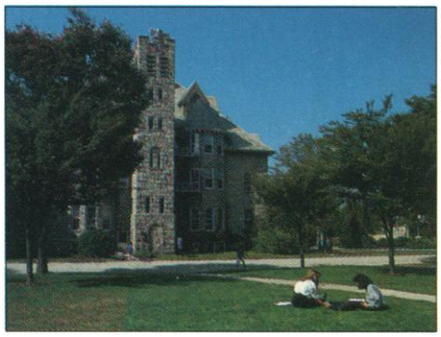
URI Tries Downsizing by Formula

The University of Rhode Island is cutting departments on the basis of a detailed self-audit aimed at preserving the best and the most cost-effective; other universities are watching closely

KINGSTON, RHODE ISLAND—If your lab is in one of the many U.S. universities facing a budgetary crisis, you might want to pay attention to what's happening to plant pathologist Larry Englander. The University of Rhode Island (URI), where Englander works, is in the midst of a sweeping downsizing that many believe could be a model for other hard-pressed schools around the country. Admissions to graduate programs in plant sciences were cut off last fall, a move that Englander says pushed his department "one step closer to oblivion."

Englander isn't alone. After one of the most detailed self-audits ever undertaken by a large university, URI this fall will no longer admit students to 47 undergraduate and graduate degree programs, 16 of them in science and engineering (see table). The audit compared tuition dollars and other revenues generated by each degree program to



NORA LEWIS/URI

the total cost of the resources—especially faculty time—needed to maintain it. Programs running too far in the red became prime targets for cost-cutting suspensions. While no faculty members were fired, the affected professors have to seek new ways to train students and fulfill teaching requirements. And although most URI faculty members admit that something had to be done to shore up the university's crumbling fiscal base—and some have welcomed the changes—many worry that the new strategy will do more harm than good.

That's certainly Englander's view of what's happening to his department. URI President Robert Carothers argued that restructuring this and other small, environment-related programs into a single course of study would help the university recapture faculty time now wasted teaching underpopulated, unprofitable courses. But Englander says it's "a self-fulfilling prophecy. You don't have enough students, so you have to make cuts. But when you rename and rearrange things . . . it hides you from the students you are trying to attract."

Researchers at other institutions could soon be voicing similar concerns, for URI's bold moves are making waves far beyond its wooded campus near Narragansett Bay. Many other universities are trying to become, as University of Michigan Vice President Walter Harrison puts it, "smaller but better." These schools are, however, finding it nearly impossible to cut programs and restructure in the absence of faculty cooperation or detailed data on earnings and expenses (*Science*, 6 October 1995, p. 135). Michigan—with a student body nearly three times the size of its Rhode Island counterpart—is one university that will be watching URI's streamlining effort "very carefully," Harrison says.

Focusing on strength

URI has thousands of students, hundreds of degree programs, a range of cooperative extension programs, and more than 600 tenured or tenure-track faculty members. But after a banking crisis in the late 1980s forced the Rhode Island government to slash support for higher education, it became clear that the university's budget "just would not support that mission any longer," says Carothers, who became president of URI in 1991. His conclusion: URI should transfer resources to fields where it already excels—including oceanography and environmental sciences, nursing and pharmacy, business technology, and family and community studies—by shutting down many programs unrelated to these so-called "focus areas."

NO MORE STUDENTS

Program	+/– Cost to URI $ (thousands)
B.S. Botany	+1
B.S. Statistical Science	0
M.S. Animal and Veterinary Science	–1
B.S. Materials Engineering	–2
Ph.D. Applied Math, statistics track	–3
B.S. Plant Science	–9
Ph.D., M.S. Plant Pathology*	–11
M.S. Entomology	–11
M.S., Ph.D. Plant Science*	–44
M.S. Geology	–72
M.S. Industrial Engineering	–115
Ph.D., M.S. Botany*	–136
Ph.D. Fisheries & Aquaculture	–170

* M.S., Ph.D. programs were analyzed together.

SOURCE: URI

Shrinking by degree. Based on URI's audit, admissions to these programs were ended.

A resistant URI faculty senate, which by law shares the power to create or eliminate academic programs, thwarted Carothers's first few attempts to slim down the university. But last spring—with a $7 million deficit on the horizon for the 1995–96 academic year and a $25 million loss projected by the year 2000—Alvin Swonger, a professor of pharmacology and a member of an informal committee of faculty who supported parts of Carothers's plan, came up with a way around the impasse.

Swonger contended that focusing alone wouldn't improve URI's bottom line. "It wasn't widely understood that the things for which we are known and which are exciting, active areas, such as oceanography and pharmacy, actually lose money," Swonger says, because their courses are relatively small and tend to require costly facilities and equipment. Simply cutting programs unrelated to the focus areas would leave the university even farther in the red, as it would have nothing left but expensive activities. To raise the money to support these central but high-priced programs, Swonger argued, Carothers should use his unilateral authority to suspend student admissions to choke off only the most expensive, expendable degree programs within each existing department, leaving intact programs with lower costs or higher revenues. Faculty members would still be on the payroll to teach larger courses elsewhere in the university, and the school would get more money for faculty time.

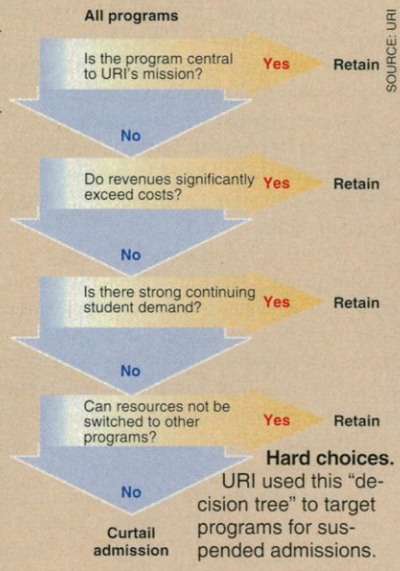
Carothers liked the idea, but there was one problem: No one knew for certain which programs at URI were the most expensive. Says Carothers, "Most academic institutions still run on mythology, half-truths, and bits and pieces of data," and URI was no exception. While Carothers already had figures showing each department's overall budget, what he really needed was a way to measure the profit or loss to URI from particular faculty activities—teaching master's degree courses in microbiology, for example, or carrying out a year's worth of government-funded research.

Swonger and other committee members spent the summer designing what became the Program Contribution Analysis—in essence, a gigantic computer spreadsheet using

How Much Is a Program Worth?

With coffers draining faster than they could be refilled, administrators at the University of Rhode Island (URI) needed to caulk all their financial leaks. But a university is a big, complex place, and no one knew the location of every hole. The solution, says President Robert Carothers, was to go over the place from the ground up, tracking costs and revenues "not only of programs within departments, but down to the level of the individual faculty member's productivity."

A committee of URI faculty members sat down last summer to design the management tool Carothers wanted, the so-called Program Contribution Analysis (see main text). Although complex in its details, the analysis had a simple goal: to find out whether faculty time was being spent efficiently. Here's how it worked for one pseudonymous professor in the Department of Human Development, Counseling, and Family Studies:



Hard choices. URI used this "decision tree" to target programs for suspended admissions.

Workload model. The basic unit of currency at the university is the credit hour. For faculty, each hour of teaching time per week was converted to one credit hour. URI expects each of its full-time faculty members to devote 18 credit hours per year to teaching, and another 6 credit hours to unfunded research, professional development, and committee work. Faculty members who spend part of their time on revenue-generating activities other than teaching, such as sponsored research or administrative service, can obtain a "release" from part of the 18-hour requirement. Professor I. V. Halls, for example, taught a three-credit undergraduate course in the fall semester of the 1994–95 academic year and a three-credit graduate course in the spring. He was granted 6 credit hours of release time for sponsored research, and received another 6 credit hours of release time for directing one of the department's degree programs, for a total of 18 credit hours.

Faculty service contribution (FSC). Once each faculty member's time was accounted for, the total amount of faculty time invested in each degree program could be determined. Credit hours devoted to undergraduate teaching by all the faculty in I. V. Halls's department were summed, as were hours of graduate teaching, research release, and service release. The ratio of each category total to the total number of credit hours generated by the department became that category's FSC. In Human Development, for example, the FSC for the master's degree in family therapy was 0.078, meaning that the department faculty members spent 7.8% of their total time on activities associated with this degree program.

Revenues. Each of the department's programs was credited with generating a share of the university's income from tuition, fees, and state appropriations, as determined from the fraction of the university's total credit hours delivered by each program. The "overhead" portions of research grants to department faculty members were added to the department's direct revenues. In 1994–95, the family therapy master's degree brought $203,000 to the Human Development department.

Expenditures. The department's direct costs (salaries for faculty, graduate assistants, lecturers, and office staff, plus operating expenses and capital acquisitions) were distributed among all its programs according to their FSCs. The department's share of URI's total indirect costs—for university-wide support services such as buildings and grounds, scholarships, athletics, student affairs, and administration—was determined from the square footage of the offices and classrooms the department occupied for items such as buildings and grounds, and from the share of the university's total credit hours it generated for other items. This department share was then divided among programs according to FSC or to the program's fraction of departmental credit hours. Expenses charged to the family therapy master's degree amounted to $251,000.

The bottom line. A program's total revenues minus its total expenses determined its net contribution to URI—what Carothers calls the "return" on the investment of faculty time. The master's degree in family therapy, at –$49,000, would appear at first glance to be a poor investment. But that doesn't mean admissions to the program will be suspended, because URI has already identified family studies as one of its strong suits. I. V. Halls will still have students to teach. Shutting down expensive degree programs that aren't so central, Carothers hopes, will free up money URI can then use to "reinvest" in its premier programs.

–W.R.

data on student enrollment, research income, department expenses, and the allocation of faculty time to calculate the net monetary gain or loss to URI from each degree program (see box). While many faculty members feared the analysis would lead to sweeping cuts, a few welcomed the effort. Faculty senate Chair James Kowalski, a professor of philosophy and computer science, says he tried to persuade his colleagues that "good decisions require good information. What are we supposed to do—hide our heads in the sand?"

The university's most lucrative programs, the completed analysis showed, were undergraduate humanities degrees with large courses and low overhead costs, such as English, sociology, and history. The biggest money-losers were equipment-intensive graduate programs in engineering and the sciences, including chemical and electrical engineering, microbiology, biochemistry, and oceanography. These results, combined with nonfinancial measures—including trends in student enrollment and estimates of each program's national reputation and relevance to the university's focus areas—guided the committee's decisions about which programs should stay and which should go. Explains Swonger, "We wanted to eliminate programs that are losing money, that aren't central, that have low demand, and where we can easily reinvest those resources somewhere else."

Blair Lord, URI's vice provost for academic programs, says the school wants newly student-starved faculty members to work across department boundaries and design new umbrella degrees that will attract more students, such as a proposed Environmental Science degree to replace URI's old graduate programs in plant science, botany, plant pathology, entomology, geology, fisheries, and animal and veterinary science. "If we rearrange programs to be more efficient, the short-term dollar savings are going to be modest, but over a period of several years we'll recapture a large mass of resources," says Lord.

Still, once the cuts were announced, many professors argued these were hardly the "good decisions" spoken of by Kowalski. In the plant science department, which lost both its master's and doctoral degree programs, Chair

Richard Hull complains that the program analysis measured only profitability, not quality or usefulness: "We have one of the best entomology programs in New England. We are extremely strong in vector-borne diseases and pest management. Those quality things don't translate into dollars per faculty."

Other faculty members argue with the numbers. Grant income and student enrollments in the geology department were unusually low in 1994–95, the year of the analysis's financial snapshot, and the department's aging quarters showed up as a $300,000 expense in the analysis even though the building is "literally crumbling," says geology Chair Don Hermes. Real costs are lower, he says, and revenues are higher.

Still other URI faculty members, including accounting Professor Richard Vangermeersch, point to inconsistencies in the assumptions behind the analysis. For example, the analysis spread the costs of university-wide services among departments according to the number of students each taught. It spread those costs among programs within departments, however, according to the amount of time faculty members devoted to courses in each program. As a result, in departments such as psychology—where faculty members teach a few large undergraduate courses but spend most of their time teaching small graduate courses—each graduate program appeared to suffer "unbelievable deficits," says Vangermeersch.

Not everyone is displeased, however. "After years of living with financial instability," says paleontologist David Fastovsky of URI's geology department, which lost its master's degree program, "many faculty members were open to the fact that some changes do need to take place." And at the faculty senate's request, Carothers gave each department a chance to review the program analysis and make an argument against proposed suspensions. Several programs, including biochemistry and microbiology, won reversals.

This drama is likely to be played out again on other stages, as variations on URI's efficiency experiment are under way in many states. As part of its Priorities, Quality, and Productivity project, or "PQP," the Illinois Board of Higher Education is comparing instructional costs at each of Illinois's state universities to state averages for each discipline and recommending specific cost-cutting measures and program shutdowns. Private research universities, including the University of Rochester, Duke University, and Washington University in St. Louis, are now gauging the productivity of their own faculty members through a similar comparison of departmental data.

Whether research universities can push faculty productivity upward fast enough to offset continuing decreases in funding will mainly be a matter of ingenuity and clever coaching. It's unclear, however, how long faculty members will remain willing pawns in all this money-minded strategizing. "When someone working more than full-time is asked to account for his time as if he's not working hard enough, it's a little demoralizing," says URI's Fastovsky. "Ultimately you have to ask yourself whether education is a business, and whether business management practices reflect what it's about."

–Wade Roush

ECOLOGY

Deliberate Flood Renews Habitats

The Colorado River at Vesey's Paradise, Arizona, where waterfalls cascade down limestone walls, is usually a clear emerald green. But beginning on 26 March, it turned the color of chocolate milk as a flood wave deliberately released from Glen Canyon Dam surged downstream, lifting and churning river-bottom sediments. The flood was a challenge for experienced boaters, who rode the river at nearly triple its average flow. But the week-long surge was actually a $1.5 million ecological experiment designed to test the idea that controlled floods are to river ecosystems what prescribed fires are to forests—a means of rejuvenation. "This is the first time, on a large river, that we have actually attempted to restore some of the dynamic range of flows for the protection and maintenance of ecological resources," says Edmund Andrews, chief of the River Mechanics Project for the U.S. Geological Survey (USGS).

JEFF SORENSEN/ARIZONA GAME AND FISH

Snails' place. Biologist prepares to gather and move amber snails before the flood.

Some 100 scientists were stationed along a 390-kilometer stretch of river from the dam through the Grand Canyon, and they quickly tallied early results: Sediment swept up by the flood built or rejuvenated hundreds of sand bars, adding anywhere from 0.5 to 3 meters to their height. Now the waiting game begins, as researchers see whether the resculpted riverbanks prove more hospitable to the Colorado's endangered species—and how long the new habitats persist.

Beach growth. Before and after photos show sand deposition.

Glen Canyon Dam began impounding water in 1963, transforming the Colorado River from a muddy, turbulent, desert river into one that is clear, cold, and controlled. It cut the river's annual peak discharge from nearly 2700 cubic meters per second to a quarter of that today. These unnaturally low flows have drastically reduced the river's ability to carry sediment. Before the dam, floods would periodically sweep up sediment deposited in the Colorado's main channel by its headwaters and tributaries. As the high water subsided, the sediment would settle out to form beaches and sandbars. But without the floods, these deposits and the slack backwaters they created—the nurseries for native fish—have slowly vanished.

Scientists at the USGS figured that a controlled flood, created by running all of the dam's eight turbines at full throttle and opening its four jet tube outlets, could churn up the sediments again and rejuvenate the beach habitats. In collaboration with the Bureau of Reclamation and the National Park Service, they released 1200 cubic meters per second from Lake Powell for seven straight days. As the flood wave traveled downstream, the USGS monitored water velocity, river rise, sediment transport, erosion, and water chemistry.

One surprise, said senior USGS hydrologist Mark Anderson, was how quickly the beaches were rebuilt. While computer models had suggested that the beaches might grow steadily for 6 days, most of the deposition took place within the first 40 hours. That's an exciting find, says Anderson, because it means that future floods could be much shorter and still rebuild beaches. "We now have more tools in the management box," he says.

Now scientists want to see whether endangered species—in particular a fish called the humpback chub—move into the rejuvenated habitats. The chub is the only native fish that persists as a reproducing population in the Grand Canyon. But it faces a hostile environment: The dam has cooled the river, and the sun-warmed backwaters that young chub rely