CLIMATE OF OPPORTUNITY

Awareness about climate change is at an all-time high. Will this surge of attention translate into more jobs for climate scientists? **Amanda Haag** reports.

With global warming gracing covers from *Rolling Stone* to *Sports Illustrated*, it is clear that extreme weather, climate change and environmental concerns have penetrated the mainstream psyche in the United States. Terms such as 'green', 'sustainable', 'energy efficient' and 'carbon neutral' are now in vogue. Although these have been active research areas for years, heightened awareness is already affecting jobs and career prospects.

Graduates and faculty members alike are testing the waters in new interdisciplinary arenas and the private sector and local governments are looking for climate-science researchers to apply their skills in new ways.

In industry, various new job descriptions have been created. Large corporations are now adding chief sustainability officers to their line-ups. Google boasts a 'green energy czar', and Home Depot — a home improvement retailer — now has a vice-president for environmental innovation. As no comprehensive training exists for such roles, hybrid degree programmes are being founded to produce a workforce that's qualified to fill them. "Global warming and the need to become a sustainable society are driving a new industrial economic revolution," says Tom Kimmerer, executive director of the Association for the Advancement of Sustainability in Higher Education, based in Lexington, Kentucky. "Any time you have an industrial economic revolution, you create thousands of new jobs in disciplines that didn't exist before, and I think we're at the early stages of that."

There is great demand for graduates who have grappled with the complexity and uncertainty of issues such as environmental sustainability, development, economics and climate change, says Charles Redman, director of the new School of Sustainability at Arizona State University in Tempe, which will welcome its first class this autumn (see 'Lessons in climate').

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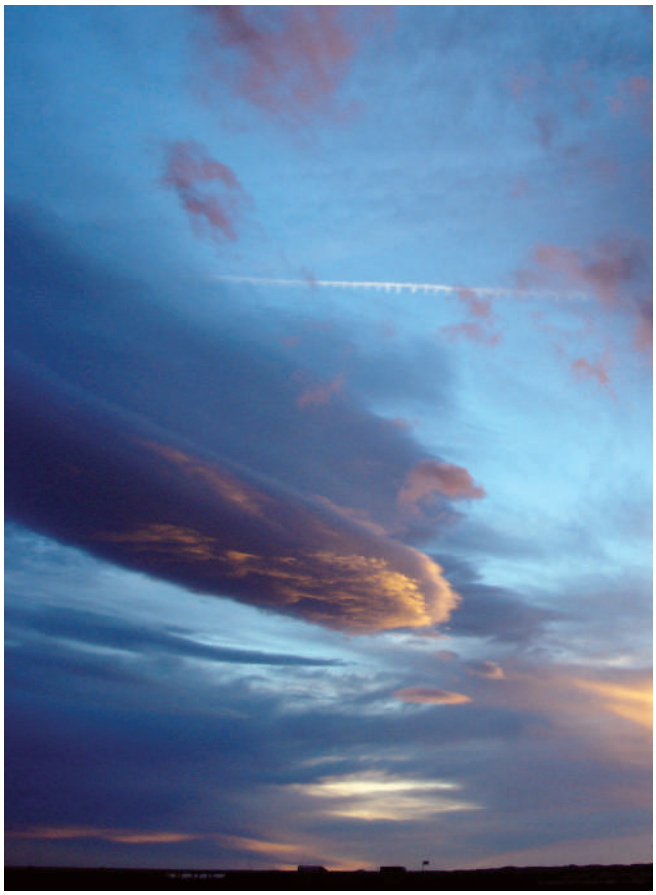
Ronald Cohen is positive about the opportinities for climate-science graduates



"We've talked to companies such as Wal-Mart, Starbucks, British Petroleum and U-Haul, each of whom already has an officer or two to spearhead this work," Redman says. "After the visit they say, 'do you have people ready for us to hire? We need people right now.'" Redman points out that even though the United States has not ratified the Kyoto Protocol, the mayors of more than 600 US cities have signed on to meet its requirements, and many are now looking for environmental leaders at the state and local levels to set them on the right path. And Ronald Cohen, director of the Berkeley Atmospheric Science Center at the University of California, says that graduates of his programme are being sought to fill positions at the intersection of policy and science at places such as the California Air Resources Board, which will implement the state's strict laws for limiting emissions from vehicle exhausts.

More undergraduates than jobs

In the world of traditional academia, the job market for positions that criss-cross the environmental and atmospheric sciences isn't clearly defined. According to an as-yet unpublished study of undergraduate enrolment and job trends in meteorology, five to ten times more US undergraduates are enrolling in meteorology courses than there are jobs for them. "If we don't have a problem now, we could have a problem later on as students who can't get jobs at the bachelor's level go on to graduate school," says study author John Knox, a meteorologist at the University of Georgia, Athens. (see 'Mixed prospects').

Positions open to bachelor's recipients include broadcast meteorology for local weather stations as

LESSONS IN CLIMATE

A handful of new programmes are springing up to meet the demand from industry for experts in everything from product sustainability to carbon trading and carbon neutrality.

At the University of Edinburgh, UK, faculty members from the geosciences school have teamed up with the business school to design an MSc in carbon management, a one-year masters programme that will kick off in the autumn of 2008. Students will take core courses in carbon trading, the carbon cycle, carbon legislation, and climate change impacts and adaptation. They will have opportunities to specialize in areas from risk analysis to economics of the energy industry.

"The demand [for graduates of these courses] is there and we need to fill it quite urgently," says David Reay, a climate scientist who is director of the programme.

Likewise, the University of East Anglia, UK, has just launched the world's first MBA in carbon management, a one-year programme that will begin accepting students in January 2008. **A.H.**

C. STONEBURNER

NASA

NOAA/OAR/ERL/NSSL

Broadcast meteorology is one of the many career opportunities available.

250 private US meteorological companies.

And the atmospheric science community in the United States is concerned about flagging funding from key government agencies such as the National Oceanic and Atmospheric Administration (NOAA), NASA and the Department of Defense. In fiscal year 2004, 51% of the funding for weather and space-weather research came from NASA, 20% from NOAA, and 12% from the defence department, according to a 2007 report from the US National Academy of Sciences. But over the past five to ten years, NASA and the defence department have significantly decreased their support for basic atmospheric-science research, and NOAA has faced budget constraints in various Earth and atmospheric science departments for years. Richard Anthes, president of the University Corporation for Atmospheric Research, based in Boulder, Colorado, estimates that NASA's budget has dropped in terms of real purchasing power by some 35% in the past three to four years. The end result, according to the National Academy of Sciences' report, is that the research community will increasingly look to the National Science Foundation for funding, making research grants even harder to come by.

But there are opportunities. NOAA's National Centers for Environmental Prediction hires about 40 new people annually, or some 10% of its workforce, according to the centre's director, Louis Uccellini. Bachelor's or master's-level degree recipients generally hold forecast desk positions, and doctorates fill 95% of research positions. Uccellini stresses that in every arena, from basic forecasting to research monitoring and data assimilation, the desired candidates are those with an eye towards an interdisciplinary, 'Earth-systems' approach. "Coupling the interactions of ocean, ice and land to atmosphere is a huge issue for weather and climate prediction," says Uccellini. "We're just on the front edge of that."

In academia, government, the private sector and myriad non-profit organizations, the boundaries between climate change, atmospheric science and environmental sustainability continue to blur. And with that comes no shortage of creative career moves within and between fields. "You're going to see a lot of opportunities for people to retool their careers," Kimmerer says. ■

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MIXED PROSPECTS

Climate-change science has long been a part of the mainstream in Europe. The European Union's Seventh Research Framework Programme includes €1,890 million (US$2,590 million) for environment, sustainability and climate change research for 2007–13 — a 40% rise above previous funding.

And yet job prospects are mixed. For example, in Britain, as in the United States, demand is growing within the private sector for climate expertise and for scientists able to bridge disciplinary boundaries. The Met Office, the country's national weather service, hears concerns about climate-change effects from representatives within the construction, insurance and energy industries, says Wayne Elliott, business manager at the Met Office. "With severe weather impacting on the bottom line to a large degree, we're being asked to answer questions that we haven't even addressed before," says Elliott. Companies need to know how climate will affect them, and how they should prepare and adapt. He notes that one of the Met Office's leading climate scientists recently moved into the service's business section to work directly with the insurance and energy industries.

A. ZIMDARS

Paul Williams is concerned that there is a lack of university jobs in Britain.

Some doctorates and postdoctoral fellows are already sensing a scarcity of permanent faculty positions. Paul Williams, a postdoctoral research fellow in atmospheric modelling at the University of Reading, is worried about a shortage of university jobs in atmospheric science, a relatively young discipline offering fewer positions than traditional departments such as maths, physics and chemistry.

Graduates of these traditional departments are also moving into the atmospheric-sciences arena to apply their training, further limiting opportunities.

Neither is Germany is experiencing a surge in climate-science roles, says Jochem Marotzke, a director of the Max Planck Institute for Meteorology in Hamburg, because interest in basic climate science peaked several years ago. Yet a clear need is developing for detailed climate information for local governments. He says there's "a lot more work to be done before we can provide this information reliably". Germany is focusing largely on mitigation and adaptation issues and analysing what directions this work should take, he says. To that end, German research minister Annette Schavan announced in February that €255 million would be allocated to a climate 'action programme' over the next three years, including expansion of the German Climate Computing Centre, Hamburg. How much money will be spent on classical research versus adaptation efforts — and how these will translate into new job opportunities — is still under discussion. **A.H.**