NATURE|Vol 437|15 September 2005

The nightmare before funding

Asked to name one thing they hate about their jobs, many scientists say grant applications. *Nature*'s reporters have asked researchers just why the process is so frustrating, and what can be done to improve matters.

J. MAGEE

Physicists find it exasperating. Cell biologists say it drives them crazy. Some even want to quit science because of it. When it comes to applying for grants from funding agencies, researchers of every persuasion describe the process as time-consuming and stressful. For many, it is the worst part of their job.

So when *Nature* journalists began asking scientists about their experiences with grant applications about a year ago, we were not surprised to hear some horror stories. Many researchers were reluctant to talk, understandably wary of biting the hand that feeds them. But others spoke of interminable delays, confusing application forms and acts of bureaucratic incompetence that threatened to derail careers. We've collected the most revealing stories here, together with thoughts from researchers and agencies on how to ease the pain.

Wasted time topped the list of complaints. Researchers from Europe, Asia and the United States all spoke of the frustrations that come when grants are delayed, but the most striking example came from Jens Schmidt, a chemist at a German university. Like most of the researchers who talked to *Nature*, he did so on condition that his story was presented under a different name.

The German Federal Ministry of Education and Research says that the average processing time for a grant application is six months. Schmidt's experience is somewhat different. His application was praised from the first review onwards, yet it still took two-and-a-half years to get funded.

The saga began in April 2000, when Schmidt submitted an outline for a grant request of €150,000 (US$186,000) for an environmental science project. The reply took eight months to arrive, but contained positive reviews that encouraged him to submit a full application in early 2001. That did not receive a reply until October, when the reviewers were again enthusiastic — perhaps too much so.

Given such good reviews, Schmidt was asked to extend the proposed project from two to three years, requiring him to submit a third application. But after doing so in early 2002, the ministry said it did not have enough money for a three-year project. A slimmed-down application number four was duly submitted, and funding eventually arrived in October 2002. By this time, the laptop Schmidt had bought for the project was no longer capable of running the software required for his work. At least his ideas were not out of date.

"It's no surprise that NERC is a four-letter word."
A British researcher sums up her feelings after having a grant rejected by the Natural Environment Research Council.

Next on the list of application annoyances came the bureaucratic burdens associated with accounting for how grant money is spent. Researchers recognize that accounts are needed to prevent fraud, but say that research agencies often lack a sense of perspective when it comes to tracking spending.

Called to account

France's notoriously bureaucratic research agencies and universities often require scientists to supply evidence of several competing tenders before purchasing basic items, right down to lab reagents. Onerous accounts are just one of many aspects of European Union grants that drive researchers to distraction (see 'Paper, paper, everywhere…', overleaf).

But when it comes to over-the-top accounting, Japan seems to steal the show. Grantees from the health ministry, for example, must keep track of changes to the ministry's accounting rules by buying annual copies of a 445-page guidebook for US$32. And the country's education ministry insists that its funds are used by the end of the financial year in which they were issued, unless the delays were caused by unforeseen events such as an earthquake. Any yen not accounted for must be returned.

Kazunari Taira, a professor of biological chemistry at the University of Tokyo who was happy for *Nature* to use his real name, recently

discovered just how petty his country's bureaucracy could be. Last year, he received ¥50 million (US$450,000) in government funds. Under plans to make Japan's research institutes more independent, the university was entrusted to manage the grant, with some bizarre consequences. When Taira's secretaries asked university officials if they could purchase pens and erasers for the office, they were instructed that such supplies were to be used only in connection with the grant in question. The university denies this, saying it merely assumes that researchers already have pens and would "like them not to buy them again". Either way, absurd accounting wins over common sense.

Arbitrary rules such as these may raise a sigh — but flawed funding decisions can have much more serious consequences. Most scientists need to win competitive grants to keep their careers going. If the application process is mishandled, they can fall behind in the race to publish or, in extreme cases, be forced out of a field altogether.

445

The number of pages in the annual document that describes the budgetary rules associated with grants from Japan's health ministry.

The latter almost happened to Hugh Roberts. Last year, the UK-based immunologist, who asked *Nature* not to use his real name, was facing a tough career decision. During eight years of postdoc work, Roberts had authored well-received papers in top journals. "My CV was as good as anyone's," he says. But he was struggling to make the transition to group leader. Some UK agencies offered career-development grants for this purpose, but the schemes were restricted to applicants with no more than six years' postdoctoral experience. At the age of 34, Roberts felt he was still a young scientist, "but I was being told I was over the hill".

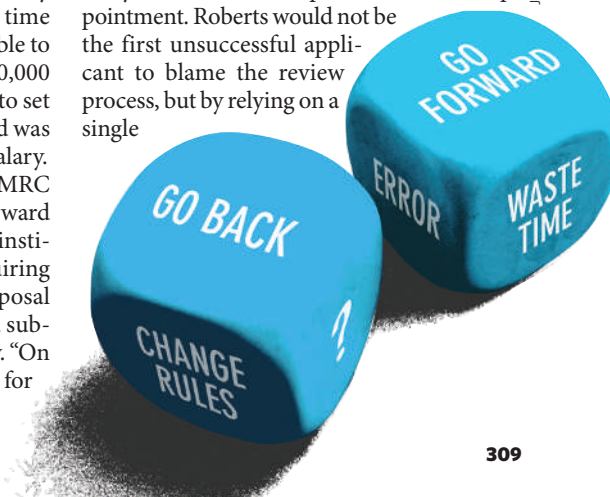
Then a potential solution appeared. The Medical Research Council (MRC), the body that distributes most UK government money for biomedical projects, removed the time limit for one of its grants. Roberts was able to apply for a three-year award of £250,000 (US$460,000), which he planned to use to set up a lab. The university where he worked was keen to keep him and agreed to pay his salary.

To reduce applicant numbers, the MRC decreed that any university could put forward no more than three people. So Robert's institute set up an internal competition, requiring researchers to submit an eight-page proposal and give a ten-minute talk. He won and submitted an application to the MRC in May. "On and off it was the main thing I was doing for a month," he says.

Roberts was philosophical when told in October that he had not been successful, as he knew there had been more than 120 applications for just 20 grants. "It was tough, but I didn't mind losing in those circumstances," he says. Until, that is, he received his rejection letter from the MRC, and saw the basis on which it had made its decision: a single review from a scientist who, judging by a copy of the review seen by *Nature*, held strong views that were not representative of the field. With no recourse to appeal the decision, Roberts felt let down by the MRC. "They never really gave the grant a chance," says Roberts.

Feeling rejected

Tales of accounting rules and bureaucratic delays seem trivial compared with this disappointment. Roberts would not be the first unsuccessful applicant to blame the review process, but by relying on a single



J. MAGEE

Paper, paper, everywhere...

When *Nature* asked scientists to name the most frustrating grant-application process, one phrase got mentioned again and again: the European Commission's €17.5-billion (US$21.8-billion) Sixth Framework Programme.

It is, say researchers who have applied, the most confusingly bureaucratic procedure imaginable. A nightmare of mile-high paperwork that requires mental acrobatics to penetrate the Byzantine language and complex eligibility criteria. It may also be beyond major reform, structured as it is around giant collaborations that satisfy the needs of politicians more than bench scientists.

Just working out which grant to apply for is hard enough. A multimillion-euro Integrated Project perhaps? There are five types of integration to choose from, none of them straightforward to understand. 'Vertical integration', for example, is described as involving "the full 'value-chain' of stakeholders from those involved in knowledge production through to technology development and transfer".

Then come reams of forms demanding information that can seem distant from the research project in question. A life-sciences grant, for example, requires an explanation of the gender relevance of the work. "It's hard to project a gender relevance onto research on the basic molecular biology of an asexual microorganism," points out one Dutch researcher.

Equally tortuous is identifying and recruiting the multiple partners needed to make up an international and interdisciplinary collaboration that mixes academics, industrialists and sociologists. All this, and still a coherent scientific research plan to construct.

Why was such a system ever designed? The answer lies with the political reasoning behind the Framework programme. Rather than existing to fund science, it was created to support the policy aims of the European Union (EU). And although all research agencies are linked to political paymasters, the connections between European politicians and the Framework programme are particularly tight.

So the programme is pulled in many different directions. Ministers from EU states, as well as the directly elected European Parliament, have to approve the Framework structure and research themes, for example. Research priorities are also shaped by states pushing their national interests. And the politicians' appetite for breaking down all conceivable barriers requires that the programme plays its part in solving wider social problems — such as gender discrimination.

Following past financial scandals, the commission added further bureaucracy to protect itself from accusations of financial mismanagement. Researchers have to submit detailed finances for each project in advance, and the actual expenditure afterwards. National research grants are usually paid out on

trust and detailed accounting occurs only after the project ends.

Can things improve? Commission bureaucrats recognize the problems but few are optimistic about major changes. The best hope, say scientists, is the planned European Research Council for basic research, a separate funding agency that will be part of the next Framework programme, which starts in 2007. The council is expected to be accompanied by a much lighter bureaucracy and may distribute as much as €1.5 billion annually to individual investigators. But large, unwieldy collaborations will continue to dominate European funding — and to infuriate its researchers.

Alison Abbott

reviewer, instead of the usual three, the MRC seems to have erred. Researchers who sit on grant panels confirm that it is very rare for applications to be dismissed on the basis of a single review. Peter Dukes, a programme manager at the MRC's London offices, insists that the case is not representative of "the standard to which we work".

There was a happy ending for Roberts — he has since obtained a position at his university that will allow him to set up a lab. Some of the work outlined in the grant has been completed and published in prestigious journals. But, looking back, Roberts recalls how he thought about quitting science when the MRC application was rejected. Bureaucratic failings could have cost Britain a talented scientist.

A better way?

As much as researchers would like to be funded without the hassles of peer review, none would argue in favour of actually distributing public research money in this manner. Funding agencies need to make scientists justify their ideas to make sure that the money goes to the right people. But they also need to minimize the pain involved. How can they avoid some of the incidents mentioned here?

In many cases, US organizations lead the way. In the mid-1990s, the National Science Foundation introduced FastLane, an online application procedure that has won praise for saving researchers' time, in part because the system automatically picks up problems with formatting issues. Other US agencies are following suit, and eventually all applications to federal funders will be processed through a single website. British researchers have given the thumbs up to a similar website introduced by the country's research councils last year, and Germany's main granting agency, the DFG, has plans for the same sort of approach. Agencies that aren't exploring such possibilities, including some of Japan's government ministries, are beginning to look like the odd ones out.

Other US initiatives have also earned praise, in particular the frequency with which staff attend conferences and talk to scientists. One climate researcher, for example, says that she meets officials from US funding organizations more often than she does their UK counterparts, even though she is based in Britain and receives funding from British agencies.

142

The number of pages, from six different documents, that applicants to the European Union Framework Programme are advised to read before they begin the application process.

"We manage to have only a few days out of the office every month," acknowledges Dukes. He points out that all UK research councils work under a tough cap on the money they can spend on staff activities rather than grants. Instead, Dukes says, the MRC is exploring how internal reforms could help existing staff to get out more. "We want to do better," he says.

But the reforms that generated the most plaudits were those that reduced the number of forms, instruction documents and guidelines that researchers have to plough through. This summer, for example, the US National Institutes of Health (NIH) assessed the impact of a simple change it made six years ago. Applicants who ask for less than $250,000 in research costs have to describe their project in detail, plus how much funding they require, but the detailed accounting is handled later on at the applicant's research institution.

More than 80% of scientists surveyed about the change say they were satisfied with the policy and about three-quarters of applicants to the NIH's most commonly sought grant, the R01, no longer supply detailed costs in advance. Peer reviewers were similarly enthusiastic, saying that the changes helped them to focus on the pros and cons of the grant itself. Perhaps most importantly, peer reviewers say the process reduced the administrative burden that comes with acting as a referee.

If the NIH system has a failing, say

researchers, it is the length of the application forms. For example, a research outline in an R01 can run to 25 pages. NIH officials say that this is the maximum allowed and that scientists are free to write less. But the psychology of application behaviour seems to dictate that researchers fill all the available space in the hope of winning over reviewers. Simply cutting the length of the form could save time, suggest researchers who have applied for grants elsewhere. In Britain, for example, the equivalent of the R01 involves a form that is a maximum of eight pages long.

When it comes to the grant types on offer, researchers also say that fewer is better. The MRC has recently reduced the number of grant types it offers but made them more flexible, so that researchers can apply for different durations of support, for example. Dukes says the plans are generating positive feedback. Contrast that with the situation in Japan, where the number of different grant types rose from 28 in 2004 to 37 this year.

"You name it, we have heard it."

Walter Schaffer, acting director of the NIH's Office of Extramural Programs, describes the range of complaints he gets from scientists.

In many cases, successful reforms follow a simple recipe: scientists like it when agencies are open, accessible and make the effort to understand them. As one university official who helps researchers with grants notes, it makes a big difference simply to provide a telephone helpdesk that is manned by people (see 'The inside track', right). Scientists also like it when agency staff come to conferences and visit labs, or convene focus groups to ask their opinion on agency practices. Most of all, they like it when agencies actually act on the feedback they are given. Grant applications may be the bane of many scientists' working lives. But they need not be, as research agencies who listen and respond are finding. ■

Jim Giles is a senior reporter for *Nature* in London. Additional reporting by Andreas von Bubnoff in Washington, Ichiko Fuyuno in Tokyo, Tamara Gruener and Valeska Stephan in Munich, and Declan Butler in Paris.

L. WICHSER

The inside track

Meet Karen Bergeron, an administrator at the University of Washington in Seattle with over 20 years' grants experience. She thinks funding applications are fun.

Are US grant applications getting more convoluted?

Sponsoring agencies are having a harder time getting money from Congress, so they are asking scientists to justify their work. You really have to come out and say what the intellectual merit of your project is and what the broader applications are. They want that right at the beginning of the proposal. It's not enough just to describe what you plan to do. I realize a lot of scientists find this insulting — just like they always hate doing progress reports.

One thing that has got easier is that sponsors are a lot more flexible now. In the old days, you had to go back and get approval if you wanted to make changes to the way you were going to spend the money. It's harder now to get the money in the first place, but when you do, you have more control.

Which US agency takes the longest to apply to?

I think it's the National Institutes of Health (NIH), because there are always last-minutes things with the proposal — such as getting the pagination and the table just right. It's pretty anal. You can't have staples or some kinds of binding, but you can have binder clips or rubber bands. And your font has to be either Arial or Helvetica at a point size of ten or more.

It's got to the point where people are calling me the font police. I was training someone the other day and he teased me about running an NIH boot-camp, dressing in camouflage and saying: "You too can get an NIH grant proposal out".

The National Science Foundation (NSF) was the first to introduce electronic submission, in the form of FastLane. Does it help?

Yes. Before FastLane, it was not uncommon for proposals to be returned out of hand because of mistakes. One scientist used proportional spacing — he thought it met the requirement. But the NSF took the ruler out and found that there were too many characters to an inch. FastLane does a lot of that checking for you.

And the one thing I love about the NSF is that it has a help desk, and it's always manned by people. You never get a machine — and those people are really smart. There is no substitute for human intelligence.

Most scientists find grant applications infuriating. Do you like your job?

I just think that grants are so much fun. Maybe because things are always changing. You are always working with new sponsors, and your clientele is always different: people come and people go. I love it, it's intellectually satisfying and it's an adrenaline rush when you find out, the second or third time you apply, that this research is getting funded. And even though I am not going to Africa to work with elephants, it's nice to know that is happening.

Emma Marris