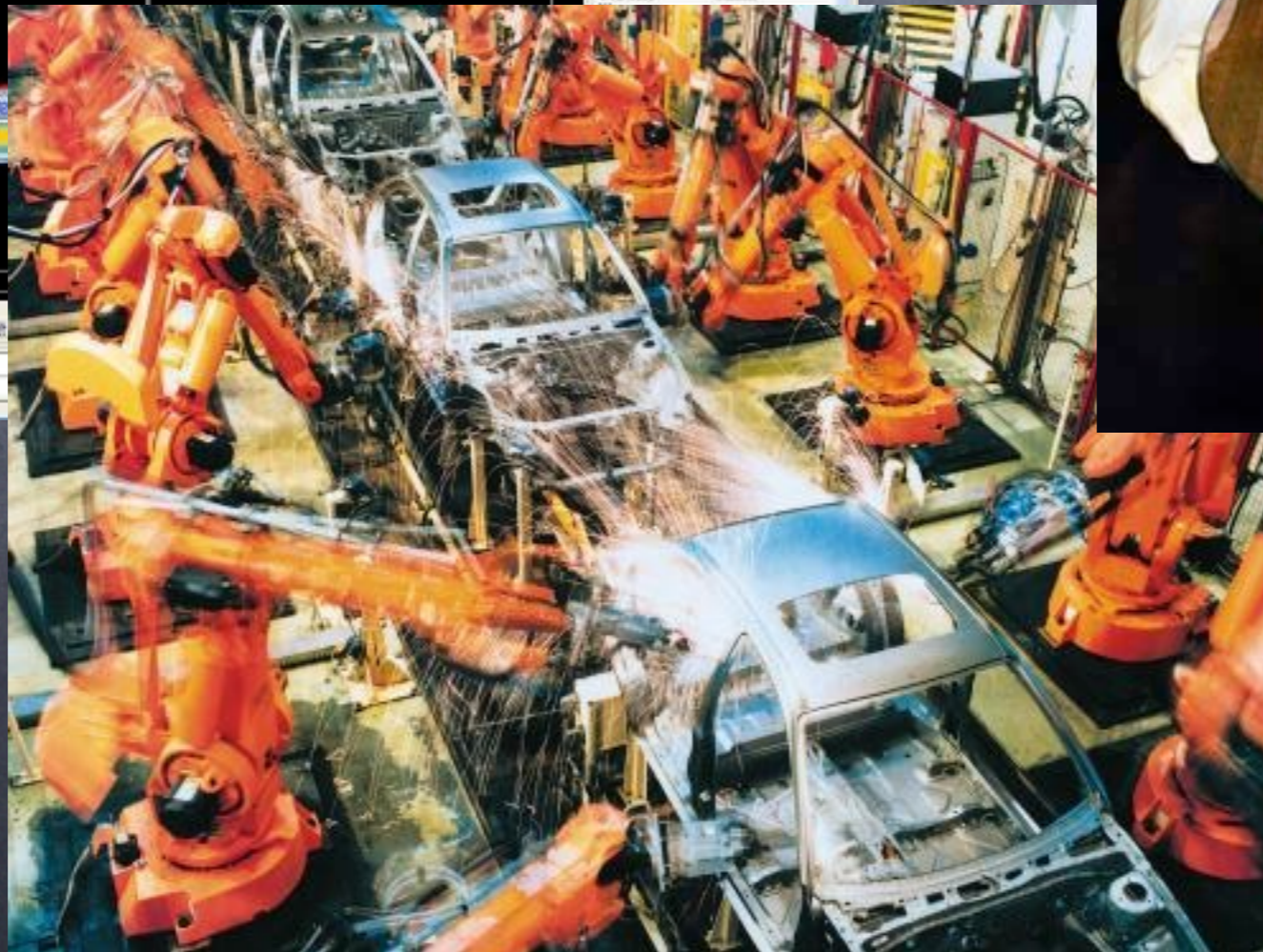
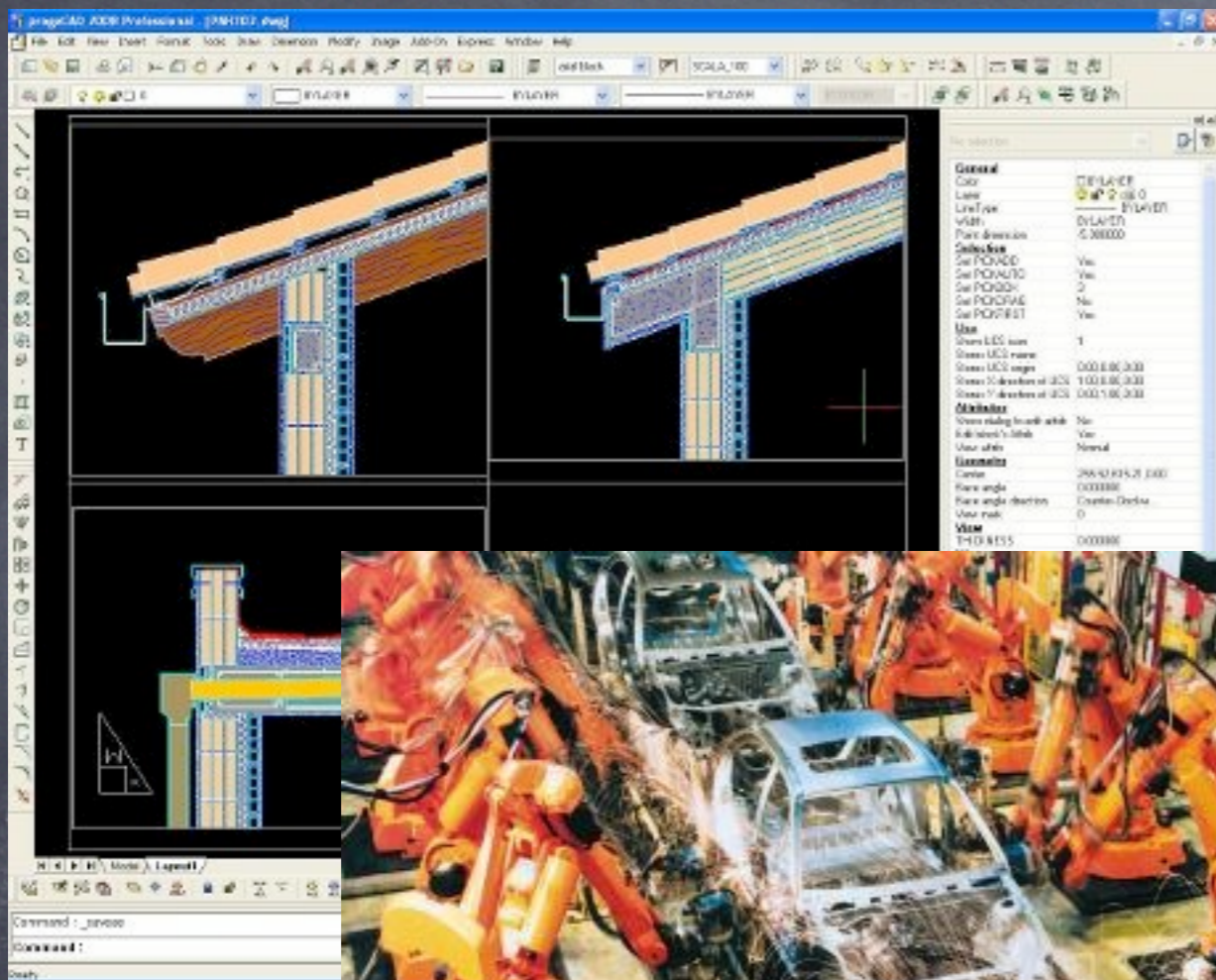


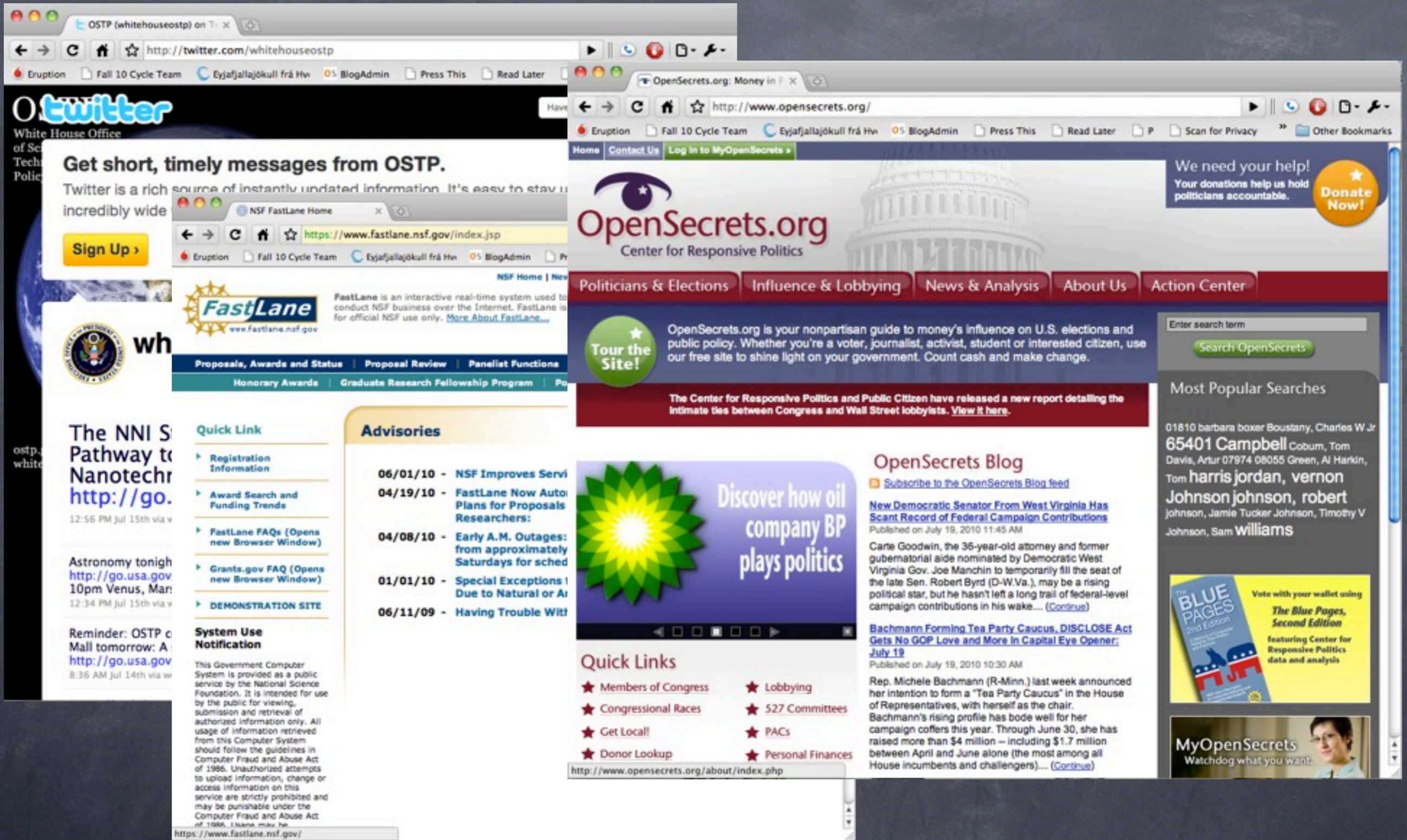
...how we work...

...how we care for ourselves...

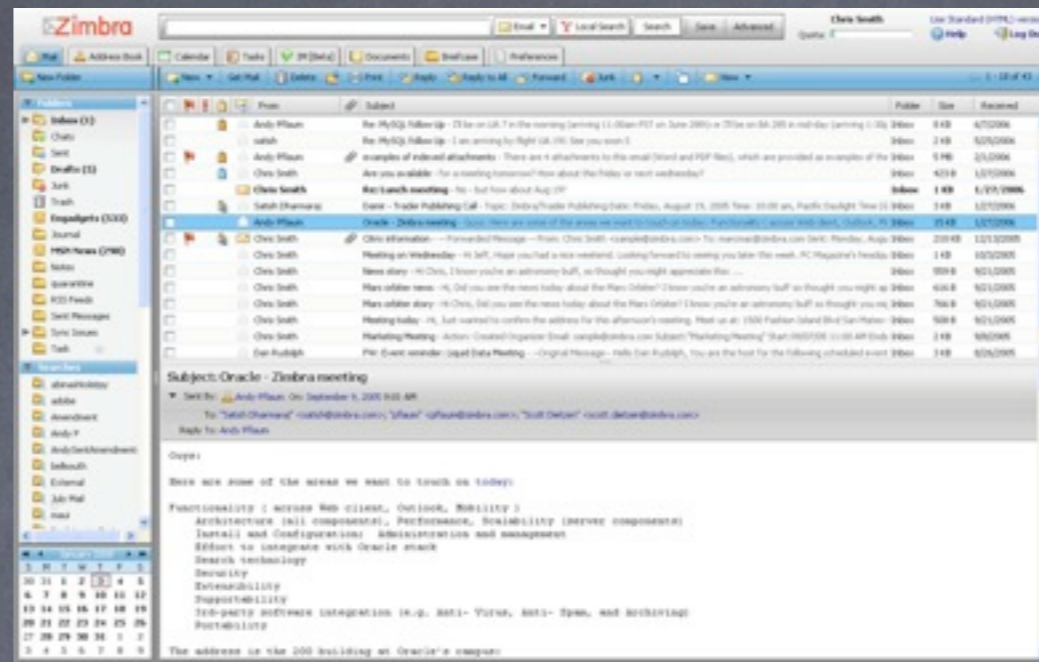
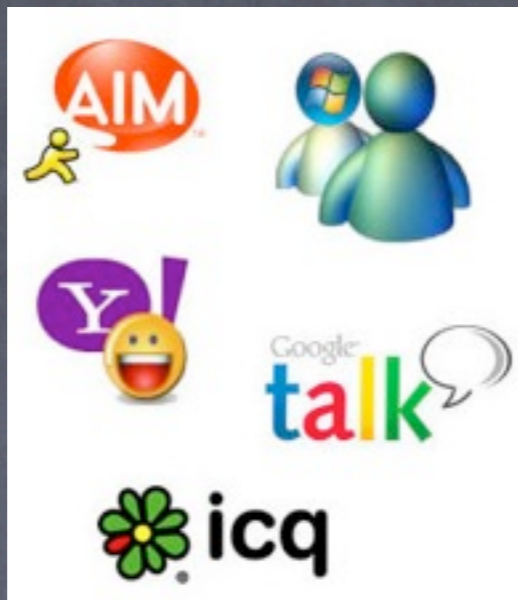


...how we manufacture...





...how our governments function..

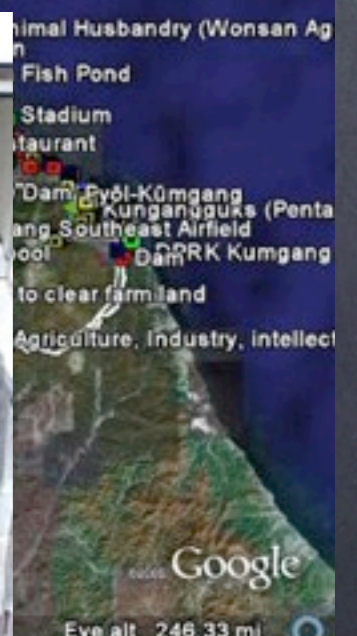


...how we communicate...

...how we're entertained...



...and how we preserve our nation's security.

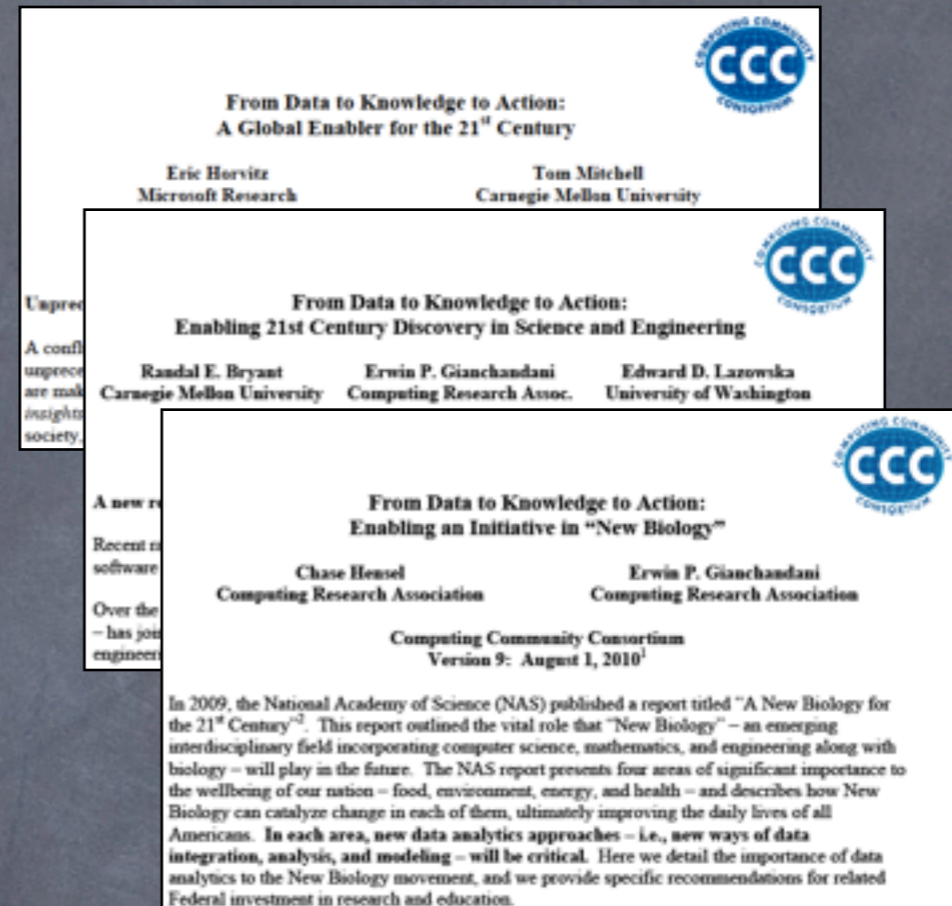


Courtesy Peter Lee, DARPA

So we have to make a case for
Federal investment in
basic computing research...

Current ongoing activities

- Data analytics
 - Overview
 - eScience
 - Healthcare
 - Energy
 - Education technology
 - New Transportation
 - Intelligence
 - New Biology
 - Robotics & emergency response
- Ongoing visioning activities
 - Robotics
 - Collective intelligence/how the brain is engineered & functions
 - Energy
 - Computing at the margins/global development
 - ...



Last but not least...

...A call to service

- 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 the field
- **Stay involved -- even if you can't make it to DC**

Questions?

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