

# CAREERS

**GRADUATE STUDENTS** Union membership could reopen for US research assistants **p.397**

**EARLY-CAREER RESEARCHERS** Global coalition to advocate for better conditions **p.397**

**NATUREJOBS** For the latest career listings and advice [www.naturejobs.com](http://www.naturejobs.com)



B. WELSH/CORBIS

These bold breakthroughs grabbed public attention — and earned Nicolelis an appearance on popular US television programme *The Daily Show* in March last year. “This is our moonshot,” Nicolelis told host Jon Stewart.

But he says that a proposal to enable a monkey to control an on-screen avatar using brain electrodes would have been laughed out of the room by the review panel for an R01, the standard US National Institutes of Health (NIH) grant for biomedical research. Luckily, says Nicolelis, reviewers for the NIH Director’s Pioneer Awards, a funding scheme to support bold scientific leaps rather than incremental advances, saw the potential of his work. His research not only earned him a Pioneer award, but also led to new research exploring a treatment for Parkinson’s disease using minimally invasive spinal-column stimulation with an NIH-funded Transformative R01 award.

Many scientists are concerned that the conventional grant-review system has become too conservative, and that this trend has been exacerbated by budget crunches in recent years. All too aware of this perception, funders are creating new types of grant schemes (see ‘In support of innovation’). Many such schemes aim to bring together interdisciplinary brainstorming teams to tackle the world’s big problems.

Innovative grant mechanisms put less emphasis on primary data than on vision, imagination, reasoned logic and relevance to global issues. Not all researchers are equipped for such a shift in strategy, but those eager to break new ground would be wise to adjust their thinking.

## ON FURTHER REVIEW

Funding schemes identify the most promising risky research in different ways. Four programmes run by the European Research Council, collectively funded at €1.75 billion (US\$2.15 billion) for 2013, rely on conventional peer review, but do not pre-select topics; investigators can identify ideas free of political, geographical or economic considerations.

Other schemes use more unorthodox methods. Last year, the US National Science Foundation (NSF) announced the US\$24-million Creative Research Awards for Transformative Interdisciplinary Ventures (CREATIV) pilot programme, which awards grants through an internal process without peer review. Researchers don’t simply submit a proposal: they must first send an inquiry, authorized by directors from two intellectually distinct NSF programmes. “It’s a pretty small fraction of inquiries that lead to a proposal,” says Tom ▶

## RISKY RESEARCH

# The sky’s the limit

*Transformative research projects can bring big rewards. But securing funding requires a particular set of strategies.*

BY VIRGINIA GEWIN

**M**iguel Nicolelis has made advances that could help people with paralysis to walk again. That success was possible thanks to funding earmarked for high-risk, high-reward research. “Usually you have to write a grant on a narrow project using a technique you are deemed an expert in, but that’s

not how major discoveries occur — for that, you have to explore a vision,” says Nicolelis, a neurobiologist at Duke University in Durham, North Carolina. His vision has him recording the activity of large populations of neurons and developing a theory of how brain circuits work. With that, he translates the brain’s electrical activity into digital signals that a robotic suit can interpret to control body movements.

## PIONEERING PROGRAMMES

*In support of innovation*

Governmental funding bodies are recognizing the need for mechanisms that encourage blue-skies research. Here are some of the most popular.

**EUROPEAN RESEARCH COUNCIL (ERC)**

**Starting Grants** — for researchers who have completed their PhDs in the past 2–7 years.

**Consolidator Grants** — for researchers who have completed their PhDs in the past 7–12 years.

**Advanced Grants** — for researchers at any career stage doing frontier research.

**Synergy Grants** — for interdisciplinary teams of 2–4 principal investigators.

**Proof of Concept** — for grant-holders developing innovations from their ERC-funded frontier research.

**US NATIONAL INSTITUTES OF HEALTH**

**Early Independence Award** — for new PhD holders eager to skip postdoc training and start an independent laboratory.

**New Innovator Award** — for creative early-career investigators who lack the preliminary data necessary for conventional grants.

**Pioneer Award** — for scientists at any career stage, who will spend at least 51% of their research effort on the pioneer research.

**Transformative R01** — for bold, paradigm-shifting but untested ideas from teams or individual researchers at any career stage.

**US NATIONAL SCIENCE FOUNDATION (NSF)**

**Creative Research Awards for Transformative Interdisciplinary Ventures (CREATIV)** — proposals must include approval from two intellectually distinct NSF divisions or programmes.

**Early Concept Grants for Exploratory Research (EAGER)** — for untested but potentially transformative ideas.

**Special creativity extensions** — for high-risk opportunities not covered by the proposal for a standard grant. Based on the recommendation of the relevant programme officer.

**US ADVANCED RESEARCH PROJECTS AGENCY—ENERGY**

**Open solicitations for transformational technologies** — for early-stage energy-research projects from any discipline that would not attract private investment.

**Targeted solicitations** — for research projects on agency-determined topics ranging from high-energy advanced thermal storage to materials for advanced carbon-capture technologies. **V.G.**

► Russell, programme director for CREATIV in Arlington, Virginia. “The vast majority of inquiries are not promising or appropriate, and the programme directors act as a tough filter.”

Applications to the NIH’s high-risk, high-reward programme — encompassing Pioneer awards and Transformative R01s, among other schemes — have a 5% success rate, and go through a two-panel review process. Pioneer proposals first go to three generalist reviewers who have a broad view of science and are not allowed to discuss the applications with each other. A second panel scores the resultant reviews and selects the 25 most exciting projects. Proposals don’t require data or a detailed research plan; applicants need only suggest how they will accomplish the research, and describe their qualifications and how they have overcome research roadblocks. “These aren’t incremental awards; these are big ideas that move the field forward,” says James Anderson, director of programme coordination, planning and strategic initiatives at the NIH in Bethesda, Maryland.

Without the need to include preliminary data, applicants must think differently about what they write. “It’s hard to make yourself write those kinds of proposals,” says Eric Toone, principal deputy director at the US

Advanced Research Projects Agency—Energy (ARPA-E) in Washington DC, launched by the government in 2010 to encourage risky, transformative ideas. Funders recognize that speculative research may not pan out, but they want to see radical ideas that will yield interesting insights. Researchers are often so entrenched in incremental approaches — or hindered by the need to secure tenure — that, say programme officers, it takes time for them to work out how best to write radical proposals. “I suggest that researchers try reframing problems,” says Tina Seelig, executive director of the Stanford Technology Ventures Program at Stanford University in California, and author of *inGenius: A Crash Course on Creativity* (HarperOne, 2012). In biomedical research, for example, they could “reframe the questions in terms of wellness rather than sickness”.

It is that original perspective that funders are looking for. “We want to have that ‘holy cow’ moment when reading a proposal, one that makes clear the potential to change how we think about a technology area,” says Toone. A researcher’s enthusiasm for a high-risk project can make or break the case for funding. “A good grant reads like a novel; it grabs you on the first page and you can’t put it down,” says Nicoletis.

Applicants also need to convey the potential

impact of the project, says Ravi Basavappa, NIH programme manager for high-risk, high-reward funding. “Why is this proposed project so important, what communities would be affected and how?” he asks.

Funders suggest that researchers discuss their ideas with the appropriate programme directors before submitting a grant. “Find the people running those programmes and see if you catch their interest with a description of what you want to do,” advises Russell.

### NEW APPROACHES

Some funders are going even further off the beaten path. At the NSF, programme directors can authorize a ‘special creativity extension’ to fund work not covered under a standard grant. In 2010, the UK Biotechnology and Biological Sciences Research Council (BBSRC) in Swindon teamed up with the NSF to create a jointly funded Ideas Lab: a five-day meeting to brainstorm ways to improve plant photosynthesis and enhance food production. Participants hashed out the most promising approaches and wrote proposals that were reviewed at the meeting; the funding agencies shared a total of £6.15 million (US\$9.5 million) between the best projects. Another Ideas Lab is planned for later this year, this one on producing crops that require less nitrogen fertilizer.

The UK Engineering and Physical Sciences Research Council in Swindon also supports high-risk work. For its Bright IDEAS Awards, it offers researchers up to £250,000 over 18 months to tackle a specific challenge — most recently, the development of quantum technologies that could transform communication, imaging or computing.

The Research Corporation for Science Advancement (RCSA) in Tucson, Arizona, runs the Scialog programme, in which it provides \$100,000 for individual researchers working on a given topic, or \$250,000 for teams. Grant recipients must attend a meeting to discuss their work with colleagues, which offers an extra incentive to get creative. “If a new idea comes out of the meeting, we encourage people to write a two-page application on site — which we’ll fund if we think it is possible,” says Jim Gentile, president of the RCSA. The foundation launched a Scialog on enhancing solar cells in 2010; another, on energy storage, will be

launched this year.

Individual institutions are also promoting innovative approaches. To take advantage of the expertise spread across departments, scientists at the University of Michigan in Ann Arbor sought a “fast, interdisciplinary funding vehicle that doesn’t have the downside of peer review”, says Thomas Zurbuchen, associate dean for entrepreneurship. They came up with MCubed, a 2-year pilot project funded with \$15 million from the provost and individual university schools, colleges and investigators.

University researchers can register with the MCubed website (<http://mcubed.umich.edu>) and float their ideas to the community. Each is allotted a token for \$20,000; to unlock and combine the funding, three researchers from different disciplines have to establish a team and register their project. Once they’ve done that, they immediately receive their combined \$60,000 to hire staff and begin work. The teams must draft a mentoring plan to protect participating students’ academic progress and must give a talk about the project after it ends. The website launches this summer, says Zurbuchen, and should fund its first ideas by the end of the year. “We want to swing for the fences, realizing we may have some failures on the way to some massive successes,” he adds.

### RISK MANAGEMENT

How can applicants endure without losing funds if their risk doesn’t pay off? In the NIH’s high-risk, high-reward programmes, “if an idea isn’t developing the way it was expected to, awardees have the flexibility to pursue a more promising avenue of research”, says Basavappa, adding that he cannot recall a requested change in course ever being denied.

ARPA-E takes a different tack, instilling a rigid level of oversight — something some researchers may not like. Instead of grants, the agency uses cooperative research agreements, which pay incrementally for work performed, giving ARPA-E the authority to remove funding if projects don’t meet expectations in on-site visits and tangible milestones at decision points every three months. Toone says that about 10% of projects are spiked. “We take on more technical risks and we manage that risk,” he says.

High-risk, high-reward research can break down barriers and bring diverse teams together, but some researchers are not cut out for life on the edge. “There is a self-selection of those applicants willing to take a risk,” says Basavappa. Alf Game, acting director of research at the BBSRC, agrees: “Not everybody is capable of or wants to be at the cutting edge of every damn thing they are doing.” ■

*Virginia Gewin is a freelance writer based in Portland, Oregon.*

### GRADUATE STUDENTS

## Unionization review

Graduate-student assistants at private US universities may once more be eligible to join a union if a 2004 federal ruling that blocks formation of bargaining units is reversed. On 22 June, the US National Labor Relations Board (NLRB) voted to review the ruling. A solicitation for legal comment closes on 23 July. The 2004 ruling said that graduate students are not employees and cannot elect unions; in doing so, it overturned a 2000 decision. Graduate students at New York University and the Polytechnic Institute of New York University have petitioned the NLRB for an election in the past two years. Nancy Cleeland, director of public affairs at the NLRB, says that no date has yet been set to review the ruling.

### TRAINING

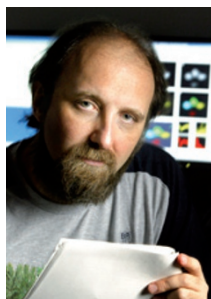
## Clinical course for PhDs

To broaden career options, the US National Institutes of Health (NIH) has launched a scheme to introduce biomedical PhD students to clinical and translational research. The two-week programme at the NIH Clinical Center in Bethesda, Maryland, began on 9 July. Students will learn principles of clinical and translational research design, implementation and analysis; participate in a mock institutional review board; and learn how to apply for a drug to be approved by the US Food and Drug Administration. “We wanted to open students’ eyes to the fact that there are opportunities beyond core, basic research,” says Frederick Ognibene, a deputy director at the clinical centre. Next year’s programme will incorporate feedback and is expected to include more participants.

### EARLY-CAREER RESEARCHERS

## Advocacy group forms

A cross-border coalition of researchers has formed to advocate for better working conditions and to inform and inspire policy. The International Consortium of Research Staff Associations (ICoRSA) will address early-career challenges including low wages, limited career prospects, mobility restrictions and inadequate recognition. “The same issues exist in almost every country, and we felt that they have to be addressed globally,” says Cathée Johnson Phillips, executive director of the US National Postdoctoral Association, one of ICoRSA’s founding members. ICoRSA held its first meeting on 14 July at the 2012 Euroscience Open Forum in Dublin.



**“A good grant reads like a novel; it grabs you on the first page and you can’t put it down.”**

Miguel Nicolelis