

"The doors are open," says MECA manager Kirk Alexander. "We're open for business...and really putting technology in the classroom. Not just putting syllabuses on the web, but tackling using the technology to do new things." And doing new things is what MECA, the Multimedia Engineering Computation Atelier, has always been about.

MECA was established in 1996 to support instructional multimedia in the School of Engineering and Applied Science (SEAS) and in academic departments throughout the university. In the past two years MECA has collaborated on projects reaching into dozens of classrooms in fields ranging from art history to ecology and evolutionary biology, comparative literature, and chemical engineering. And the demand for cutting-edge solutions is growing.

This year MECA's staff has been expanded from two to four and a half. And according to Mr. Alexander, "MECA is being called upon more and more to provide leadership in formulating and designing new projects whether or not MECA ultimately implements them." MECA's staff has strong programming skills, enabling technology to be put to use in ways that would be impossible with commercial software products alone, he said. But often, there are issues more complex than the technical ones:

"What is real content? How do you deliver it? How do you reshape it in ways that it can be used in the classroom?"

"How do we change the pedagogy to account for what we can accomplish with the new technology, and how do we prepare the students for what they will be doing with the technology?" These are the important questions Mr. Alexander says he hopes faculty working with MECA can address.

One project developed over the past two years is called Almagest. A networked database, accessible over the Internet, Almagest began by linking descriptions of people, places and objects to images used in art history. Students view images and a wide range of related information using standard web browsers, and faculty can call up slide databases for classroom presenta-

tions. More complex uses of the database build on an interlinked set of tables, tying together images with dozens of attributes. This makes it possible, for example, to view all of the oil paintings located in a given country and commissioned by a particular patron.

Almagest is a versatile tool, currently being used in courses ranging from Theories of Housing and Urbanism, to the Biology of Organisms, and Renaissance Architecture. "If you take the trouble to build your database, and the database structure is strong, then lots of different output modes are possible, meeting different needs," Mr. Alexander points out.

"So the database being there makes it a trivial matter to sequence slides from the database for your lecture presentation," he said. "It is just another matter to tie them all to locations on a big image map and enhance the image map with multiple resolutions." And that is exactly what the Nolli project does.

Giovanni Battista Nolli (1701-1756) was the master topographer responsible for a famous plan of Rome completed in 1748. MECA developed a project with Art and Archeology Professor John Pinto for *Art 320: Rome, the Eternal City* that has placed the famous Nolli map online, and tied it to the Almagest database. The result is a new way to study the map, with its monuments and features linked to a rich collection of paintings, photographs, histories and literary references.

To date, Almagest is a resource MECA has developed together with individual faculty and departments. But there has been increasing interest in seeing the database "packaged as a campus resource." Mr. Alexander said the discussion "is on the table. Should MECA, CIT and all go the extra miles to...make it available so that everyone has access to it all the time? There are major enhancements that you can imagine."

"Classics would like to add a bibliography component, and we'd like to have that draw from a standard resource like our library," he reported. "We'd like to have every faculty member be able to write his own annota-

tions on the bibliography and personalize it...and have that be a campus-wide system."

Seeing one of MECA's projects develop into something commonplace is exactly what Mr. Alexander says he is looking for. "We're trying to look five years ahead," he said. "Princeton students go out of here and they're going to be the leaders no matter where they go. I want to have what is state of the art today ready because it is going to be commonplace five years from now when they are in a position to make a difference." So, if systems like the Nolli map online and the Almagest database are common in another couple of years, MECA's success will have been doing it first.

A new initiative this fall will bring technology right into the classroom for art and archeology students. "They're really supposed to learn either a bit of 2D drafting or 3D modeling to the point where they can be given a simple plan and try to come up with alternate proposals for how a building might have looked," Mr. Alexander said.

"That's a critical piece in how they think, how they learn to do their own presentations, and how they learn to be art historians in the future." Perhaps five years in the future.

Another MECA effort, the Pierc project, demonstrates the accuracy of Mr. Alexander's timeline. The Pierc project takes another approach toward presenting text and images online. Its unique character allows students to view works of art on computer in a simulated, three-dimensional environment. Developed in 1992, before MECA became part of the SEAS and the team was a part of CIT, it originally required a \$100,000 workstation. "It runs on my laptop just fine now," Mr. Alexander notes, only six years later.

"It has only been recently that what is available on the web and the speeds of the computers mean that you can do something other than tinkertoy things," he points out. And this is changing the meaning of multimedia. Today, when MECA gets involved in a multimedia project, it probably involves more simulation than animation.

Initially multimedia tended to mean animations - a movie or story presented in a particular order while the user

watched. Later, there were linked animations, maybe with decision points and more than one possible outcome. But MECA is at the next level, developing simulations for use in the classroom.

Mr. Alexander uses a materials class as a possible example: "You could do with a movie. You could put stress on a bar and watch it break. But, what if you really want to go in and look at how much stress there is, and at what points, all the way along. You have to have all the math in there as well to demonstrate what's actually happening. That's a simulation."

"You have a program with a mathematical model and algorithms that define what happens – and it doesn't have to be discipline specific, you can simulate powerplants, you can simulate automobiles, you can simulate just abstract equations. You're allowed to play with all the inputs, and sometimes you're even interested in adjusting the algorithms in between – and then the results are calculated and presented," Mr. Alexander explains. (see possible sidebar) Simulations are great for teaching when the tools work this way," he said, because demonstrations can follow class discussion. Teachers are not locked into a scenario by their tools; they are free to explore the possibilities with their classes.

There are other multimedia resources available on campus, but MECA is uniquely positioned, within the engineering school, staffed with programmers, to develop new tools for the classroom.

"There isn't enough software today to do what we're capable of with the hardware," Mr. Alexander notes, "especially in teaching. To teach, people have to be able to work in their own ideas, which means it always has to be customizable; the more that it is easy to bend it to your own purposes the more people will use it."

Important educational questions drive MECA onward as surely as advances in technology do. "Commercial programmers are out there trying to build the next big money maker; they are out there hoping to compete with Microsoft; they aren't asking the kinds of questions that are necessarily going to help in the

classroom."

"Where can you go to school and learn how to communicate part of a class on a web page and have the visual presentation be a part of that discussion?" Mr. Alexander asks. "You need to have somebody teach you. In the past we've taught writing courses, now we need to teach writing and graphics design as an integrated concept. I doubt there's a school in the country that does that." Beyond the simulations and the elaborate databases, these are the issues MECA and faculty members address on each project.

Mr. Alexander finds MECA's efforts reflect the priorities of the university. "If we're teaching what everybody else is teaching, we're not doing Princeton students any kind of service," he said.

MECA's role is to develop new tools, but Mr. Alexander emphasizes that is not all. "There is more going on here than just using computers to do what we've always done. So MECA has tried to fill that gap. Along those lines we have an educational role as well."