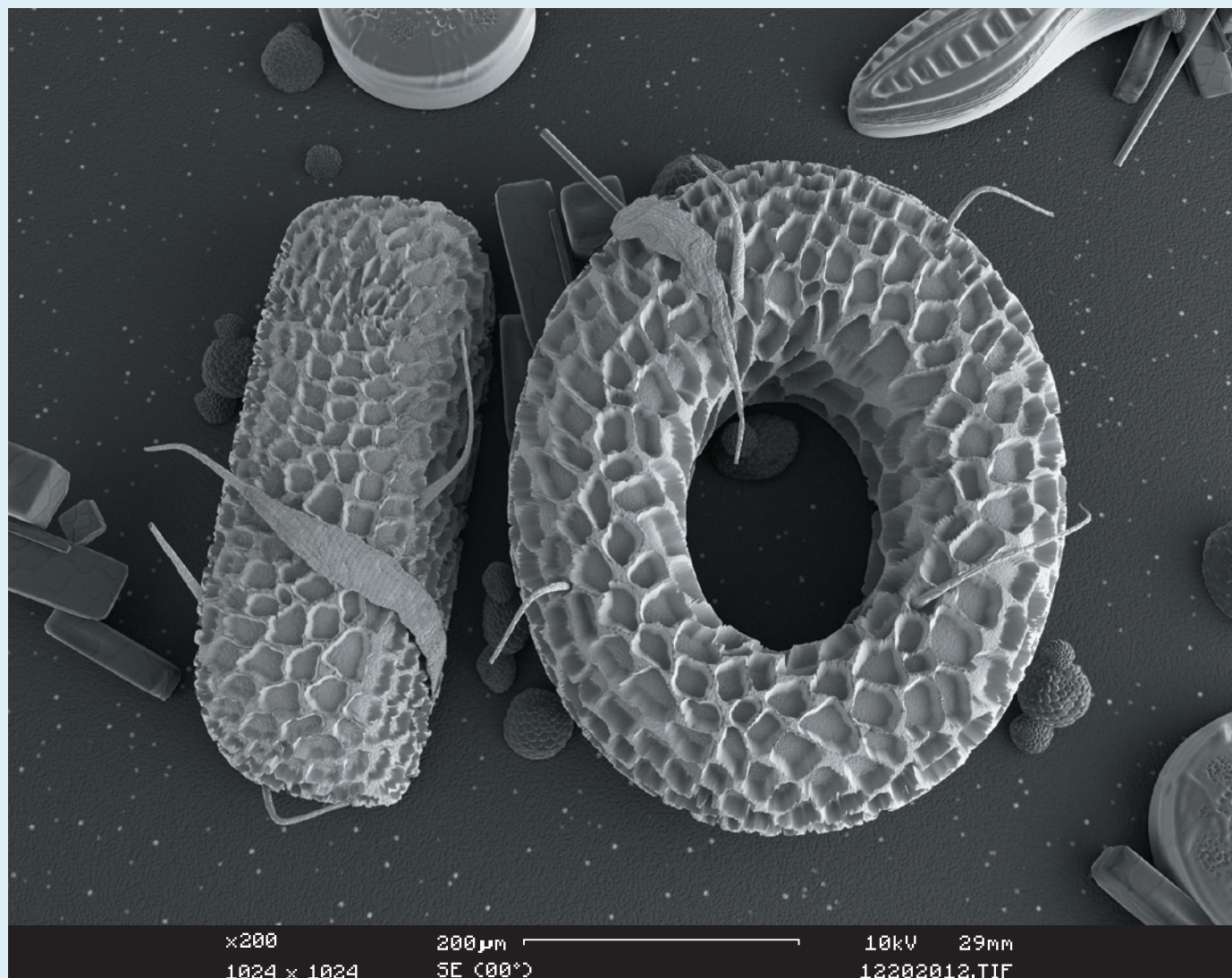


ROLF-DIETER HEUER / CYNTHIA ROSENZWEIG / ADAM STELTZNER / CÉDRIC BLANPAIN / ELIZABETH IORNS
JUN WANG / JO HANDELSMAN / TIM GOWERS / BERNARDO DE BERNARDINIS / RON FOUCHIER

CHRIS LABROOY



NATURE'S 10

Ten people who mattered this year.

366 DAYS:
the year in science



**ROLF-DIETER
HEUER**

LAURENT EGLI/CERN

THE HIGGS DIPLOMAT

Gentle nudging from the head of CERN ensured that the world heard about the discovery of a long-sought particle.

BY GEOFF BRUMFIEL

The detection of the Higgs boson, announced to the world on 4 July, was the scientific discovery of the year, if not the decade. But it might not have been a discovery at all had it not been for the diplomacy of Rolf-Dieter Heuer.

As the director-general of CERN, the particle-physics laboratory located near Geneva, Switzerland, Heuer has budgetary control over the Large Hadron Collider (LHC), which generated the Higgs by smashing together protons at energies higher than those of any other accelerator in the world. But Heuer has considerably less authority over the two experiments that detected the particle in the debris of the collision; those facilities are run democratically by the thousands of physicists who built them.

Heuer didn't even know what the groups had seen until mid-June, when their two sleep-deprived leaders, Fabiola Gianotti and Joe Incandela, gave him short presentations on what their building-sized detectors had found. The results were tantalizing: after months of gathering data, both experiments now had strong signals from a new kind of particle inside the LHC — signals that closely mirrored what theorists expected from the Higgs, first predicted nearly 50 years ago.

Yet neither group leader was willing to claim that they had 'discovered' the Higgs. High-energy physicists are reluctant to make such a declaration until the chances of a statistical error are whittled down to a level known as 5-sigma — 1 part in 3.5 million — and neither experiment was quite there with the Higgs data. Both leaders had many group members pushing to delay announcement of the discovery until the end of the year, when the steadily accumulating data would make the

conclusion cast iron. "Fabiola and I felt tremendously stressed about the whole thing," Incandela recalls.

Heuer was under pressure, too. That same week, there was a meeting of CERN's governing council: a committee of civil servants, diplomats and independent scientists from the lab's member states. The council made it clear that, if there was something to say about the Higgs, the physicists had a duty to say it out loud to the governments and citizens who had paid for the LHC.

Heuer and the detector groups agreed to have a public seminar at CERN on 4 July, but with days to go it was still unclear just what would be claimed. The evidence was growing stronger every day as more data were analysed, but the detector groups remained cautious and reluctant to make any bold claims. A less astute director-general might have pushed Incandela and Gianotti to declare victory, says Incandela. "Imagine, you've got these two people coming in who are both paranoid as hell and incredibly conscientious showing you these unbelievable results," he says. "Rolf was looking at us both and thinking, 'What's the matter with these guys?'"

But the affable, 64-year-old Heuer has a reputation for guiding without being bossy, and for listening. "In German it's *'ein Händchen'*" — a gentle hand", he says. "You have to have a feeling for people, a feeling for what they can do and what they cannot do." If the consensus within the experiments wasn't quite there, he wasn't going to push it further. But after consulting with Incandela, Gianotti and others, says Heuer, "I decided that I could use the word 'discovery'." He would take the risk that the experiment groups wouldn't.

The final press release was drafted with just two days to go and, as promised, the word "discovery" appeared just once, in a quote from Heuer. On the morning of the announcement, Gianotti and Incandela stood before their peers, politicians and the press. In back-to-back talks, they laid out the evidence they had for the new particle. "We agreed that we would just stick to the facts," says Gianotti.

After the talks, Heuer, who had played the role of jovial master of ceremonies for the entire affair, stood before the packed auditorium. Now was the time for him to drop the 'D' word. But he paused ahead of his prepared remarks. Ever the diplomat, his first words were not a declaration but a question: "As a layman, I would now say, 'I think we have it.' Do you agree?"

The auditorium burst into applause. ■

GUARDIAN OF GOTHAM

New York's climate-adaptation champion is determined to make her city more resilient to natural disasters.

BY JEFF TOLLEFSON

As Superstorm Sandy battered the US east coast this year, Cynthia Rosenzweig huddled with her 97-year-old mother in a suburb of New York City, not far from where she grew up. After making sure that her own home had sustained only minor damage, Rosenzweig turned her attention to the city, which had not been so lucky.

Sandy had driven a 4-metre wall of water into low-lying neighbourhoods, destroying homes, flooding transportation tunnels and leaving millions of people without power. Although the damage came as a shock to most, Rosenzweig and a team of researchers had forecast those consequences a dozen years earlier as part of the first national assessment by the US Global Change Research Program.

"Everything that happened is in our earliest report," says Rosenzweig. Because of that work and many follow-on studies conducted for state and city officials, New York has incorporated climate-change adaptation and resilience into its long-term planning initiatives, which include upgrading building codes and managing parks and wetlands to accommodate flooding and sea-level rise. The actions have made New York a leader among cities working to prepare for the threats of climate change, says Rosenzweig. She is now trying to assess whether these steps helped to lessen Sandy's impacts, which may offer a preview of the threats expected as climate change intensifies storms and raises sea levels.

Rosenzweig's path to urban protector started in the fields of Tuscany, Italy, in 1969. She had left university in California to rent a small farm with her future husband, where they learned to pick grapes and olives and raise goats, pigs, ducks and geese. Eventually, she decided it was time to go back to

university to study agriculture. While pursuing a master's degree at Rutgers University in New Jersey, she found her way to a job at NASA's Goddard Institute for Space Studies (GISS) in New York, analysing satellite data on croplands.

When she arrived, GISS director James Hansen was busy modelling the impacts of a doubling in atmospheric carbon dioxide concentrations. He wanted to know what would happen to crops. As an agriculture expert, "I was the only person at GISS at that time who could begin to answer that question", she says. "I've been answering that question ever since."

To do so, Rosenzweig had to expand her focus from crops to agricultural economics, folding in the broader impacts on farmers, food supply systems and society. Thanks to her experience in complex assessments, Rosenzweig was chosen to head up the northeastern regional analysis when the first national climate assessment kicked off in 1997. Her team's analysis suggested that singular shocks such as Sandy would cause widespread problems.

Today, she co-chairs the New York City Panel on Climate Change, which advises local policy-makers. She is also helping to coordinate regional and international groups that are exploring climate adaptation and resilience.

The city has a long way to go. Rather than focusing on big-ticket solutions such as storm-surge barriers, Rosenzweig calls for a range of initiatives, from increasing redundancy in the electric grid to sealing off tunnels and making coastal areas more resilient to flooding. She doesn't pause for breath while running through the litany of needs. "We have to do more. We have to do better. We have to spend more money. We need pilot funding projects. There's just a lot to it." Then Rosenzweig flashes a wide smile. "I'm not a pessimistic person," she says. "We have to succeed. We don't have a choice." ■

NATL. CLIMATE CHANGE ADAPTATION FACILITY





ADAM
STELTZNER

OUR MAN ON MARS

NASA called on an unconventional engineer to give its pricey new rover a baby-soft landing on the red planet.

BY ERIC HAND

When NASA's Curiosity rover slammed into the Martian atmosphere at 5,900 metres per second on the night of 5 August, no one on Earth was more worried than Adam Steltzner, the engineer who led the 50-person entry, descent and landing (EDL) team for the US\$2.5-billion mission.

At first, says Steltzner, all the data coming back from the spacecraft seemed fine as it began to brake by carving S-turns in the thin air like a crazed snowboarder. But then a few abnormal telemetry signals arrived at the control room at the Jet Propulsion Laboratory in Pasadena, California. "Beta out of bounds catastrophic," read one. Translation: Curiosity was tilting too much to the side. "The first two data points we see are like: 'You're going to die,'" says Steltzner.

He still uses the present tense as he recollects the landing sequence, and is not averse to hyperbole and dramatic pauses, unlike most engineers, who cloak their emotions in cautious jargon. "He's a very instinctual person," says colleague Al Chen, who was the voice of mission control that night. "And his instincts are often right."

Part of Steltzner's persona stems from growing up in Marin County, north of San Francisco. More interested in theatre and rock music than in his studies, the feckless teenager barely graduated from high school. Eventually, he realized he was just "bright and bored". He went

BILL INGALLS/NASA

CELL TRACKER

By tracing the descendants of a single cell, a cautious developmental biologist tackled a controversy over tumour growth.

BY MONYA BAKER

Cédric Blanpain likes to see things for himself. His students, he says, "tell me in the morning that they have something very important. And I run, not to the screen, but to the microscope." When he was first setting up his lab at the Free University of Brussels six years ago, Blanpain's see-it-to-believe-it approach drew him to study untouched cells in tissues from living animals rather than, as is often done, in dishes or after transplantation. He didn't trust what cells do outside their normal environment.

His advisers warned him that the task would be tough — but Blanpain, a quick-talking developmental biologist with a penchant for snowboarding and jazz, was undeterred. He decided to refine a technique called lineage tracing, which reveals patterns of cell division in tissue. Blanpain uses low levels of a drug to activate a gene and change the colour of

specific cells and all their descendants, so that they can be seen under a microscope. He often works with a theoretical physicist to analyse the starting cells' contribution to the resulting tissue. No one has been able to track cell lineages as carefully or as quantitatively, says Brigid Hogan, a cell biologist at Duke University in Durham, North Carolina.

In October last year, Blanpain's team looked at mammary glands in mice during fetal development, pregnancy and lactation. Cell-culture work had led researchers to believe that a common cell type gives rise to multiple kinds of mammary cells. But when Blanpain looked at cells left undisturbed in mammary fat pads, he saw that they contributed just to a single lineage. He then went on to show that the adult mammary gland actually contains distinct types of stem cells (A. Van Keymeulen *et al. Nature* **479**, 189–193; 2011), a fact that could help to pin down the genesis of breast cancers. Blanpain "cleared up what had been a very confusing field", says Hogan.

This year, Blanpain tackled a long-standing controversy over the existence of cancer stem cells. By applying a carcinogen to mouse skin and then using his cell-tracking method, his team was able to show that cells do not contribute equally to the resultant tumours: some of the cells in a tumour peter out after a few divisions, and others — the stem cells — produce thousands of clones (G. Driessens *et al. Nature* **488**, 527–530; 2012). This implies that drug developers should focus on killing these tumour-generating cells.

Blanpain says that he hadn't expected such dramatic results. "I saw the first slide, and I said 'show me the second one'. After the fifth, I was sure what I was seeing." ■

on to earn a PhD in engineering physics and deeply absorbed the Navier–Stokes equations on fluid motion and the laws of thermodynamics until, he says, “they were woven into my soul”. But he still hasn’t given up his flair for the dramatic. Nor, with his western-style shirts, pomaded hair and big-buckle belts, has he ceded a rock star’s fashion sense. He describes his look as “rockabilly meets post-punk Poindexter”.

On the night of the landing, however, Steltzner was wearing one of the several hundred blue Curiosity golf shirts that had been issued to the mission team. Steltzner had had the acronym ‘EDL’ discreetly embroidered on the left sleeve of his team’s shirts — a badge of honour for the tightly knit group.

Steltzner paced around the control room. The dire tilt warnings turned out to be false alarms. But a second moment of tension came 7 minutes later, as a hovering jet pack called a sky crane slowly unspooled the 1-tonne rover to the floor of Gale crater from an altitude of 20 metres.

Nothing like the sky crane had been tried before in a Mars landing. Steltzner vividly recalls the brainstorming session in which he and a dozen others “groped it into existence”. In guiding other design choices, Steltzner tended towards a ruthless simplicity; he argued for the spacecraft to use one parachute instead of two, and for the rover to use a pulverizing drill instead of one that extracts a core. But with the sky crane, Steltzner can’t help but acknowledge a design sensibility that was a bit more baroque. “Because it looked so outlandish, we all felt very exposed,” he says. “If it failed, people would have been like, ‘You idiots.’”

That’s one reason why, in the control room, Steltzner wouldn’t declare success until he had two independent confirmations that the rover had landed, one from the rover itself and one from the sky crane, still hovering overhead. Then came the hardest part: he counted to ten, to ensure that the sky crane, after being severed and rocketed away, hadn’t somehow crashed down on top of the rover. He recalls, “At that point, I pointed at Al and said, ‘Do it’. And he called out: ‘Touchdown confirmed. We are safe on Mars.’” ■

ELIZABETH IORNS



REPLICATION HOUND

A geneticist takes her quest to check results to the forefront of science.

BY MONYA BAKER

Elizabeth Iorns did not expect to be attacked for following the scientific method. As a postdoc at the University of Miami in Florida in the late 2000s, she spent a year trying to replicate findings that a particular gene worked as a switch for malignancy. After she concluded that the original research was flawed — a conclusion denied by its authors — she wanted to warn others. But she struggled to publish her data, and faced personal attacks and career setbacks after she succeeded. “It’s still an experience that I don’t like to bring up,” she says.

Given the obstacles, she began to suspect that many published experiments are never repeated. And this year, she decided to do something about it. The need was clearer than ever, she says. Increased retraction rates had drawn the attention of the US National Academy of Sciences. Scientists at Amgen and Bayer reported that they had been unable to reproduce the vast majority of ‘landmark’ papers describing promising approaches to treat disease. The field of psychology was hauled up for widespread replication problems (see *Nature* **485**, 298–300; 2012).

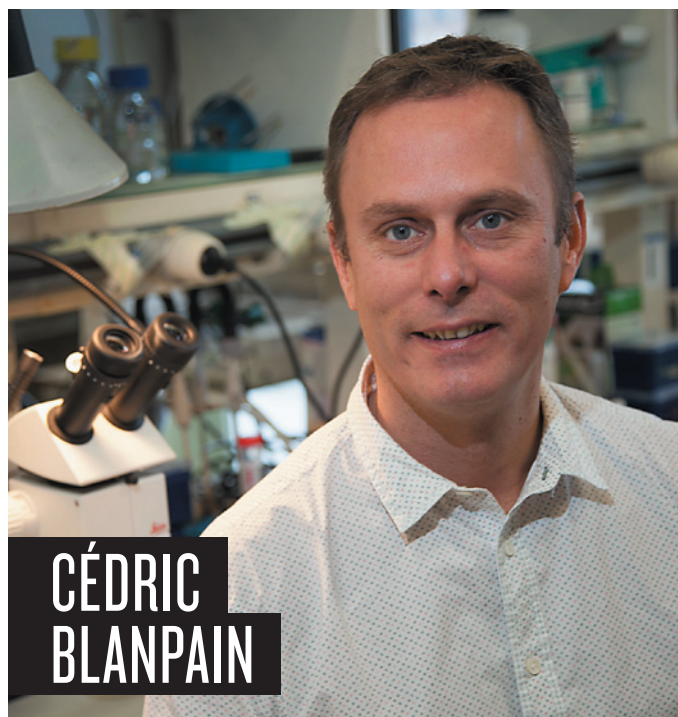
In August, Iorns founded the Reproducibility Initiative, based in Palo Alto, California, which allows authors to submit their papers for replication. Scientific advisers select key experiments and arrange for disinterested third parties to repeat them. If the results are replicated, the validation study is published in *PLoS ONE*, linked to the original paper. This, says Iorns, can draw more attention to the original findings and motivate authors to put their results up for testing.

The Reproducibility Initiative is a limited solution to an important problem, says Ferric Fang, a molecular biologist at the University of Washington in Seattle who has investigated causes of sloppy science. “The ability of work to be reproduced is a hallmark of good science, but it’s difficult to publish work that replicates someone else.” Fang advocates finding easier ways for scientists wishing to expand on the original research to report their replication attempts.

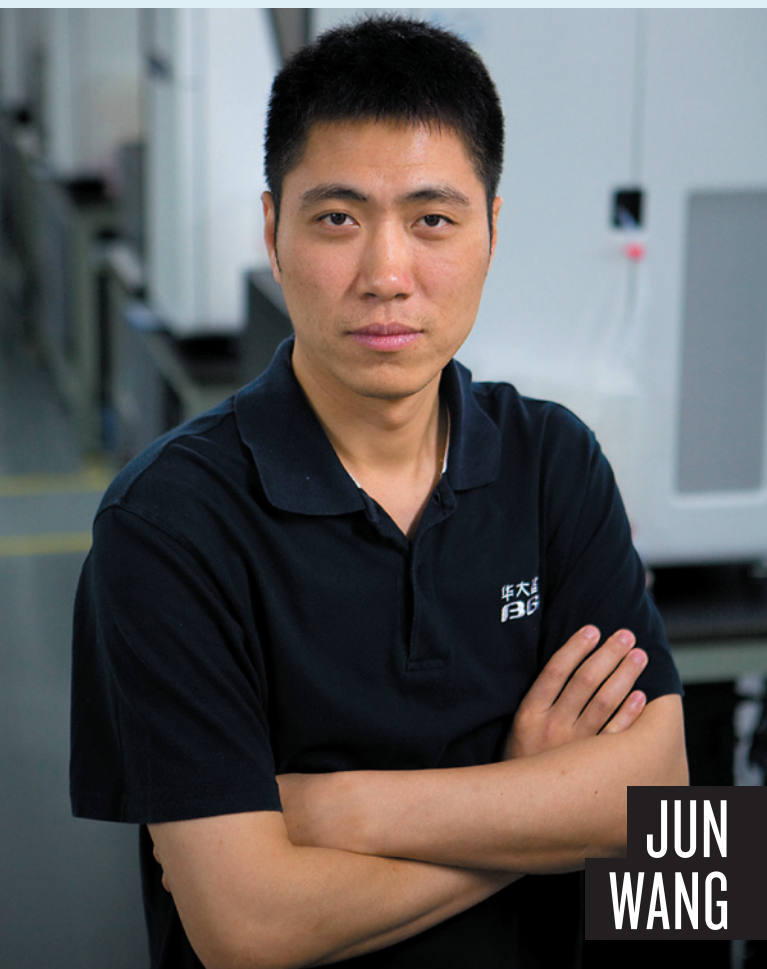
On 14 November, the Reproducibility Initiative e-mailed about 7,000 corresponding authors of recent publications in PubMed asking them if they would like their study validated. By the next day, they had 675 replies, of which 77% said yes. But someone has to foot the bill — which Iorns estimates will be about 10% of the original research cost. Iorns is busy convincing funders that supporting replication work eventually frees up more resources for discovery. “It’s wasteful to not have any idea what is real,” she says. ■

E.J. DYKSON

DELMÍ ALVAREZ/GETTY



CÉDRIC BLANPAIN



JUN WANG

GENOME JUGGERNAUT

The head of a Chinese sequencing powerhouse reveals the scale of the institute's genome ambitions.

BY DAVID CYRANOSKI

“We are the muscle — we have no brain,” said Jun Wang in 2009, describing BGI, the Chinese genome-sequencing institute he leads. It was the kind of cheeky statement for which Wang has become known, but there seemed some truth to the claim. BGI had just purchased 128 top-of-the-line DNA-sequencing machines and was putting hundreds of young programmers — often plucked directly from universities — to work on an onslaught of data. It was a sequencing centre on steroids, using its unparalleled technical power to tackle almost every project going. Today, BGI is the biggest genome-sequencing operation in the world, and Wang, a 36-year-old bioinformatician who has been with it from the start, is well on his way to demolishing the organization’s brawn-without-brains reputation.

BGI was established in 1999 to support the Human Genome Project. It went from accounting for about 1% of the genomics community’s sequencing capacity at that time, to “more like 50%” today, says George Church, a geneticist at Harvard University in Cambridge, Massachusetts. With eight overseas offices and 600 representatives around the globe, BGI works with more than 10,000 collaborators from universities, pharmaceutical and agricultural companies and other research institutions. Although it calls itself a non-profit organization, BGI has courted investors and made moves to acquire other companies in the sequencing field. The rapid growth has been stressful at times. Wang remembers chucking

THE BIAS DETECTIVE

With an experiment that exposed sex discrimination, a microbiologist has opened researchers’ eyes to their unconscious biases.

BY HELEN SHEN

Ever since she saw the results of her study, Jo Handelsman has thought twice about any recommendation letter she writes. Has she somehow slighted a woman or given an unconscious boost to a man, despite her commitment to advocate for women in science?

Last summer, Handelsman injected new life into the long-standing debate about what holds women back in science with a study that showed that both male and female researchers tend to rate job applications from women lower than those from equivalent men (C. A. Moss-Racusin *et al. Proc. Natl Acad. Sci. USA* **109**, 16474–16479; 2012).

Handelsman, a microbiologist at Yale University in New Haven, Connecticut, asked more than 100 scientists to evaluate

applications from undergraduate students seeking a job as a laboratory manager — often a stepping stone to graduate school. Unbeknown to the researchers, the students were fictitious. But the prejudice that Handelsman uncovered was not. On average, researchers who received ‘John’s’ resume said that they would offer an annual salary of US\$30,238; those who read an identical resume from ‘Jennifer’ offered just \$26,508.

Chemists, physicists and biologists — men and women alike — also rated Jennifer as less competent than John and expressed less interest in mentoring her. “There was simply one treatment and one variable, and there’s no escape from the conclusion,” says Handelsman. This type of bias could be one factor holding back female scientists, she says.

Handelsman says that she has never personally experienced significant hurdles because of her sex. But she became an outspoken campaigner for women in science in the 1990s, after hearing how female colleagues and students had faced gender discrimination and seeing them passed up for honours that went to male scientists who were no better qualified.

A wealth of social psychology data had convinced Handelsman that unconscious bias presents a major obstacle for female scientists. But when she spoke about that bias at universities around the country, she encountered scepticism. “I had heard so many times from scientists that this couldn’t possibly be true of us, that we’re trained to be rational,” says Handelsman. So she decided to put it to the test.

“This is one of us — telling us that there are problems,” says Ronald Breaker, who chairs Handelsman’s department. “It comes with a certain amount of street cred.” ■

a computer out of the window during the race to sequence the rice genome a decade ago because his team didn't know enough computer programming for the task at hand. "I had a bad temper. But that's history," Wang says. "I'm very nice and gentle now."

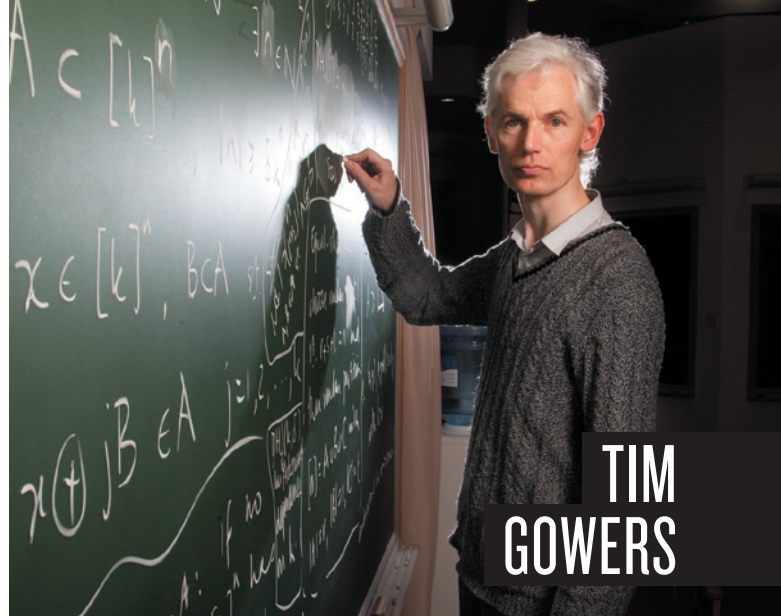
As a public face for the institute, Wang uses his energy and self-effacing humour to highlight BGI's ambitions, which seem to include sequencing the genome of just about every organism on the planet. It is taking a leading role in sequencing 10,000 vertebrates through the Genome 10K project; 5,000 insects and other arthropods through the i5k initiative; and more than 1,000 birds, including some extinct ones in a separate project.

This year, BGI was listed in more than 100 publications. It was a main player in the 1,000 Genomes Project Consortium, which aims to tease out genetic factors in disease by comparing human genomes from geographically distinct regions. And it has increasingly been initiating its own projects, including two studies that analyse the genomes of single cells to chart cancer development (Y. Hou *et al. Cell* **148**, 873–885; 2012 and X. Xu *et al. Cell* **148**, 886–895; 2012).

But the largest change in 2012 was BGI's progress in translating genomic science into real-world applications. A partnership with the Gates Foundation signed in September will expand the repertoire of sequenced agricultural organisms and infectious diseases. The institute is also working on genetic tests that detect fetal chromosome abnormalities from a mother's blood, and it is pushing to use next-generation sequencing for diagnostic tests in newborns.

In an attempt to secure a dominant position in clinical testing, BGI offered US\$118 million in September to acquire sequencing-technology company Complete Genomics of Mountain View, California. Church, who serves as an adviser to both companies, says that Complete Genomics has technologies that will be invaluable in screening for disease-related genes.

Wang says now that he never really doubted that BGI was more than just brawn. "I was just being modest," he says when reminded of his comments from three years ago (see *Nature* **464**, 22–24; 2010). "If you really don't have a brain, you can't move the muscles." ■



**TIM
GOWERS**

SEED OF DISCONTENT

A disgruntled mathematician ends up sparking a global publishing boycott.

BY RICHARD VAN NOORDEN

Tim Gowers is still surprised that he ended up leading a global boycott of Elsevier, the Dutch publishing giant. "I'm not someone who naturally seeks to be a campaigner," says the mathematician at the University of Cambridge, UK. Yet Gowers' impatience with the publisher's business practices had been building for years. He particularly disliked what he saw as its high prices, its habit of forcing libraries to subscribe to unwanted journals by 'bundling' them with the popular ones and its opposition to open-access publishing.

On 21 January, Gowers let rip in a searing blogpost entitled 'Elsevier — my part in its downfall'. "Why do we allow ourselves to be messed about to this extraordinary extent," he wrote. "I am not only going to refuse to have anything to do with Elsevier journals from now on, but I am saying so publicly," he went on — and he encouraged others to do the same.

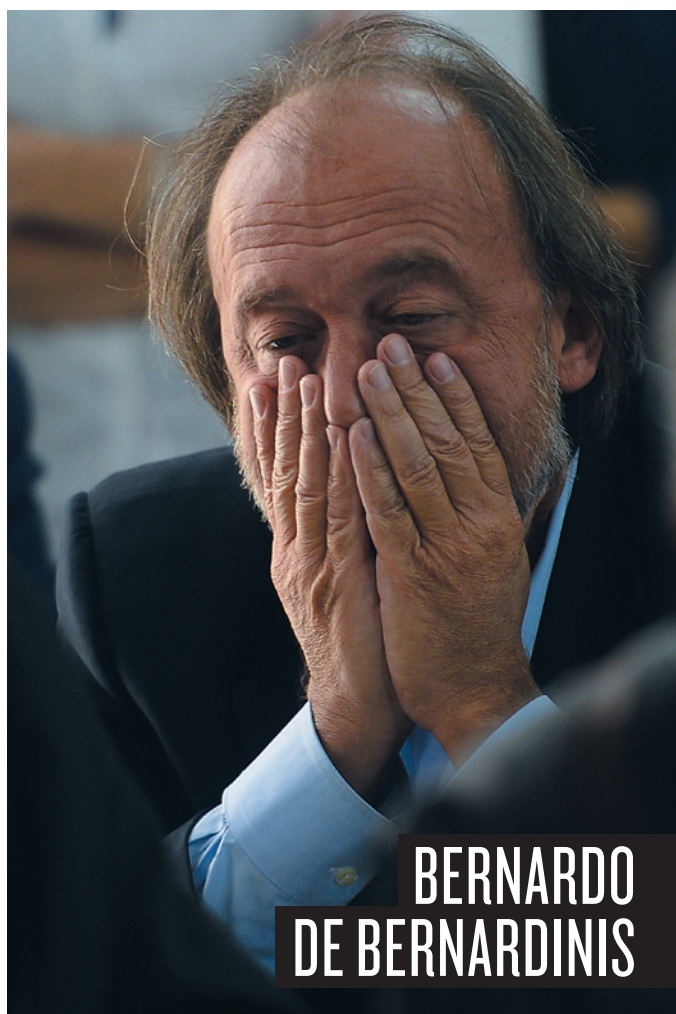
The blog caught the attention of Tyler Neylon, a software engineer in Mountain View, California, who the next day created a website (www.thecostofknowledge.com) inviting people to sign up for a boycott. More than 13,000 scientists across the world have now pledged variously not to publish with or referee or do editorial work for Elsevier.

The signatories are only a tiny fraction of the world's researchers — but the campaign was a spark in this year's explosion of interest in open access and new visions for research publishing. In February, Elsevier, facing growing criticism, withdrew its support of the Research Works Act, a proposal to prohibit the US government from requiring open-access publication for the research it funds. In July, the UK government mandated that much of the nation's taxpayer-funded work be published openly from April 2013. This year also saw the birth of several experimental publishing models, such as the open-access venture PeerJ, which will publish any number of an author's papers for a one-off fee. "We've disagreed with a lot of what [Gowers] has claimed, but for certain he's helped us better understand the sentiment of the maths community," says Tom Reller, head of Elsevier's global corporate relations.

Gowers' campaign was "a little bit accidental," says Ben Green, a fellow Cambridge mathematician. Gowers agrees. He may have won the Fields Medal in mathematics and, this year, a knighthood, but in academic publishing he says he is an amateur. "I feel more like an individual whose views just happen to resonate with others." ■



**JO
HANDELSMAN**



**BERNARDO
DE BERNARDINIS**

ON THE FAULT LINE

Convicted of manslaughter after a deadly earthquake, an Italian official says that he had put his trust in scientists.

BY NICOLA NOSENGO

Minutes after hearing himself declared guilty of manslaughter, Bernardo De Bernardinis looked like a defeated man. With shadowed eyes, he told journalists outside the court in L'Aquila, Italy, that he was "innocent before God and men".

De Bernardinis's journey to court began in early 2009, when a string of seismic shocks around L'Aquila rattled the local community. On 31 March, De Bernardinis and six of the country's seismic experts participated in a meeting of Italy's Major Risk Commission to assess whether a serious earthquake might be imminent. Some townspeople say that the advice they received from the experts was reassuring — but six days later, a magnitude-6.3 quake struck, killing more than 300 people in the region. In October this year, the court of L'Aquila found the seven guilty of the manslaughter of 29 of those people, and sentenced them all to six years in prison.

The trial and verdict attracted worldwide attention — and De Bernardinis was at the centre of the storm. An engineer by training, De Bernardinis was in 2009 deputy head of the Italian Department of Civil Protection. He was the only government official on the expert panel and was charged with deciding what to do. In a now-infamous television interview shortly before the meeting, he said that the situation was "favourable... according to the scientific community", that minor shocks were linked to "a continuous discharge of energy" and that "there is not an immediate danger".

The trial prosecutors argued that those messages falsely reassured the local population. Seismologists from the National Institute for

FILIPPO MONTEFORTE/AFP/GETTY

FLU FIGHTER

A virologist did research that some deemed too dangerous to publish, and he spent much of the year defending his work.

BY DECLAN BUTLER

The Dutch are known for being blunt, and Ron Fouchier, a virologist at the Erasmus Medical Centre in Rotterdam, certainly seems to live up to that reputation. His candour caught global attention at the end of 2011, when he described his experiments to engineer a strain of highly pathogenic H5N1 avian influenza that can be transmitted between mammals. His team had "mutated the hell out of H5N1", Fouchier told a flu-research conference in Malta, until it could infect ferrets — and presumably humans — through the air. Just five mutations were enough to cause this change, suggesting that wild H5N1

strains might eventually evolve to spread in humans. "This is very bad news, indeed," he said.

His work (S. Herfst *et al. Science* **336**, 1534–1541; 2012), and similar experiments by Yoshihiro Kawaoka (M. Imai *et al. Nature* **486**, 420–428; 2012), a virologist at the University of Wisconsin–Madison and the University of Tokyo, prompted the US National Science Advisory Board for Biosecurity (NSABB) to recommend in December 2011 that the research findings be published only if key methodological details were left out. The events sparked an international debate as to whether the risks of an accidental or intentional release of the pathogens outweighed any benefits of the research.

Fouchier relentlessly defended the rationale and safety of his work. In public debates, commentaries and media interviews, he often dismissed opponents' arguments against the research, playing down the risks, and he often seemed exasperated when arguing against those who scrutinized the flu-research community. In March, the NSABB reconvened and eventually gave the green light to publishing both papers. Fouchier was at the airport on his way home from the NSABB meeting when he heard the news. "Boy, did that glass of champagne in the airplane taste good!" he recalls.

Still, the Dutch government refused to let him publish until he applied for an export permit, which the government requires for the

Five to watch

2013

ANNE GLOVER

EUROPEAN COMMISSION CHIEF SCIENCE ADVISER

As the first person to hold the position, Glover is planning to tackle hot-button topics such as genetically modified organisms and the use — or abuse — of science in policy-making. Let the fights begin.

THOMAS STOCKER

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

As co-chairman of the IPCC's Working Group I, which will publish its report on the physical science aspects of climate change in 2013, Stocker will channel a familiar but increasingly urgent message.

CHRIS AUSTIN

US NATIONAL CENTER FOR ADVANCING TRANSLATIONAL SCIENCES

There are big claims, high expectations and sharp critics; now the head of the US National Institutes of Health's bold new venture has to show that academia can succeed at drug discovery where pharma has struggled.

JAN TAUBER

EUROPEAN SPACE AGENCY'S PLANCK MISSION

When Tauber's team releases the most precise map yet of the cosmic microwave background, astronomers will comb the data for evidence of gravitational waves associated with inflation: a wrenching expansion of the Universe hypothesized to have occurred just after the Big Bang.

RAFAEL YUSTE

COLUMBIA UNIVERSITY, NEW YORK

Big neuroscience is in vogue and nothing comes bigger than Yuste and his colleagues' proposed Brain Activity Map Project, which aims to record all electrical activity from every neuron in a circuit.

Geophysics and Volcanology (INGV) in Rome, some of whom were tried alongside De Bernardinis, have criticized him for suggesting that minor shocks release energy and lower the risk of a big earthquake — an incorrect concept, they say, which was not raised at the meeting or in any official INGV communication.

Throughout the trial, De Bernardinis, now president of the Institute for Environmental Research and Protection in Rome, never hid from his critics. He was the only one of the indicted who showed up at every hearing and he speaks with respect of the citizens who brought the case. "Had I lost a son, a relative or a friend in the earthquake, I would have done the same," he says.

In November, a few weeks after the verdict, De Bernardinis is ready to resume battle at appeal. A chatty, energetic man in his mid-60s, he flips through hundreds of pages of press clippings and documents that he has put together for the case. He pounds his fist on the table when he rejects charges that he meant to reassure the population or that he denied the risk of a big earthquake. In interviews before and after the L'Aquila meeting, he insists, he was "repeating, not modifying" concepts used by the seismologists, and he denies saying that the discharge of energy

decreased risk. He blames the press for misreporting his interviews and says that by "favourable", he meant that the minor shocks had not yet caused major damage. De Bernardinis does acknowledge that he should have waited until after the meeting before giving an interview, and that he would have avoided problems if he had asked the scientists to prepare a written note for the press.

"I understand scientific language, but I am not a seismologist," he says. "I could only trust what seismologists said." The prosecutor at the trial, Fabio Picuti, seemed to agree when he called De Bernardinis "a victim of the seismologists" in his final argument; the seismologists disagree.

While the case inches towards appeal, De Bernardinis continues to work, and keeps the wrinkled trial documents in his briefcase. "They follow me everywhere," he says.

De Bernardinis hopes that the trial will eventually lead to a better risk-prevention system in Italy, by clarifying the obligations of scientists, government officials and the media. He still considers himself innocent. "But if at the end of the appeals I will still be found guilty, I'll go to jail, no problem," he says. "I'd rather go to jail feeling I am innocent than stay out feeling I'm guilty." ■

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release of material or information that could have malicious uses. Fouchier threatened to defy the mandate, but backed down after it became clear that such action risked up to six years' imprisonment (see *Nature* <http://doi.org/hvg; 2012>). He got the permit and published the work, but is still disputing in the courts that export-control laws apply. "If there is anything I can do to prevent future generations of infectious-disease specialists being censored against their will by government, I will do it," says Fouchier.

In January 2012, flu biologists including Fouchier agreed to a voluntary moratorium on the specific kinds of experiments that had sparked the debate. Although initially set for 60 days, the moratorium remained in place as *Nature* went to press, and Fouchier, among others, complains that it has gone on for too long. It has put a hold on some of his research, but Fouchier says that a mysterious case of deadly pneumonia in Saudi Arabia over the summer drew him back into the lab. He discovered that the victim had died from a previously unknown coronavirus that has since been recognized as the cause of an outbreak in the Middle East (see *Nature* 492, 166–167; 2012). Before that case, Fouchier had been resigned to spending the year dealing with the "politics, censorship, moratorium, biosafety and biosecurity" of the H5N1 experiments, he says. "It was a good therapy for me to get back to work." ■

