

THIS WEEK

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Paper money

China and other countries should look again at how they pay bonuses and allocate grants that are based on individual research papers.

With great fanfare, Sichuan Agricultural University held a ceremony two weeks ago to announce that it was awarding a 13.5-million yuan prize (US\$2 million) to a group of its researchers, for a publication in the journal *Cell*.

The announcement triggered social-media chatter about how much is too much when it comes to rewarding research success. Li Ping, director of the university's rice research institute and a co-author of the published paper, was forced to clarify in a blogpost that most of the money — 13 million yuan — was actually for grants towards future research. Only the 0.5 million yuan extra was a prize, and that is being split among 27 people: no one will retire in luxury from this. Li further justified the prize by writing that researchers at small universities in China have difficulty getting stable grants, so funds such as those provided by the university are crucial for groups like his to continue their promising research.

The discovery of a disease-resistant gene by Li and his team could help countries around the world to secure their food supply. The university has a right to be excited. But is an instant cash injection — the prize was announced on Friday 30 June, the day after the manuscript was published — the right way to celebrate?

Clearly, most universities in China think so. The custom of rewarding researchers monetarily for single publications is deeply entrenched at Chinese scientific institutions. For many, it is an official policy, written in the bylaws. Zhejiang Agricultural and Forestry University in Lin'an, for example, pays a flat rate of 500,000 yuan for a paper published in *Cell*, *Science* or *Nature*. And it uses a table with equations to help calculate prizes for publications elsewhere. For any paper in a journal with an impact factor (IF) higher than 10, for example, the prize is $IF \times 1.5 \times 10,000$ yuan. According to a *People's Daily* news story last year, some 90% of universities have policies of rewarding publications. And the practice is far from unique to China. Scientists in countries such as Qatar and Saudi Arabia can find themselves similarly rewarded.

That might be good for researchers, and it can be a way for universities to advertise their achievements. Whether it is good for research, in the long term, is a more difficult question. The answer is probably no.

For one thing, it creates a culture in which scientists look at their research as a means to make quick cash. Instead of considering the best way to pursue and expand on experiments, scientists focus on getting the results published.

The emphasis on impact factors, as has been discussed repeatedly in these pages, is greatly overblown. Such metrics already exert undue influence on the evaluation of grants, on hiring and on promotions. Monetary prizes only further inflate the importance of impact factors, at the expense of assessing the significance of what has actually been achieved.

Perhaps more importantly, handing out prizes so soon after publication rewards science that is not yet proven. There is no reason to think

that the Sichuan scientists' discovery — a gene that confers resistance to the fungal disease rice blast — won't stand up to the scrutiny of post-publication peer review. But what if it doesn't? Many papers are not necessarily wrong, but their significance might have been overestimated.

Last week's announcement that this is more a grant than a prize makes an important distinction, but it might point to a more fundamental problem in China, as well as in other countries — a tendency to base grants on past achievement rather than future potential.

“Handing out prizes so soon after publication rewards science that is not yet proven.”

The rice-blast gene has tremendous practical potential, and the Sichuan scientists might be the right group to exploit it. Or they might have found, based on their research protocol,

a number of other avenues for investigation that are unrelated to this gene. Whatever the case, the best way to argue that the group deserves more grant money is through a grant proposal that lays out where the research is heading, and that is fairly evaluated against rival proposals.

There, too, this episode raises a critical question about how research funds are being spent in China. In his blogpost, Li implies that steady funding gives scientists at major universities an advantage over more far-flung scientists, who have to depend on locally distributed monetary awards as a lifebuoy. To be sure, the concentration of resources at top institutions is a phenomenon, and to some extent a problem, around the world. It is one that the research community needs to address. But — centrally or locally — rigorous and fair review must come first. ■

Culture clash

In contrast to Donald Trump, new head of US public health champions women and children.

Scientists have reason to be concerned over the proposed head of the US public-health agency the Centers for Disease Control and Prevention (CDC). Brenda Fitzgerald, an obstetrician and gynaecologist who currently leads the Georgia Department of Public Health, has no background in scientific research. She has also been criticized for promoting controversial anti-ageing medicine while working in private practice.

Still, her tenure has been met, by and large, with praise from colleagues. She is regarded as an effective leader, who raised the profile of public-health efforts in the state. And she was driven by a trait that scientists can appreciate: a healthy respect for data.

Key to improved public health in Georgia, the data showed, was to target mothers and children, particularly in low-income areas. Fitzgerald put maternal and child health at the forefront of many of her policies. And this is what makes her a curious choice to head the CDC during the administration of a president whose policies promise to cut health care for mothers and children around the world.

Once in office, President Donald Trump moved quickly to reinstate and expand the 'global gag rule', a policy that prevents organizations that receive money from certain US programmes from providing information about or access to abortions, regardless of whether they use their US funding to do so. Formally called the Mexico City Policy, the gag rule has been put in effect by several Republican presidents. But Trump expanded it to include organizations that receive funding from the US National Institutes of Health and the President's Emergency Plan for AIDS Relief.

This decision was not rooted in analysis of the data. The desired effect, presumably, is to reduce the number of abortions around the world. But the data suggest that the gag rule does the opposite: by limiting access to contraception, a past iteration of the rule may have increased the number of abortions in sub-Saharan Africa (E. Bendavid *et al. Bull. World Health Organ.* **89**, 873–880C; 2011). Trump has also attacked contraception in other ways, including a proposed US\$523-million decrease in funds for services providing contraceptives to women in developing nations (*Nature* **546**, 185; 2017).

Meanwhile, Trump's immigration policies have left undocumented pregnant mothers unwilling to seek medical attention for fear of being deported. And US-born children of undocumented immigrants — frightened that immigration officials will take their parents away — are

experiencing mental health damage (*Nature* **544**, 148–149; 2017).

Another of Trump's favourite rallying cries — to repeal Obamacare, the health-care plan put in place by former president Barack Obama — could mean that millions lose their health insurance. The repeal bills backed by Trump and under consideration by US lawmakers could also dramatically raise the cost of health insurance for pregnant women. The bills may also roll back provisions for Medicaid, a health-care programme for those on lower incomes that has been used to bolster health-care options for pregnant women, children from poorer backgrounds and children with special needs. Collectively, these policies could have lasting consequences: poor health of pregnant mothers and children during the first few years of life is associated with poorer health trajectories for the rest of those children's lives.

“Fitzgerald will lead an agency with an uncertain future.”

When Fitzgerald arrives at the CDC, she will lead an agency with an uncertain future. Trump has proposed to reduce the agency's funding by \$1.2 billion (about 17%) in 2018. The proposal may never come into being — it is US lawmakers, not Trump, who will develop the country's budget — but it clearly conveys his lack of interest in the agency.

In her time at the Georgia Department of Health, Fitzgerald lobbied conservative Georgia state politicians to support her efforts. She opens many of her speeches with reference to the data that drives her decision making. It has been an effective strategy: under her tenure, funding grew, even as the state tightened budgets in other arenas. Scientists should support her if she employs the same determination to promote maternal and child health on the national stage — even in the face of strong headwinds. ■

AI love you

We cannot pretend that humans won't have sex with robots.

Enabling robots to read human behaviour and to respond in appropriate ways is a burgeoning area of research. As is the study of how humans will react to these potentially clever, personalized and ever-available companions. But there is another aspect of human-robot relationships that is rarely mentioned, and it's one on which robots could have just as great an impact as any other. Sex.

That reticence changed, at least in the United Kingdom, last week. A flurry of press reports followed the publication of a consultation report (see go.nature.com/2u4578x) by the Foundation for Responsible Robotics that aims to encourage public debate about sex robots. Technological developments in soft robotics and artificial intelligence put these machines on the horizon, at least in basic form, the authors of the report suggest. And the impact of sex robots could differ markedly from that of conventional sex aids. The fact that such bots are most likely to be anthropomorphic, female and inspired by pornography prompts legitimate fears. Even if few people are talking about this topic, the report points out that doll brothels already exist in Asia, and tentative evidence from surveys suggests that there could be a market for both sex robots and robot brothels.

On reading these news reports, it's tempting for scientists to question the priorities of the news cycle. But there is a serious point to make.

The sex industry is not often written about in these pages, but no one can claim that it is irrelevant to people's lives. Worldwide, the sex-technology market is worth a reported US\$30 billion, and although accurate figures for the pornography industry do not exist, revenue is thought to reach tens of billions of dollars a year. (Meanwhile, the annual revenue of the academic publishing market in 2013 was around \$25 billion.)

Just four companies, all located in the United States, currently

produce sex robots. No one knows how many people own one. They are still more doll than robot, but Matt McMullan, chief executive of one of the bot manufacturers, Abyss Creations, is focusing his company's efforts on interactivity. As artificial intelligence and robotics improve, advances will filter into robots designed for sex. And bonds will form, even though unrequited. (Soldiers have been shown to develop emotional attachments to bomb-disposal robots.)

Although a handful of researchers have looked seriously at the issues surrounding relationships with robots, research into the social, legal and moral implications is scarce. Academic research on sex-related technology is even scarcer, and the work that has been done so far — including a study by Stanford University in California that revealed that people get physiologically aroused when touching a robot in places that they would find sensitive themselves — is plagued by caveats and differing interpretations. The academic world has largely looked on the topic as both trivial and sensational. A fledgling academic conference — the International Congress on Love and Sex with Robots — had to be moved from City, University of London, to neighbouring Goldsmiths after the original host deemed its topic to be “uncomfortable”.

But the difficulty of the work, and the existence of the taboo, does not mean there is a lack of legitimate scientific questions to ask. As well as the impact of human-robot interactions, academics could examine pressing issues that surround the privacy of sex technology imbued with artificial intelligence. Some smart sex toys can be hacked, and others that collect data with the aim of personalization have failed to guarantee anonymity.

Right now the world of sex robots, and technology more widely, is driven by white, middle-aged men. Improving the gender diversity of those involved in the research and development of sex technology could dampen possible harm such as objectification. And the potential benefits could be boosted by making products that might appeal to more people.

The foundation's report is correct to argue that society needs to decide how best to deal with this growing industry. Academics must be part of this conversation. And they should carry out the research to make such discussions evidence based. ■