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### **5 College Majors On the Rise**

*By Karin Fischer and David Glenn*

For the most part, tomorrow's bachelor's-level majors will look very much like those offered by colleges today. But in interviews with *The Chronicle*, academic experts, business analysts, and economic forecasters helped identify five emerging areas of study.

Some new majors arise in response to student demand, while other degree programs are meant to provide an industry with workers. Many cross disciplinary boundaries, such as combining environmental science with agriculture or bringing together chemists and computer scientists.

"Most of the interesting work today is done at the interstices of disciplines," says Robert B. Reich, a former U.S. labor secretary and a professor of public policy at the University of California at Berkeley.

Here is a look at five up-and-coming majors you are likely to see at more colleges in the coming years.

#### **Service science**

On the average day, the typical American uses services 40 times, from turning on the faucet in the morning to turning out the lights at night. "The new service economy is not just people flipping burgers," says Roland T. Rust, executive director of the Center for Excellence in Service and a professor of marketing at the University of Maryland at College Park.

Although the service sector makes up fully 80 percent of the economy, there has been little effort to study service as a science or to prepare workers who can improve productivity and increase innovation in the sector.

That's changing. Now 250 colleges and universities in 50 countries offer degrees or courses in a nascent field known as service science, management, and engineering. A coalition of companies, universities, and research institutions is developing content standards for such programs, says James C. Spohrer, director of global university programs at IBM, one of the lead partners.

So far, most of the offerings are at the graduate level. But a pair of undergraduate programs at U.S. institutions highlight two approaches to the study of service.

The University of Wisconsin-Stout's bachelor's of science in service management takes a business-centric tack. Students take courses in service operations, service marketing, and electronic services, says Joseph W. Holland, the program director, and typically go on to management-track jobs in fields such as finance, hospitality, and information technology.

Service-systems engineering at Michigan Technological University is more akin to industrial engineering, says Dana Johnson, an associate professor of operations management who teaches in the program, which focuses on service instead of on the production and manufacture of goods.

Graduates, the first of whom will earn their degrees next spring, could find ways to streamline emergency-room operations at hospitals, shorten lines at bank-teller windows or tollbooths, or improve the delivery of products worldwide. One of the biggest potential service-engineering challenges, says Amlan Mukherjee, an assistant professor of civil and environmental engineering, could come with the passage of health-care-reform legislation.

Mr. Spohrer, of IBM, argues that future programs need to more closely link the business and engineering approaches to service to prepare "deep problem solvers" who understand the economic, human, and technical dimensions of complex systems.

### **Health informatics**

There are few attention grabbers like a pledge of \$19-billion.

That's the amount included in the economic-stimulus package passed this year to computerize every American's medical records by 2014. Some of the federal funds will go to doctors and hospitals, but a share will go to colleges to train health-care workers who will use the electronic databases.

"I talked to three programs just yesterday," says Claire Dixon-Lee, executive director of the Commission on Accreditation for Health Informatics and Information Management Education. The commission has accredited 270 programs, including 53 at the bachelor's level, and Ms. Dixon-Lee expects the number to rise to 300 by the year's end.

With the proliferation of degrees has come great variety in the curricula and even in what such course work is called, Ms.

Dixon-Lee says. Health-information management has been around for decades, with bachelor's-degree programs at institutions like East Carolina University that train medical-records administrators and librarians.

But the move to bring those records online has led to significant curricular changes. The digitization of medical information has spurred growth in data analytics. Walgreen's headquarters, near Chicago, employs eight people in health-data analysis, Ms. Dixon-Lee says.

David D. Potenziani, senior associate dean for planning, coordination, and administration at the University of North Carolina at Chapel Hill's School of Public Health, says he hears regularly from physicians and hospital directors who want to hire information-technology workers with a strong understanding of health-care delivery systems, and from public-health agencies who need specialists who can make sense of data, such as medical-reimbursement records, to ground policy recommendations. The university is considering what kind of health-informatics program it might offer.

"We're drowning in data," Mr. Potenziani says, "and we don't know we're wet yet."

### **Computational science**

What does the design of a potato chip have to do with weather forecasting? Both are products of computational science, the use of computer modeling and simulation to advance other fields.

Computational science is sometimes confused with computer science, says Robert E. Tuzun, an associate professor and chair of computational science at the State University of New York College at Brockport. But in computer science, the computer is the object of study, Mr. Tuzun says, while in computational science, the computer is the tool.

Meteorologists and atmospheric scientists use computer modeling to predict weather, study severe storms, and better understand climate change. In biology, computers are used to map the functions of different organs, learn about genetic abnormalities, and help conceive new medicines. Companies have used computational analysis to increase the absorbency of disposable diapers and to tweak the shape of potato chips so they drop into packages rather than fly off the conveyor belt.

"It's a modern way to solve problems," says Rubin H. Landau, emeritus professor of physics at Oregon State University, who

started the computational-physics program there. (See article, Page A14.)

Programs typically include advanced mathematics, computer science, and simulation and modeling, along with courses in specific scientific fields, like chemistry or engineering. Indeed, a number of current undergraduate programs, like the one at Oregon State, are focused on particular fields of study or are offered as concentrations or minors.

### **Sustainability**

Colleges across the country have embraced sustainability, seeking to make their campuses more environmentally friendly. Now, spurred in large part by student demand, colleges are greening their curriculum, too: Some 70 institutions have sustainability-related academic programs, according to the Association for the Advancement of Sustainability in Higher Education.

There is no single approach to a sustainability degree, says Julian Dautremont-Smith, the group's associate director. Some colleges have married sustainability studies with traditional liberal-arts majors, like economics, while others have developed green architecture and business degrees. Still other institutions prepare graduates to become sustainability scientists or environmental professionals. And beginning last fall, students at the University of New Hampshire can enroll in an undergraduate program in ecogastronomy, combining the fields of sustainable agriculture, hospitality, and nutrition.

The federal government has also gotten involved. This spring NASA awarded \$6.4-million in climate-change-education grants to higher-education groups, as well as elementary and secondary educators, that make use of the agency's earth-science data and resources. One recipient, the National Council for Science and the Environment, a nonprofit group, is crafting a virtual tool chest of lesson plans and resources for colleges interested in teaching about climate change.

At Unity College, in Maine, the three-year-old program in sustainability design and technology has a practical bent. "We didn't want to take an ivory-tower approach," says Michael (Mick) Womersley, the program's coordinator and an associate professor of human ecology. "We focused on jobs that are being hired for, now."

The major is heavy on applied skills, like learning how to assess the feasibility of installing wind turbines, and is grounded by a core of physics, biology, and math. Mr. Womersley expects that his students—he has 12—will go on to become energy auditors,

environmental-compliance officers, and sustainability coordinators, as well as enrolling in related graduate programs.

## **Public health**

In a 1987 essay titled "Epidemiology as a Liberal Art," David W. Fraser, who was then president of Swarthmore College, argued that the study of public health offered an ideal way to teach about medicine in an undergraduate setting.

Two decades later, Mr. Fraser's essay seems prophetic. At least a dozen institutions have recently created undergraduate public-health majors. (Some of these, including fledgling programs at Yale University and the University of Virginia, are five-year hybrids that lead to both a bachelor's and a master's degree in public health.) Between 2003 and 2007, the number of bachelor's degrees awarded in public health doubled, increasing from 1,322 to 2,639.

"What I like about this major is that it will give me the science background I need to go into almost any health field," says Sarah D. Ali, a junior in the University of South Carolina's bachelor-of-science program in public health, which enrolled its first students in 2008. (See article, below.)

The major will almost certainly continue to expand. But there may be a natural ceiling on its growth, says Richard K. Riegelman, a professor of epidemiology at George Washington University. Dr. Riegelman is a prominent advocate of undergraduate public-health education. His enthusiasm, however, focuses on minors and concentrations in public health, which have exploded recently. At least 100 institutions now offer such minors, according to a 2008 survey by the Association of American Colleges and Universities.

"The major itself is trickier," Dr. Riegelman says. "Institutions without graduate programs in public health generally don't have the infrastructure to support a major. ... And there still isn't a solid sense of how to articulate course requirements between the undergraduate majors and M.P.H. programs." (The master's-level programs generally require upper-level courses in statistics, public policy, and research methods that go beyond anything in the undergraduate majors.)

But G. Thomas Chandler, dean of public health at South Carolina, says he expects such programs will continue to sprout. "Our undergraduate courses are very well subscribed," he says, "and I've gotten a lot of positive feedback from students. They see public health as something relevant. And the national health-care debate has helped us immensely."

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