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IMPACT

Pack a punch

Grant reviewers are increasingly focusing on the scientific and social impact of proposed research projects.

BY AMBER DANCE

When a few dozen scientists in a US National Institutes of Health (NIH) study section sit down to start reviewing grant applications, they have one main question on their minds, says Fatah Kashanchi, who has participated in more than 100 such sessions. Does the proposal lay out a significant question? “If it’s not important, then you shouldn’t be spending your time — and other people’s money — on this,” says Kashanchi, a former NIH virologist now at George Mason University in Manassas, Virginia.

Public and private granting bodies across the world focus on the impact of research. But

the terms used to describe impact, and the types of impact that the bodies are interested in, vary widely. Some funders, such as the NIH, are mainly concerned with the project’s importance in a specific field. Others expect grant recipients to make a splash beyond laboratories, publications and conferences — they are looking for implications for the economy, on education or elsewhere in society.

Interest in broader impact is rising. In 2009, the seven government-funded granting agencies that make up Research Councils UK



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(RCUK) began requiring applicants to delineate their impact plans. The Swiss National Science Foundation (SNSF) added a section on broad impact to its application forms in 2011. The US National Science Foundation (NSF) has long required applicants to combine scientific value with impact outside the lab, and in 1997 made broader impact an explicit part of the grant review. The foundation started requiring a separate section on impacts in applications this year.

Why the increased emphasis? It is attributable mainly to governments with ever-shallower pockets wanting to know that the research they pay for will pay off in the real world. “A scientist’s ability to sell his research is becoming more and more important,” says Meg Bouvier, a medical writer in Amherst, Massachusetts, who has helped clients to win millions of dollars in NIH grants.

Some scientists worry that heightened attention to impact will draw funds away from basic, ‘blue skies’ science in favour of applied projects. When the RCUK first introduced impact statements, “a small but vociferous group of scientists were not keen on what they termed the impact agenda”, says Alexandra Saxon, head of the RCUK’s strategy unit in Swindon. But reviewers’ interest in impact does not have to pose a risk to basic studies, says Bill Petri, a biomedical scientist at the University of Virginia in Charlottesville who has scored millions of dollars from the NIH. “You can make a compelling case for the most fundamental of science being impactful,” he says.

VARIETIES OF IMPACT

Scientific significance is always a high priority. NIH grant applicants must explain the scientific value of their projects at several points in the application, including the abstract and the Significance section. The first sentences of the Specific Aims section should clearly lay out the epidemiology of the health issue at hand, says Kashanchi. The Wellcome Trust, a biomedical funding charity in London, does not specifically ask about impact, but does expect the Vision section of the proposal to mention the importance of the topic. Science significance takes a back seat only in certain early-career grants, such as the NIH’s Career Development, or ‘K’, awards, in which the long-term potential of the applicant may outweigh the importance of the project.

At some agencies, broader impact also comes into play. For RCUK bodies, applicants must write a short, plain-English Impact

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► Summary, explaining who might benefit from their research, and how. They must also submit a Pathways to Impact statement, describing how they will engage with those beneficiaries. Applicants might plan to partner with industry, for example, or develop an educational programme.

The type of broader-impact project can differ between disciplines. A mathematician could explain his or her research to scientists in other fields, who might find it useful for modelling their own systems, suggests John Hand, head of impact at the UK Engineering and Physical Sciences Research Council. Engineers, by contrast, might offer applied projects with more direct practical impact, such as ways to scale up production processes.

The RCUK bodies not only want to hear about impact ideas, they also want to pay for them. Saxon says that applicants might reasonably ask for roughly 5% of the grant budget to go towards impact activities — paying for a research associate to work in an industry lab for several months, for example.

BROAD BASE

For some grants, broad impact is optional. SNSF applicants can choose whether to designate their project 'use-inspired'. If they do select this label, they must explain the practical implications of the work at some point in the application. A use-inspired proposal does not necessarily give applicants an advantage, but it does help the SNSF to know whether it should recruit non-scientist reviewers — for example, clinicians for biomedical proposals.

For NSF grants, which do require evidence

of impact, it used to be sufficient to mention publications or presentations. But today the agency wants more direct societal benefits, says Ed Hackett, a social scientist at Arizona State University in Tempe who has worked at the NSF. With the competition so stiff, a good case for broader impact could make the difference between success and failure, says Hackett. Projects might include visiting schools, developing educational materials, communicating science to the public, training young scientists or collaborating with local industries.

To find out what kind of impact information an agency is looking for, applicants should check the agency's mission statement, suggests Bouvier. Even better, she says, ask a programme officer about priorities.

There are many ways to address broad impact, if that is what the agency is asking for. Hackett recommends looking beyond the lab and university. For example, a researcher might talk to parents to find out what gets their children excited about science, and tailor an educational programme to match. Or an engineer might chat to local industry figures about their environmental concerns, and work out how to use academic



"You can make a compelling case for the most fundamental of science being impactful."
Bill Petri

inventions to solve their problems. University knowledge- or technology-transfer offices may be able to help scientists to forge relationships with industry partners, says Saxon, and those partners could inspire impact ideas or collaborate with academic scientists to carry out impact activities. Knowledge-transfer officers may even be able to help scientists to brainstorm ideas or craft impact statements, she adds.

NSF applicants from a microscopy group at the University of Illinois at Urbana-Champaign sought a new scanning electron microscope, and included a plan to involve schoolchildren in the project. The application was successful, and since 1999 the Bugscope programme has invited students of all ages from around the world to send in insect samples, giving them the chance to control the microscope remotely to look at them. "We're using scanning electron microscopy and insects as a 'Trojan horse' to get kids interested in the possibility of science as a career choice," says Scott Robinson, a microscopist at the university.

MAKING THE CASE

Selling a project's significance means targeting the appropriate audience. Reviewers may not all be experts in the field, and some may not even be scientists. The American Heart Association in Dallas, Texas, this year added lay volunteers to the review process, to help to find studies in line with the association's mission of making people free of stroke and cardiovascular disease.

Some other agencies require lay summaries as part of the application: the significance of a proposal "has to be spelled out for the least-expert person on the review committee," says Petri.

The application should also identify a gap in current knowledge that the applicant plans to fill. "Give a sense of why we're losing an opportunity if we don't fund this research," says Jane Aubin, chief scientific officer at the Canadian Institutes of Health Research in Ottawa (see *Nature* **482**, 429–431; 2012). Bouvier recalls one client with a basic-science project on brain development. He could not get a grant until he pointed out in an application that people can get tumours in the brain region he wanted to investigate (see 'Stand out from the crowd').

Statistics matter too. Kashanchi wants to read something like, "More than 20 million people are affected by X." Bouvier also wants to be blown away by horrible numbers. "If I don't pause and say, 'Oh my God, that's awful,' then it's not well written," she says.

Overall, the key to identifying areas of impact is empathy, says Mark Reed, an environmental researcher at Birmingham City University, UK, who is funded by two RCUK bodies. His work has spawned a music video and children's book about the importance of preserving peatlands. "It's about putting yourself in the shoes of the people who might use your work." ■

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IMPACT FACTOR

Stand out from the crowd

Individual granting agencies deal with research significance and broader impact in different ways, so be sure to check specific instructions when applying. Here are some general tips.

- Look up the mission statement of the granting agency — your proposal should fit its aims.
- Use online databases, such as the US National Institutes of Health's RePORTER tool (<http://projectreporter.nih.gov>), to find out what kinds of research an agency funds.
- Contact programme officers to understand what kind of impact the agency is looking for.
- Significance starts with your research question. Address an important issue, rather than proposing an incremental advance.
- Describe the significance of the research up front, and continue to back up your argument throughout the application.
- Point out where current knowledge is insufficient, and how you aim to fix that.

- Do not assume that reviewers will find the significance obvious. Make it clear even to lay readers.
- You should be able to sum up your impact in a few punchy sentences. Be specific. Phrases such as "Our research will improve the health of Americans" are too broad.
- Mention it if your research addresses an underserved population, such as people at an economic disadvantage or rural communities without ready access to medical care. Also say if you will be collaborating with people who are underrepresented in science.
- When broader impact is a priority, put as much creative thought into impact as you do into the scientific portion of your application.
- Confer with people outside your field, and outside science, to brainstorm impact ideas.
- Include costs for impact activities in your grant proposal. **A.D.**