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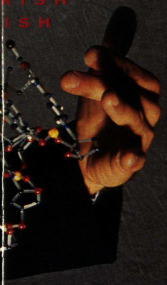

STORIES BY
JANINE LATUS MUSICK

PHOTOS BY
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JOE POLACCO PRANCES AROUND the room, hands overhead, toes dramatically pointed. He leaps less-than-gracefully through the air, urging his male students to copy him as they cavort around a circle of females. When the music stops, each of the male dancers joins hands with the nearest female.

The odd man out—and there always is one—has to sit down.

This is biochemistry?

Indeed it is. It's Professor Polacco's way of demonstrating how DNA segments combine with vectors to create new DNA strands. You see, the male dancers are DNA segments, and the females are DNA vectors—the worker bees that serve as templates for copying a DNA strand. Their joined hands represent the cohesive ends of the DNA molecules. And the music? It's just for fun.

Polacco teaches Biochemistry/Biological Science 101, part of a learning cluster called Exploring Diversity: Humans and Nature. The dancing and other schmaltzy dramatics—he's been known to lip-sync Tony Bennett during a demonstration on using *E. coli* bacteria as a host for foreign DNA—combine with lots of laughter-filled in-class discussion and a whole lot of hands-on lab work to teach students from all over campus the science of genetics.

"We take people who are complete novices and nonmajors, and within a couple of weeks they start playing with DNA," Polacco says. "It can be a little daunting, but I think it's a great medium for getting students to understand the basics of DNA manipulation."

In the lab, engineers, theater majors and future journalists take up the tools and learn the techniques of picking apart and copying strands of DNA.

They're encouraged to ask questions and to learn from their mistakes.

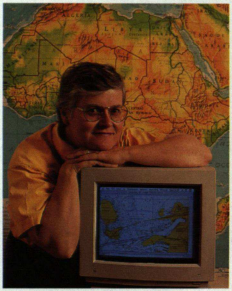
"I try to put a lot of humor into things, praise students when things work, and not use big words," Polacco says. "I think it's important to learn things much like you would in a lab, not so much the tedium and rote, but the unexpected. I hope things don't always work the way they're supposed to," he continues, "because that makes it more exciting."

Polacco is one of the many teachers at MU who stretch their imaginations—and, in his case, hamstrings—finding vibrant ways to reach undergraduates. Their techniques range from the theatrical to the technological. They are performers and explorers, scientists and poets. Above all, they are builders of the next generation.

The faculty's efforts were recognized this year when MU won two prestigious undergraduate teaching awards: the Theodore M. Hesburgh Award from Teachers Insurance and Annuity Association-College Retirement Equities Fund (TIAA-CREF), and one of the first-ever awards given by the National Science Foundation to recognize efforts by science and engineering faculty to integrate research into undergraduates' education.

The Hesburgh award, named after the Rev. Theodore M. Hesburgh, president emeritus of the University of Notre Dame, specifically honored MU's General Education Program. About half of the University's faculty contributes each year to the program, working across disciplines to make sure MU's graduates carry knowledge not just from their chosen field, but from science, the fine arts, literature and mathematics.

Part of that knowledge comes from clusters of courses students are encouraged to take outside their major. "It isn't enough that students be well-trained, they must also be well-educated," says Gil Porter, director of the General Education Program. "We don't want music majors graduating without a course in science, or engineers graduating without a course in drama or music or art or literature. We want all of our students to have the intellectual tools to evaluate the quality of their lives regardless of their vocations."



"Students are often afraid to come in during office hours, but e-mail opens that door. I think it provides for more communication."
—Gail Ludwig

Virtual Geography

Log onto Professor Gail Ludwig's geography course site on the World Wide Web (http://www.missouri.edu/~ludwig) and you will find connections to four classes. Click on the first, the Language of Maps, and you'll see a course description, with links to the syllabus and all assignments. Pick one at random. You'll find a witty description of the day's assignment, with links that shoot you directly to more information. For example, on a day when the class is to meet at a local cemetery to practice map-making, there's a link to the National Weather Service, just in case it rains. On a day when they're to study scale and map-making techniques, there's a link to the U.S. Geological Survey.

But if you're not computer savvy, you don't understand what you just read. That's half of the purpose of Ludwig's course. As part of a cluster on integrating technology in the social sciences, she is trying to push today's students out onto the information highway. "My goal is to get these kids to use the resources that are out there and to be able to use technology in a way that helps them learn," she says.

There are no paper handouts, only e-mail messages alerting students to new assignments or postings they should read before coming to class. Students also rarely come in for office hours. Instead, they send late-night e-mails to Ludwig, who may be sitting up in her home office. "I keep my computer running in the background, and if someone e-mails me a question I hear a ding, and I can get back to them right away," she says.

She once got a message while working late in the advanced technology center on the top floor of the Memorial Union. A student in the downstairs computer lab was mystified by a software problem. "I ran downstairs, worked with him for a few minutes, and ran back up. A lot of people think technology is negative because you don't get as much one-on-one interaction, but I think it's just the opposite. Students are often afraid to come in during office hours, but e-mail opens that door. I think it provides for more communication."

"This is what I call experiential learning. ... When they get to those courses about the underlying components, they'll understand why that information is important."
—Michael Barker

Engineering Effort

Nicole Peltier and Matt Lock, both sophomores, are bent over a map of Arnold, Mo., trying to decide whether a squiggly line is a group of trees or a change in the elevation.

Across the room, four other students are debating where they should bridge a ravine to reach an industrial area. "I'd start with a map and draw in the hills so you can understand the natural drainage," says Michael Barker, an associate professor of civil engineering. "Remember, if you put in a raised road, that impacts the flood plain, which will have an effect on the town next flood season." The students look at him and nod, trying to stretch their minds around the enormous project in front of them.

Barker is orchestrating four teams of aspiring engineers as they design a road to reroute industrial traffic around a residential area in the town of Arnold. But they can't just draw a line on a map. They must account for things like the porosity and depth of the soil, the location and type of bedrock, the movement of water in all seasons, and the type and volume of traffic that the road will carry. Yet the students haven't had any of the courses that would prepare them for this huge undertaking.

"This is what I call experiential learning," Barker says of his Introduction to Civil Engineering Design class. "They're learning by experience. Then when they get to those courses about the underlying components, they'll understand why that information is important."

Last year the class designed residence hall lofts, or elevated beds, that are actually being used this year. First they interviewed students, studied room configurations, and learned the math behind weight limits and bracing. They calculated how much room a student would need to study underneath the loft, the ease of exit in case of emergency, and the most efficient use of wood.

Then they put on their business clothes and made a formal presentation to representatives from Residential Life. The end result: Their designs greeted this year's freshmen, and the engineering students walked away understanding how to work

as a team, how to solve a problem and how to present ideas to clients.

"Engineers are the doers," Barker says. "They employ a knowledge of the mathematical and natural sciences to use the materials and forces of nature for the benefit of mankind."

A Different Light

Physics makes some students' hair stand on end. Literally. At least it does during lectures on electrical fields and static electricity in College Physics II, taught by Associate Professor Paul Miceli.

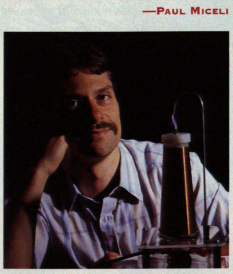
The students in the class are not physics majors. They're not necessarily fascinated with the movements of atomic particles, so Miceli uses real-life examples to capture their imaginations.

"I think it's important to make the course mean something to the students," he says. "Physics can be kind of esoteric, depending on how you approach it. What I try to impress on them is that everything you live and breathe every day has to do with physics."

That's not easy to do in a lecture hall of nearly 200 students. So Miceli sticks with universal examples, like the static electricity that makes your hair stand on end when you remove a hat on a dry day, or the oscillating current that surges through the wires in the wall every time you turn on a light.

"From the times of Aristotle and the ancient philosophers, people have been trying to understand the world in which they live."

—Paul Miceli

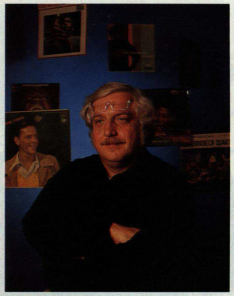


Physics also helps them see things in a new light—or any light at all.

"A part of physics is studying how light is bent through a lens, and the bending of the light affects how you perceive an image," he says. "The eye has a lens, and the students have eyes. So we discuss the anatomy of the human eye and how it utilizes the principles of physics.

"The intro course is fun for me because I get a chance to explain why physics is important," Miceli says. "From the times of Aristotle and the ancient philosophers, people have been trying to understand the world in which they live.

"Physics allows us to address the philosophy of nature in a more precise manner. At a more practical level, our culture is very technical," he continues. "I think it's an important part of education to understand these things. You don't want to go through life believing everything is magic; you want to know why it works."



"Music does not exist in a vacuum, you know. It is part of a society. It is used to express meaning for a society."

—Michael Budds

Musical Passion

Standing in front of a packed recital hall, his gray hair to his shoulders and half-glasses perched midway up his forehead, Associate Professor Michael Budds raves about jazz, tying it to the social, spiritual and political movements of the past 100 years.

"At the beginning of this century, there was Dixieland and Swing," he tells the standing-room-only crowd. "Jazz was entertainment. It was music to listen to while you danced and drank, OK?"

From the '40s on, though, jazz became increasingly political, and jazz musicians became spiritual and social leaders. "In the '60s, the nation had a nervous breakdown. Society wanted FREEDOM," Budds says, writing the word large on the board. "FREEDOM. And so did jazz musicians. Jazz splintered into political factions, just like the rest of the country.

"Music does not exist in a vacuum, you know. It is part of a society," he says, flinging his arms to encompass the world. "It is used to express meaning for a society."

Indeed, in the course of an hour lecture for his course in Jazz, Pop and Rock, Budds ties '60s jazz to Vietnam, the civil rights movement, the baby boom, even actuarial tables. He plays John Coltrane, Stan Getz and Sonny Rollins. He listens intently, head tilted, pointing out what makes each artist different.

"This is something you might want to invest in," he tells the 250 students listening to Miles Davis. "And once again, I invite you to investigate some of these things on your own."

Budds has been teaching or team teaching the course with passion for 14 years. There's been a waiting list since the beginning.

"I have no problem drumming up enthusiasm for this. I love the music I teach," he says. "I have this crusading zeal, and nothing pleases me more than to give someone the materials to enhance their quality of life. Musical experiences and musical knowledge can do that!" ❋