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A nation with ambition

India is making great strides in improving its science, but it needs to look carefully at its approach and work with the rest of the world if it is to realize its full potential.

The website of the Indian Department of Science and Technology proudly states that "India is one of the top-ranking countries in the field of basic research".

It is true that India has made considerable progress in areas such as biotechnology, renewable energy and aerospace. But it is also mired in deep problems that impede innovation and are hampering the country's progress. India has a puny scientific workforce, relatively few high-quality universities, an anaemic manufacturing sector and an epidemic of red tape. The result is that many Indian scientists head to other countries for training and jobs.

It would be easy to argue that a lack of funding is holding India back and stopping it from becoming a science superpower. The country devotes less than 1% of its gross domestic product to research and development, which puts it far behind emerging nations such as China and Brazil, as well as the established economies of the United States and Europe. But more money will not cure India's multiple science ills, as *Nature* documents this week in a special issue on the state of research in the country (see page 141).

One of India's biggest challenges is to boost its science to help drive national development. As a start, it must expand its research workforce. But that will require more high-quality universities and appropriate jobs for their graduates. The government is taking steps in the right direction. It has established tax incentives for research and development that are among the best in the world. These have helped to boost research investments by a few industries, but have yet to drive widespread innovation.

In tandem, India must tackle the bureaucratic morass that is impeding research and innovation. Scientists complain that funds for grants routinely arrive months late and that it can take years to fill positions. As a measure of the problem, one-third of the national laboratories, which are overseen by the prestigious Council of Scientific and Industrial Research (CSIR), lack permanent leaders (see page 144). Even the CSIR is run by a temporary director-general, Madhukar Garg, who told *Nature* that if the organization continues along these lines, "it will affect the national innovation system as a whole".

Prime Minister Narendra Modi, like his predecessors, has denounced the bureaucratic brakes holding back science, but there has been little progress here. A key to solving the issue is to elevate talented scientists who have administration experience into positions of responsibility. One example is Krishnaswamy VijayRaghavan, who is profiled on page 148. He is a gifted geneticist who in 2013 took over as head of the Department of Biotechnology, the leading funder of bioscience research grants. Among other changes, he is attempting is to streamline the notoriously cumbersome grant-application process.

India could use some help. Compared with some other developing nations, it has a relatively low level of international collaboration, even with the United Kingdom, with which it shares a unique history. It bodes well that the new UK minister of universities and science, Jo Johnson, has a strong interest in India. In fact, he co-edited a book entitled *Reconnecting Britain and India: Ideas for an Enhanced Partnership* (Academic Foundation, 2012).

India does, however, need to look closely at the changes it is making, because not all are positive. As part of its effort to encourage development, the Modi administration has tried to silence some critics of policies on energy, climate and human rights. In April, the Indian government revoked the registrations of thousands of non-governmental organizations (NGOs) that receive foreign funds, and it has frozen the assets of Greenpeace over claims that it had violated reporting rules about foreign contributions. On 6 May, the US ambassador to India, Richard Verma, warned about "the potentially chilling effects of these regulatory steps focused on NGOs".

"The solution is not to silence discussion or to shrink environmental oversight."

Some scientists might be tempted to applaud India's clampdown on environmental groups, which have stymied certain research initiatives. In March, environmentalists held up construction of a major neutrino observatory with debatable claims that the facility would harm an aquifer. And *Nature* reports this week that the Modi government has quietly moved forward with trials of genetically modified crops, which have long been desired by biotech researchers but have been impeded by environmental groups (see page 138).

But scientists in India should not cheer the government's attempts to suppress dissent, even if it helps them to achieve their research goals. It would be wrong to blame environmental advocates for India's lengthy and fault-ridden procedures for weighing up the impact of projects. The solution is not to silence discussion or to shrink environmental oversight. Rather, India should make strategic improvements to the environmental evaluation process that balance progress with protection. ■

Challenging times

A European initiative to ban animal research has galvanized resistance.

The Stop Vivisection initiative has been panicking European researchers since it was first proposed in 2012, but its long-trailed public hearing this week at the European Parliament in Brussels turned out to be a pretty grey affair.

The duo who presented the initiative — which calls for the replacement of the 2010 European Union (EU) directive on the use of animals in scientific research with legislation banning all animal research — spoke calmly but unconvincingly. Their extremist claims, that animal models have no predictive value for human disease, drew thin and only

occasional ripples of agreement from a cluster of supporters seated at the back of the half-filled auditorium.

The hearing was part of the EU's move to expand direct democracy by introducing European Citizens' Initiatives, which allow individuals to launch requests for legislation. A proposed initiative that collects at least one million signatures from at least seven EU countries wins the right to a public hearing in the Brussels parliament and obliges the European Commission to consider whether new legislation is warranted.

As Kay Davies, an animal researcher at the University of Oxford, UK, wrote in *Nature* last week, in this case, it is not (see *Nature* **521,** 7; 2015).

For too long, activists have been left to dominate animal-research debates in many European countries. Their frequently inaccurate declarations — along with their not-infrequent physical attacks and death threats — have gone largely unchallenged by the scientific community and by the agencies and politicians who support the community's work. This has been slowly changing in the past few years, mostly thanks to the efforts of UK-based scientists and science organizations, who have emerged from their bunkers to set the record straight.

Germany, despite its status as one of Europe's major scientific powerhouses, has lagged behind in this effort. But a recent incident has sparked a remarkable change — one that should shore up support to protect the EU directive.

One of the country's top neuroscientists, Nikos Logothetis, a director at the Max Planck Institute for Biological Cybernetics in Tübingen, last month gave up a long and painful struggle to maintain his primate laboratory, which had been targeted by animal activists. Unable to handle the death threats and insults to himself and his family, on 22 April he told local authorities who handle licences for animal experimentation that he would wind down his primate work and continue his work on rats only. This would mean reducing the scope of his research questions to levels still valuable for understanding general principles of neuronal action, but no longer directly translatable to human investigations.

Logothetis's problems began last September, when a German television channel aired a documentary using footage of his macaque monkeys secretly filmed by an animal-activist infiltrator. It seemed to show maltreatment of the animals. The resulting scandal led to a series of investigations that exonerated him and suggested that the behaviour of the monkeys had been staged for the camera. A police investigation is still going on.

His decision to quit primate work dismayed many of his colleagues, and so did its timing. Coming so close to this week's public hearing, they feared that it would be presented as a victory for the Stop Vivisection proponents. But something quite different happened: a swell of support for Logothetis and the type of primate research he carries out.

First, politicians at the highest levels reacted with unprecedented speed and clarity to mount an unambiguous defence of the scientific use of non-human primate research. The research minister in the state government of Baden-Württemberg, where Tübingen is located, condemned as cynical and exploitative the wild claims that Logothetis's decision implied that research with monkeys was not after all necessary. The federal research minister stated that such research was still crucial for developing treatments for brain disorders such as dementias.

"For too long, activists have been left to dominate animal-research debates in many European countries."

And a new policy of the Max Planck Society to be more open about its animal research showed its teeth. On 30 April, the society released a statement of regret about Logothetis's decision and confirmed its own commitment to continue supporting research using non-human primates. The society's president, Martin Stratmann, a materials scientist who took office last year and who has selected the handling of the animal issue as a priority for 2015, spoke out to pledge greater protection of its researchers against attack. At the grass roots, colleagues in Tübingen launched a petition to support Logothetis that has received more than 4,000 signatures from scientists around the world.

This outspoken support has been echoed elsewhere. Parliamentary debates on animal research in Italy this week, where animal groups have been particularly active in the past few years, questioned rather than accepted animal-activist claims. Sixteen European Nobel laureates published an open letter in UK and German newspapers to rebut the Stop Vivisection campaign, joining a similar statement by 149 major research organizations and patient groups.

The European Parliament has until 3 June to decide what to do. It should listen to the loud and unified voice of the continent's scientists, and then do precisely nothing. ■

Polls apart

The UK voter opinion polls show that an anomalous answer can be the correct one.

Britain's new Conservative government has barely settled into office, but already the results of last week's general election have got certain members of UK society fearing for their future. They are scorned by the tabloid press and social media; even serious observers are questioning whether the country has been in thrall to them for too long. An inquiry has already been announced.

Opinion pollsters, the media told everyone, were predicting the closest election for decades. Labour and the Conservatives were neck and neck; weeks of constitutional chaos would follow the election as mandarins and officials wrestled with competing and overlapping political claims to power. The small print says that opinion polls should always be taken with a decent pinch of salt. But who reads the small print when there is an election on and a 24-hour news cycle to fill?

It took a single poll of voters post-voting to reveal the truth, which was confirmed as the counted results flooded in: David Cameron's Conservative Party had grabbed 37% of the vote (see page 134). That was nearly seven percentage points ahead of Labour and, crucially, well outside the margins of error of all the previous deadlocked polls.

Amid the fallout, a single polling firm revealed that it had correctly predicted — and then buried — the result. Gathered the day before the election, its poll results seemed so out of line with what everyone else was saying that the firm did not dare to publish them. "I chickened out of publishing the figures," confessed Damian Lyons Lowe, the chief executive of Survation in London. "Something I'm sure I'll always regret."

Nature's readers can surely sympathize. The question of how to deal with anomalous data is a centrepiece of research, and the results can make or break careers — or launch scientific revolutions. From the discovery of the ozone hole over Antarctica to the observation that some people seemed unaffected by HIV infection, unusual results — data that make you go 'hmmm' — have led scientists to question their methods, their knowledge and, ultimately, their understanding of the world.

The importance of anomalies in science has spawned its own sub-field of research into how researchers respond to them. In the mid-1980s, psychologists supported by US military funds went as far as constructing a bespoke computer program to recreate how Hans Krebs reacted to surprising results during his discovery of the urea cycle in 1932. Others conduct *in vivo* studies by filming astronomers and physicists as they wrestle with unexpected findings.

The ultimate test of anomalous data is, of course, to repeat the experiment. But that demands that scientists have the courage and insight to treat such results seriously in the first place. How many potential discoveries lie in the waste-paper bin of history because the cautious chickened out? ■

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