Perspectives from Victor de Lorenzo

Centro Nacional de Biotecnología (CSIC) Madrid | EMBO Council Member 2014 – 2019 | EMBO Member

Tell us about your journey from chemistry to microbiology to synthetic biology.

When I was a child, I dreamt of being a scientist: in my parents' vacation house, we had a little garage with some chemicals, and I enjoyed experimenting with them. After I had finished my undergraduate degree in Madrid, I worked in a laboratory interested in isolating new types of antibiotics called microcins. That was the first time I became exposed to microbiology. I was fascinated by bacteria, and I decided to study these antibiotics from a microbiological perspective for my PhD.

By the time I finished my PhD, plasmids and recombinant DNA technologies had become popular. So, after a stint at the Institut Pasteur, I did postdoctoral research at the University of California, Berkeley, which was a big hub for molecular biology. There, I studied the role of iron in microbial metabolism. Iron is found in the environment, and I developed an appetite for knowing more about the interactions between bacteria and the environment. When I finished my postdoctoral research, I wanted to examine how to use microorganisms for counteracting chemical pollution. I landed in one of the best laboratories at the time. It was run by Ken Timmis who was trying to reprogram microorganisms genetically to become agents for remediation. The science that we generated by the late 1980s and early 1990s was fabulous, but the actual results in terms of effective cleanup of contaminated sites were not satisfactory.

The topic came to a standstill until synthetic biology emerged in the early 2000s. The new perspectives rekindled my interest in developing bacteria as agents for bioremediation. In the past years, we became interested in developing tools for large-scale interventions aimed at mitigating climate change. I would like to spend the next years redeveloping the interface between synthetic biology and environmental issues. Many old problems about contamination and environmental deterioration can now be revisited by leveraging systems and synthetic biology enriched with artificial intelligence. This will be of utmost importance for the future of our planet.

What is your advice for those who are starting out as scientists in Spain?

After a period of PhD and postdoctoral research, the typical destinations for researchers are universities or research institutions. There is also a growing number of private foundations that conduct high-level research. In the past few years, many scientists have started spin-offs. Venture investors are becoming more and more interested in biotechnology, so there is a growing job market in this area.

Science is a profession for curious individuals who are willing to take risks. Whether you like it or not, competition is what drives excellence and sometimes you do your best, but it doesn't work – one must be prepared for that. Another advice would be to identify a good mentor and a research topic that one is excited about, which may not necessarily be a fashionable topic. Also, science is an international endeavour so researchers shouldn't be afraid of continuing their career in another country. I believe one doesn't have to be a monk to do science, but enjoy what life has to offer, and approach science with joy.

Speaking of excellence, tell us more about your connection with EMBO.

I became an EMBO Member at the end of the 1990s, and years later I have served as a member of the EMBO Council for six years. I have been very active in promoting activities in India, where I lectured as EMBO Keynote Speaker at various meetings, and I co-organized a memorable synthetic biology workshop in Chennai in 2020. I also used the platforms offered by EMBO to make some noise about synthetic biology and how good it would be for the planet's health. Likewise, I have enjoyed participation in the earlier EMBO Science and Society Committee and later in some activities of the EMBO Science Policy Programme. While working with these, I often interacted with politicians and officers of the European Commission where I tried to push evidence-based decision making. For me, EMBO is about fostering creativity, listening to ideas, trying to eliminate bureaucratic barriers. It is an example of how a scientific organization should look like.

How does EMBO support researchers in Spain?

EMBO has helped many Spanish scientists to achieve good professional standing. The prime way of support is through fellowships, and in the past few years EMBO has also driven research integrity initiatives that have been very impactful.

In my opinion, a key challenge for EMBO is how to maintain the balance between scientific excellence and the fact that not all countries can compete on an equal foot with the others. Given that EMBO is a European organization, we need to bring not only actors from the big players like the UK, Germany, France into the conversation – we need to involve many other voices and listen to them.

Meet scientists from the EMBO communities

Guillermina López-Bendito
Brain power

Institute of Neuroscience, Alicante | EMBO Member

When neuroscientist Guillermina López-Bendito was elected an EMBO Member in 2020, she wasn't new to the EMBO community. Since 2012, López-Bendito had been part of the EMBO Young Investigator Programme, which supported her to consolidate her laboratory at the Institute of Neuroscience in Alicante. Working in mouse embryos, López-Bendito and her team are revealing the early mechanisms that specify sensory circuits – work that could help to understand how brain circuits that process information received from the senses develop and adapt to changes in sensory experience in humans.

López-Bendito went back to her home country Spain after doing a postdoc in Oxford, United Kingdom. The Spanish scientific community, she says, is a close-knit community that has worked hard to create jobs and careers. In the past decade, Spain's government has invested more money to support scientists and created new initiatives to bring young researchers back to the country. " Now it's a good time to establish a lab in Spain," López-Bendito says.

As an EMBO Young Investigator, López-Bendito benefited from conferences and trainings,. Now, as an EMBO Member, she is serving on the Young Investigator Committee to ensure the highest quality in the selection of future EMBO Young Investigators. "It opened opportunities for my lab to establish a network of excellent scientists in Europe."

Constanza Marín-Márquez
Up for growth

Assistant professor at Andrés Bello National University in Viña del Mar | EMBO Scientific Exchange Grantee

In 2019, oral pathologist Constanza Marín-Márquez - an assistant professor at Andrés Bello National University in Viña del Mar - moved from her home country Chile to the United Kingdom to pursue a PhD at the University of Sheffield. There, she set out to analyze genomic and transcriptomic data from a rare and aggressive tumor of the jaw in hopes to find new therapeutic targets. But a few months into her project, Marín-Márquez started to struggle with some bioinformatics analyses. Her PhD supervisor suggested that she check whether EMBO offered financial support to spend time in a laboratory that could help her with the analyses.

Marín-Márquez contacted a computational genomics group led by Núria López-Bigas at the Institute for Research in Biomedicine in Barcelona and secured an EMBO Scientific Exchange Grant. The grant allowed her to travel to Spain and spend a week in López-Bigas's lab, where Marín-Márquez received support and expert feedback . She also had the opportunity to meet scientists from different backgrounds with whom she may collaborate in the future.

Marín-Márquez went back to the UK with renewed confidence and enthusiasm. Since then, she always keeps an eye on EMBO events and funding schemes. "All the opportunities that they offer – in terms of travel grants, fellowships, courses – are very useful, especially when you're starting your career."

Marija Matejčić
Gut feeling

EMBO Postdoctoral Fellow at the Institute for Bioengineering of Catalonia in Barcelona

When EMBO Postdoctoral Fellow Marija Matejčić first visited the laboratory of Xavier Trepat at the Institute for Bioengineering of Catalonia in Barcelona, she was impressed by its level of interdisciplinarity. Biologists worked hand in hand with engineers, physicists and optics experts. Matejčić decided to join the group, and she doesn't regret it. "With so many different perspectives, this is a super-productive and creative environment," she says. Living in Barcelona, she adds, is the cherry on the cake.

In the Trepat lab, Matejčić uses 2D gut organoids to investigate the cell mechanisms behind a process called 'apical extrusion,' where cells are removed from an epithelial layer by neighbouring cells. Scientists do not fully understand how extrusion happens in the intestine, although the process is at the core of gut turnover. Because too much or too little extrusion could result in intestinal disorders or cancer, Matejčić's work may also help to understand what goes awry during disease.

The EMBO Training Courses – which include research integrity and leadership courses – offer scientists essential tools for leading their own research groups, Matejčić says. The EMBO Fellowship also provided Matejčić with a higher job security than she may have had in a country where public investment in research has been stagnating for years. Having the support of EMBO, she says, "makes you a better scientist ultimately, because you can just focus and enjoy doing science."

Spain and EMBO in numbers

91 **EMBO Members**[a]

+24 67

34 **EMBO Young Investigators**[b]

- **2** in Alicante
- **17** in Barcelona
- **7** in Madrid
- **1** in Paterna
- **1** in Santander
- **5** in Sevilla
- **1** in Valencia

2 **EMBO New Venture Fellows**[e]

- **1** Going abroad from Spain
- **1** Coming to Spain

138 **EMBO Postdoctoral Fellows**[c]

- **102** Going abroad from Spain
- **36** Coming to Spain

1 **Core Facility Fellow**[e]

- Going abroad from Spain

47 **EMBO Courses & Workshops**[d]

5,820 participants in Spain
2,117 Spanish nationals attended EMBO Courses & Workshops anywhere

495 **EMBO Scientific Exchange Grantees**[d]

429 Going abroad from Spain

66 Coming to Spain

Santander
Barcelona
Madrid
Paterna, Valencia
Alicante
Sevilla

a Working in Spain
b Current and former programme members, working in Spain
c 2017 – spring 2022
d 2017 – 2021
e 2022

EMBC Delegates and advisors

Angela Nieto
Institute of Neurosciences (CSIC-UMH), San Juan de Alicante, Spain

Ignacio Baanante
Ministry of Science and Innovation

Inmaculada Figueroa
Ministry of Science and Innovation

The EMBO Programmes are funded by the European Molecular Biology Conference (EMBC), an intergovernmental organization that comprises 30 Member States. Spain has been an EMBC Member State since 1970.

EMBO opportunities in Spain

EMBO Postdoctoral Fellowships

fund scientists to carry out research for a period of up to two years. International mobility is a key requirement. Applications open all year around.

EMBO Scientific Exchange Grants

support new, international collaborations, enabling the transfer of expertise unavailable in the applicant's laboratory. They fund research visits of up to three months. Applications open all year around.

EMBO New Venture Fellowships

help early career scientists to explore topics outside their current area and prepare to enter a new research direction. They fund research visits of up to three months. Applications open all year around.

EMBO Core Facility Fellowships

support training for staff of core facilities that provide services to research institutions or universities. They fund international exchanges of up to one month. Applications open all year around.

The EMBO Young Investigator Programme

supports group leaders in the early stages of setting up their independent laboratories for a period of four years. Networking is a key aspect of the programme. Application deadline: 1 April.

EMBO Practical Courses

provide training in new techniques for researchers and core facility staff. Application deadlines for organizers: 1 March and 1 August.

EMBO Workshops

bring together scientists to present and discuss their latest discoveries. Application deadlines for organizers: 1 March and 1 August.

The EMBO Gold Medal

is awarded annually to young scientists for outstanding contributions to the life sciences in Europe. Awardees receive 10,000 euros and a hand-crafted medal. Nomination deadline: 1 February.

EMBO Press

publishes five journals that serve the global life science community: *The EMBO Journal*, *EMBO Reports*, *EMBO Molecular Medicine*, *Molecular Systems Biology*, and *Life Science Alliance*, which is published in partnership with Rockefeller University Press and Cold Spring Harbor Laboratory Press.

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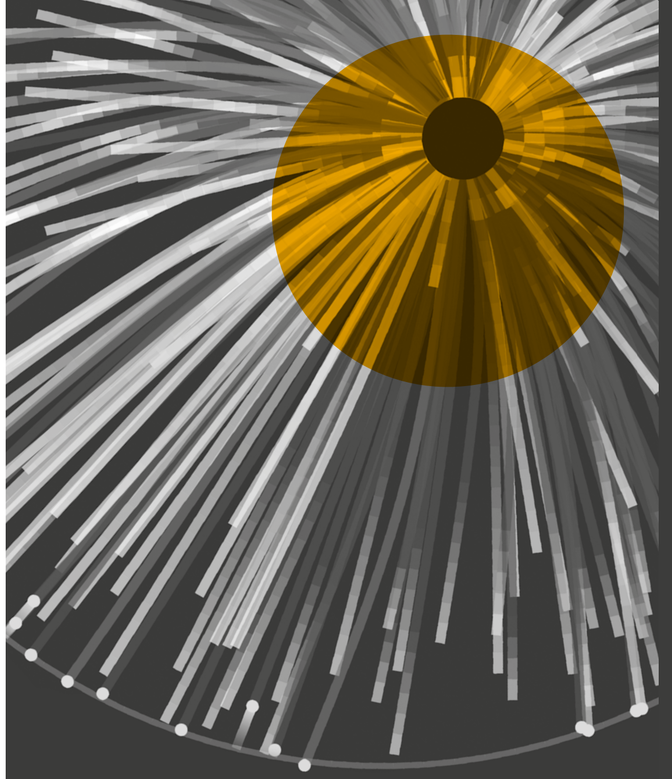

Focus on Spain

EMBO

Facts and figures

Spain has more than 1.6 million students enrolled across 84 universities, of which 50 are under public law[1]. With nearly half of its population aged 25-34 having completed tertiary education, Spain has one of the highest tertiary education attainment in the EU. However, the employment rate for recent tertiary graduates in Spain is below the EU average[2].

In 2020, Spain's public and private spending on research was 1.41% of GDP, below the roughly 2.3% average of European Union countries[3]. More than half of R&D expenditure was financed by the business sector, and the government contributed about 38% of total expenditure. In 2020, more than 230,000 people were engaged in R&D activities, including about 145,000 researchers[4].

Spain ranks among the 30 most innovative world's economies[5]. In 2021, the European Patent Office granted nearly 2,000 patents to first patentees residing in Spain[6]. According to the Organisation for Economic Co-operation and Development (OECD), Spain outperforms other OECD countries in work-life balance, health, social connections and safety[7].

Researchers in Spain have secured more than 6 billion euros through EU's Horizon 2020 research funding scheme, with more than 3,700 Spanish entities obtaining financing through the programme[8]. Spanish researchers have also been successful in securing funding from European Research Council grants, Marie Skłodowska-Curie Actions programmes[9] and EMBO Fellowships[10].

In August 2022, Spain's parliament passed a bill to reform a law on science, technology and innovation, with the aim of doubling public investment in research and improving job security for those working in the sector. The reform also seeks to address gender inequalities in R&D by requiring public research institutions to have and evaluate an annual gender equality plan[11].

In October 2022, the Spanish government announced a 2023 R&D budget of almost 4 billion euros – an increase of about 20% compared to 2022. The government also announced a funding call that will distribute 40 million euros to attract scientific talents[12].

Key figures

Population: 47.4 million[13]

R&D spending: 1.41% of GDP[4]

Researchers: 145,372 full-time equivalents[4]

Foreign researchers: 2,491[14]

Patents: 1,954[6]

Number of universities: 84 (50 under public law)[1]

Horizon 2020 funding[9]**:**

52,673 organizations involved in EU R&I programs

870 ERC Principal Investigators

4,523 Marie Skłodowska-Curie Actions funded researchers

References
1. Datos Y Cifras Del Sistema Universitario Español. Publicación 2021-2022: https://www.universidades.gob.es/stfls/universidades/Estadisticas/ficheros/DyC_2021_22.pdf
2. 2022 European Semester – Country Report: Spain https://ec.europa.eu/info/system/files/2022-european-semester-country-report-spain_en.pdf
3. OECD Data - Gross domestic spending on R&D https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm
4. Instituto Nacional de Estadística - R&D Statistics year 2020 https://www.ine.es/en/prensa/imasd_2020_en.pdf
5. Global Innovation Index 2021 - Spain https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2021/es.pdf
6. European Patent Office, Patent Index 2021 https://www.epo.org/about-us/annual-reports-statistics/statistics/2021/statistics/patent-applications.html#tab2
7. OECD Better Life Index https://www.oecdbetterlifeindex.org/countries/spain/
8. RESULTADOS DE LA PARTICIPACIÓN ESPAÑOLA EN HORIZONTE 2020 https://www.horizonteeuropa.es/sites/default/files/noticias/Nota%20-%20Resultados%20participación%20española%20en%20H2020%20vpub_1.pdf
9. Horizon 2020 country profile – Spain https://webgate.ec.europa.eu/dashboard/extensions/CountryProfile/CountryProfile.html?Country=Spain
10. EMBO facts & figures 2020 https://www.embo.org/documents/news/facts_figures/EMBO_facts_figures_2020.pdf
11. El Congreso aprueba definitivamente la reforma de la Ley de la Ciencia, la Tecnología y la Innovación https://www.ciencia.gob.es/Noticias/2022/Agosto/El-Congreso-aprueba-definitivamente-la-reforma-de-la-Ley-de-la-Ciencia--la-Tecnologia-y-la-Innovacion.html
12. El Ministerio de Ciencia e Innovación cuenta en 2023 con el mayor presupuesto en I+D+I de la historia de nuestro país https://www.ciencia.gob.es/Noticias/2022/Octubre/El-Ministerio-de-Ciencia-e-Innovacion-tiene-el-presupuesto-mas-grande-de-su-historia.html
13. Instituto Nacional de Estadística - Population Figures at 1 January 2022 https://www.ine.es/en/prensa/cp_e2022_p_en.pdf
14. Estadística de residentes extranjeros en España https://extranjeros.inclusion.gob.es/ficheros/estadisticas/operaciones/con-certificado/202012/Principales_resultados_residentes.pdf