Computing Research Association

Snowbird 2004
The State of Computing Research
The State of CRA

Snowbird 2004

Jim Foley, CRA Chair
Andy Bernat, CRA Executive Director
Good News – we Have a Great Story to Tell

• Computing maps directly onto national priorities
  – Health
  – Defense / Homeland Security
  – Economic strength & competitiveness

• Two-thirds of productivity gains since 1995 due to IT
  – “Information Technology has been the distinguishing feature of this pivotal period in American economic history” – Alan Greenspan
The Computing Research Story

• Significant economic activity in Computer and Communications segment
  – All based on results of long-term Federally-funded computing research
  – Significant contributions to balance of payments
The Computing Research Story

• Computing is improving our lives
• Computing has changed the conduct of scientific research
• Demand for IT professionals projected strong for next 10 years
Good News – Overall Research Funding is Increasing

- Bad News – CS & Engineering not keeping up
More Bad News

• Computing Research not even being funded at PITAC-recommended levels
## More Bad News – NITR&D Funding Decreasing

<table>
<thead>
<tr>
<th>Agency</th>
<th>FY04</th>
<th>FY05</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSF</td>
<td>$754</td>
<td>$761</td>
<td>1%</td>
</tr>
<tr>
<td>NIH</td>
<td>$368</td>
<td>$371</td>
<td>1%</td>
</tr>
<tr>
<td>DOE</td>
<td>$344</td>
<td>$354</td>
<td>3%</td>
</tr>
<tr>
<td>NASA</td>
<td>$275</td>
<td>$259</td>
<td>-6%</td>
</tr>
<tr>
<td>DOD</td>
<td>$252</td>
<td>$226</td>
<td>-10%</td>
</tr>
<tr>
<td>NIST, NOAA</td>
<td>$26</td>
<td>$33</td>
<td>27%</td>
</tr>
<tr>
<td>EPA</td>
<td>$4</td>
<td>$4</td>
<td>0%</td>
</tr>
<tr>
<td>TOTALS</td>
<td>$2,023</td>
<td>$2,008</td>
<td>-1%</td>
</tr>
</tbody>
</table>
Funding Expectations Flat

• “We” may have to make do with less
  – There are more of “us” each year

• Especially hard on new faculty
  – Overall NSF acceptance rates in 25-27% range
  – CISE typically 5-10%, sometimes lower
Good News - CISE Staff Increase

• At last!
• 8-10 program director positions to fill
• Plus two Division Director openings
Good News

• PITAC back in business
  – 5 CRA present/past board members
    • Lazowska (co-chair), Bajcsy, Patterson, Reed, Spafford

• Topics
  – Cyber Security
  – Health and IT
  – Computational Science
CRA – SPEAK WITH ONE VOICE FOR COMPUTING RESEARCH COMMUNITY

• The case for computing research
• The case for graduate school
• Advocacy and testimony on the Hill
• Information collection and dissemination
Good News

• Computing is Everywhere
• (No Bad news here :)
CRA Role

• Engage the broader Computing Research community
  – IT Deans
  – ECEDHA
  – ..........

• CS Dept Chairs - Please reach out to your Comp Engr Depts.
Instant Survey

• How many of you are from academic units that have more than “Computer Science” in title?
  – (About half of the academics raised their hands)
CRA Role

• Help define the new world of Computing Research
  – Interdisciplinary
  – Use-motivated

• SPEAK WITH ONE VOICE
Good News - Projected Demand for IT Professionals

Total IT Job Openings 2002 to 2112 – New jobs plus replacements due to retirements - BLS
Bad News? Demand > Supply?

Yearly demand and supply of new grads; **unemployed workers not included**. Source: Bureau of Labor Statistics
Bad News – A “Triple Whammy”
Bad News – A “Triple Whammy”

First the Dot-Com Bust
Then 9/11
Then Off-Shoring
A Word on Off-Shoring: Causes

1. Technology – successes of computer science and computer engineering!
   The “Death of Distance”
   If it can be bits, it’s up for grabs
   No Neo-Luddites out there

2. Economics – business realities
Off-Shoring Economics - 5Cs

- Closer to market
- Closer to suppliers
- Closer to talent
- Closer to politicians - to do business
- Cost reduction - just one of many considerations
  - Labor
  - Infrastructure
  - Taxes and regulations
  - Government subsidies
Triple Whammy has Driven Down UG Enrollments

- Undergraduate – perceived low demand
  - Newly-declared CS/CE undergrads in 2003
    - Down 22% to 18,000 (2003 Taulbee)
    - A strong trend
  - *Which in turn can affect our financial viability*
Good News – PhD Production

Finally Trending Back Up

![Graph showing PhD production trends from 1995 to 2003. The yellow line represents Pass Quals, and the green line represents Graduate.]
CRA Role

• Data - Taulbee Survey
• Pipeline
  – CRA-W
  – Support Coalition to Diversify Computing
• Support changes to Visa process
• Much needed beyond what CRA can do - High School and earlier
Triple Whammy + Other Factors =>
Positive Impacts on Universities

• Re-examine what we teach in CS/IT
  – Connect computing with X
  – X = people, biology, science, business, etc.
  – Two of the PITAC topics do this
    • Health and IT, Computational Science
  – Computing and IT ⊃ Computer Science
  – “Customer Facing” knowledge and skills
Warren Washington - Chair, NSB

"Academic institutions need to change to educate students in a much broader context than they do now. You'll be hearing enlightened university presidents talking about this. But down at the department level, there's this focusing only on the narrow sort of discipline objectives. That's where it's going to be hard to make changes."

Quoted in the Chronicle of Higher Education
An Inflection Point for Computing?

• Opportunity to really examine Computing Education and Research
• “TripleWhammy” gave us breathing space and motivation
• Potential Crises in Funding and Pipeline
• Self-examination of what is computing
So What Can CRA Do About This New World?
CRA Role – New Activity

• Pipeline
  – The case for grad school
  – Why strong BS students don’t go to grad school
• Improving graduate education
  – Best practices
  – Courses beyond computing - broadening
• If we stand still, we will fall behind
• Interested? Talk to Jack Stankovic
CRA – New Activity

• PhD opportunities beyond professoriate and research labs

• Interested? Talk to Marc Snir
CRA – New Activity

• Computing Research is increasingly interdisciplinary
• Faculty are increasingly interdisciplinary
• Need best practices in evaluating interdisciplinary faculty?
• Interested? Talk to Dan Reed
CRA as Catalyst

• Leadership Summit Tomorrow
  – AAAI, ACM, CACS/AIC, CRA, CSTB
  – IEEE-CS, NSF, PITAC, SIAM, USENIX

• Strategies / cooperation on
  – Defining Computing & Computing Education
  – Sharpening and Delivering the Computing Message
  – The Case for Computing as an Undergrad Major/Minor
  – The Case for Graduate School
  – The Case for Computing Research Funding
More Generally

- Time for broader community involvement in CRA
  - CRA-W and Snowbird already there
- Participate in existing committees
- Participate in new activities
- Chairs – please identify
  - Promising Associate Professor
  - Seasoned Full Professor
CRA Finances are Strong

- Growing membership
- Stable revenue
- Sufficient reserves
CRA Does

Policy

Information

Human Resources

Community
## CRA Mission Areas

### Policy
- IT Research Funding and Research Environment
- Tracking Budgets
- Educating Members on Advocacy
- CRAN (advocacy network)
- Testimony
- Submissions to Congressional Committees
- Policy Reports
- Workforce Policy
- Issues Related to Women and Minorities
- News Conferences
- Congressional Visits
- Publications
- Policy blog
- Website

### Information Gathering and Dissemination
- Computing Research News (CRN)
- Computing Research Bulletin
- Surveys—Taulbee, Profiles, Lab Salaries
- CRA Best Practices Reports
- Foster’s List/Address Labels
- CRA-W Careers Booklet
- CRA-W Graduate School Information Guide
- Publications
- Brochures
- Annual Reports
- Websites—CRA, CRA-W, CDC
- Conferences, Workshops

### Human Resources
- Job Service
- Workforce Issues
- Academic Careers Workshop
- CRA-W Support
- CRA-W Lucid, Distinguished Lecture Series
- CRA-W Distributed Mentor Project
- CRA-W Career Mentoring Workshops
- CRA-W Collaborative Research Experiences for Undergraduates (CREU)
- CRA-W Glad Cohort Program
- CRA-W Cohort for Associate Professors Project
- CRA-W Recruitment and Retention Report
- Recruitment and Retention of Women in CS&E Graduate Programs Study
- CRA-W "Expanding the Pipeline" Column in CRN
- CDC Support
- CDC Recruitment and Retention Report
- Sessions at Snowbird
- CDC Tuple Conference
- Outstanding Undergraduate Awards
- A. Nico Habermann Award
- CRA-W Anita Borg Early Career Award

### Community Building
- CRA Conference at Snowbird (biennial)
- Computing Leadership Summit
- Lab Directors Regional Meetings
- IT Deans Meetings
- CRA Membership Activities
- Distinguished Service Award
- External Awards
- Industry/University Relations
- Industry/University Model Agreements
- Grand Challenges Conference
- CRA-W/Lucent Technologies Distinguished Lectures
- Conferences, Workshops
CRA Does Computing Research Policy
The blog

Computing Research Policy Blog

Advocacy and Policy Analysis for the Computing Research Community

Awards  Events  Gov't Affairs  Information  Jobs  Committees  People  Publications  What's New  Home

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Search

Archives


Recent Entries

Sci Com to hold e-voting hearing Thursday  Pics from the CNSF Science Exhibition on Capitol Hill  Senate Hearing on High End Computing at DOE  EMCA Reform Gathering Momentum?  Latest IT/AC Highlights

Advocacy  CRAN  Policy Issues  Budget  Congress  Executive Branch  Archives

June 23, 2004

SCI COM TO HOLD E-VOTING HEARING THURSDAY

The House Science Committee will hold a hearing on testing and certification for voting equipment. Here’s an early version of the hearing charter.

Posted by Peter Harsha at 06:16 PM  |  TrackBack (0)

PICS FROM THE CNSF SCIENCE EXHIBITION ON CAPITOL HILL

CRA joined 31 other scientific societies and universities yesterday in showing off the results of NSF-sponsored research at the 10th annual Coalition for National Science Funding Science Exhibition and Reception on Capitol Hill. CRA was ably represented at the event by DK Panda and his students (Jiuxing Liu, Pavan Balaji, Ranjit Noronha, and Sayantan Sur) from The Ohio State University, who presented work on software that allows high performance, scalable communication using the InfiniBand networking technology.

The Exhibition was a great opportunity for making the general case for federal support of basic research, especially at NSF. This year’s event was widely-attended. Many key congressional staffers, influential Members of Congress, and important members of the Administration and NSF took time out of their schedules to see the exhibits. Here’s the proof! (click for larger images)

The CRA booth. Underneath the table were
When CRA Talks, People Listen
CRA Organizes Workshops that Drive Policy

Workshop on The Roadmap for the Revitalization of High-End Computing

June 16-18, 2003
Edited by Daniel A. Reed
Everyone gets advice from
CRA Does
Computing Research
Information
Table 1. Base Salaries in Industrial Research Labs by Years of Post-Ph.D. Experience (thousands of dollars)

<table>
<thead>
<tr>
<th>Years</th>
<th>2001 Median</th>
<th>2001 Mean</th>
<th>2002 Median</th>
<th>2002 Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>New PhD</td>
<td>97.5</td>
<td>98.8</td>
<td>99.7</td>
<td>99.5</td>
</tr>
<tr>
<td>1-5 Years</td>
<td>105.2</td>
<td>107.1</td>
<td>110.4</td>
<td>112.9</td>
</tr>
<tr>
<td>6-10 Years</td>
<td>124.3</td>
<td>126.3</td>
<td>129.9</td>
<td>132.2</td>
</tr>
<tr>
<td>11-15 Years</td>
<td>134.2</td>
<td>134.3</td>
<td>140.8</td>
<td>141.7</td>
</tr>
<tr>
<td>16+ Years</td>
<td>138.0</td>
<td>139.3</td>
<td>147.1</td>
<td>147.5</td>
</tr>
</tbody>
</table>

* Total Cash Compensation is base salary plus additional cash (e.g., bonus) items.

Table 2. Total Cash Compensation* by Years of Post-Ph.D. Experience (thousands of dollars)

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<tbody>
<tr>
<td>New PhD</td>
<td>105.7</td>
<td>107.1</td>
<td>105.7</td>
<td>103.2</td>
</tr>
<tr>
<td>1-5 Years</td>
<td>113.1</td>
<td>114.9</td>
<td>117.1</td>
<td>120.6</td>
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<td>147.2</td>
<td>150.2</td>
<td>157.3</td>
<td>159.0</td>
</tr>
</tbody>
</table>

Figure 3. PhD Pipeline Corrected for Year of Entry

Figure 6. BS Production

Figure 7. Newly Declared CS/CE Undergraduate Majors
An Overview of Past and Projected Employment Changes in the Professional IT Occupations

By John Sargent

Professional information technology (IT) occupations have experienced both rapid growth and, most recently, higher-than-average job losses.

Professional IT occupations provided the lion’s share of science and engineering job growth during the period 1991-2001. Computer system analysts and scientists and computer programmers together accounted for 79.4 percent of job growth in the science and engineering occupations during this period; if one also adds electrical/electronic engineers (many of whom are IT professionals), the total rises to 93.1 percent—and their importance to U.S. competitiveness, economic growth, and innovation, policymakers have focused attention on understanding this key labor market and the challenges associated with both rapid job growth and recent job losses in these occupations.

Accordingly, since the mid-1990s the U.S. Department of Commerce’s Office of Technology Policy (OTP) has conducted extensive analysis of the characteristics of the IT workforce, the dynamics of the IT labor market, the IT education and training landscape, and potential policy implications. This article presents an overview of OTP’s analysis of IT occupational employment changes between 1990 and 2002, as well as OTP’s analysis of the Department of Labor’s Bureau of Labor Statistics’ (BLS) projections for IT occupational growth through 2012. IT Population Survey (CPS), a product of the U.S. Department of Commerce’s Census Bureau and BLS, and 2) the Occupational Employment Statistics (OES) survey, a BLS product.

These surveys used separate and distinct occupational classifications. In addition, the survey methodologies differ significantly; for example, CPS data are acquired through a survey of households, while OES data are derived from a survey of companies. As a result, the CPS and OES surveys arrive at different aggregate numbers for the IT workforce and thus are not directly comparable. Still, both surveys provide insight into the dynamics of the labor market for professional IT workers.

A Decade of Strong Employment Growth

Rapid advances in digital technologies and their widespread deployment throughout the economy fueled explosive growth in the demand for workers skilled in the development and use of information technology. Between 1990 and 2000, CPS data show that the number of jobs in professional-level IT occupations doubled, expanding from 1.2 million to 2.5 million. This translates into an annual growth rate of 7.2 percent for these IT occupations, compared with 1.3 percent for all occupations during the same period.

Recent Losses in IT Occupational Employment

The IT occupational employment picture has been quite different since 2000. Between 2000 and 2002, OES
CRA Bulletin

June 3, 2004

- NSF Funding Outlook Grim But Cyberinfrastructure Is a Priority
- Highlights from the House Science Committee HPC Hearing
- President Awards CRA-W for Mentoring Efforts
- Industrial R&D Expenditures Declined in 2002
- Academic R&D Grows in 2002
- Academies' Presidents Comment on U.S. Visa Policies
- CREU Program Accepting Applications
- Fulbright Scholar Awards 2004-05

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<< Previous Bulletin (April 27, 2004)

NSF Funding Outlook Grim But Cyberinfrastructure is a Priority, says NSF Director

National Science Foundation Director Arden Bement met recently with the Coalition for National Science Funding (of which CRA is a member) and warned the science community CNSF represents to lower expectations of increased funding for the agency in the near-term, saying the expectation of budget-doubling, as authorized by Congress and the President in 2002, "isn't reasonable."

For more information: http://www.cra.org/govaffairs/blog/archives/000084.html.

Highlights from the House Science Committee HPC Hearing

In what could fairly be described as a "love in," the recent House Science Committee hearing on HR 4218, the High Performance Computing Revitalization Act of 2004 (HPCRA), featured witnesses from the Administration, industry, university and federal labs all singing the praises of the committee's bill to amend the 1991 High Performance Computing and Communications Act. The Committee's bill attempts to address concerns within the computing community about interagency coordination in the government-wide Networking and Information Technology Research and Development (NITRD) program generally, and specifically within the high-performance computing community. See http://www.cra.org/govaffairs/blog/archives/000080.html.
CRA Does
Computing Research
Human Resources
2003 Undergraduate Awardees

Anna Cavender - U. Oregon
Ethan Eade - Duke
Heather Wake - U. South Carolina

2004 Undergraduate Awardees

Thuc Vu - CMU
CRA Does
Computing Research
Community Building
Why Grand Challenges?

- Inspire creative thinking
  - Encourage thinking beyond the incremental
- Some important problems require multiple approaches over long periods of time
- Big advances require big visions
  - Small, evolutionary steps won't take us everywhere we need to go
All happening at Snowbird:

CRA Bi-Annual Meeting
IEEE-CS IT Strategy
NSF PI Investigator’s Meeting
CRA Board of Directors
IT Deans
Leadership Summit
CDC Executive Committee
All brought to you by the Board, the Volunteers and the Staff
The State of CRA is, indeed, good
Thank You for Supporting CRA!