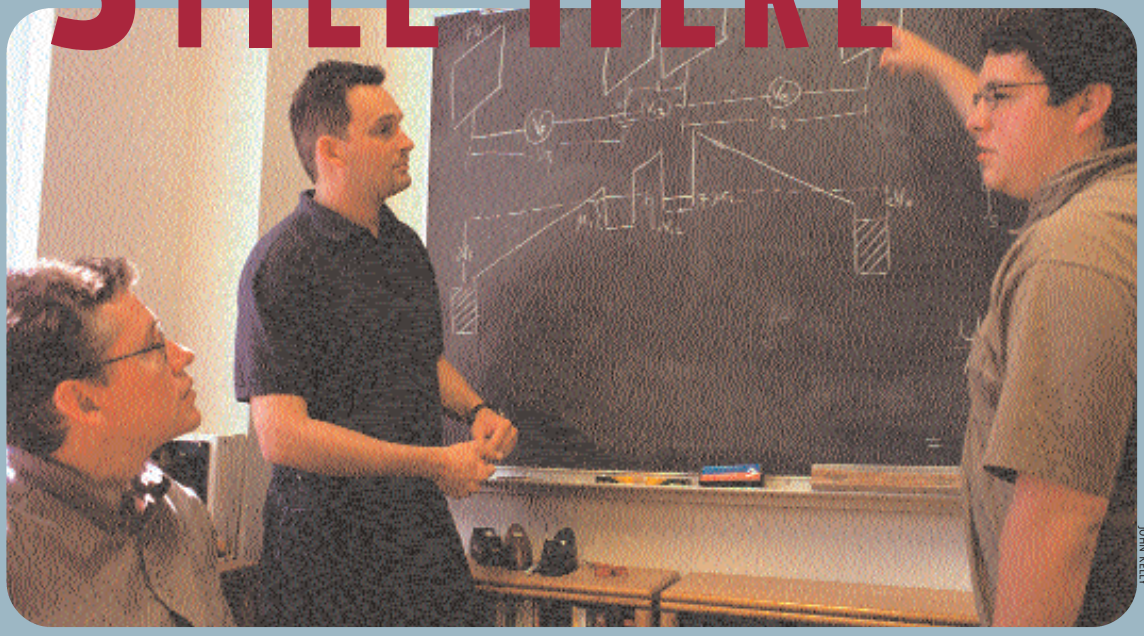
WHY I AM STILL HERE



JOHN KELLY

The author, left, listens as students James Rodriguez, right, and Juan Carlos Díaz-Vélez discuss a model of a nanoscale capacitor they developed.

Conducting research with undergraduates keeps the job fresh

BY CHARLES HANNA

A colleague of mine once asked point blank why I am here at Boise State University. Like many of the important choices in my life — who I married, why and when I had children — the answer is a combination of chance (the physics department at Boise State had one of the few suitable faculty openings in the year I applied) and calculated decision (it offered the balance between teaching and research that I was looking for, and it seemed like a good place to live, work and raise a family). But as I answered my colleague's question, I realized that the more important question is why I continue to stay.

There are several reasons: the encouragement and support of colleagues and the administration in building a vibrant physics research program, successes in pursuing external funding and gratitude to the university for helping me realize a lifelong dream of being a college professor. I like the opportunities to make significant contributions to my department and college, and to the university.

Boise State is a growing institution that is still inventing itself, and there is room for enterprising people with vision to make substantial contributions to the growth and character of the university. I admire the pluck and enterprising character of Boise State, which manages to do so much with so little, and which truly serves the diverse needs of a wide variety of students by offering degree programs that run the gamut from a Ph.D. in geophysics to a vocational certificate in professional truck driving. All of these things are important to me, but there is another hallmark of my career at Boise State that has profoundly affected the way I do research and which has been unexpectedly compelling — conducting scientific research with undergraduates.

In graduate school and in my postdoctoral positions, the researchers I worked with did their research almost entirely with faculty colleagues, postdoctoral researchers and graduate students. Undergraduates never played a central role. I always assumed this was because research in theoretical physics demanded years of preparatory study. My career at Boise State forced me to challenge that assumption and to stretch my research projects to include undergraduates. I have also had to stretch my undergraduates to meet the demands of doing cutting-edge research. Ultimately, I have found that doing research with undergraduates is the art of melding teaching, research and mentoring into a single practice — one that has been unexpectedly rewarding for me both professionally and personally.

"I have found that doing research with undergraduates is the art of melding teaching, research and mentoring into a single practice."

I confess to being very selective about the students who work with me. Part of the reason is practical: my research in theoretical nanoscale physics involves developing specialized mathematical models that describe the group behavior of large numbers of interacting quantum particles. It is very difficult for an undergraduate to make a significant contribution to the research without a lot of mentoring, coursework and preliminary research apprenticeship. During a student's first two years with me, the pace of my research is reduced from what I could accomplish on my own. It is typically only during the student's last year that his or her contribution exceeds the tutoring and supervision required. So I have had to choose my students carefully and work with

HEALTH RESEARCH

.....By SHERRY SQUIRES

Because of the work and enthusiasm of undergraduate nursing students like Shandy Davis, area hospitals know how to better reach out to rural communities — and hopefully improve breast cancer survival rates through early detection.

Davis, a senior, and fellow students Brandi Hinrichs and Jane Loyd, gathered surveys from women in rural areas regarding mammograms, then compiled and analyzed their comments. They then pulled together graphs and charts and drew comparisons, researched what other rural communities were doing and formulated a list of recommendations for Rural Connection, a partnership between Boise State, St. Luke's Regional Medical Center and several rural hospitals. They also attended health fairs and workshops.

"We were looking for things that we could implement at little or no cost that would make a difference," Davis says.

They concluded that translating information to Spanish and encouraging doctors and other health-care providers to discuss mammograms with their patients could mean major strides.

Rural Connection coordinator Connie Smock says the students' efforts greatly enhanced area hospitals' efforts to reach out and will be used in planning.

Davis says for her, the research drove home how important it is for everyone in the health-care system to reach out to patients.

"It made me see that things like hospital discharge planning that might seem routine really are important," she says. "I think just understanding the role research plays and seeing how it translates to making things better is so important."

Professor Cindy Clark says research plays a critical role in nursing education. "It makes the students better nurses and betters all of us as consumers of the health-care system," she says.

The study was funded by a grant from Friends of Nursing, a volunteer group that supports nursing education at Boise State.

Cindy Clark, left, and St. Luke's mammography coordinator Darla Blair, center, run through the basics of a mammogram with Shandy Davis.

JOHN KELLY

only one or two at a time. The other reason I am choosy about students has nothing to do with practical considerations. I like working with engaging people who have interests outside the sciences. Unusual backgrounds or experiences are not required, but they are a plus. Perhaps this is a legacy of my Anglo-Latino working-class heritage.

My first undergraduate research collaborator, Dylan, began at Boise State as a theatre arts major, acted in a movie and worked at several fine Boise restaurants. He had the most colorfully choreographed wedding I have ever attended. He was personable and dedicated, and it was always interesting to work together, including during his long apprenticeship where he learned about physics, computers, modeling physical systems, writing and making presentations. Dylan was my first undergraduate co-author of a very long paper published in the leading journal of condensed-matter physics, *Physical Review B.* His theater background was an asset; he won the award for the best undergraduate presentation in physics at the 1998 meeting of the Idaho Academy of Sciences.

My second undergraduate research collaborator, Juan Carlos, also came from a performance background; he was a professional ballet dancer with Ballet Idaho. He is also a dad. I admire Juan Carlos because of the long road he has cheerfully taken in physics; he started at the very beginning, with Math 025 and Physics 100, and worked his way course by course through vector calculus, quantum physics and advanced computer programming. Juan Carlos and I have so far co-authored four refereed scientific papers, and he has given contributed talks at two meetings of the American Physical Society. Fortunately for me, he continues to collaborate with me during the summer as he pursues his master's degree in computer science.

My newest student, James, came to Boise State through the College Assistance Migrant Program (CAMP), and worked for CAMP as a tutor. I recruited him to work with me while he was still taking introductory physics, and he is just now taking his first course in quantum physics. James is majoring in physics and plans to become a patent attorney. Although usually soft-spoken, he is an outspoken advocate of gay rights. James, Juan Carlos and I are writing a scientific paper based on calculations that James carried out on quantum effects in nanoscale devices.

I have been blessed to work with a remarkable group of talented and interesting undergraduates at Boise State. Although long apprenticeships were needed before they could contribute to my research in theoretical physics, each student has persisted and made valuable contributions. My students' personalities, thoughts and opinions have enriched my life, and working with them has amply repaid the time and effort I have invested in them.

Charles Hanna is a Boise State associate professor of physics.

JOHN KELLY

BIOMECHANICS RESEARCH

By SHERRY SQUIRES

To be called a colleague while still a student is quite a feat. But what Yvette Barrios (above) has accomplished goes far beyond that, her professors say.

"We have not found anyone else who has been able to isolate the growth plate in a pediatric knee," says Boise State mechanical engineering professor Joe Guarino. "Yvette has made a real contribution to the field. It's remarkable."

A senior mechanical engineering major, Barrios' work will appear in medical and professional journals across the country.

It began last May when Boise State's mechanical engineering department assisted a local hospital in creating a model of an infant spine to help surgeons prepare for a delicate operation. Barrios helped produce a plastic, three-dimensional model with the department's rapid prototyping machine.

The surgery was successful and the project helped set the course for Boise State's continuing biomechanical research.

One night last summer, Barrios was "playing and analyzing" and found a way to direct the machine to separate tissue from bone in a pediatric knee and isolate the growth plate.

Barrios went on to develop software that shows a surgeon exactly where to drill during a reconstructive knee surgery to remove the smallest amount of tissue, thus affecting growth as little as possible.

Her work earned her an "Innovator of the Year" award from the Better Business Bureau and accolades from professors and medical professionals throughout the community.

For Barrios, the research solidified her plans to work in the field of biomechanics. The three-year starter on the Boise State women's basketball team says she has always loved the competitiveness of basketball and the mental challenges of math. Her field combines the two.

Barrios says she has worked closely with several professors and credits them with giving her the structure she needed to be successful.

"It was the first time academically I had someone really believe in me."