Three At UCSD Named To List Of Top Young Innovators By 'Technology Review,' MIT's Magazine Of Innovation

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A graduate student, postdoctoral researcher and faculty member at the University of California, San Diego, have been named to the 2004 list of the world's 100 Top Young Innovators, which was announced today by *Technology Review*, MIT's Magazine of Innovation.

Jamie Link, a chemistry graduate student, Lei Wang, a postdoctoral researcher in pharmacology, and Serge Belongie, an assistant professor of computer science, were named among the 100 individuals under age 35 whose innovative work in technology has a profound impact on today's world. This year's winners, chosen by the editors of Technology Review and an elite panel of judges, are recognized for their contributions in transforming the nature of technology and business in industries such as biotechnology and medicine, computing and nanotechnology.

"For UCSD to have three individuals represented in this prestigious list is a testament to our university's strength in science and technology, as well as our ability to produce the innovators of the future," said Marye Anne Fox, the new Chancellor of UCSD.

Wang, 32, was honored for a unique study of life's origins that sets the stage for highly specific genetic engineering, thus opening new research horizons. His current research focuses on protein engineering using somatic hypermutation and mRNA imaging. Belongie, 29, is an expert in computer vision who joined the faculty of UCSD's Jacobs School of Engineering in 2001 after creating the first company to market a consumer-oriented fingerprint recognition device. At 26, Link is the youngest individual and one of 31 female members of this group of top innovators.

"Jamie and the 30 other women recognized for this award serve as powerful reminders that our nation needs to do more to encourage women to pursue careers in science and technology," added Fox, one of the leading organic chemists in the nation. "With promising young innovators such as Jamie, the future of our nation's technological enterprise and economy has no limits."

Last October, Link won the $50,000 grand prize in the Collegiate Inventors Competition, a program of the National Inventors Hall of Fame for her development of dust-sized chips of silicon that allow scientists rapidly and remotely to detect a variety of biological and chemical agents, including substances that a terrorist might dissolve in drinking water or spray into the atmosphere. The invention of these tiny silicon chips, or "smart dust," was made in the laboratory of Michael Sailor, a professor of chemistry and biochemistry at UCSD and her graduate adviser.

Link was in the process of making a thin multi-layer film of porous silicon on a crystalline substrate when the silicon chip accidentally broke. She then observed that each piece-her smart dust-retained the properties of the original. The particles have been found to have a wide range of uses in medical diagnostics and research, environmental testing, drug delivery and countless other uses. For instance, Link can make her particles a particular color, then program them to detect a particular substance, such as a toxin. As the microscopic sensors find the toxin, they join together as a red spot to mark the toxic pollutant. The invention could have

wide commercial use in research and medical laboratories-in performing rapid biochemical assays, screening chemicals for potential new drugs and testing air and water for toxic chemicals.

As an undergraduate student at Caltech, Serge Belongie developed new techniques for fingerprint analysis and co-founded Digital Persona, Inc., the world leader in PC-based fingerprint authentication. While doing his Ph.D. work at UC Berkeley, Belongie introduced an approach to recognizing objects in images called 'shape contexts'. When applied to the recognition of handwritten digits, his method took the world record for the lowest error rate on the standard evaluation corpus from the National Institute of Standards and Technology. His shape-context method was also adopted by other researchers to break *captcha* 's- authentication programs that generate visual tests that a person can easily pass, but a machine cannot. Separately, Belongie's work on content-based retrieval from large databases of images was profiled in Scientific American.

Currently Belongie is adapting computer-vision techniques for use in medical research, notably by automating the analysis of tissue microarrays, and the monitoring of mice and other animals in lab research. Funded by the UCSD division of the California Institute for Telecommunications and Information Technology, Belongie's 'smart vivarium' project aims to equip each cage in a vivarium with a camera and embedded processing, then use pattern recognition to generate a continuous stream of measurements 24 hours a day-providing better data on how animals respond in drug trials, while also improving their health and welfare.

In Lei Wang's study of life's origins, he showed, for the first time, how the genetic code of life could be expanded by human power using nature's own techniques. He developed a method for inserting an extra amino acid into a protein in live cells, in the same way that natural amino acids are incorporated. The result produces a living, or "in vivo," means for studying the evolution of genetic code and paves the way for probing life processes.

"In a way, our methods remove the constraints of nature, suggesting exciting opportunities for studying and engineering various biological functions," Wang said.

Using the bacterium *E. coli* as a host, Wang hijacked a new set of components including nucleic acids and enzymes. A "nonsense codon," a trio of bases that codes for nothing, was hijacked to serve as the trigger, or signal. These new building blocks, when added into the cell machinery, selectively insert a new amino acid into proteins in response to the signal. The research resulted in an article in the April 20, 2001 issue of the journal *Science*, describing the method and the first bug with an expanded genetic code. In follow-up work by other researchers, the system and strategy were transplanted from the bacterium into mammalian cells and yeast.

Wang's study has won several prizes over the past two years including the Young Scientist Prize awarded by Amersham Biosciences and the journal *Science*, the $50,000 grand prize in the National Inventors Hall of Fame's Collegiate Inventors Competition and a Merck Fellowship from the Damon Runyon Cancer Research Foundation.

Belongie, Link and Wang will be honored for their achievements September 29-30 at *Technology Review's* Emerging Technologies Conference at MIT, which will feature speakers and discussions about the technological innovations that have the potential to fuel new economic growth and dramatically change the future.

The panel of judges that selected these top young innovators for the 2004 list included senior executives from the following organizations: Boston University, Caltech, Cambridge University, CombinatoRx, Concept2Company, Cornell University, General Electric, Geekcorps, Georgia Tech, Harvard Medical School, Hewlett-Packard, IBM, Intellectual Ventures, Microsoft, MIT, Northwestern University, PureTech Ventures, Singapore Institute of Bioengineering and Nanotechnology, TIAX, Wharton, Xerox and YankeeTek Ventures.

"In the five years since we began naming our annual selection of the world's top innovators under age 35, inclusion among the TR100 has become one of the most prestigious awards for young innovators around the world," said David Rotman, executive editor of *Technology Review*. "This year's winners are all pioneering fascinating innovations in the fields of biomedicine, computing and nanotechnology, and were chosen after a

rigorous selection and judging process. The result is an elite group whose visions and inventions will shape the future of technology."

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