

# EUROPEAN REGIONAL FOCUS: ON THE HORIZON

Berlin

Across Europe, budgets are tight. But investing in research and development drives economic growth, say scientific advisers. Our knowledge is a resource, they say, and countries with high research spending—Germany and Scandinavian countries such as Sweden—have high GDP growth. European Union politicians are getting the message as they plan Horizon 2020, a €90 billion program to fund European research in 2014–2020. In the meantime, educational and research institutions are preparing for science in an uncertain economy with practical training, applicable results, and networking to join forces with local and global partners. **By Chris Tachibana**

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“**A**ll we hear about Europe is gloom and doom and the global economic crisis,” says **Anne Glover**, “but we have a fantastic raw resource—our knowledge—so why not talk about that?” In January 2012, Glover became Europe’s first chief scientific adviser, a job she previously held for her home country of Scotland. Now, she advises European Commission President José Manuel Barroso on scientific topics from global health to climate change.

Glover’s message to European policymakers is that Europe’s talent in science, engineering, and technology could boost the economy of the entire region—and she’s confident her message is getting through. “Two things that might gladden hearts of young scientists are that in this economic environment, the president of the European Commission appointed a chief scientific adviser, so he regards science as crucial for the future of Europe. Also, even with fiscal constraint in other areas, the proposed budget for Horizon 2020 is a substantial increase from the previous program.”

## PLANNING FOR 2020

Horizon 2020 is the next European Union (EU) research funding program, running from 2014 to 2020 and taking over from FP7 (Framework Programme 7). Horizon 2020 is still under discussion by the EU governing bodies, so the proposed budget of nearly €90 billion is still uncertain. However, scientists are “reasonably optimistic” about the ongoing negotiations, says **Peter Tindemans**, secretary general of Euroscience, a nonprofit organization that supports and promotes science, similar to the American Association for the Advancement of Science. So far, the funding seems secure.

FP7 funding was under themes such as health, transport, and space. Horizon 2020 organizes activities under three priorities, or pillars: excellent science, competitive industries, and a better society. Don’t worry, these changes are largely organizational, say those who are following the development of Horizon 2020. Scientists familiar with FP7 should be able to find opportunities in the new program.

Information and communication technology are priorities in Horizon 2020 under the excellent science and competitive industries pillars. An example is the Future and Emerging Technologies program that funds exploratory research and high-risk proposals. A related field to watch, says Tindemans, is data-driven science. This is emerging as a new scientific discipline as fields such as systems biology generate large amounts of data, driving a demand for facilities and methods for storing, managing, and analyzing large datasets.

Horizon 2020 includes initiatives to promote small and medium-sized enterprises, and public-private partnerships, and applicants will need to describe their potential return on investment. However, this is not new—EU funding programs have long encouraged collaborations between research institutions and industry. [continued>](#)

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## Focus on Europe

Tindemans says that policymakers and industry leaders continue to feel that basic research is a priority. Successful public-private partnerships work at the interface of basic and applied research, he says, with enough room for both types of science.

Professor **Elena Cattaneo**, School of Pharmacy, University of Milan, agrees but says that academic scientists are feeling a lot of pressure to do translational research, especially in her field of stem cell research. She urges caution, saying “There is nothing worse than clinical trials done too early.” Cattaneo hopes funding agencies will remember that science is also about exploring the unknown. “How can we promise we will cure something without knowing precisely how tissue and cells work and how they are affected by a disease? We need the two elements of research—basic and translational—to work tightly together. Otherwise it is like asking to go from here to the moon without acknowledging that in many cases we do not even know where the moon is.”

### ACTING LOCALLY

Many countries are looking for the balance between applied and basic science in their own research and training programs. In these uncertain economic times, practicality is often the strategy, with an emphasis on knowledge and technology transfer, job training, and public-private partnerships.

Practical training and industrial partnerships are actually long-term U.K. initiatives, says **Iain Cameron**, head of research careers for Research Councils UK (RCUK). For example, the country has an engineering Doctorate that is equivalent to a Ph.D. but with training that aligns with business practices. Rather than focusing on a single project, students conduct a series of smaller projects while spending time working in industry.

Cameron says that a specific area of emphasis in the past 10 years has been “training researchers to be aware of the transferable skills they have so they can be prepared for jobs outside of academia.” He notes that 50 percent of Ph.D. students in the United Kingdom find work outside of universities, so “we want researchers to think about who will use the research they are doing, and what they will make of it.” Thinking about the two-way transfer of knowledge and people that occurs between the research base and industry is a culture change in the educational system, says Cameron. RCUK is now studying the effects of the emphasis on practical training, for example tracking Ph.D. students to see if it helps them be more immediately effective in their jobs.



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—Marja Makarow

The United Kingdom, like several other European countries, is imposing strict austerity measures in response to the economic crisis. The RCUK budget is frozen at 2010 levels (about £2.5 billion annually) through 2015. Although this means budget reductions of about nine percent over four years, Cameron says that funding is still available for all research areas. That’s good, says **Marja Makarow**, because this is a critical time for countries to continue research funding. Makarow, who was chief executive of the European Science Foundation through 2011 and is now vice president of the Academy of Finland (the Finnish Research Council), says we should remember that only five to seven percent of total European research funding is from the European Commission, with most support coming from individual countries. We must maintain R&D and science education funding, warns Makarow, or we’ll waste investments over the last decade in infrastructure improvements and efforts to make research careers attractive to young scientists. “If we miss this opportunity,” says Makarow, “we’ll miss out on the next generation of researchers.”

As we train young scientists to think about the future applications of their work, we also need to train them in knowledge and technology transfer that is smart, deliberate, and effective.

This is the realm of **Guy A. Boy**, director of the Human Centered Design Institute of the Florida Institute of Technology, fellow of the Air and Space Academy in Toulouse, France, and author of the book *Orchestrating Human-Centered Design*. “We live in a very short-term-oriented society,” says Boy. “Everything has to be effective now.” However, fast and cheap rarely succeeds, especially in introducing research results into society, says Boy, who advocates for STEAM education—science, technology, engineering, and math—with art and creativity. Boy calls for a mature approach to introducing new inventions and technologies that considers the impact on society’s practices and organizations. Human-centered design can ease the introduction of a new technology or policy, making it acceptable to the public. This approach requires input from the humanities and the arts, and in fact, Horizon 2020 includes funding and opportunities to integrate the humanities and arts into research activities.

### LOOKING GLOBALLY

In addition to focusing on technology development and applications, European countries and universities are increasingly seeking to globalize. Spinning an international web with far-flung anchor points can support research by diversifying funding sources, [continued](#)>

## Focus on Europe



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—Anne Glover

increasing collaborations and business opportunities, and tapping into the global talent pool.

The Freie Universität Berlin has relied on international partnerships since its founding after World War II as an educational institution committed to being free of Soviet political influence. The global perspective has continued throughout the university's history. For universities seeking international research collaborations, President **Peter-André Alt** advises that these types of partnerships are most successful when the universities are matched in their fields of strength, size of faculty, and number of students.

In contrast, study abroad exchanges can focus on complementary, rather than shared strengths, says Alt. For example, Freie Universität Berlin has student exchanges with emerging countries such as Egypt. The university's first exchange students went to Stanford in 1949 and now roughly half of all Freie Universität Berlin undergraduates participate in a study abroad. Universities should encourage this by being flexible in accepting credit for classwork done abroad, says Alt. He hopes that U.S. universities in particular will encourage European partnerships and study abroad programs, noting that the current U.S. focus on Asia is causing his university to work more with Canada, which tends to be more focused on Europe.

Effective globalization relies on creating a solid network and knowing how to use it. **Angie Bukley** is dean and vice president for academic affairs at the International Space University (ISU) in Strasbourg, France. She has experience in the academic and corporate worlds, a job that spans multiple countries, and 500+ LinkedIn connections. Although ISU combines space and education—two areas that are prime targets for financial austerity advocates—75 percent of ISU graduates successfully find jobs in their field. Contacts are the secret, says Bukley. “ISU has more than 3,300 graduates in over 100 countries, many in high-level management positions, so we really leverage that network to help students find internships and jobs.”

Bukley takes the long view and has no qualms about promoting space science and engineering careers. “I’ve been around for a while and seen the economy go up and down,” she says. “Humans are meant to explore so we will always find a way to do that.” In promoting its programs, ISU can play the technology transfer card, pointing to civilian applications such as weather graphics, remote sensing, and global satellite positioning that have come from government and military research including space science. Bukley is optimistic about the future of European research. Having worked in both the United States and the EU, she says that although the EU is extremely slow in making decisions, once they decide to fund something, “it’s pretty solid,” unlike funding in the United States, which can involve ongoing negotiations, contingencies, and post-award cuts.

#### MOVING EAST

To make international exchanges easier, many universities are establishing a physical presence in another country, particularly in Asia. Germany's Max Planck Society has several international partner institutes and centers, including in Shanghai. In 2010, the eight Danish universities and the Graduate University of the Chinese Academy of Sciences created the Sino-Danish Center for Education and Research near Beijing. Work has begun on a new building for the center, which has a goal of 100 researchers, 100 Ph.D. students, and 300 Master's students by the end of 2013. European and Chinese students gain research experience on collaborative projects and take classes together in English, led by Danish and Chinese professors. Currently, students can earn a Master's degree in Neuroscience and Neuroimaging, Water and Environment, Innovation Management, and Public Management and Social Development, with additional Master's programs in Nanoscience and Nanotechnology, Chemical and Biochemical Engineering, and 'Omics starting in 2013.

“Personally, I think it's a great opportunity for students,” says **Hans Gregersen**, executive director of the Sino-Danish Center. “They'll get a degree with Danish and Chinese accreditation and multicultural experience. We hope they'll learn the language. About 500 Danish companies are active in China, and we think these and other companies will want to employ our students after they graduate.”

Another institution reaching out to the East is ETH [continued](#)>

Focus on Europe

Featured Participants

**Academy of Finland**  
www.aka.fi/eng

**Air and Space Academy**  
www.academie-air-  
espace.com

**ETH Global**  
www.global.ethz.ch

**European Commission**  
ec.europa.eu/index\_  
en.htm

**European Science  
Foundation**  
www.esf.org

**Euroscience**  
www.euroscience.org

**Florida Institute of  
Technology**  
www.fit.edu

**Freie Universität Berlin**  
www.fu-berlin.de/en

**International Space  
University (ISU)**  
www.isunet.edu

**Research Councils UK  
(RCUK) - www.rcuk.ac.uk**

**Sino-Danish Center for  
Education and Research**  
www.sinodanishcenter.  
com

**University of Milan**  
www.unimi.it/ENG



models, cultivate international collaborations, and broaden the institute's knowledge base. Even sabbaticals are a potential resource. Both faculty and academic staff have sabbatical leave opportunities, and are primed before they go to watch for institutional innovations that might improve ETH, and debriefed on their observations when they return. Schmitt says ETH has its own internal LinkedIn-type system: a database of international connections "so the ETH community knows who of our colleagues is interacting with whom around the globe and can connect to them."

INVENTING THE FUTURE

European countries and the EU are hoping that investment in R&D will

Zurich, a public Swiss science and technology university. ETH Zurich has had international engagements before, including outreach to China in the 1980s, but marked a new era with ETH Global, a center for international exchange and interdisciplinary projects. The ETH Global perspective is that developing countries are an opportunity and a growing market for smart, clean development. Europe can provide the methods and means for this development, from sustainable city planning and high-precision machinery such as tunnel-boring machines, to personal items such as pharmaceuticals. ETH has decided this strategy requires being on site in regions such as Africa, South America, and Asia.

This is what brought Professor **Gerhard Schmitt**, ETH Zurich chair of information architecture and senior vice president, ETH Global, to Singapore. He is establishing the Singapore-ETH Center (SEC) for global environmental sustainability, currently with 140 faculty and students, funded by both ETH Zurich and the National Research Foundation of Singapore. Long-term goals are attracting the best students and faculty, while training them for international success. "Our first goal is top-quality research and education," says Schmitt, "but we also want to make people around the world more aware of ETH and recruit from the global pool. Intelligence and talent are distributed worldwide, so it doesn't make sense to exclude anyone." The first program of the SEC is the Future Cities Laboratory (FCL). With 31 nationalities in the program, FCL embodies the goals of ETH Global and the charrette approach to science. FCL is a non-traditional, nonsiloed research degree program, in which sociology, physics, architecture, engineering, and simulations contribute to a project, for example in transportation systems.

From its global efforts, ETH hopes to harvest novel education

drive economic growth. This is creating a world of opportunities for young scientists. The trend in globalization expands educational and job possibilities. "We're moving from a linear, local world to a world that is nonlinear and global," says Boy. His advice is to embrace the complexity and connectivity. Incorporate technology, arts, a variety of people and organizations into your work, and take advantage of the symbiosis.

Get connected to the world early, says Freie Universität Berlin President Peter-Andre Alt. "Study abroad is a great experience. It's helpful for communication, learning a different culture and system, and maybe also finding your own way." With companies, universities, and research institutions stressing globalization, it's also an experience that could pay off in the job market. Keep this in mind during your training, says RCUK's Iain Cameron. Think about implications, applications, and dissemination of your research. "Know the research environment and know your skills. Think about how to communicate what you can do to people in other disciplines, in industry, and internationally."

Finally, keep your eyes on the horizon. To young people considering a career in science, Europe's Chief Science Advisor Anne Glover says when you face challenges, remember the rewards of struggling with a concept then celebrating when you figure something out or make a discovery. "In our world, in the 21st century, scientists are inventing the future, says Glover. "Why not be part of that?"

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