

CAREERS

RETIREMENT EU pension scheme caters to mobile researchers **p.509**

GENDER Male scientists far outnumber female scientists in US job sectors **p.509**

NATUREJOBS For the latest career listings and advice www.naturejobs.com



BARTEK SADOWSKI/BLOOMBERG VIA GETTY

Warsaw is becoming a hub of globally competitive science.

POLAND

Into the light

As it embraces competitive international science, Poland is becoming a force to be reckoned with.

BY QUIRIN SCHIERMEIER

Cecilia Lanny Winata knew almost nothing about Poland before she was invited to move there from Singapore. At a 2013 zebrafish conference in Barcelona, Spain — where she presented her work on developmental genomics — she was approached by Jacek Kuznicki, director of the International Institute of Molecular and Cell Biology (IIMCB) in Warsaw, who asked if she might like to do science at his institute. The first thing she did was to look Poland up on a map.

A visit to the institute three months later persuaded her that the Polish capital is as good a place to start a lab as any better-known science hub in Asia, Europe or North America. Impressed by the IIMCB's state-of-the-art labs, and by the spirit of optimism and enthusiasm among its staff, she decided to take a chance. "Frankly, I was scared about exploring the possibility of moving to a country I knew so little about," she says. "But I find Warsaw to be a great place to do science, and I feel that as a young group leader I can establish myself in Poland for at least a couple of years."

Stretching from the Baltic Sea in the north to the wild Tatra Mountains in the south, Poland is larger than Italy or the United Kingdom. Like most European countries, it has a long and noble tradition of science and scholarship, epitomized by the likes of Nicolaus Copernicus and Marie Curie. But Polish science, like its national history, has been turbulent. During more than four decades of communist rule, when the country was effectively a satellite state of the Soviet Union, Polish scientists were largely isolated from the rest of the world. Communist regimes generously supported scientific research that was often conducted in secrecy. But when communism imploded around 1990, science in Poland (and throughout Eastern Europe) suffered a dramatic financial collapse and an exodus of researchers.

Those days of hardship are over. Poland's research intensity — the percentage of gross domestic product (GDP) spent on science — almost doubled between 2005 and 2015, to 1%. Its GDP grew even faster, so overall public and private science spending more than tripled, to €4.3 billion (US\$4.6 billion). And since 2004, when the country was one of several from the former Eastern bloc to join the European Union, about €100 billion in EU infrastructure funding has been spent on modernizing roads, hospitals — and scientific facilities. Economically, Poland is already the most successful transition country in Eastern Europe. As for its standing in science, it seems to be en route to regaining lost strength and talent.

GLOBAL PROFILE

Poland is already taking the lion's share of scientific publications produced in Eastern Europe. An influx of foreign researchers such as Winata and the creation of international centres and research facilities add a cosmopolitan touch to the country's science. And the proportion of funding through competitive grants is sharply rising. As a result, Poland's contribution to 68 leading science journals examined for *Nature's* 2016 rising-stars index leapt by 12.7% between 2014 and 2015 (see *Nature* 535, S56–S61; 2016). But although the brain drain is abating, the European Research Council is still awarding few of its prestigious grants to Polish science institutions — just 3 last year and 16 since 2007 — far fewer than have gone to the United Kingdom, Germany or Hungary. An ambitious scheme, launched last year, aims to create a network of independent research centres that will lure more top scientists.

The IIMCB, established in 1999, is ►

► emblematic of the country's upswing. In line with international practice, group leaders are selected in open competition and employed on fixed-term contracts. Their research performance is regularly evaluated by an international advisory board. Thanks to the institute's reputation, Winata found it much easier than she had expected to quickly establish a competitive multinational group that includes Polish and Indian PhD students, two postdocs who have returned from abroad and one postdoc from Pakistan. Her exploratory visit had already convinced her that the institute's zebrafish facilities and experimental equipment are top-notch.

Salaries, although on average about one-third of those in Western Europe, were no hindrance, she says. The IIMCB leads the EU-funded FishMed project — aimed at establishing zebrafish models for human diseases — which allows her to offer her lab members more money than universities and institutes that rely solely on Polish funding sources.

The €3.6-million project also involves elite centres in Austria, Germany, the Netherlands, Switzerland and the United Kingdom. "Being able to closely collaborate and exchange staff and students with leading groups in other countries is a big plus," she says.

GROWTH AND CHANGE

EU infrastructure funding has helped to refurbish existing labs and create new campuses and science parks across Poland. Warsaw is the country's main research hub, but other cities have benefited as well. The Małopolskie Centre of Biotechnology in Krakow, which received €24 million in structural funds, and the EIT+ science campus in Wrocław, which got more than €200 million, boast ample lab space and research equipment. But the international success of the IIMCB, whose researchers have published in *Nature* and other high-impact journals, isn't easily replicated (see 'In Pole position').

Poland needs brainpower to establish itself as a scientific nation of international rank, says Maciej Żylicz, president of the Foundation for Polish Science, the country's biggest independent research-funding agency. "We have fantastic labs by now, but we're lacking enough scientists," he says. "We must attract more foreign talent."

Persuading aspiring foreign scientists to come and do science in Poland hasn't been easy. Some among the country's traditionally conservative academic community are suspicious of attempts to make science more international, more competitive and less hierarchical. At universities, the power over money, research directions and publications often still resides with established professors, who tend to resist change. Early-stage independence, which is crucial for a young scientist looking for a professional career in international science, is rare. "Any progress in science depends on courage to try new things,

Poland is already pulling ahead of the rest of Eastern Europe in terms of research output, and it is gaining ground globally, according to *Nature Index* data from 2015–16. The nation is ranked 24th in the world for quality research output.

The index tracks research at more than 43,000 global institutions and 8,000 parent institutions. It found a 12.7% rise between 2014 and 2015 in Poland's weighted fractional count (WFC), which measures an institution or country's share of scientific-paper authorship across all subjects, corrected for an over-representation of astronomy articles.

Index data place Poland above the Czech Republic (26th), Hungary (37th), Slovenia (40th) and Romania (43rd), and earned it a place in *Nature Index's* 'Rising Stars' list. The country's science — particularly life sciences — has benefited from generous support from the European Commission (EC) and from a new competitive-funding regime. In 2011, the government established the

something that has been missing in Poland in the past," says Olga Malinkiewicz, founder of the Wrocław-based Saule Technologies, a privately backed solar-energy company. "And if you never were in touch with good scientists abroad you can't really change things at home."

No one was studying photonics seriously in Poland in 2006, when Malinkiewicz left for graduate studies in Spain. While at the University of Valencia, she developed a type of efficient solar cell based on a promising material called perovskite (see *Nature* 513, 470; 2014).

Potential investors began to line up before she finished her PhD, and when the opportunity arose in 2014 to start her own company in premises rented from the EIT+, she didn't think twice. Her expanding company has since moved to the Wrocław Technology Park, where commercialization of perovskite-based solar cells is set to start this year. Although no official figures have been made public, a Japanese investor is said to have provided \$5.3 million.

NETWORKING OPPORTUNITIES

Meanwhile, the Foundation for Polish Science has launched an ambitious attempt to create a network of independent basic-research institutes run by international-calibre researchers. Ten planned centres will each operate in strategic partnership with an existing institute

NATURE INDEX

In Pole position

National Science Centre funding agency.

The country's oldest higher-education institution, the Jagiellonian University in Krakow, was 69th in the Index list of the world's top 100 institutions. With EC funding, it has built Poland's first synchrotron radiation facility supporting cutting-edge research in physics, chemistry and material science. The facility began operating in 2015.

Poland's top ten institutions by WFC are:

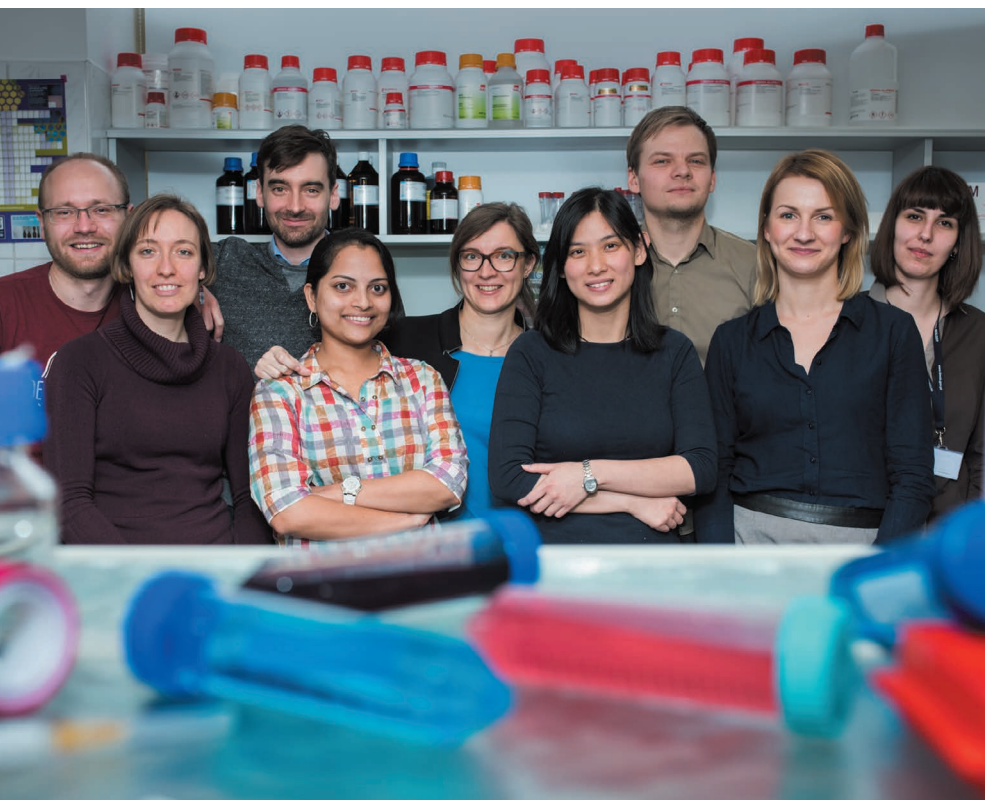
- The Polish Academy of Sciences
- University of Warsaw
- Jagiellonian University
- University of Wrocław
- Wrocław University of Science and Technology
- Maria Curie-Skłodowska University in Lublin
- Adam Mickiewicz University in Poznań
- AGH University of Science and Technology in Krakow
- Warsaw University of Technology
- Nicolaus Copernicus University in Torun **David Payne**

abroad, and will focus on emerging fields.

The government has earmarked €126 million in EU structural funds for this International Research Agendas programme. What's new, says Żylicz, is that the centres will be built up around individual scientists who will have maximum freedom to define research directions and hire staff — a principle adopted from the German Max Planck Society, which has successfully applied it for decades. "An empty lab is not a good starting point for science," he says. "That's why we will look for strong leaders first and then apply a tailor-made research structure around them."

Tomasz Dietl and Tomasz Wojtowicz, two Polish semiconductor physicists who last June won the first round of competition for funding, have received 40 million złoty (\$9.8 million) for research on topological phases of matter and new classes of exotic materials. The windfall, says Dietl, will allow him to hire some 40 scientists and set up 6 groups at an international centre in Warsaw, hosted by the Polish Academy of Science's Institute of Physics. "We're not the centre of the universe," he says. "But we can offer a great deal of scientific freedom, excellent research conditions, nice salaries and good connections with top institutes abroad."

Researchers at the institute will be able to rely on experimental facilities, such as equipment for crystal growth and low-temperature physics, that are on a par with the best centres in Western Europe, says solid-state physicist Laurens Molenkamp of the University of Würzburg in Germany. He has a long-standing collaboration with Dietl and will serve as an



Cecilia Lanny Winata (fourth from right) has built a multinational genomics lab in Warsaw.

adviser to the new centre. “The molecular-beam facilities they now have in Warsaw are pretty unique in Europe,” he says.

Winners of the second open call will be announced in April, and two more calls will follow. Żylicz hopes that the programme will eventually draw a few dozen principal investigators and hundreds of international postdocs to do science in Poland. Funding for each centre is limited to five years. “But as they learn to swim in Polish waters I hope that many newcomers will opt to stay longer,” he says.

ABUNDANT OPENINGS

Competition for funds is much less fierce in Poland than in Germany and many other countries, says Austrian-born structural biologist Sebastian Glatt, who leads an independent research group funded by the Max Planck Society at the Małopolskie Centre of Biotechnology. Things there have turned out so well for him that he is considering extending his stay in Poland beyond the envisaged five years. Within a year of starting, his lab had grown to 16 members — including postdocs from Austria, Spain, Taiwan and Ukraine — and it is set to keep expanding. He has no teaching obligations and is pleased with his success in attracting foreign talent and securing grant money from Polish and European sources. “There is abundant grant money available in Poland now and it is easy for junior scientists with a good track record to get funded here,” he says. “That’s a huge advantage — and from the large number of

job applications I receive, I can see that many people are aware of it.”

Scientists who consider moving to Poland, says Winata, should make sure that their host institute is prepared to help foreigners to acclimatize, for example by supporting them in dealing with authorities and landlords. They should also choose institutes that adopt an open-minded and communicative research culture. Glatt is keen for students to openly discuss their work in department seminars and for scientists to exchange ideas while meeting in core research facilities or during social events. “Office doors at our institutes are wide open all the time,” he says.

The government is set to continue to enlarge and modernize Poland’s research base. Teaming up with high-profile institutes in Western Europe will assist that effort, and will also help Polish science to get international recognition, says Żylicz. The Max Planck Society plans to expand its collaboration with Poland, and France, Switzerland and Spain are also potential partners.

Outside the new labs and campuses, Poland has turned into a colourful place with liberal cities brimming with restaurants, bars and theatres. “Poland has become a much different country to the one I had left ten years ago,” says Malinkiewicz. “Something is happening here, and now is a perfect moment for scientists to come and grab their piece of cake.” ■

Quirin Schiermeier is a senior reporter for *Nature* in Germany.

FINANCE

Pan-European pension

A pension-investment scheme for researchers in Europe is open for contributions. The Retirement Savings Vehicle for European Research Institutions (RESAVER) aims to help mobile researchers within the European Economic Area (EEA) to save for retirement and to supplement their social-security pensions. Those eligible to contribute include researchers with employment contracts within the EEA and researchers coming into the EEA, as long as the employers are members of the scheme. The EEA includes Norway, Iceland, Liechtenstein and European Union member states. Early-career scientists, who move often between institutions and nations, have baulked at institutional pension-savings plans because they often do not stay long enough to gain vesting rights and must forfeit contributions when they leave. RESAVER says that contributors to the new scheme may withdraw their full assets, including dividends and external contributions, if they move within the EEA. If they leave, they can collect the account’s total funds at retirement.

EMPLOYMENT

Male majority

Men outnumber women in US science positions across academia, government, industry and the entrepreneurial sector, according to a report from the US National Science Foundation. *Women, Minorities, and Persons with Disabilities in Science and Engineering* found that 4.7 million people were working in science positions in the United States in 2015, across all disciplines and employment sectors. The figure included twice as many men as women. Of that total, 17% worked in academia, including at universities and undergraduate institutions, and men held 53% of those positions. Of the 5% who worked for the federal government, men held two-thirds of the jobs. About 3.5% of scientists were self-employed, two-thirds of whom were men. Of the 5% of scientists who work in state or local government jobs, two-thirds were men. More than half of all scientists, about 59%, were employed in industry or business, and three-quarters of these scientists were men. Another 6% worked in non-profit positions, in which women outnumbered men by 1 percentage point. Women held two-thirds of science jobs at other educational institutions, including two-year and community colleges.