

# The Computing Community Consortium: An Update

Ed Lazowska

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

Chair, Computing Community Consortium

GENI Engineering Conference  
July 2009

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



# This morning ...



- Quick background on the Computing Community Consortium
- Principal activities since October 2008
  - Transition Team white papers
  - Library of Congress symposium
  - Computing Innovation Fellows project
  - Current
    - Computing research and health care
    - Computing research and energy
- NetSE Research Agenda

# The Computing Community Consortium

- A cooperative agreement between NSF and CRA
- Catalyze the computing research community ...
  - 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



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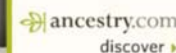
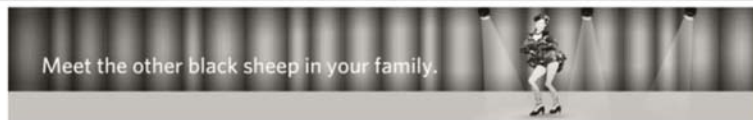


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Internet, Mobile Phones Named Most Important Inventions

By PHYLLIS KORRKKI  
Published: March 7, 2009

In response to the shouted-out question, "What are some of the greatest inventions of all time?," nearby office workers in a recent informal survey gave the following answers: the wheel, the engine, the ballpoint pen, diapers and the cheese Danish.

Life Changers

The top innovations of the last 30 years, according to judges at the Wharton School of the University of Pennsylvania.

1. Internet, broadband
2. PC and laptop computers
3. Mobile phones
4. E-mail
5. DNA testing and sequencing
6. Magnetic resonance imaging
7. Microprocessors
8. Fiber optics
9. Office software
10. Laser/robotic surgery
11. Open-source software
12. Light-emitting diodes
13. Liquid crystal display
14. GPS devices
15. E-commerce and auctions
16. Media file compression
17. Microfinance
18. Photovoltaic solar energy
19. Large-scale wind turbines
20. Internet social networking

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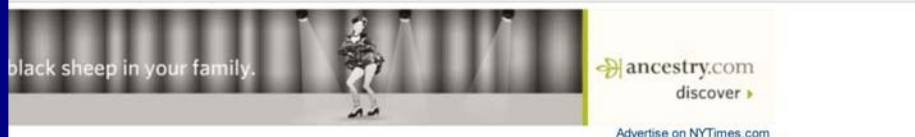
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7. Microprocessors
8. Fiber optics
9. Office software
10. Laser-guided surgery
11. Open-source software
12. Light-emitting diodes
13. Liquid crystal display
14. GPS devices
15. E-commerce and auctions
16. Hard-drive compression
17. Microfinance
18. Photovoltaic solar energy
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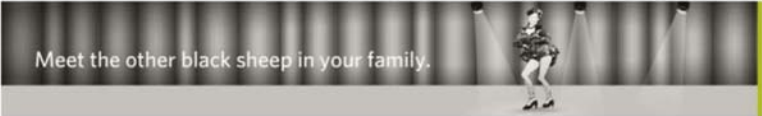
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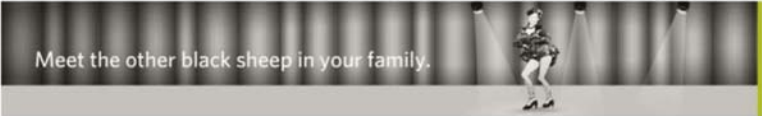
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# Imagine spending a day without information technology



- A day without the Internet and all that it enables
- A day without diagnostic medical imaging
- A day during which automobiles lacked electronic ignition, antilock brakes, and electronic stability control
- A day without digital media - without wireless telephones, high-definition televisions, MP3 audio, DVD video, computer animation, and videogames
- A day during which aircraft could not fly, travelers had to navigate without benefit of GPS, weather forecasters had no models, banks and merchants could not transfer funds electronically, factory automation ceased to function, and the US military lacked technological supremacy

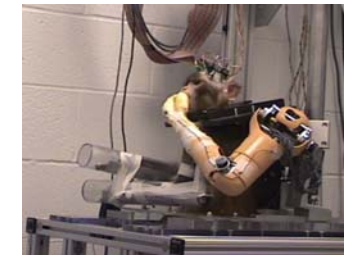
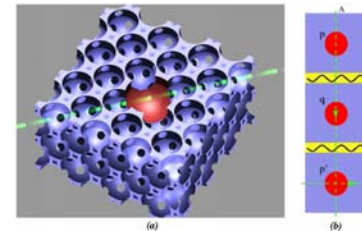
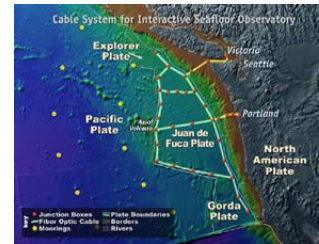
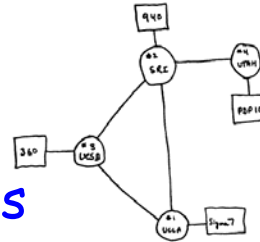
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- A day without the Internet and
- A day without diagnostic medicine
- A day during which automobiles have no antilock brakes, and electronic
- A day without digital media - with no high-definition televisions, MP3s, computer animation, and videogames
- A day during which aircraft could not navigate without benefit of GPS, and we had no models, banks and merchandise that are funded electronically, factory automation, and the US military leadership and supremacy

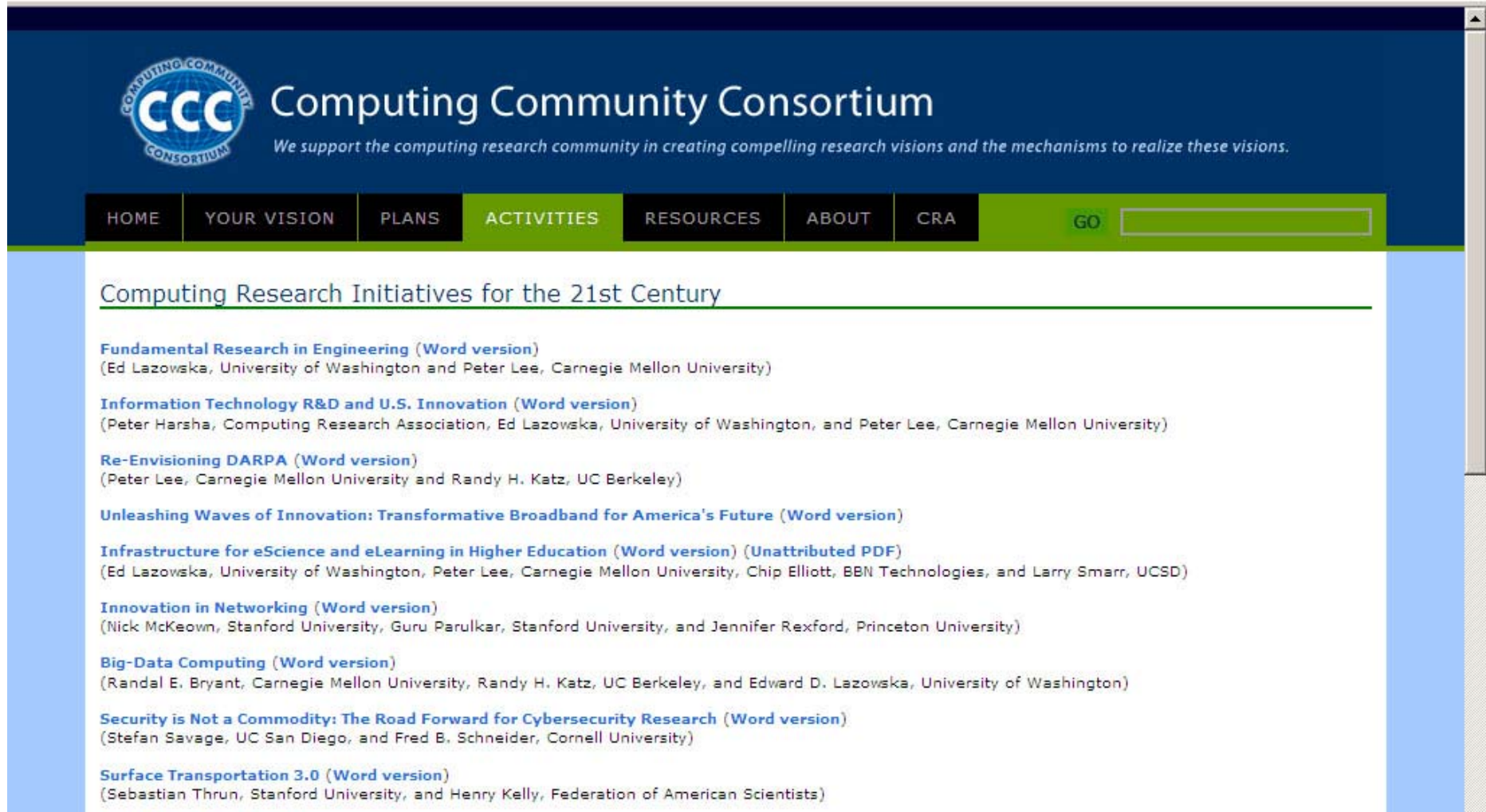


# The future is full of opportunity

- Creating the future of networking
- Driving advances in all fields of science and engineering
- Revolutionizing transportation
- Personalized education
- The Smart Grid
- Predictive, preventive, personalized medicine
- Quantum computing
- Empowerment of the developing world
- Personalized health monitoring => quality of life
- Neurobotics
- Synthetic biology



# November-December: 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, and CRA. A search bar with a "GO" button is also present. The main content area is titled "Computing Research Initiatives for the 21st Century" and lists several white papers with their authors and affiliations.

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

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## 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)
- Innovation in Networking (Word version)**  
(Nick McKeown, Stanford University, Guru Parulkar, Stanford University, and Jennifer Rexford, Princeton University)
- Big-Data Computing (Word version)**  
(Randal E. Bryant, Carnegie Mellon University, Randy H. Katz, UC Berkeley, and Edward D. Lazowska, University of Washington)
- Security is Not a Commodity: The Road Forward for Cybersecurity Research (Word version)**  
(Stefan Savage, UC San Diego, and Fred B. Schneider, Cornell University)
- Surface Transportation 3.0 (Word version)**  
(Sebastian Thrun, Stanford University, and Henry Kelly, Federation of American Scientists)



**Robotics (Word version)**

(Rodney Brooks, MIT)

**The Ocean Observatories Initiative (Word version)**

(John Delaney, University of Washington, John Orcutt, Scripps Institute of Oceanography, and Robert Weller, Woods Hole Oceanographic Institution)

**Quality of Life Technology (Word version)**

(Howard Wactlar, Carnegie Mellon University, and Takeo Kanade, Carnegie Mellon University)

**P4 Medicine (Word version)**

(Leroy Hood, Institute for Systems Biology, and David Galas, Battelle Memorial Institute)

**"Smart Grid": R&D for an Intelligent 21st Century Electrical Energy Distribution Infrastructure (Word version)**

(Randy H. Katz, UC Berkeley)

**Quantum Computing (Word version)**

(Scott Aaronson, MIT, and Dave Bacon, University of Washington)

**Synthetic Biology (Word version)**

(Drew Endy, Stanford, and Ed Lazowska, University of Washington)

**Computer Architecture (Word version)**

(David Patterson, UC Berkeley)

**Cyber-Physical Systems: A National Priority for Federal Investment in Infrastructure and Competitiveness (Word version)**


(Janos Sztipanovits, Vanderbilt University, and John Stankovic, University of Virginia)

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## **Unleashing Waves of Innovation Transformative Broadband for America's Future**

**Version 15: March 22, 2009<sup>1</sup>**

### **Executive Summary**

A forward-thinking National Broadband Strategy should focus on the transformative power of advanced networks to unleash new waves of innovation, jobs, economic growth, and national competitiveness – and to create new tools to deliver health care, education, and a low carbon economy. ARRA broadband decisions should target high-impact investments with those criteria in mind. They should seek to rebuild U.S. global leadership in networking – and the economic innovations that networking can create. Broadband investments should “pull from the future.”

A proven track record of innovating in networking and its applications, of deploying and continually upgrading advanced networks, and of extending those networks to the unserved and underserved across our nation, lies not with telephone or cable companies, nor with most state governments, but with our nation's colleges and universities and the state, regional and national research and education networks that this community has built, in many instances forged through partnerships with telecommunications providers and state agencies to achieve these goals. A National Broadband Strategy should begin with America's colleges and universities and the state, regional and national research and education networks that connect them and extend to

# January: CCC Council renewal



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  - Chris Johnson
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- Karen Sutherland

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- John King
- Peter Lee
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## ■ Terms expire 2010

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- Dave Waltz

# March: Library of Congress Symposium

*The* LIBRARY of CONGRESS

Computing Research That Changed The World





*The* LIBRARY of CONGRESS

# Computing Research That Changed The World

Organized by the Computing Community Consortium

Honorary Co-Sponsors:

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Congressman Vern Ehlers (R-MI)

Congressman Rush Holt (D-NJ)

Senator Jay Rockefeller (D-WV)

March 25, 2009

# Agenda



- Game-changing advances of the recent past
- Advances that are on the horizon, and what will be needed to achieve them
- Lessons that can further increase the already remarkable effectiveness of the IT R&D ecosystem
- Synthesis (and some demonstrations)

## Session 1: The Internet and the World Wide Web

9:00 - 10:20

### **Why We're Able to Google**

Alfred Spector (Google)

### **The Magic of the "Cloud": Supercomputers for Everybody, Everywhere**

Eric Brewer (University of California, Berkeley)

### **Human Computation**

Luis von Ahn (Carnegie Mellon University)

Discussion by the speakers of future challenges and synergies



Computing Community Consortium

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

# Why We're Able to Google™

Converging Progress from Government-  
& Industry-sponsored Research

The  
Modern  
Web

Human Interface Technologies  
(broadly construed)

Information sharing  
and retrieval

Web technologies

Distributed computing

Security Technologies

Networking  
Operating  
Systems

Open systems  
approaches

Programming  
Languages &  
methodologies

Algorithms and Theoretical Results

Long Term Geometric Growth in Processing, Network, Storage

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Dr. Alfred Z. Spector  
VP, Research and Special Initiatives  
Google, Inc.  
Internet and the World Web Panel, March 25, 2009  
*Computing Research that Changed the World*



# The Magic of the Cloud: Supercomputers for Everyone, Everywhere

Prof. Eric A. Brewer  
UC Berkeley

# Human Computation

Luis von Ahn

Carnegie Mellon University



## Session 2: Evolving Foundations

10:40 - 12:00

### **Security of Online Information**

Barbara Liskov (Massachusetts Institute of Technology)

### **Learning to Improve Our Lives**

Daphne Koller (Stanford University)

### **Global Information Networks**

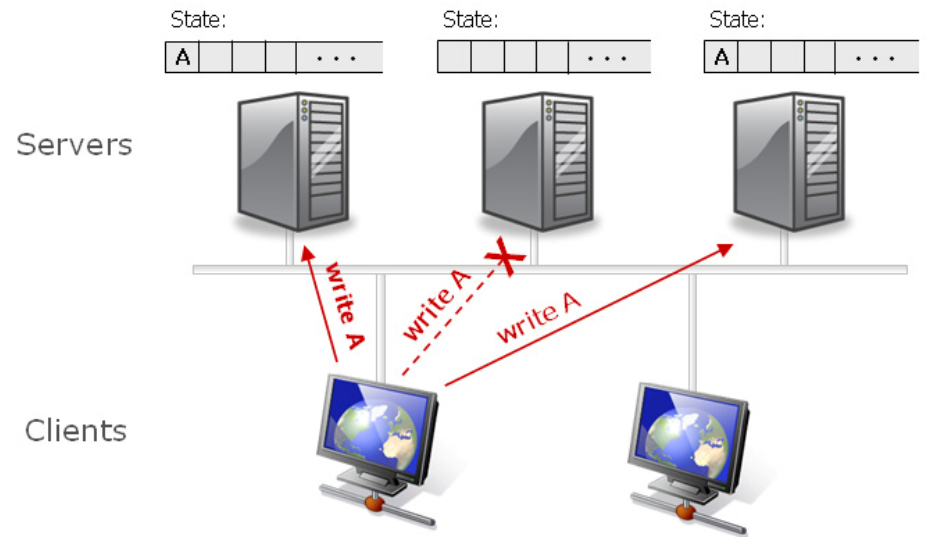
Jon Kleinberg (Cornell University)

Discussion by the speakers of future challenges and synergies



Computing Community Consortium

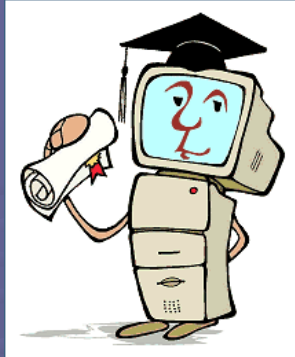
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# Security of Online Information

Barbara Liskov  
MIT CSAIL  
March 2009





# Learning

to improve our lives

Daphne Koller  
Stanford University



# Global Information Networks

Jon Kleinberg

Cornell University



Crandall-Backstrom-Huttenlocher-Kleinberg (2009)

### Session 3: The Transformation of the Sciences via Computation

1:00 - 2:20

#### **Supercomputers and Supernetworks are Transforming Research**

Larry Smarr (University of California, San Diego)

#### **Computing and Visualizing the Future of Medicine**

Chris Johnson (University of Utah)

#### **Zooming In On Life**

Gene Myers (Howard Hughes Medical Institute)

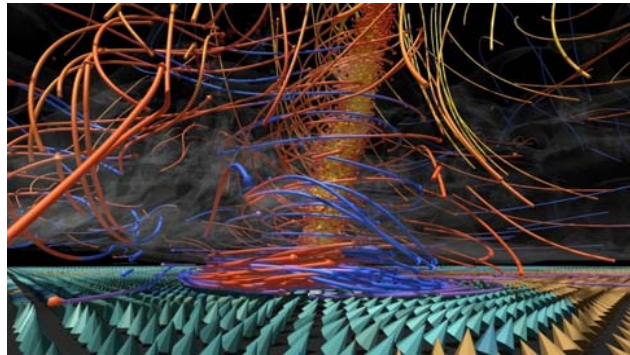
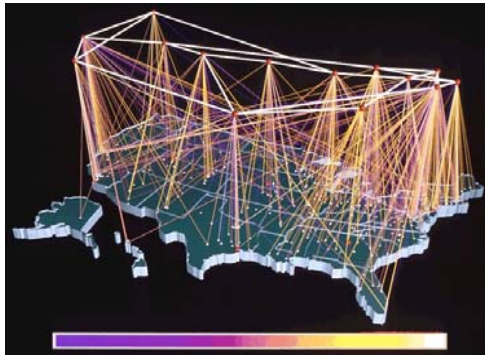
Discussion by the speakers of future challenges and synergies



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# Supercomputers and Supernetworks are Transforming Research



**Dr. Larry Smarr**

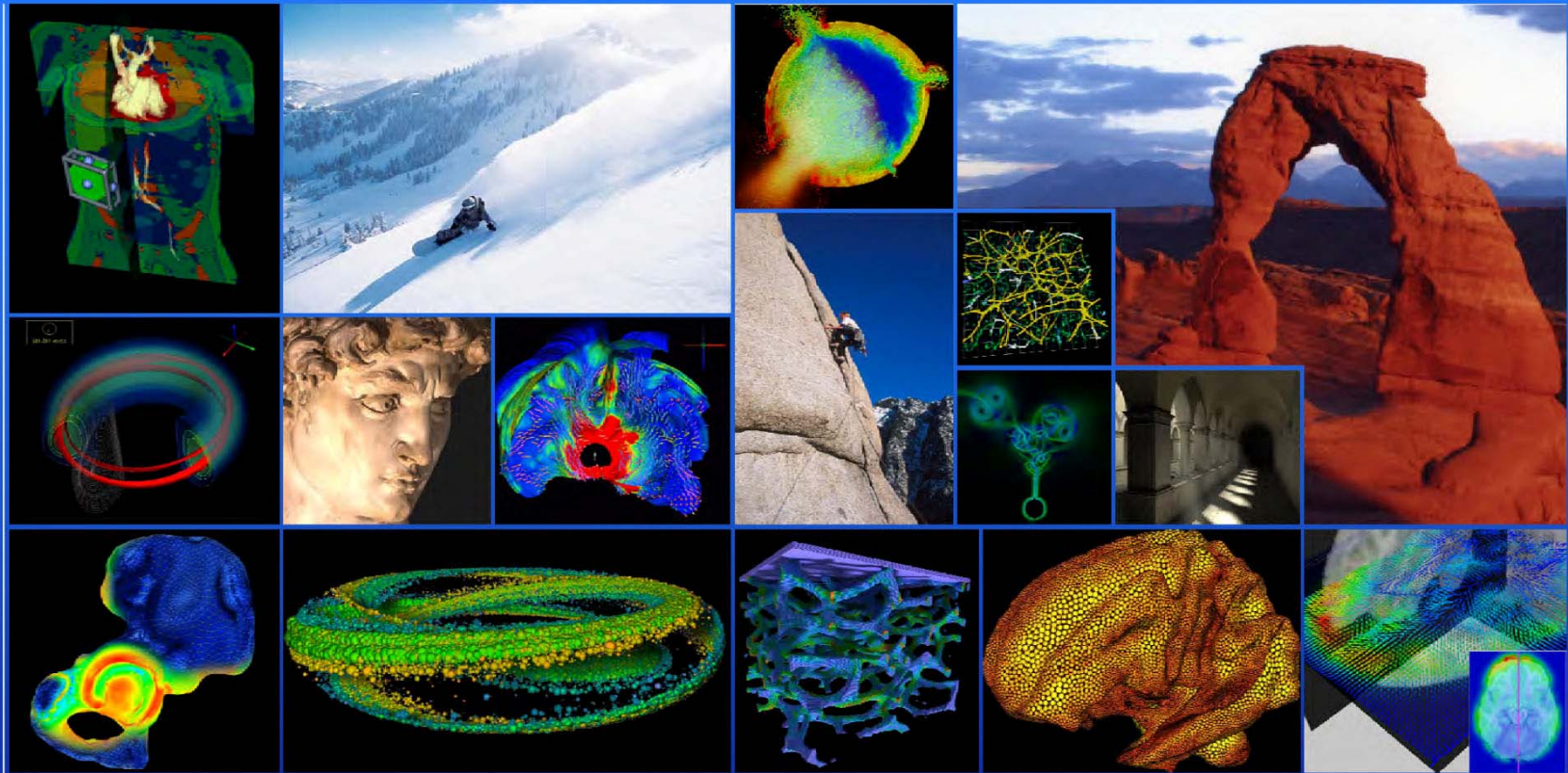
**Director, California Institute for Telecommunications and  
Information Technology**

**Harry E. Gruber Professor,**

**Dept. of Computer Science and Engineering  
Jacobs School of Engineering, UCSD**



# Computing and Visualizing the Future of Biomedicine



**Chris Johnson**  
**Scientific Computing and Imaging Institute**  
**University of Utah**

# Zooming in On Life

Gene Myers  
Group Leader

HHMI Janelia Farm Research Campus

## Session 4: Computing Everywhere!

2:30 - 3:50

### **Sensing Everywhere!**

Deborah Estrin (University of California, Los Angeles)

### **Pixels Everywhere!**

Pat Hanrahan (Stanford University)

### **Robotics Everywhere!**

Rodney Brooks (Massachusetts Institute of Technology and Heartland Robotics)

Discussion by the speakers of future challenges and synergies



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# *Sensing Everywhere! from ecosystems to human systems*

Professor Deborah Estrin

NSF Science and Technology Center for Embedded Networked Sensing (CENS)

UCLA Computer Science Department

[destrin@cens.ucla.edu](mailto:destrin@cens.ucla.edu)

... in collaboration with faculty, students and staff at CENS

We gratefully acknowledge the support of our sponsors, including the National Science Foundation, Nokia, Intel Corporation, Cisco Systems Inc., Sun Inc., Google, Microsoft Research, UC Micro, Crossbow Inc., T-mobile, Conservation International, and the participating campuses.

<http://urban.cens.ucla.edu>





# Pixels Everywhere

Media Tech and How it Changed the World

Pat Hanrahan

Department of Computer Science

Stanford University





# Robots Everywhere!

Rodney Brooks

Massachusetts Institute of Technology

iRobot Corporation

Heartland Robotics





## Evaluation Session: Moving Forward

4:00 - 5:00


Discussion by the speakers and the audience of what factors made these achievements possible and what factors will accelerate future advances.

Moderators: Susan Graham (University of California, Berkeley) and Peter Lee (Carnegie Mellon University)



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|  |                    |
|--|--------------------|
| <b>Walk to Madison Hall, James Madison Building, Library of Congress</b> | <b>5:00 - 5:30</b> |
| <b>Closing Session</b>   | <b>5:30</b>        |



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# April-July: Computing Innovation Fellows Project



## Computing Innovation Fellows Project

[Home](#) [CRA](#) [CCC](#) [CISE](#)

*The 2009 Computing Innovation Fellows have been selected!*

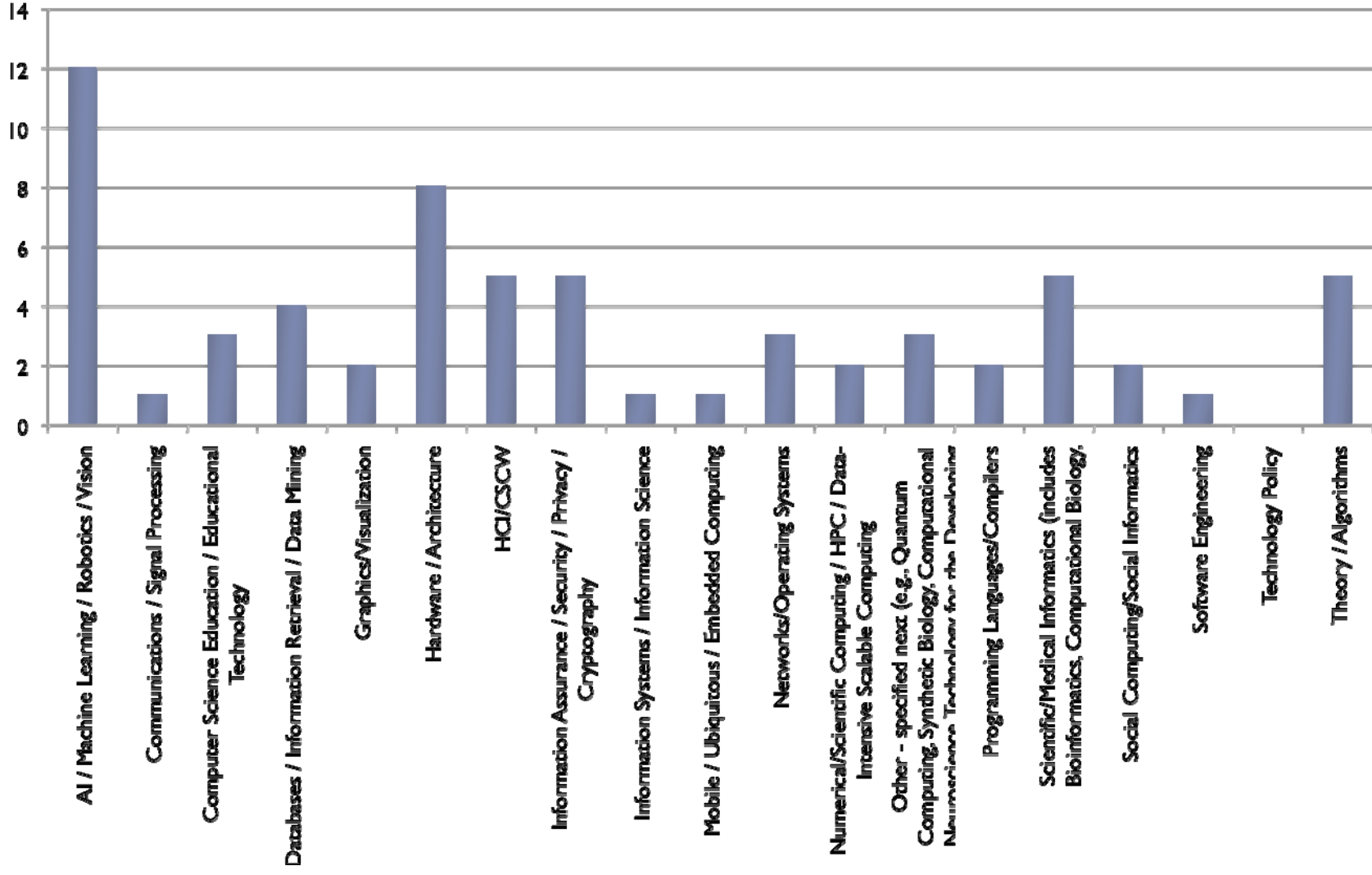
Congratulations to everyone who was selected for a CIFellow award!  
We are contacting each of the awardees, to confirm acceptance of each award.

The deadline for acceptance is July 24, 2009, at which point we will fill any open award slots with people from the waiting list.

Information about the winners will be posted here at that time, including statistics on research area, gender, ethnicity, citizenship, etc.

*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.](#) 

- 
- > 1200 prospective mentors
  - > 500 applicants
  - 60 awardees
    - > 40 distinct Ph.D. institutions
    - > 40 distinct mentoring institutions
      - 85% academic, 15% industrial
    - 75% citizen or permanent resident
    - 40% female
    - 12% under-represented minority







# Current



- Computing research and health care
- Computing research and energy

# NetSE Research Agenda

## **Network Science and Engineering (NetSE) Research Agenda**

A Report of the Network Science and  
Engineering Council

July 2009

