agriculture fits into global ecology," he says.

Both Beachy and Moloney are eager to demonstrate to young researchers that agricultural research has plenty of opportunities for scientists whose background is not in agriculture. Mathematicians are needed to model greenhouse-gas emissions, genomicists to work with traditional plant breeders to develop crops with desirable traits, and ecologists to apply their expertise to protecting biodiversity in intensely managed systems.

But simply luring non-agricultural scientists into agricultural research, without a concomitant increase in traditional plant breeders, agronomists, crop physiologists, plant pathologists and entomologists, could hamper progress towards agricultural productivity and sustainability. "We need more people who can think and act in a systems framework, putting all the good science together into practical solutions for farmers," says Achim Dobermann, deputy director-general of research at the International Rice Research Institute (IRRI), the Philippines-based branch of the Consultative Group on International Agricultural Research. Non-agricultural scientists interested in the field should obtain an understanding of agricultural practices. "Students need a practical knowledge of agricultural systems to ferret out opportunities for innovation," says Philippe Petithuguenin, a senior adviser on agricultural research development at the European Commission.

Skills shortage

The IRRI's staffing needs, like those of other agricultural research centres, are acute. It recruited more than 200 employees in 2009 and expects that level of hiring to continue through mid-2010. The food shortage of 2008 prompted agricultural research organizations, such as the IRRI and the USDA, to address a skills gap resulting from retirements and a decade of low recruitment. The USDA estimates that 17,000 of its 100,000 staff will retire in the next five years.

And the demand for scientific talent in agricultural research is expected to grow. Young agricultural scientists will soon have their pick of research positions, according to Molly Jahn, acting under secretary for research, education and economics at the USDA in Washington DC. "Many agricultural research operations will face large waves of retirement in the next five to seven years, so we are really emphasizing graduate training opportunities," she says.

Industry also expects to add staff, and some companies are setting up in-house training programmes. Monsanto, based in St Louis, Missouri, has its 'Emerging Leaders of Science' initiative, a three-year programme designed to provide both newly minted PhDs and those with postdoctoral experience with an opportunity to develop new skills — for example, adding traditional crop breeding to a background in quantitative genetics. For fellows who successfully complete the programme, a high-level position at Monsanto awaits. "Our goal is to develop a pipeline of hybrid individuals who are able to marry skills across the genetic and molecular technologies, regulatory and chemistry processes," says David Feldman, Monsanto's senior recruiter for technology.

"My objective is to attract young scientists who are eager to make an impact."
— Maurice Moloney

The seed company Pioneer Hi-Bred International, owned by DuPont and headquartered in Johnston, Iowa, hired more than 700 scientists and support staff last year globally — a recruitment trend the company expects to continue in the near term. Although it currently hires for specific skills — particularly molecular biologists, biochemists and statisticians — Bill Neibur, vice-president of crop-genetics research for DuPont, says the company is searching for people who can combine molecular technology, simulation technology and agronomic understanding to find new ways to extend the limits of a plant's productivity.

NIFA

"I want students to go to a programme or lab because of the excitement of the study."
— Roger Beachy

Breaking down silos

One way in which research institutes are trying to attract top talent is by crafting positions that defy traditional discipline boundaries. INRA, the French national agency for agricultural research, based in Paris, is Europe's largest such body. Its labs recruit around 70 scientists each year and six positions to be advertised later this year will be free of any disciplinary label and designed specifically to attract new scientists to agricultural research. "We want to see top economists competing with top plant breeders or biologists for these fully open positions," says François Houllier, INRA's deputy director-general.

Other research organizations are breaking down disciplinary barriers in pursuit of specific goals. Like NIFA with its challenge-based approach, Australia's Commonwealth Scientific Industry and Research Organization (CSIRO) has created flagship goal-oriented programmes. One of these is involved in breeding crops with greater nutritional value, which requires the skills of both plant breeders and nutritionists. A recent success is BarleyMax, a high-fibre grain developed to improve bowel health that's been made into a top-selling breakfast cereal. "We feel that if we do things in a single discipline, we don't tap into the innovation that lies at the interfaces between disciplines," says Bruce Lee, director of the CSIRO's Food Futures Flagship.

The interdisciplinary study of the impact of climate change is likely to play a big part in many research agendas. Following the Copenhagen Climate Conference in December 2009, the USDA created the $90-million Global Research Alliance (GRA) on Agricultural Greenhouse Gases. Through partnerships with 20 other countries, researchers will expand climate-change mitigation research. The US money will be split between USDA in-house research projects and NIFA-funded extramural grants focusing on topics such as carbon sequestration and reducing agriculture's carbon footprint. In addition to training opportunities for MSc and PhD candidates that will result, the GRA will also increase the scientific capacity in developed countries by supporting developing scientists through the Borlaug Fellowship scheme (see 'Opportunities in developing nations').

Hickman hopes his climate-change work will benefit the wider world. But he also expects it to pave the way towards a viable academic career; he is encouraged that so many institutions are placing increased emphasis on interdisciplinary research. "The kind of interdisciplinary research structure at the Earth Institute is rare," he admits. But given the global need, and the fact that agriculture is at the heart of so many colossal ecological, biological and societal challenges, many more universities are likely to follow suit. ■

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Correction
The story 'Big Apple biotech' (*Nature* **463,** 836–837; 2010) incorrectly stated the role of Tom Cirrito at Stemline Therapeutics. He is the director of operations at the company. In addition, contrary to what the article implied, the company employs more than four people.