

Q&A

The Upper Limit

Jeannette Wing talks about clusters, creativity, and the power of computational thinking.

A PROFESSOR OF computer science at Carnegie Mellon University, Jeannette Wing has long been interested in the power of abstraction. She is a leading researcher in the area of formal methods, and has worked on diverse problems in software specification and verification, security, concurrent and distributed systems, and programming languages. Wing is also deeply engaged with a concept she calls computational thinking: the way computer scientists use decomposition, recursion, and algorithms to tackle difficult problems. As the current assistant director for computer and information science and engineering at the National Science Foundation (NSF), she now has the opportunity to put her talent for abstraction to use and help shape the future of the field.

You're about a year and a half into your tenure at NSF. What's it been like?

It's been an eye-opening experience. It gives me a much better appreciation of the university/industry/government ecosystem, and how we all need to work together to advance the frontiers of science and engineering.

What role do you play within the organization?

I wear two hats. One is to act as a spokesperson for the field, a scientist who represents the whole computing community—and let me just use the word “computing” to stand for all of computer and information science and engineering. At the same time, I



also have the opportunity to help guide and shape the frontiers of our field.

How's that?

NSF is really a bottom-up organization. We listen to the computing com-

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munity to find out what the trends are, where they're going, and what their research interests are, and we try to respond to their needs.

Let's talk about some of your most recent initiatives, such as the Cluster Exploratory program.

The Cluster Exploratory program enables us to offer software and services running on a Google-IBM cluster to the entire computing community. For a long time, we could see that there was something very exciting happening in industry with respect to these large data centers. But no university can really afford to build its own center and run it and pay for the power. Now, finally, researchers can access these resources and run their experiments at scale.

There's also a second cluster at the University of Illinois at Urbana-Champaign (UIUC).

Yes, thanks to HP, Intel, and Yahoo!. It's hosted at UIUC, but it's being made available to all of academia. And this time, it's not just the software and services that we're providing, it's access to the bare machine, so researchers can run experiments that go down to the processing level and below.

Has your involvement with NSF altered your own research interests?

Being here has increased my awareness of the need to do more fundamental research into privacy, and to understand things like information flow and use [CONTINUED ON P. 111]

to the overall development of the School. A Ph.D. in Computer Science, or equivalent, is required, with evidence of excellence in teaching and research. Rank and salary will be commensurate with experience, and appointments are expected to commence during the 2009 calendar year.

With over 70 faculty members, the University of Waterloo's David R. Cheriton School of Computer Science is the largest in Canada. It enjoys an excellent reputation in pure and applied research and houses a diverse research program of international stature. Because of its recognized capabilities, the School attracts exceptionally well-qualified students at both undergraduate and graduate levels. In addition, the University has an enlightened intellectual property policy which vests rights in the inventor: this policy has encouraged the creation of many spin-off companies including iAnywhere Solutions Inc., Maplesoft Inc., Open Text Corp and Research in Motion. Please see our website for more information: <http://www.cs.uwaterloo.ca>.

Applications should be sent by electronic mail to cs-recruiting@cs.uwaterloo.ca, or by post to
Chair, Advisory Committee on Appointments
David R. Cheriton School of Computer Science
200 University Avenue West
University of Waterloo
Waterloo, Ontario, Canada N2L 3G1

An application should include a curriculum vitae, statements on teaching and research, and the names and contact information for at least three referees. Applicants should ask their referees to forward letters of reference to the address above. Applications will be considered as soon as possible after they are complete, and as long as positions are available.

The University of Waterloo encourages applications from all qualified individuals, including

women, members of visible minorities, native peoples, and persons with disabilities. All qualified candidates are encouraged to apply; however, Canadian citizens and permanent residents will be given priority.

Washington University in Saint Louis Multiple Tenure-track/ Tenured Faculty Positions

The Department of Computer Science and Engineering (CSE) and the School of Medicine (WUSM) are jointly searching for multiple tenure-track faculty members with outstanding records of computing research and long term interest in scientific and/or biomedical problems. Appointments may be made wholly within CSE or jointly with the Departments of Medicine or Pathology & Immunology.

A key initiative in the CSE department's strategic plan is Integrating Computing and Science. As part of that initiative, we expect to make synergistic hires with a combined research portfolio spanning the range from fundamental computer science/engineering to applied research focused on science or medicine. Specific areas of interest include, but are not limited to:

- ▶ Databases, medical informatics, clinical or public-health informatics
- ▶ Theory/Algorithms with the potential for biomedical applications
- ▶ Analysis of complex genetic, genomic, proteomic, and metabolomic datasets
- ▶ Image analysis or visualization with the potential for biomedical applications
- ▶ Computer engineering with applications to medicine or the natural sciences
- ▶ Other areas of computational biology or computational science

These positions will continue a successful, ongoing strategy of collaborative research between CSE and the School of Medicine, which is consistently ranked among the top 3 medical schools in the United States. CSE currently consists of 24 tenured and tenure-track faculty members, 71 Ph.D. students, and a stellar group of undergraduates with a history of significant research contributions. The Department seeks to build on and complement its strengths in biological sequence analysis, biomedical image analysis, and biomedical applications of novel computing architectures.

Washington University is a private university with roughly 6,000 full-time undergraduates and 6,000 graduate students. It has one of the most attractive university campuses anywhere, and is located in a lovely residential neighborhood, adjacent to one of the nation's largest urban parks, in the heart of a vibrant metropolitan area. St. Louis is a wonderful place to live, providing access to a wealth of cultural and entertainment opportunities without the everyday hassles of the largest cities.

We anticipate appointments at the rank of Assistant Professor; however, in the case of exceptionally qualified candidates appointments at any rank may be considered. Qualified applicants should submit a complete application (cover letter, curriculum vita, research statement, teaching statement, and names of at least three references) electronically to recruiting@cse.wustl.edu. Other communications may be directed to Prof. Michael Brent, Department of Computer Science and Engineering, Campus Box 1045, Washington University, One Brookings Drive, St. Louis, MO 63130-4899.

Applications will be considered as they are received. Washington University is an equal opportunity/affirmative action employer.

LAST BYTE

[CONTINUED FROM P. 112] of information flow. What can or can we not guarantee with respect to preserving the privacy of citizens? How can we control what happens to the information we divulge about ourselves? What would be the equivalent of an impossibility result in privacy, in the way that we have for reliability?

Do you have time these days to actually do research of your own?

Yes, I do. Every program and division director has that opportunity, and I think it's really important, because it keeps you current, it keeps you abreast of what's happening, and it keeps you engaged. I try to devote the equivalent of at least one day a week to research—talking and emailing with my students, and working at nights and weekends. I also make it a

point to try to go back to Carnegie Mellon at least once or twice a month.

Let's talk about computational thinking, the term you coined to describe computer scientists' unique way of approaching, understanding, and solving problems.

Computational thinking encompasses all the benefits of computational models and methods and tools and the abstractions that we use. It's not just our metal tools, it's our mental tools—that's a phrase I like to use.

What sort of reception has it gotten?

There's been an incredible groundswell of support and enthusiasm from around the world, from all sorts of cultures and institutions. And there's been a lot of interest recently in com-

putational thinking with respect to education. Many colleges and universities are revisiting their undergraduate curricula and realizing that an introductory computer science course, an introduction to Java programming, is hardly the best we can offer.

I understand you're also focusing on the K-12 level.

Absolutely. The Computer Science and Telecommunications Board, through a partnership with NSF, is going to be planning a series of workshops to address exactly that question: what are effective ways of learning, or teaching, computational thinking by, or to, children. □

Leah Hoffmann is a Brooklyn, NY-based science and technology writer.