

# Expanding the Pipeline: CRA-W Grad Cohort: Equipping the Next Generation of Computing Research PhDs for Success

By Dr. Kathryn S. McKinley

CRA-W hosted its 11th annual Grad Cohort in Santa Clara, California on April 11 and 12, 2014. Grad Cohort is a two-day workshop that seeks to improve the success and retention of women in computing research. Senior women advise graduate students on research skills, publishing, career

---

*"I felt like I was inducted into the league of Computing Research professionals."  
- Grad Cohort Participant*

---

stages, internships, networking, and collaborations with presentations, panels, individual mentoring, and by creating professional social networks.

### The attendees

This year, 304 masters and PhD women graduate students in their first, second, and third year of graduate school attended. More than 30 senior women and a few men volunteered to share career advice and mentor students for the full two days. Since women remain under represented in computing (e.g., the 2013 Taulbee report [cra.org/govaffairs/blog/2013/03/taulbeereport/](http://cra.org/govaffairs/blog/2013/03/taulbeereport/) indicates that less than 400 women earned PhDs in computing in 2013), the 304 Grad Cohort attendees represent a critical community resource and an enormous opportunity for computing.

All participants received full funding for travel expenses, meals, and registration, made possible by generous corporate, ACM, IEEE, university department, and individual sponsors. With 503 well-qualified applicants this year, even more wanted to attend. CRA-W endeavors to choose applicants who are in their first three years of graduate school (Masters or PhD), giving priority

to under-represented minorities and students who have not attended previously. CRA-W funded up to two qualified students from each computing department and then department chairs had the opportunity to partially fund additional students from their institution.

This year over 80 students were able to attend thanks to the generous support of their departments. In many cases, departments sponsored multiple students, which resulted

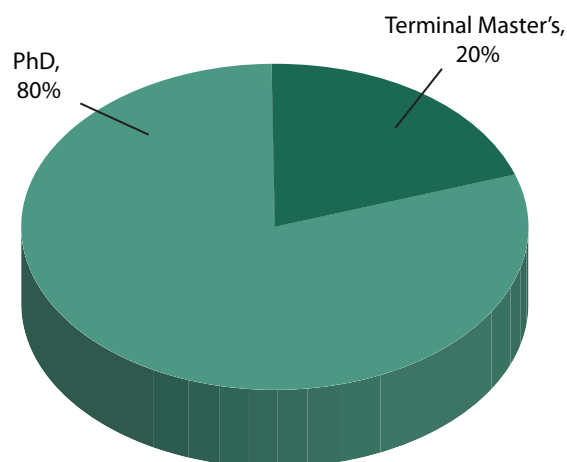
in student participants representing 124 distinct masters and PhD granting institutions.

Figure I shows that 20% of students were in masters programs and 80% in PhD programs.

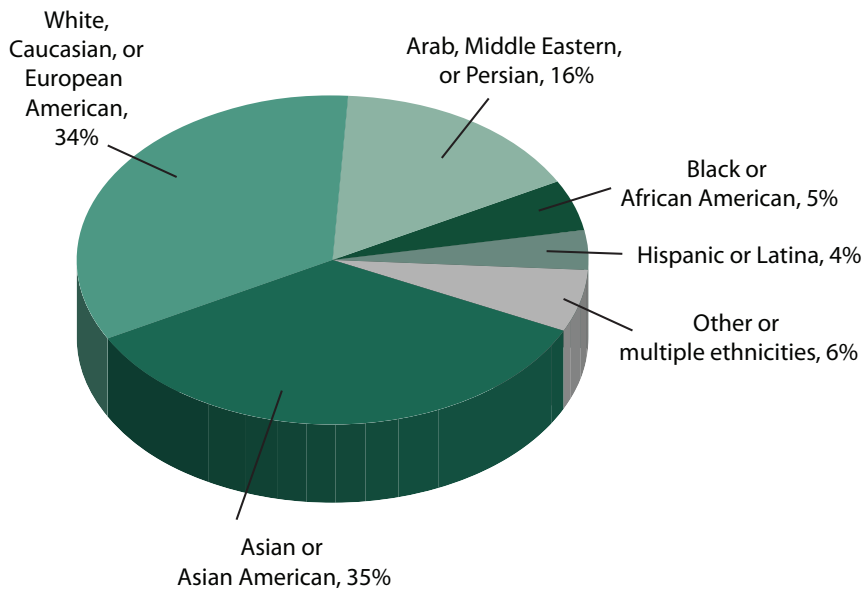
Figure II shows student race and ethnicity. 39% are U.S. citizens or permanent residents. Only 5% of the attendees self-identified as African Americans and 4% as Hispanic, even though we accepted all who applied this year. Unfortunately, ethnic minority women are even more severely under represented compared to ethnic minority men in computing.

Under representation can lead to feelings of isolation, lack of fit, and attrition. Developing networks of social support with others who share similar experiences often helps individuals persist in the face of adversity. Most women graduate students find themselves in the minority within their computing departments. Furthermore, variations in advisor mentoring strengths and unconscious biases can disproportionately discourage students that already feel isolated.

Figure I



**Figure II**



*“Presenting at the poster session was really nice because you could meet people who were specifically interested in your research and build a bond with them – also makes me feel good knowing that I’m bouncing my research off really bright people and getting their feedback. I initially wasn’t thinking that I’d present anything but I’m really, really glad I did.”*  
- Grad Cohort Participant

**Goals and execution**

To address these problems, CRA-W created Grad Cohort, a two day workshop, to help students to connect with peers and senior role models, and to provide resources on how to build a successful research career.

CRA-W organizes the workshop into plenary sessions, presentation and panel tracks, a poster session, and individual mentoring (new this year) with plenty of time for questions. CRA-W has three simultaneous tracks that deliver material most appropriate for first, second, and third year students, although students are free and do move between tracks. The first evening includes a reception with a DJ and dancing.

Professors Lori Clarke, Sandhya Dwarkadas, and Lori Pollock organized this year’s workshop, selecting students from the 503 applicants, contacting department chairs for additional funding, choosing speakers, and content. CRA Director of Programs Erik Russell handled all the logistics, including reimbursing

the students. The co-chairs invite carefully vetted successful women researchers to serve as speakers and mentors. Volunteer speakers include professors, government, and industrial researchers, who serve as role models from a range of institutions, such as Rochester, Princeton, Georgia Tech, Delaware University, the University of Massachusetts, Yahoo!, Google, and Microsoft Research. The speakers are very accomplished with many prestigious research awards, this year including at least seven ACM Fellows.

Another highlight this year was the plenary session on the “Future of Computer Science,” given by Dr. Farnam Jahanian, Director of CISE

at the National Science Foundation, who pointed to critical problems such as secure systems, cyber physical systems, and the ending of Moore’s law as research directions and opportunities critical to our nation.

Other popular sessions included “Finding a Research Topic,” “Networking,” and “Balancing graduate school and personal life.” Between 80% to 90% of student participants in our post-workshop survey described most sessions as “quite a bit” or “extremely useful.” For more details on the agenda, please see: <http://cra-w.org/Portals/0/Pdfs/2014%20CRA-W%20Grad%20Cohort%20Agenda.pdf>

For more details on student changes in knowledge, peer and mentor networks, and favorite sessions, please see the CERP report on the post-workshop surveys: <http://cra.org/cerp/wp-content/uploads/2014/05/Grad-Cohort-Evaluation-Report-2014.pdf>

This year for the first time the workshop offered as the final session, an hour, which turned into two, for formal individual mentoring. The mentors each occupied one table and then individual students had 5 to 10 minutes to ask them for personal advice on their careers and curriculum vitae. This session was extremely popular – I think every student joined and stayed in line. Many of the mentors stayed late to make sure every student got the opportunity to speak to a mentor individually. The students asked questions about job opportunities, how

*“I left feeling a lot more positive about my experience as a PhD student so far and less isolated and worried about the ways I think I struggle in school.”*  
- Grad Cohort Participant

to know if they were good at research, and strategies for dealing with difficult people and situations. By popular demand, the workshop will offer more time for this session next year.

### Results: CRA-W programs move the needle

One thing that makes CRA-W stand out is that our programs work! We know they work because we survey computing graduate and undergraduate students across the nation and compare participants and non-participants. For example, CRA-W Grad Cohort participants at similar stages in their careers (one to three years after attending) later publish

first author papers at higher rates than their peers who do not attend Grad Cohort (71% participants vs. 23% for non-participants). In addition, Master's students who attend CRA-W Grad Cohort are over two times more likely to have the intent to pursue a PhD than master's students who do not (67% participants vs. 29% non-participants). See examples of the in depth analysis [<http://cra.org/cerp/wp-content/uploads/2014/05/Grad-Cohort-Evaluation-Report1.pdf>] that compares Grad Cohort participants and non-participants by the CRA Center for Evaluating the Research Pipeline (CERP) [<http://cra.org/cerp/>].

An increasing body of evidence shows that more diverse teams make better products and improve business outcomes. By equipping young women researchers with career knowledge, strategies, and a network of supportive peers, CRA-W seeks to improve the success and retention of a diverse

computing research workforce. CRA-W believes “Diversity drives innovation.”

**About the Author** Dr. Kathryn S. McKinley is a CRA-W co-chair, CRA Board member, ACM and IEEE Fellow, and Principal Researcher at Microsoft. She was previously an Endowed Professor of Computer Science at The University of Texas at Austin and received her PhD, MS, and BA from Rice University. Her research interests span programming language implementation, architecture, security, performance, and energy. Three of her research publications recently earned test of time awards from OOPSLA, ICS, and SIGMETRICS. She is passionate about increasing the success and representation of women and minorities in computing, because computing is changing how we live, learn, communicate, and govern; a more diverse workforce will better drive these changes.



---

*“I had a very good time interacting with different professors and other graduate students. I made a lot of friends in the process and got some invaluable advise. I was looking to build a community of peers and I think this goal was achieved.”*

*- Grad Cohort Participant*

---