James Madison University to Eliminate Physics Major, Terminate Contracts

The administration of James Madison University, in Harrisonburg, Virginia, announced on 13 January that it will terminate the contracts of its ten tenured physics faculty in August 1996 and cease offering a physics major as of the 1995–96 academic year. JMU's is the largest US physics program to be eliminated in the last two decades, and the announcement generated intense debate throughout the university and on the other state campuses in Virginia. "It was really a bombshell," said physics professor Raymond Serway.

Douglas Brown, JMU's associate vice president for academic affairs, said that "physics will continue as an important component" of study at the university. Bethany Oberst, JMU's vice president for academic affairs, went further: "I think we're going to come out with a stronger presence of physics within the general education program." JMU's two-year-old interdisciplinary College of Integrated Science and Technology offers courses that contain physics, but the courses are not taught by faculty members of the physics department.

Despite the termination of faculty contracts and the elimination of the major, Oberst insisted, "We did not terminate the physics department." She said an academic program review of the physics department will begin immediately. Brown assured us that "all students currently in the program who are physics majors will be permitted to complete the program."

These actions further a restructuring that has been under way at JMU for the past year and a half. Oberst portrayed the previous dissolution of the human resources development department, whose remaining programs are now affiliated with other departments, as a situation where "positive steps" were taken "to address program redesign and organization." Similarly, she contrasted the physics department with the dance program, which merged with the theatre program into one department—"another example of positive change."

> As the faculty and the administration at James Madison University battle over a restructuring that removes the physics major from the curriculum, physicists elsewhere might ask, Can it happen here?

Calibrating a department

As measured by the number of faculty, JMU's physics department lies in the top 10% of BS-granting physics departments in the US, according to Patrick Mulvey of AIP's education and employment statistics division. The division profiled the nearly 500 physics departments that grant the bachelor's as their highest degree: The average number of faculty is 4–5; the average number of degrees granted each year is 4.5; and the average number of students taking their first introductory course is about 250. For the 11 departments with 10 or 11 faculty members, that last average rises to approximately 475, which is about the number for the JMU department. (The total number of JMU students taking physics courses has been 650–700 in each of the last three years.) The department also teaches an introductory astronomy course that enrolls between 250 and 300 students each year.

How unusual is the removal of a program of this size? According to Mulvey's data, when a physics department vanishes, it is often one that already had existed in combination with another science discipline. Over the last five years, on average two to three departments, with three or four faculty members each, have been dissolved each year. Those departments have typically graduated one or two majors per year. Numbers from the JMU department chairman, H. Kent Moore, show that over the last five years an average of seven students have graduated in physics each year.

JMU's physics department has done more than teach. In a letter sent to the local newspaper summarizing the strengths of the department, Moore, Serway and associate professors Jon Staib and Kevin Giovanetti wrote that detector development research for Virginia's Continuous Electron Beam Accelerator Facility has brought in grant money and "involved ten undergraduate students who have presented at least 15 papers at scientific meetings" over the last five years.

Dollars per student

Ten days after the initial announcement, Oberst released a "Dear Colleague" letter to explain the decision more fully. In it she gave two main arguments. First, compared with other departments at JMU, the relatively low enrollments in the physics department mean "the student–faculty ratios have been very low." Second, the "direct instructional cost per full-time equivalent student taught in physics at JMU is $5838," which, according to the administration's interpretation of results of a "National Study of Instructional Costs and Productivity" conducted by the University of Delaware, is $2109 above the average cost for comparable institutions. Also, said Oberst, the physics department's average cost per student is more than $1000 higher than the JMU department with the next highest cost.

Commenting on the rationale, Bernard Khoury, executive officer of the American Association of Physics Teachers, said that "the need to look at data in an input–output mode has pervasively grown. People are focusing on accountability and are using a narrow production model: You have a numerator and a denominator and you can divide them, but what does it mean?" Oberst herself told us that "this issue is not one of academic quality."

JMU began examining its educational configuration in the fall of 1993, about a year before the state requested the "restructuring" efforts now taking place throughout the Virginia system. Much anger is being directed at the new Republican governor, George Allen, over these events, but according to Beverly Sgro, Virginia's secretary of education, the biennial education budget has varied little over the last six years: $1.242 billion for 1990–92, $1.173 billion for 1992–94 and $1.232 billion for 1994–96.

The second year of the latest budget contains about $23 million less than the first year, but Sgro said that the missing funds should not affect students in classrooms. She did say, however, that the state cannot afford complete "redundancy"—that is, offering every degree on every campus. Sgro told us that she will not get involved in the details of the JMU restructuring because physics is not being removed from the curriculum. "I'd have a major heartburn if they did that," she said.

Squabbles and protests

The JMU administration initially stated that the physics graduation rate over the last two years had averaged five degrees per year, but department chairman Moore said his figure of seven holds true for both two- and five-year averages. This discrepancy over what should be a simple datum illustrates the relationship between the department and the administration.

The administration has issued statements about making a "good-faith effort" to reassign as many of the ten faculty members as possible. Moore saw little evidence of good faith immediately after the original announcement, but was more hopeful four weeks later, after Oberst had met with all physics faculty members individually.

Charges and countercharges were part of the intense debate throughout the university. On 18 January the faculty of the biology department gave its unanimous opposition to the administration decision. On 30 January the mathematics faculty joined them in opposition, also unanimously.

On 23 January faculty members voted 305 to 197 for "no confidence" in president Ronald Carrier's ability to lead the university, and more than 3600 students (of a total population of about 11 000) reportedly signed a petition in favor of restoring the physics department. As of this writing, the administration has stood firm, and Robert LaRose, the rector of JMU's governing Board of Visitors, said that the board "fully supported" the administration and was not planning to reverse the decisions.

Sgro, Oberst and Moore all told PHYSICS TODAY they believed publicity about the difficulty that physics PhDs are having getting jobs influences decisions like the one at JMU—indeed, Oberst called it a "direct result." But Sgro also made a more general comment, independent of the situation at JMU, that perhaps exemplifies the times: "Decisions have to be made about priorities. It's a tough thing to do in education—as well as everyplace else."

DENIS F. CIOFFI

STAT OF THE MONTH

About 450 new physics faculty (not postdocs) were hired at the 747 US physics departments for the 1993–94 academic year. Departments that offer the bachelor's as their highest degree hired about 200 new faculty, as did those who grant PhDs. In the late 1970s, there were nearly twice as many young (under 35) faculty in PhD departments as there were in 1993–94.

	Highest physics degree offered		
Some traits of new faculty, 1993–94	PhD	Master's	Bachelor's
Migrated from other US academic jobs	58%	59%	50%
Migrated from US nonacademic jobs	24%	12%	12%
Earned PhD in US since 1990	27%	50%	60%
Earned PhD within one year of job	8%	25%	35%
Earned PhD outside US (any year)	22%	13%	5%

Source: AIP Education & Employment Statistics division (stats@aip.org).

Inventions Born of Necessity Offer New Tools for the Blind to Study and Do Science

New ways of rendering advanced mathematics are removing a major barrier to the pursuit of science by the blind.

At its heart, science is about observation: looking at things, measuring them, analyzing their properties, figuring out how they work. How then does one proceed when nature's most basic and powerful tool for observing—that of sight—is missing?

To be sure, the blind are not without tools of their own. Speech synthesizers interfaced to personal computers can read text aloud; a blind person can send and receive e-mail and access the Internet with nearly the same ease as a sighted person.

And then there's Braille, the tactile alphabet developed in the 1800s by Louis Braille, in which each letter is represented by a pattern of raised dots. But Braille code, like the more modern computer tools, works best when the material being conveyed is simple—that is, plain text. A not-too-tricky equation can bring even the most clever talking computer to its knees. And even though in principle there's a way to write math in Braille, in practice it's unwieldy for higher math.

That's a situation John A. Gardner, a professor at Oregon State University, knows well. His career in solid-state physics was already well established when, in 1988, he became blind. Adding to the difficulties of adjusting to this loss of sight was having to figure out a way to continue with his work. "If I wanted to read the *Physical Review*," Gardner says, "I couldn't get it in Braille. I could get second-grade textbooks or maybe even a high school algebra book, but nothing that I was interested in." An imperfect solution was to have his assistant, Mark Pretty, either tape-record or type journal articles and other reading material into a computer. The neater solution was to build a better Braille code—or two.

Solving Braille's problems

"Present Braille is very peculiar," Gardner says, explaining some of what he encountered while learning to "read" at age 48. "Blind students have to learn to use one Braille system for math, another for literary things and another for computers."

The existing math Braille code—also known as the Nemeth code, for its creator, Abraham Nemeth—has been around for about 40 years, and in its time it revolutionized how the blind did math. Still, it is cumbersome, and many blind scientists ended up devising their own private notation schemes, which worked just fine until it came time to publish.

"A complicated equation has two-dimensional structures, and those dimensions carry a lot of information," Gardner says. But Braille is linear; a single equation can go on for lines before the equals sign is even reached. Representing numbers is also tough. "Louis Braille made a serious mistake in that regard," Gardner notes. Each number is preceded by a number sign followed by letters. So, for example, "# A C C B" means 1332. "It's very difficult to do algebra that way."