Name:
Chris Cavello

Major/area of study:
Product Design

Year:
Master's Program, School of Engineering

Hometown:
New York, New York

What's your dream?

"I want to design products that add to the quality of our lives—things that celebrate how we live.

The world is becoming a more and more homogenized place, and products are becoming more and more alike. I want to find a way to create products that are mass-produced, yet look like they were created by a craftsman, not a machine."

What do you do?

"This quarter, I wrote a Macintosh program that changes the design and manufacturing process in some fundamental ways. First, it's highly interactive, which promotes greater exploration in the design phase. Second, it randomizes the manufacturing phase, allowing for variations among the finished products.

Right now, I'm using this program to create spoons—although it could be tailored to create car fenders, bicycle seats, bowls, or anything else. The program randomly chooses from different sizes, scales, and iterations of shapes that are spoonlike—and presents the designer with options. Every time the designer runs the program, it creates a totally different spoon.

This way, designers can explore possibilities that they may not have conjured up in their own minds.

The program is also capable of introducing randomness to the manufacturing process. Traditionally, when it comes to computer-aided manufacturing, designers usually have to give very precise, completely planned commands to drive metal-cutting equipment. This program lets a designer specify loose parameters for a product. Then the computer randomly generates variations within those parameters, and automatically generates the code to drive the metal-cutting machine.

The idea is that a manufacturer can make a product using advanced mass-production manufacturing techniques—but still make each item completely unique."

"...all you have to have is an idea."

What are you most proud of?

"I'm sort of an anomaly at my school. They accepted me into the graduate school of mechanical engineering—but I don't have an engineering background. I have an undergraduate degree in design.

I'd never done any programming before. The idea that I actually wrote software that helps in the design process is what I'm most proud of."

Why Macintosh?

"I've had this idea to introduce randomness, or variation, to the design and manufacturing process for a while now.

But you know, it wouldn't have gone beyond an idea if I didn't have a Macintosh. I think it's amazing that there are tools you can use to do something like this. You don't have to be a technologist or a theoretician—all you have to have is an idea.

Macintosh lets me apply my art school background in a very technical world and get very concrete results."

Software:
- *THINK Pascal by Symantec, programming*
- *Red Ryder, public domain software, communications*
- *Adobe Illustrator, illustration*
- *Aldus PageMaker, page layout*

Name:
Gregory Kovacs, Ph.D.
Assistant Professor of Electrical Engineering
Stanford University

What's your dream?

"My dad's a physician. I distinctly remember, when I was in grade school, he told me that nerves were basically electrical. I wondered then why you couldn't wire those nerves to electronic devices. As it turns out, it's a very complicated, fascinating problem. In essence, my dream is to try to make direct connections from prosthetic devices to the human nervous system, and to learn a lot by doing that—along with my students."

What do you do?

"Basically, we're trying to make an interface between nerves—or what we call 'liveware'—and hardware. The purpose is to create an artificial limb that responds directly to people's thoughts. In essence, letting the human brain control an artificial hand, arm, or leg. It's not a new idea; it's just that the technology keeps getting better and better. And now it's in the realm of the possible.

The main thing we do involves silicon chips that translate between electronic signals and nerve impulses.* So far we've implanted chips in animal nerves and proved that these chips can stimulate a nerve and record signals from it—essentially, talking back and forth to the brain.

In our work, we use Macintosh computers to design chips, run experiments, visualize data, and write up our findings."

Why Macintosh?

"In 1985, I bought one of the first Macintosh computers when I was pursuing my master's degree. I wrote my whole master's report on it. Macintosh lets you be creative—and it lets you easily take advantage of the best programs: writing, drawing, and spreadsheet programs.

Since then, I've been convinced it's the best way to go. You can use it to help you in virtually everything you do as a scientist.

We design silicon chips on it. We simulate how chips perform and spot problems before we actually build them. We use it to control the scientific instruments that take measurements of the chips and nerves we test in the lab. Everything from getting the data during experiments to analyzing that data, from graphing the results to publishing our findings—it all happens on the Macintosh."

Software:
- *Claris FileMaker Pro, database management*
- *L-Edit by Tanner Research, chip layout*
- *Nisus by Paragon Concepts, word processing*
- *Igor by WaveMetrics, Inc., data analysis and graphing*
- *LabVIEW 2 by National Instruments, data acquisition and instrumentation*

What are you most proud of?

"I'm really proud of the people in my lab. I'm proud of everything we create that works. We continue to learn and build on our successes. We're still ten years away from being able to use chips in humans, but we're inspired by the progress we're making."

*This neural-interface project is funded by the U.S. Department of Veterans Affairs

"I use my Macintosh to simulate both analog and digital circuit designs, to ensure that my chip layouts do what they're supposed to do. I also use my Macintosh to connect to the campus electronic-mail and internet services, to send findings to other people on the project."

Name:
Mike Min
Junior
Electrical Engineering
Hometown:
Soldotna, Alaska

"I've interfaced the Macintosh to our lab's instruments. This means we can use it to control the input signal to the chip we are testing, and record the output data. We also use it to graph and analyze the data. These results can then be pasted directly into our scientific and technical papers. The Macintosh greatly simplifies writing papers, grant applications, and other documents."

Name:
Todd Whitehurst
Graduate Student
Electrical Engineering
Hometown:
Nashville, Tennessee

"I'm using the Macintosh to design a set of neural-interface chips. It's ideal for this because, with a large-screen monitor, I can see most of a chip design at once."

Name:
Tom Annau
Senior
Electrical Engineering and Biology
Hometown:
Baltimore, Maryland

"I'm using the Macintosh to gather data about neurological signals. Specifically, we use the Macintosh to stimulate one end of a nerve and then record the response from the other end. We will use the Macintosh computer's data-analysis capabilities to see how well the nerves have regenerated, and how well they conduct signals."

Name:
Daniel Zucker
Graduate Student
Electrical Engineering
Hometown:
Milwaukee, Wisconsin

"I'm involved in the biological testing and evaluation of neural interfaces in living animals. There are a series of holes in the chips we design, so nerves can grow through them. I'm trying to determine the optimal size of the holes and the placement of microelectrodes so the chips can talk to the nerve fibers. I use the Macintosh to design these chips and to record and analyze data from experiments."

Name:
Carl Belczynski
Ph.D., Neuroscience
Hometown:
Brighton, Michigan

"I'm working on a microactuator—on the scale of 30 microns by 500 microns—that will be used to study the electrophysiology of the corneal nerves in the eye. The probe has the ability to apply a small force (0–0.1 gram) in a controlled manner. This will let researchers correlate stimulus force with neural output—and thus gain a better understanding of how the cornea sends signals to the brain."

Name:
Bart Kane
Graduate Student
Mechanical Engineering
Hometown:
Arlee, Montana

"I'm working on a project to micromachine actuators. I'm working on the fabrication of electronically actuated toggling elements, which will be combined to form a miniature 'spine' manipulator that's smaller than the diameter of a human hair. Applications of this technology include electro-optical switching, HDTV, and microsurgery."

Name:
Ron Maynard
Graduate Student
Mechanical Engineering and Electrical Engineering
Hometown:
Sunnyvale, California

"I'm working on a project to determine how the ear senses and encodes sound into neural signals. There are thousands of auditory nerve fibers that transmit signals to the brain. We hope eventually to 'listen in' on several hundred of them at once, to better understand their code. Once we understand how the ear encodes sound, we may be able to replicate that process—and, among other things, help deaf people hear the world around them. I'm using the Macintosh for chip design, for data analysis, and for writing papers about this project."

Name:
Charley Della Santina
Graduate Student
Bio-Engineering
Hometown:
Oakland, California