

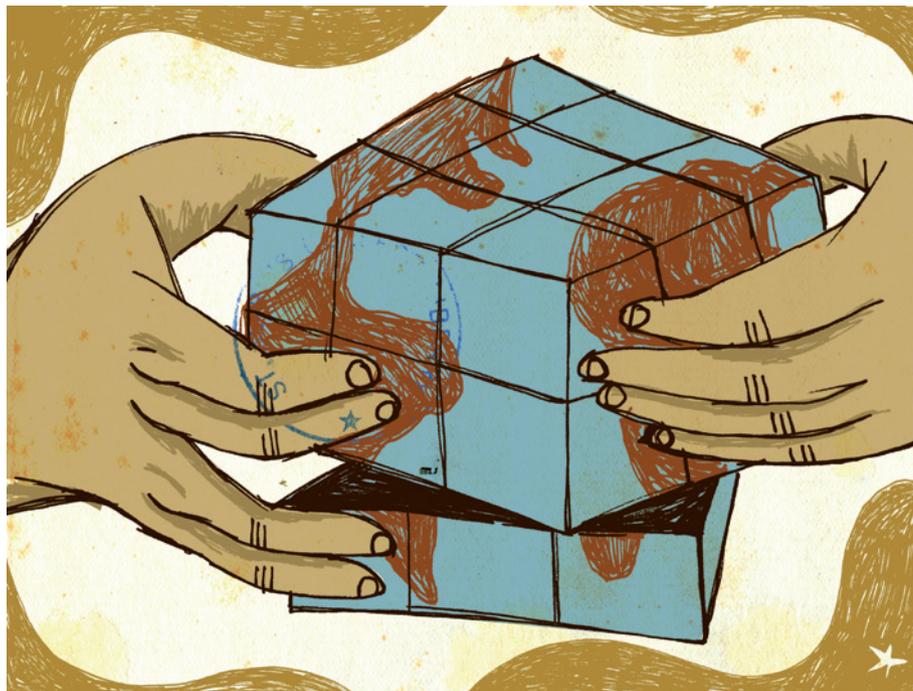
CAREERS

RECRUITMENT Survey reveals that many drug-makers plan to hire **p.509**

UNIVERSITIES Institutions ditch European Commission ranking scheme **p.509**

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SUSTAINABILITY

Environmental puzzle solvers

Sustainability training is on the rise, and institutions are working out how best to translate it into marketable skills.

BY AMANDA MASCARELLI

Just hours after defending his PhD dissertation, Thaddeus Miller was celebrating over drinks with his wife and adviser when he got a call. Portland State University in Oregon was offering him an interview for an assistant-professor position. The university's Nohad A. Toulan School of Urban Studies and Planning was "looking for someone who thinks about urban sustainability not just in terms of research but in terms of practice", says Miller. He got the job.

Miller, an environmental social scientist, was one of the first PhD graduates from the School of Sustainability at Arizona State University

(ASU) in Tempe. Established in 2007, the ASU PhD programme was one of the first in the world devoted to sustainability — using interdisciplinary approaches from fields such as Earth and environmental science, conservation biology, engineering, economics and urban planning to maintain ecosystems, the environment and natural resources. But in the past few years, colleges and schools focused on the subject have sprung up (see "The many ways to get sustainable"). In principle, sustainability training helps engineers and scientists not only to produce better materials, but also to understand the social impacts of their work.

The approach to teaching sustainability varies from institution to institution. And the

very concept has met with some scepticism. "There's definitely some risk in doing these types of programmes, both broadly for the programme and also for the individual," says Miller, who endorses the approach but notes that some employers are circumspect about the value of a sustainability degree. Among academics too, he says, there is still some cynicism. Is 'sustainability' merely a buzzword, or can it be a legitimate foundational concept for graduate education?

Programmes that are not grounded in traditional core disciplines make some people wary. But in principle, sustainability allows the pursuit of innovative approaches to environmental and societal challenges. Students attracted to sustainability programmes are often those who relish jumping between disciplines and enjoy considering how science can inform decision-making.

NEW APPROACHES

Some schools are weaving sustainability thinking into the fabric of their institutions, beginning at the undergraduate level. Others offer graduate programmes that remain largely disciplinary, yet encourage their students to cross disciplinary boundaries through extra-curricular projects. Yet others, including the ASU School of Sustainability, are still evolving.

These programmes all face a similar conundrum: how to make the interdisciplinary approach not only substantive, but also practical for early-career scientists. "We need to train ourselves at being effective at being broad," says Charles Redman, an urban ecologist and the founding director of the ASU school. "Broad is not shallow. We need excellence in bringing things together and doing interdisciplinary collaborative work."

To that end, the School of Sustainability has proposed eschewing specific subjects in favour of core competencies such as working in teams, systems thinking (which includes understanding feedbacks, cascades and unintended consequences) and understanding how values affect policy and decision-making.

The school offers two-year master of arts and master of science degrees, a PhD and an undergraduate major and minor. It will also launch a master's degree in sustainable solutions with a business focus later this year. One graduate worked with local government, non-governmental organizations and others to help the city of San Juan in Puerto Rico to adopt more sustainable practices; a current PhD candidate is working on high-school teaching strategies ►

► that encourage sustainable thinking.

Some programmes that promote sustainability have augmented, rather than abandoned, their disciplinary approaches. For example, the University of Washington in Seattle runs a graduate certificate in Environmental Management that complements the research of students doing other graduate degrees. The students form multidisciplinary teams to tackle real-world problems presented by local, federal or tribal governments under a timeline and with specific 'deliverables' such as providing cost estimates for reducing a city's carbon footprint.

Even though disciplinary boundaries are observed, some departmental barriers have been broken down. In 2008, the University of Washington brought together its marine, Earth and atmospheric departments under the umbrella of the College of the Environment to encourage cross-communication, says Lisa Graumlich, dean of the new college. "We now have a much easier way for a graduate student interested in climate change to assemble the coursework, the mentors and the professional

opportunities that bring together the dynamics of the Earth system — how the atmosphere interacts with the ocean, and how that has feedbacks with the biosphere," she says.

The Institute for Advanced Sustainability Studies in Potsdam, Germany, takes a similar approach. "The PhD itself generally stays relatively disciplinary but [the students] are in an environment where they can bring an interdisciplinary twist to it," says atmospheric scientist Mark Lawrence, a scientific director at the institute. About half of the organization's 100 scientists focus on sustainability related to climate and atmospheric science.

Crossing disciplinary boundaries is acceptable at some German universities but frowned on at others, says Lawrence. And students sometimes shy away from pursuing interdisciplinary tracks out of concern that such qualifications might not carry enough weight on their CVs, he says. "We have the challenge of developing the incentive structures and recognition so that people understand the value of interdisciplinary research."

Fledgling programmes are attempting to

ENVIRONMENTAL OPTIONS

The many ways to get sustainable

Sustainability is taught using a variety of approaches. Here are a few of them.

- The Education for Sustainability Programme at London South Bank University offers postgraduate courses focused on communicating and raising awareness about sustainability. They are held online and are open to students across the globe (see www.efscommunity.t83.net).
- The Patel College of Global Sustainability at the University of South Florida in Tampa last year launched a sustainable-tourism track for its master's degrees, owing to demand from firms such as the Walt Disney Company, Royal Caribbean and Hilton Hotels and Resorts, says Kalanithy Vairavamoorthy, dean of the college. Sustainable tourism is meant to promote environmental and cultural awareness, he adds.
- Colorado State University in Fort Collins launched its School of Global Environmental Sustainability in 2008, and offers an undergraduate minor starting with a class called Foundations of Environmental Sustainability. The school is piloting a graduate-level course and planning a graduate curriculum.
- The Golisano Institute for Sustainability at the Rochester Institute of Technology in New York opened in 2008 and offers master's and PhD programmes in sustainability and architecture. A 7,800-square-metre, four-storey main building that opened

last month includes eight laboratories for sustainability-technology instruction.

- The Monash Sustainability Institute at Monash University in Melbourne, Australia, launched its PhD programme in 2009 and graduated its first PhD student in 2012. The institute is also designing a master's degree in sustainability.
- The College of the Environment at the University of Washington in Seattle offers more than ten graduate degrees for master's and PhD students as well as graduate-certificate programmes that cut across disciplines but focus on environmental issues.
- In January, the University of Michigan in Ann Arbor launched its Dow Sustainability Fellows Program, which will provide 40 master's and professional-degree students with US\$20,000 each for a year to do an interdisciplinary sustainability project.
- Portland State University in Oregon offers graduate certificates in sustainability and urban design, as well as certificates with a sustainability bent in transportation, hydrology and property development.
- A smattering of US liberal arts colleges are also approaching sustainability training. For example, Green Mountain College in Poultney, Vermont, offers multiple online graduate programmes including a master's of science in environmental studies, a master's of science in sustainable food systems and a master's of business administration in sustainable business. **A.M.**

establish graduate concentrations or sustainability degrees that have the rigour demanded by potential employers. To ensure that its graduates walk away with useful skills, the Patel College of Global Sustainability at the University of South Florida in Tampa undertook a six-month consultation with other colleges and relevant stakeholders — ranging from the Tampa Bay Regional Planning Council to Tampa Electric, the Sierra Club — an environmental organization based in San Francisco, California — and the International Ecotourism Society in Washington DC.

The discussions allowed the college to get down to the “nuts and bolts” of the expectations and requirements that employers have for students with a sustainability degree, says Kalanithy Vairavamoorthy, dean of the college. Desirable skills include systems thinking, strategic planning and return on investment for sustainable practices — which entails evaluating environmental performance (for example, gauging water and energy use and pollution loads), economic performance (such as efficiency gains) and social performance (including gains in green jobs). The college’s master of arts degree offers three concentrations: water, sustainable tourism and entrepreneurship, with courses covering topics such as sustainable business practices, environmental management and communicating the value of sustainability.

SUSTAINABLE CAREER PATHS

Although unconventional, sustainability training has job potential. University of Washington graduates, for example, have been offered employment in local government, national agencies and universities. They might advise on smart-grid electrical technology and energy-use issues, or work in fisheries assessment or on clean-water issues, says Julia Parrish, associate dean for academic affairs and diversity at the College of the Environment. “They can point to a specific product they’ve done in graduate school,” says Parrish. “It lands them jobs and internships. It’s a fabulous way for students to gain that breadth and real-world sustainability and environmental-science experience while still becoming experts in their disciplines.”

Parrish says college directors were careful not to limit their graduates by establishing jack-of-all-trades degrees. “When we talked to employers, whether they’re top-tier universities, federal labs or large environmental non-governmental organizations,” she says, “they said ‘we want disciplinary experts with cross-cutting skills in communication, problem-solving and leadership.’”

James Thorson, now a population ecologist with the US National Oceanic and Atmospheric Administration’s National Marine Fisheries Service in Seattle, did a PhD in aquatic and fisheries studies at the college. Alongside his degree, he also conducted a

team-oriented project with a real-world business bent: he worked with the Washington Restaurant Association in Olympia to develop standards and guidelines for restaurant sustainability. Thorson focused on energy-efficient lighting, which pushed him out of his area of expertise and into one with varied stakeholders. He learned about everything from environmental auditing and certification programmes

“Broad is not shallow. We need excellence in bringing things together.”

to project management. Later, he used these skills in an outcomes assessment for the Marine Stewardship Council, an international organization based in London that establishes standards for sustainable fishing. Making the transition from research to team-based projects is a big jump, he says. “It requires a ton of skills that graduate students don’t learn when working individually.”

Tischa Munoz-Erickson, a research social scientist with the US Forest Service in Flagstaff, Arizona, who last year graduated from ASU with a PhD, says that she and many of her fellow students worried about the number and type of positions they would find upon graduating. But she has seen plenty of demand. “There’s such a need for people with this range of skills,” she says, citing problems such as climate change and water management, which require a knack for collaborating with multiple stakeholders and an expertise in a variety of subjects.

As a PhD student, Munoz-Erickson worked on urban sustainability with the Forest Service and San Juan Urban Long Term Research Area, an interdisciplinary network of scientists in Puerto Rico. She landed her current job shortly after she graduated. The ASU School of Sustainability, she says, taught her how to speak fluently to people in various social- and natural-science disciplines; showed her the limitations of science in informing policy; and prepared her to talk to ecologists, economists and geographers. “When fleshing out what makes a city sustainable or vulnerable, natural and social scientists realized that they had different meanings for these terms and that they valued things about the city differently,” says Munoz-Erickson. As part of her PhD project, she helped to facilitate collaborative meetings to develop a common vocabulary.

“With interdisciplinarity, I find it’s not so much that you’re knowledgeable about all these disciplines,” she says. “It’s about learning the way other disciplines think and their assumptions and methodologies. By looking at your problem from all these different perspectives, it enriches the way you do your own work.” ■

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RECRUITMENT

Biomedical hiring

Many biopharmaceutical companies plan to hire scientists in the next three years, according to a report published on 4 February by the PwC Health Research Institute in Washington DC, part of London-based professional-services firm PwC. *New Chemistry: Getting the Biopharmaceutical Talent Formula Right*, which is based on surveys of company executives and recruiters, finds that 72% of drug-makers plan to boost their research capacity in the next 12 months by hiring scientists, creating partnerships or improving infrastructure. The results of the survey suggest that jobs will grow by about 30% among US medical scientists, biochemists and biophysicists by 2020. Responding companies want recruits who can develop and manage external partnerships, and who know about regulatory science, bioinformatics and outcomes research. Early-career scientists looking for opportunities need to “think about the entire value chain that leads to the development of a drug or medical device”, says Christopher Khoury, a senior manager at the Health Research Institute and lead author of the report.

UNIVERSITIES

Ranking – system doubts

Members of the League of European Research Universities (LERU) do not plan to support the U-Multirank university ranking system launched last month by the European Union (see *Nature* 494, 273; 2013). LERU, which is based in Leuven, Belgium, and represents 21 universities across the continent, objects to what it calls a lack of reliable and objectively verifiable data in U-Multirank, problems in comparing institutions between countries, the temptation for universities to change policies or practices to improve their rankings and the burden on universities to collect data, says Kurt Deketelaere, secretary-general of the league. He says that such problems plague all existing university ranking systems, and notes that LERU pulled out of a U-Multirank advisory group in 2010 because its concerns were not addressed. “Since then, we have not seen any evidence of a substantive change of course which could lead us to revisit that decision,” says Deketelaere. Individual member universities can still participate in the programme if they choose, he says, but he notes that none has opted to join so far.