

## ADVANCING SCIENCE IN SPAIN: NOT SIMPLY A QUIXOTIC QUEST

The tapas of Barcelona, the Prado of Madrid, and the architecture of Sevilla are all international draws to the nation of Spain, but its scientific heritage has not always been so noteworthy. The country has not seen the scientific growth and productivity that some other European countries, such as Germany and the UK, have enjoyed. Grants have been generally small and its academic and research system has been plagued by a culture of bureaucracy, overrun by civil servants with no incentives for excellence. But times are changing in España. Since 2000, novel, regionally driven and funded initiatives have led to the establishment of new research institutes, which have fostered significant change. There is an increase in recruitment of foreign scholars, more Spanish scientists are returning from positions abroad, and there is a feeling of excitement that Spain is on its way to take a place on the world stage of science. But there is still much to do. **By Alaina G. Levine**



Erwin Wagner



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**A**ccording to **Christina Garmendia**, Spain’s Minister for Science and Innovation, Spain has moved from 30th place to ninth in the world’s ranking of scientific powers. This rise was second fastest in the world, behind only China. With more than 36,000 annual scientific publications, Spain produces slightly over 3 percent of the world’s scientific papers, says **Felipe Pétriz**, secretary of state for investigation for the ministry.

This improvement is significant. A democracy only since 1978, Spain has languished on the sidelines of science for years. But the fact that there is “no long tradition in science is an advantage,” claims **Erwin Wagner**, director of the Cancer Cell Biology Programme at the Spanish National Cancer Research Centre (Centro Nacional de Investigaciones Oncológicas, CNIO) in Madrid. “People here are very motivated. It’s something new, and people are excited.”

### A CLIMATE OF CHANGE

Motivation for building a system of research excellence is what drives **Miguel Beato**, who as director of the Center for Genomic Regulation, or Centre de Regulació Genòmica (CRG), an international research institute in Barcelona, is contributing to the national metamorphosis. CRG is just one example of the changes happening in the country, particularly in Catalonia.

Beato, who holds an M.D. from the University of Barcelona and a Ph.D. from the University of Göttingen, completed a postdoc at Columbia University’s Cancer Research Center. He spent 30 years at the University of Marburg in Germany and returned to Spain as the founding director of CRG in the early 2000s.

Supported by the government of Catalonia, one of 17 autonomous

regions within this exceptionally decentralized country, CRG operates under a novel framework that allows for independence of center leadership, and defines clear metrics of success (number of high impact papers published, for example), to evaluate researchers. Unlike most of Spain’s universities where scientists labor in “primitive conditions,” says Beato, CRG researchers enjoy state-of-the-art laboratories and large startup packages.

Many are recruited from abroad (65 percent of its scholars are non-Spanish), and two-thirds are junior scholars. The 300 scientists at CRG are organized into 30 research groups and are evaluated by an external scientific advisory board. The institute **continued »**

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Postdoc 2: Sabbaticals Abroad—July 30

Postdoc Survey—August 27



“You can write a grant proposal in English, but you must also submit a Spanish version.”

— Sabine Hilfiker

itself is governed by a board of trustees. According to Beato, CRG ranks No. 20 in the world and at the top in Spain in terms of the number of citations of its researchers’ papers. Although its budget is modest—€12 million (guaranteed from the local/regional government) —“for every euro spent, we get one euro back in grants,” says **Luis Serrano**, vice director of CRG and head of the systems biology program.

The regional government of the Basque Country has spent the past 20 years implementing and fine-tuning a comprehensive science and technology policy that integrates funding and research and development programs. As a result, to some, this autonomous region seems somewhat more ahead of the curve in advancing science as compared to the rest of Spain. It has its own science foundation, Ikerbasque, the goal of which is to foster innovative research by attracting senior researchers to area institutes. To accomplish this, the foundation funds positions, which are tenured from the start, at local universities and nonprofit research centers. The region has a number of government-sponsored centers of excellence, with strengths in climate change and applied mathematics, for example, as well as cooperative research centers with a range of foci, including biotechnology, nanotechnology, and manufacturing technology.

**Nicola G. A. Abrescia**, group leader of structural biology at the Center for Cooperative Research in Biosciences (Centro de Investigación Cooperativa en Biociencias, CIC bioGUNE), is funded by Ikerbasque. “It’s very difficult to attract international scientists to this region so they offer stability,” he argues. “Here at least your salary is safe, so you can focus on the science. But it doesn’t mean that we can relax. The Basque Country is making a lot of investments in you, so there is a drive to move forward.” But Abrescia says that the area still has strides to take to realize its ambitions. “It is a region in motion. The potential is very high. In time we will become an international center of excellence.”

### EL BAILE DE CIENCIA

Throughout Spain, banks play a crucial role in *el baile de ciencia* (the dance of science). The philanthropic divisions of firms such as La Caixa, the third largest Spanish financial group according to its website, provide fellowships of up to €100,000 for four years to Ph.D. students who conduct research at CRG. The banks were

already paying for Spanish pupils to pursue their doctorates at top institutes abroad, says Beato, so this was a natural extension of existing programs. At CNIO, Wagner’s group is funded by Fundación BBVA, the corporate responsibility arm of BBVA, a 150-year-old global financial institution ranked as Spain’s second largest bank. The foundation, which has a particular focus on supporting scientific research in biomedicine, the social sciences and the environment, has pledged €2.5 million for five years to Wagner’s program.

But the Spanish National Centre for Cardiovascular Research (Centro Nacional de Investigaciones Cardiovasculares, CNIC), the *hermana* institute to CNIO, has a different funding model. It is supported by a unique public-private partnership, in which Spanish companies, foundations, and banks invest capital into a separate organization, the Pro CNIC Foundation. CNIC researchers benefit not only from the monetary support provided by the Foundation, but also from the industrial know-how of the corporate executives who advise it.

While CNIO and CNIC, both launched in the late 1990s, are nationally funded enterprises, CRG, founded in 2000 and launched in 2002, is one of more than a dozen research institutes in Catalonia that was conceived and spearheaded by **Andreu Mas-Colell**, an economist by education who served as Minister for Universities and Research in the region from 2000 to 2003. His idea was to create a new way of stimulating scientific innovation in Spain such that it steered clear of the civil servant culture that plagued the country. “The civil servant mentality was—and still is—the main obstacle to Spanish science,” believes Beato. “There’s no recognition of good work being done.”

These institutes, which include the Catalan Institution for Research and Advanced Studies (Institutió Catalana de Recerca i Estudis Avançats, ICREA), a research center “without walls,” and the Barcelona Biomedical Research Park (Parc de Recerca Biomèdica de Barcelona, PRBB), don’t offer their scholars tenure. Rather, every five years, their research merits are appraised and, if they meet the certain criteria mandated by the scientific advisory board, they can stay. Junior researchers, however, have to leave after nine years.

But the institutes are essentially pockets of scientific distinction in an apparently bleak landscape. The universities are saturated with civil servants whose focus is on teaching rather than original research. And the Spanish National Research Council (Consejo Superior de Investigaciones Científicas, CSIC) has its own challenges. **Sabine Hilfiker**, a Swiss scientist with CSIC, observes that while 40 percent to 50 percent of grant proposals submitted are funded, the grants themselves are picayune. The large percentage of grants funded “would be wonderful if each grant were of sufficient size,” she says, “but the [total] money allocated for research is a set amount, such that the individual grants just get smaller and smaller.” Her last grant was for €100,000 for three years. This situation significantly impedes Spain’s ability to leap forward as a global scientific contender.

There is also a language barrier issue. “You can write a grant proposal in English, but you must also submit a Spanish version,” she remarks. Grant proposals for less than €150,000 **continued »**

to the Ministry of Health can be submitted only in Spanish. And the Ministry of Science and Innovation modified its language requirements just three years ago, at the time lifting the restriction that all proposals must be penned in both English and Spanish; today, an English version suffices.

### FOREIGN BRAINS IN SPAIN

And yet, Spain is still an attractive option to nonnatives, as long as they know how to navigate the system. "I get a lot of support as a foreigner," says Wagner, who received his Ph.D. in Austria, and conducted research in Philadelphia in the United States and Heidelberg, Germany, before joining the Research Institute of Molecular Pathology in Vienna in 1988 as a senior scientist and founding member. He and his lab relocated to CNIO in 2008. "When I arrived, the minister of science came in and greeted me," he says. And he jokes that "they had a check waiting for me." As a foreigner, Wagner pays a flat 25 percent personal tax for the first five years of his employment and notes that the opportunity to acquire national grants is high.

But there are some drawbacks to the Spanish system, especially for a newcomer. **Celine Perier**, a French postdoc at Vall d'Hebron Research Institute, was recruited to Spain from another postdoc appointment at Columbia University under the Ramon y Cajal (RyC) programme. RyC scholars receive five-year contracts to conduct research at various institutes throughout the nation.

Perier enjoys the people with whom she works, and her research group has sufficient grant money, she says. But compared to Columbia, which had a "critical mass of specialists," Spain is remarkably smaller. Significant research collaborations, she says, have to

be with people from somewhere outside of her institute or even the country.

But **Vivek Malhotra**, an American who spent 18 years at the University of California, San Diego and is now the Coordinator of the Cell and Developmental Biology Programme at CRG and a professor at ICREA, clarifies that when it comes to enjoying the Spanish lifestyle of science, it really is a matter of where you go. He felt "synergy" when he arrived at CRG in 2007; after all he was in a brand new building, had the opportunity to recruit people for his department, received a hefty startup package "that could easily run a lab of five to six people without seeking any external funding," he says, and did not have to participate in many administrative duties, even as department head. "I could focus on the science," he says. And he appreciated the model of "rolling tenure," in which every five years researchers are evaluated. "It keeps you on your toes."

For American and other non-Spanish scholars who desire to move to the land of "Further Beyond" (the national motto), Malhotra unsurprisingly offers the following advice: look for an institute that is well funded. "People would love to come to Barcelona—for what the city has to offer," he speculates. "But the younger scientists are concerned that they might not have a job later," especially since after their nine-year "tenure," they have no guarantee of finding positions elsewhere in the country.

Yet Malhotra and others see the nontenure system as an asset to forging Spain's technological future. "If Spain could build more institutes like CRG with the clear intent that you stay as long as you remain good in science," people might be attracted to this, he says. **continued »**

### FEATURED PARTICIPANTS

**Barcelona Biomedical Research Park (Parc de Recerca Biomèdica de Barcelona)**

[www.prbb.org](http://www.prbb.org)

**La Caixa**

[www.lacaixa.es](http://www.lacaixa.es)

**Catalan Institution for Research and Advanced Studies (Institutió Catalana de Recerca i Estudis Avançats)**

[www.icrea.cat](http://www.icrea.cat)

**Centre for Cooperative Research in Biosciences (Centro de Investigación Cooperativa en Biociencias)**

[www.cicbiogune.es](http://www.cicbiogune.es)

**Centre for Genomic Regulation (Centre de Regulació Genòmica)**

[pasteur.org.es](http://pasteur.org.es)

**European Research Council**

[erc.europa.eu](http://erc.europa.eu)

**Fundación BBVA**

[www.fbbva.es/TLFU/tlfu/ing/home/index.jsp](http://www.fbbva.es/TLFU/tlfu/ing/home/index.jsp)

**Ikerbasque**

[www.ikerbasque.net](http://www.ikerbasque.net)

**Ministry of Health**

[www.msps.es/en/](http://www.msps.es/en/)

**Ministry of Science and Innovation**

[www.micinn.es](http://www.micinn.es)

**Spanish National Cancer Research Centre (Centro Nacional de Investigaciones Oncológicas)**

[www.cnio.es/ing](http://www.cnio.es/ing)

**Spanish National Research Council (Consejo Superior de Investigaciones Científicas)**

[www.csic.es](http://www.csic.es)



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—Miguel Beato

## REASONS TO BE OPTIMISTIC

The global economic calamity has hit Spain hard. There is a 20 percent unemployment rate in the country, and the CSIC budget is down 14 percent for 2010.

Despite these factors, Mas-Colell, now the secretary general of the European Research Council in Brussels, envisions a promising future for Spain’s scientific scholarship.

“When one looks at it in historical perspective,” he says, “Spain is in a good position.” He offers the following evidence for success: the number of “research expenditures, papers, and citations all point to a steady improvement in scientific research in Spain.”

All these numbers are still low compared to more scientifically advanced European countries, he acknowledges, but cites a particular data point to support his theory. The R&D expenditure in Spain as a percentage of the gross domestic product (GDP) is currently 1.35, while 20 years ago it was 0.6. “Our Spanish levels of expenditures are nothing to write home about,” he concedes, “but the rate of growth of expenditures is.” He says that while Europe as a whole has been stagnant in its investment in scientific research, Spain is on a rise.

“The starting point was low,” says Mas-Colell, but now, “new resources have been channeled by regional and federal authorities toward new initiatives.”

He says one factor contributing to Spain’s lack of research advancement is the current economic crisis. “The Spanish R&D world should recognize that after five years of more than a 25 percent increase in annual public expenditures, we should be willing to resist one or two years of budgetary retrenchments.” Mas-Colell argues that the Spanish science system “is fragile,” and the nation cannot afford to slide backward during a period of financial cutbacks. If Spain is to prosper, “it is imperative that research policy be selective, with resources focused toward the institutions that have already shown that they can compete internationally.” Leaders must resist the temptation to reduce financial support to

these strategic national assets, and he stresses that the solution lies in a public/private system that focuses on excellence.

Secretary Pétriz, an applied mathematician, sees resolution from a different source: the industrial arena. “Innovation is fundamentally a product of the business sector,” he says. “Therefore it is necessary to have more [businesses] and more importantly, more innovative ones. Spain lacks large indigenous businesses.” Pétriz clarifies that there is a cultural divide between the public research agencies, universities, and the business sector and believes “we must improve the relationship between these agents of R&D” with two priority outcomes. First, the system must engender opportunities for the researchers to focus their efforts on solving the problems raised by the organizations. And second, channels must be forged to allow the businesses to finance research projects that they find interesting. He says one of Spain’s goals is to “mobilize an additional €6 billion into private research activity [1.9 percent of the GDP].”

Pétriz, who was appointed only at the end of 2009, says that the coordination of the innovation policies of the autonomous regions and central government could also be improved. Luckily, both his and Mas-Colell’s vision may crystallize soon. In March 2010, the text of a new science law was approved by the country’s ministers. Although it still needs to be accepted by parliament, Garmendia told reporters that the law could provide “a new model” for scientific research and development.

Among various features, the law establishes a new Spanish research agency and pushes for more state- and region-funded entrepreneurial activities. Pétriz is particularly pleased with this element of the statute, in which a new State Innovation Strategy is established, whereby “the state’s ideas for development of innovation will be coordinated with the innovation policies adopted by the autonomous communities.” The law allows researchers to pursue entrepreneurial ventures based on their innovations and “participate in the benefits that their investigation produces,” he explains. The entrepreneurial component will be kick-started by a new secretary of innovation.

Spain’s metamorphosis into an international scientific leader is possible. With national research expertise in biotechnology, transportation, the chemical industry, and information technology, to name a few fields, that already transcends borders between universities, agencies, and commerce, there is no question that the democracy can achieve its ambitious goals, argues Mas-Colell. “The issue is whether or not we want to. The key to the next positive step in reforming the Spanish research system is that it becomes more open than it is now.” The current landscape of institutes and research centers that hire leaders from all over the world is a relatively small number, he points out. The majority of the scholarly system is very traditional, very closed. “It is difficult for non-Spaniards to get into it,” he says. “There is a limit to what Spain will accomplish if the system does not become more open.”

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