Micronews Home

Micronews Archives

Articles
Bug Bash
Congratulations
Executive E-mails
In Brief
Letters to the Editor
Photo Gallery

Related Sites

MSW Home
MS Library
Windows Live Expo

Jolly Good Fellow: Researcher Elected to Royal S

By Aaron Halabe
July 29, 2005

What does Luca Cardelli of Microsoft Research (MSR) Cambridge have in common with Tim Berners-Lee, Charles Darwin, Stephen Hawking and Isaac Newton?

As with the aforementioned, Cardelli is a Fellow of the Royal Society, inducted this month into the United Kingdom's preeminent scientific academy. Many regard the honor as the highest accolade a scientist can receive, next to a Nobel Prize.

Cardelli, an MSR assistant director, joins Cambridge Senior Researchers Andrew Blake and Sir Tony Hoare as Royal Society Fellows. Blake also was inducted into the Fellowship this month, Hoare in 1982.

The Society is composed of 1,292 distinguished scientists from the U.K., other Commonwealth countries and the Republic of Ireland. Fellows are elected through a rigorous peer-review process that recognizes their contributions to science, both for fundamental research and for scientific progress in industrial and research settings.

Luca Cardelli was recently inducted into The Royal Society. Founded in 1660, it is the world's oldest scientific academy in continuous existence.

Cardelli, the Royal Society Web site noted, is distinguished for his "innovative work on the theory and implementation of programming languages, extending to mathematical modeling of interactive and mobile systems."

Born in Montecatini Terme, Italy, he studied at the University of Pisa and earned a Ph.D. in computer science from the University of Edinburgh.

At MSR Cambridge, he leads the Programming Principles and Tools group. The group devises formal techniques and models for understanding programs, programming abstractions and languages, and develops related implementation technology.

"There are still big changes in programming due to come as a result of the evolution of wide area networks like the Internet," Cardelli said. "We now commonly use highly distributed networks with dynamic connectivity, but

our normal programming models and languages are still largely those of the 1970's: sequential languages with some support for shared-memory concurrency. My area of research concerns bringing programming models in sync with networking infrastructure."

Cardelli is known for his co-development of Polyphonic C#, an experimental language that offers new, asynchronous concurrency constructs based on the join calculus. Cardelli said the language – an extension of C# – allows computer professionals to program distributed systems "without having to cope with standard, but troublesome methods based on threads and locks."

Cardelli's work has also taken him into an exploration of the foundations of object oriented (OO) languages, specifically in establishing the semantic and type-theoretic foundations of those languages. In joint work with Martin Abadi, Cardelli has studied more direct models of OO features like object calculi, a model of computation that helps both to classify and explain the features of OO languages and to develop new languages.

These object calculi inspired his design of Obliq, an OO language for network programming. "In Obliq, you can move an application from one machine to another while it is running. You cannot do that with ordinary programming languages."

Mobility is a continuing theme of Cardelli's endeavors. A focus is on mobile ambients, a formal model of distributed mobile systems he developed with Andy Gordon, a senior researcher at MSR Cambridge. The mobile ambient approach seeks to unify both hardware and software mobility, using a common model that can be formally analyzed.

Today, the challenge is in transporting working environments between two computers – say, between a laptop and a desktop. The working environment consists of data to be copied, and running programs that define the data. The programs are in various stages of communication with the network, which have to be shut down and restarted.

Cardelli and Gordon ask: Rather than dealing with separate data and software program elements, why can't entire segments of computing environments be moved from computer to computer?

An ambient – a bounded place where computation occurs – is an environment that can be moved as a whole. In such an environment, a laptop, for example, can be reconnected to a different network and all the address spaces and file systems within it move accordingly and automatically.

"The deployment of these ideas requires a solid security infrastructure, so that mobile software and hardware can be verified against malicious intent," Cardelli noted. "Such infrastructure exists, in fact, in the mobile phone network – and many mobile phones are today almost full-blown PCs – but it still has to be agreed upon for ordinary computer networks."

In devising complex ideas, Cardelli employs a basic scientific approach: theorize, then test. "I tend to prove theorems using the same skills I use to write programs. I think such an activity can be summarized as the process of engineering something very complex, and yet making sure it has precise structure and simple properties that can be validated after the fact."

As for the future, Cardelli sees a broad and unfolding horizon of computing innovation. "Research is the process of discovering what has an impact. The software horizons are wide open, and there is still much that was discovered a long time ago that will continue to have an impact far into the future. Meanwhile, we have to keep filling the pipeline of innovative ideas."

Top of page