COMPUTATIONAL FOX

*Thanks to an SU professor, computer education may be changing.*

When Geoffrey Fox teaches computational science, he's on his own. There's no textbook, no reference material, just Fox. Many of his students never heard of computational science until they heard about it from Fox, but like computer science student Gang Cheng, they recognize it as precisely what they need.

"In the job market, many companies are looking for people with expertise in both their applied field and in computer science," says Cheng. "There aren't many curricula that provide this kind of training."

Computational science is the new, third leg of a computer education triumvirate emerging nationwide. While computer engineers learn to build computers, and computer scientists learn to program them, computational scientists learn to apply them to the various problems encountered by industry and science. It's the bridge connecting computing tools to the workplace.

Fox, a world-renowned expert in computing, is a leader in the national effort to rethink the way computer experts are educated. Formally trained in mathematics and physics, he headed the supercomputing facilities at the California Institute of Technology until 1990, when he was lured to Syracuse to direct its supercomputing facility, the Northeast Parallel Architectures Center. A key part of his mission here is to establish the innovative computational science program that science and industry desire. Few universities offer courses in computational science, and SU is the only one to offer them to undergraduates.

Computational science has been under development at SU for more than three years and has involved faculty from computer science, computer engineering, mathematics, physics, chemistry, and mechanical engineer-
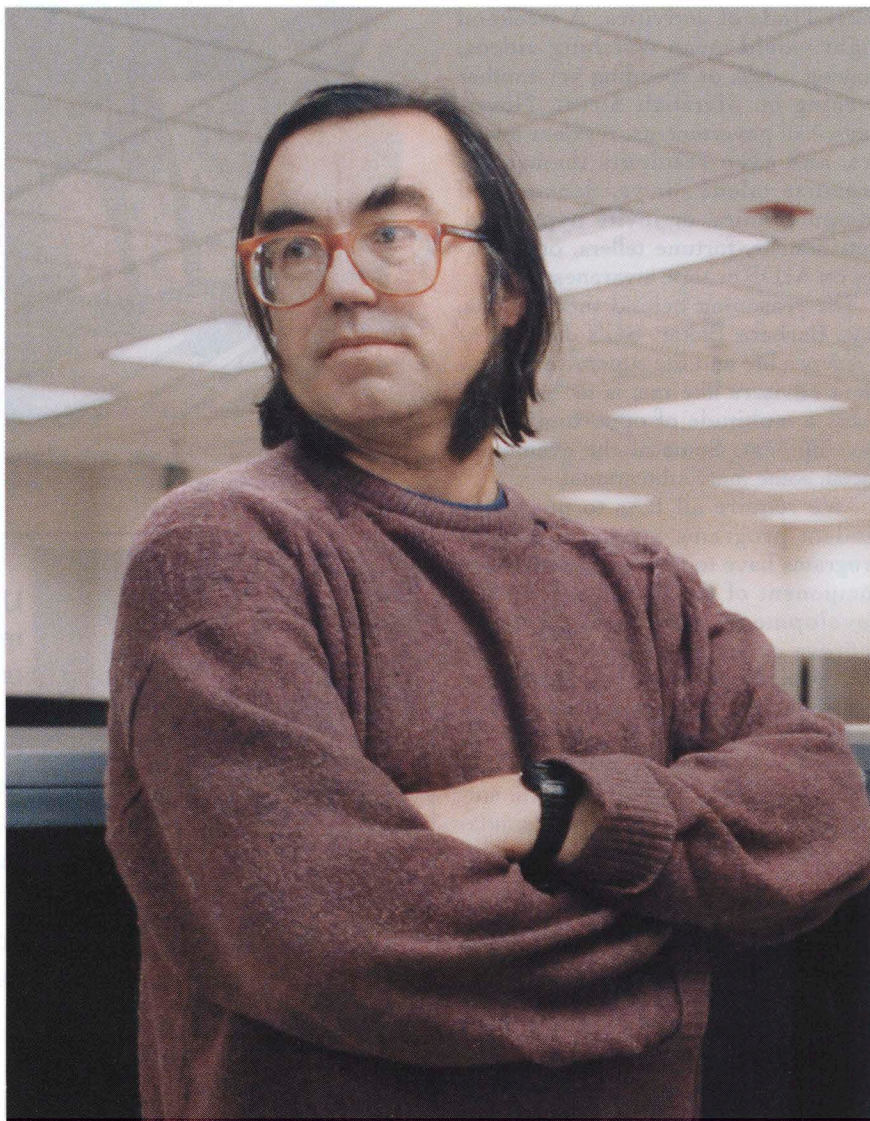
World-renowned computer expert Geoffrey Fox is director of SU's supercomputing facility—the Northeast Parallel Architectures Center—and a leader in the national effort to rethink the way computer experts are educated.

ing. Recently, Fox helped create a computational neuroscience program between SU and the medical school at the neighboring State University of New York Health Science Center. The program trains students in the complementary skills of computation and biology necessary to understand the brain and to use "neural" networks

for practical computations.

SU's offerings, through the College of Engineering and Computer Science, include a concentration in computational science for undergraduates, and certificates for master's and Ph.D. candidates. Programs of study for bachelor's, master's, and doctoral degrees will soon be offered.

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"The field is particularly relevant now because of the pace at which technology is changing," says Fox. "You need close contact between the people who know the technology and the people who use it. You can't get it right unless you have both."

Computational scientists possess a unique blend of skills beyond those of traditional computer scientists. They learn how to solve problems in specific fields of research by combining their computer skills with mathematical representations of the problems. For example, a computational scientist working at Boeing might use computers to simulate the next Boeing aircraft. The scientist might write the languages or algorithms that would make the computer simulation possible. Such a person would probably have majored in mechanical or aerospace engineering while also earning a certificate in computational science.

Because computational scientists can determine the bounds of a vast sphere of technology, SU's academic curriculum focuses on teaching people to use computers, something that computer science and computer engineering have never addressed, says Fox.

"Computer science teaches the theory of computers," he says. "It's like the difference between mathematics and engineering. Mathematics teaches you equations and how to manipulate them. But it doesn't teach you how to apply them to simulate building a bridge; that's engineering. You need computer scientists and computer engineers to build computers and the software approaches to them, but these people traditionally have little connection to the people who use computers."

The problem, says Fox, is that people believe the use of computers is trivial, a matter of technical training. "You teach them mechanical engineering, they take some technical course, and they can use computers properly? That is not the right way to think about it," says Fox. "If a computer is going to be a very important tool—indeed your whole methodology might be based on the existence of the computer—then it would be best to have a deeper knowledge of it."

—*Laurie Root Harrington*

RESEARCH NOTEBOOK

➤ *Brainy Basketball.* Maybe you saw the AT&T commercial on Monday night football during the November 15 game between the Buffalo Bills and the Pittsburgh Steelers. Two SU basketball players were hooked up to an EEG machine that monitored their brain-wave activity while they shot free throws. The demonstration, conducted by two members of SU's physical education department, depicted a pilot study on brain waves and athletic performance.

In search of new methods to help athletes consistently perform at higher levels,

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A study on brain waves and basketball players could result in improved athletic performances.
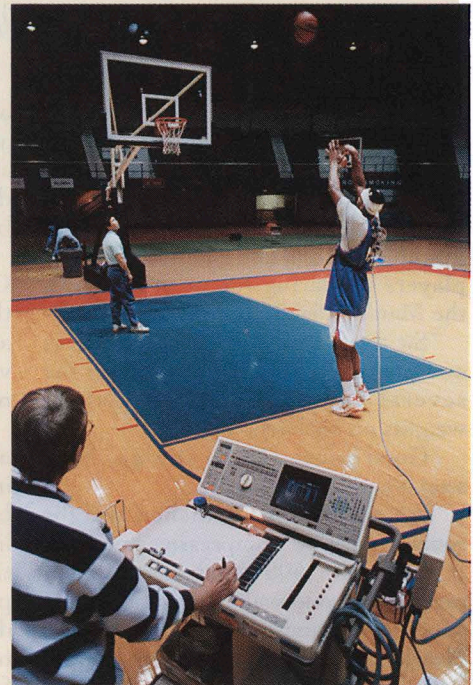
doctoral student Mike Ferrell and assistant professor Barry Copeland are testing the theory that athletes achieve a state of relaxed concentration during alpha brain-wave activity. Of the four primary levels of brain wave activity, it's believed that peak performances occur most frequently while in alpha state.

"Our question is," says Copeland, "is there a relationship between a particular state of consciousness and how well athletes perform when in this state?"

"If we find a correlation," says Ferrell, "then we can start to maintain and develop more alpha in athletes and use it to control proficiency and performance success."

➤ *Musical Editions Published.* Frederick Marvin, professor emeritus of music at SU, recently published his edited texts of several Soler and Dussek sonatas. Marvin's performance of the three Dussek sonatas has also recently been released on compact disc.

➤ *Wolff Wins Literary Award.* English professor Tobias Wolff, author of *This Boy's Life*, was recently awarded The Lila Wallace-Reader's Digest Writers' Award. One of nine authors to receive this $105,000 honor, Wolff will work with the Onondaga County Public Library to develop a program to increase the public's appreciation for contemporary literature.