

# CAREERS

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is quite normal for the reviewer comments to be published together with the original article. This also gives credit to the reviewer's ideas and contributes to the literature — it's an opinion from the expert and another perspective that could be very useful.

## MAKE SOFTWARE ACCESSIBLE

**Jean-Baptiste Mouret gave a six-limbed robot the ability to adapt quickly to a broken leg and other normally debilitating injuries by endowing it with the 'intuition' to try new approaches, such as hopping. The work, performed at the Pierre and Marie Curie University in Paris, graced *Nature's* cover in May. Mouret is now at the French Institute for Research in Computer Science and Automation near Nancy.**

My dream would be to have an arXiv-like, free, centralized repository for source code. That way, it would be easy to reproduce and follow up on work that has been done.

Everything we do in science, including biology, physics and robotics, involves software. Now, when a paper is published, if we are lucky, there is a link to a web page somewhere with some version of the software. Most of the time there is nothing.

People often describe the algorithm in the paper, giving some equations and the main points of the software. But there is no way to check exactly how they integrated these equations or other details that don't fit into the paper. And many times, software has been written by a PhD student or a postdoc who has left the lab, and no one knows where a specific version of the software is. It is also very common to find papers for which the software has been available before, but has since disappeared in an update of a server somewhere.

Science would be much better if we had access to the software each time. Reviewers and journals should be asking for the source code. I don't think papers should be accepted without the software that corresponds to the analysis. It's like having a missing part of the paper. At the very least, it should be archived on the same web page as the paper or easily accessible from the paper itself.

But having one snapshot of the software in time is not enough. Software is a living thing. What we need is a central platform where we can submit bug fixes, improve the software and collaborate. This already happens for open-source projects. In computer science, we ▶

## INTERVIEWS

# Big ideas for better science

*We asked four researchers who made the news in 2015 what they would change about how science gets done.*

## REVEAL PEER REVIEWERS

As a biochemist at Seoul National University in South Korea, Jin-Soo Kim made headlines in 2015 for developing gene-editing methods that resulted in super-muscly pigs and new strains of tobacco, rice and lettuce.

Right now, peer review is usually blind in one direction. Reviewers know the authors' identities, but not the other way around. There is some merit to anonymity because reviewers can criticize a paper openly. But sometimes

the criticism is unfair.

Reviewers are sometimes competitors who may try to delay or block publication of a rival's work. They ask for more experiments, for additional data. Editors have to decide whether the comments are fair, but they cannot always make a proper judgement call. And in that case, a paper may be inappropriately delayed or rejected.

If the reviewer had to reveal his or her name after the paper was published, I think the reviews would be fairer. In other disciplines, such as the humanities and social sciences, it

► have very good platforms, such as GitHub, for developing software. Journals and institutions should partner with these companies. If we have a way to keep the software alive, it also makes it much easier to reproduce and continue the work.

This also implies that the software is open source, which I think is key for future science. Access to some software can cost €10,000 (US\$10,900) or more, which makes reproducing the research unattainable.

We have the technology to archive scientific software and link that software to papers. We just need the will.

## BOOST WOMEN'S CAREERS

**Planetary scientist Maria Cristina De Sanctis at the Institute for Space Astrophysics and Planetology in Rome was in charge of scanning the surface of the protoplanet Ceres using the orbiting Dawn spacecraft — the first time this asteroid-belt object has been examined up close.**

I would change the way in which women are viewed in science — especially in the areas of technology development and instrumentation, because very few women are involved in those fields.

In Italy, sometimes school teachers and parents think that women and men belong in separate careers. For instance, secondary education includes classical schools based on the humanities and scientific schools based on the sciences and information technology. Most of the young women are in the classical institutes, whereas most young men are in the technical and scientific classes.

All of us should encourage girls to study sciences and support their education. This should start when parents are choosing toys, books and games — we should have the same approach for both boys and girls. Also, there should be some money reserved in grant programmes to support early-career women. I don't like the idea of having different programmes specifically for women — it can have unintended effects. But for particular fields, it could make sense in order to increase the proportion of women.

Women have a key role in the family. We need a more relaxed approach for considering things outside work. A woman who needs a few months to focus on something not related to work should be able to take that time off and then come back and refocus on her research.

In my experience and observations, women are generally less aggressive and may not seek to promote only themselves. This can be a real advantage in planetary science, where a large number of scientists come together for global collaborations and are not operating alone or in small groups. Having more women in higher positions could advance the science in better ways for the next generation.



Planetary scientist Maria Cristina De Sanctis.

## TREAT SCIENTISTS AS HUMANS

**Evolutionary biologist Danielle Edwards made the news in her home country of Australia when she turned down the prestigious Discovery Early Career Researcher Award, citing poor job prospects. Instead, Edwards, who specializes in herpetology, took a position as an assistant professor at the University of California, Merced.**

I would change the way we gauge success in science from a quantitative approach to a more qualitative one. I think that would make science a safer place for people who have human needs. Time and time again, I've seen the shortcomings of the system play out in my life and in the lives of people who have decided to leave science.

We start out in a place where you have to work, work, work and your whole life is invested in your job. That really changes for some of us after we have children because we are forced to prioritize. Not having a safe place for those who value those non-work needs earlier on in their career results in less diversity in science. You get the drop out of women, the drop out of people who are first-generation college graduates, and the drop out of those from different backgrounds.

I don't think that working all the time equates to quality science. Some of the most productive researchers that I've ever met worked from 8 am until 5 pm, 5 days a week, and produced oodles of papers every year.

We need to change attitudes towards how we view success, the way we handle tenure, promotion and hiring, and the way we mentor students and postdocs. We need to recognize that scientists have basic needs for maintaining their family life, keeping healthy and not working long hours.

I say to my students, "Are you taking some time off?" I don't expect them to be in the lab late at night or on the weekends. I try to be as flexible and accepting of their human needs as I can be. A happy, healthy individual is going to produce quality work at the end of the day. It's a cost-benefit analysis: are you able to maintain that passion?

I come at this from multiple perspectives — I'm a first-generation college attendee, I grew up in a lower socio-economic area in Australia and I'm a woman in a relationship with a fellow scientist. I was told early in my career that as a woman, I was expected to work twice as hard. I know many colleagues whose trailing spouse, usually a woman, had to take a less-prestigious position than their partner, and their career was subsequently compromised. As a first-generation student, I've had people tell me that I didn't quite understand the academic life. And early on there was pressure from my family to stay close to home.

Sometimes that geographic pull is even stronger in people from different cultural backgrounds in which family is all important. That plays a huge part in siphoning out people from minority groups. We should be doing a better job in science to make sure people from different backgrounds are being encouraged. ■

*Interviews by Kendall Powell. Interviews have been edited for length and clarity.*

### CORRECTION

The Careers feature 'Courage of conviction' (*Nature* **526**, 463–465; 2015) gave the wrong date for the conviction of Bradley Waldroup: the verdict was passed in 2009. The article also mischaracterized the part in the defence proceedings played by William Bernet. Bernet — together with James Walker — performed a complete psychiatric and neuropsychological profile of Waldroup and as a result identified that the defendant had a high-risk gene variant that, when coupled with his abusive childhood, could arguably increase his risk of violent behaviour. Bernet did not undertake any of the research linking this genetic variant to antisocial behaviour, as suggested by our article, but only presented a summary of extant scientific knowledge to the jury. Comments in the article also inadvertently could have been read as directly criticizing Bernet's testimony; this was not the intention and the text has now been corrected online to resolve this issue (see [go.nature.com/xdi44d](http://go.nature.com/xdi44d)).