and technological progress, which are hard to forecast.

Luke Harrington, a climate researcher at the University of Oxford, UK, took a different approach by developing the concept of equivalent impacts, which doesn't specify societal consequences. Instead, it focuses on quantifying the uneven distribution of extreme weather around the globe.

Harrington looked at changing patterns of extreme daily heat and rainfall in global climate projections based on fast-rising greenhouse-gas emissions. He then determined how much warming was required for a clear climate-change signal — such as extreme temperatures or precipitation — to emerge from the 'noise' of natural climate variability at each spot on the globe. The resulting maps show how quickly regional changes in weather extremes will manifest in response to different levels of global warming.

"I wanted to wrap numbers around the unevenness of impacts," he says. "Climate-mitigation policies focus on a global threshold — but global mean temperature isn't a very meaningful metric to assess what climate change might mean in specific parts of the world," says Harrington, whose work has not yet been accepted for publication.

"I wanted to wrap numbers around the unevenness of impacts."

For changes in regional heat extremes, the pattern is particularly stark. Africa, large parts of India and most of South America are likely to experience changes clearly attributable to climate warming early on, after a 1.5 °C increase in global temperatures. But mid-latitude regions — where most greenhouse gases are produced — won't see such pronounced changes until global temperatures rise by 3 °C or so.

"This is an elegant way to tie global climate targets and regional impacts," says Erich Fischer, a climate scientist at the Swiss Federal Institute of Technology Zurich, who was not involved in the study. He says that the model would need to be adapted to include metrics of specific climate-change impacts, such as those on human health and food security, for it to be useful for planning adaptation efforts or for informing international climate-finance programmes. Some proposed schemes would compensate poor countries for climate-change-related harm.

The equivalent-impacts index, says Fischer, could help quantify how climate change will affect different countries, because it focuses on identifying when they will start to face weather outside their natural variability.

"Our study provides a framework," say Harrington. "We want to know what information others care about most, then we can start to look at metrics of more-specific climate impacts." ■

FUNDING

Early success fuels further grants

Researchers who just miss cut-off for postdoc grant fall behind those who narrowly qualify.

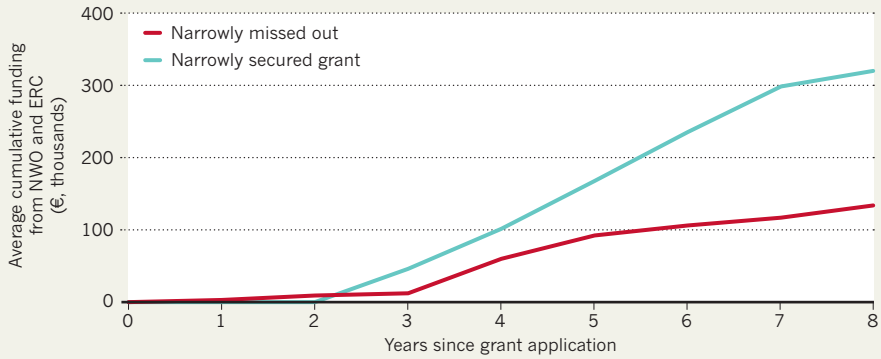
BY HOLLY ELSE

The career-defining effect of winning a postdoctoral research grant has been laid bare in an analysis of thousands of young researchers' professional trajectories. The work compared the fate of junior scientists in the Netherlands who just met the bar to qualify for post-PhD research funding with that of people who just missed out on the money. The successful group went on to secure more than twice as much research funding in the subsequent eight years, the analysis found. And the grant-winners were also 50% more likely to become professors than were the ones who fell short. The study was published on 23 April (T. Bol *et al. Proc. Natl Acad. Sci USA* https://doi.org/cnrr; 2018).

What is most striking is that winning the initial grant did not have any effect on the scientists' publications or academic impact in the following years, says Shulamit Kahn, an economist at Boston University in Massachusetts. Funders often consider previous awards when making decisions about whom to give money to. "Why are they doing this if it doesn't increase productivity?" asks Kahn,

THIN LINE

Researchers who just qualified to win a certain early-career grant went on to receive much more research funding in the years afterwards than did those who just missed out, an analysis finds.



NWO, Netherlands Organization of Scientific Research; ERC, European Research Council

T. BOL *ET AL. PROC. NATL ACAD. SCI. USA* HTTP://DOI.ORG/CNRR (2018)

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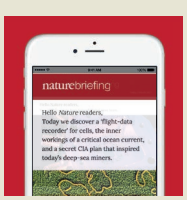

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adding that every funding body should be looking at the effect of their grants.

"If scientists are dissuaded from science by lack of funding, then the investment in scientific training becomes a sunk cost," says economist Donna Ginther of the University of Kansas in Lawrence.

COMMON TREND

Previous studies have made similar findings about the effects of early-career grants on later success, but the authors of the latest work say that they compared the fate of researchers with similar abilities in a way that no one else has. Earlier this month, Ginther published the results of a similar analysis, which found that securing a specific early-career fellowship from the US National Institutes of Health increases a researcher's chance of winning more grants from the funder (M. L. Heggeness *et al.* NBER Working Paper No. 24508; National Bureau of Economic Research, 2018).

The Dutch study, led by sociologist Thijs Bol at the University of Amsterdam, draws on data from the Netherlands Organization of Scientific Research (NWO), the country's national research council. The NWO operates a three-stream funding scheme that sets aside a total of €150 million (US$183 million) a year for scientists in the early, middle and established stages of their careers. Bol and his colleagues tracked more than 4,000 researchers who applied for the scheme's early-career grant between 2002 and 2008.

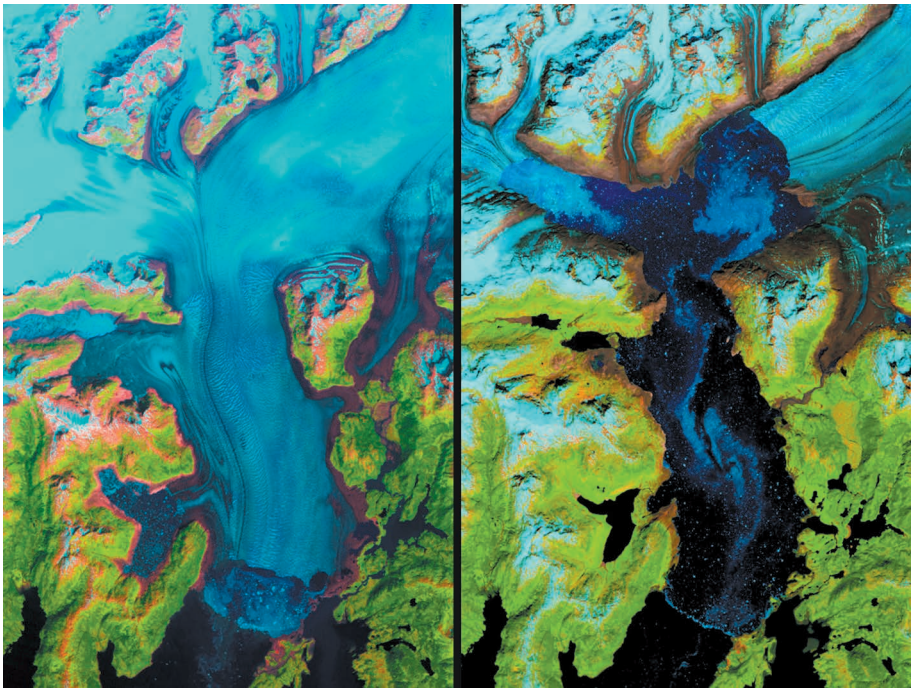
They looked at the grant-application scores of those academics, and tracked whether they went on to secure a mid-career grant from the funder in the following eight years. They also counted any grants from the European Research Council won between 2005 and 2016.

For around 1,400 of the early-career applicants, the researchers sourced data from article database Scopus about their publication and citation records before, during and after the time period of the NWO grants. They also determined how many of them had become full professors by 2018.

They found that candidates slightly above and below the funding cut-off had different career trajectories, even though their publication and citation records remained similar.

Researchers who ranked just above the threshold secured €180,000 in research funding over the next 8 years — more than twice as much as those just below it (see 'Thin line'). This was partly because researchers who lost out on the initial grant were less likely to apply for future funding.

"There is a group of very young talented scholars who have bad luck," says Bol. "They do not get the same resources to bring their ideas to life." ■



LANDSAT/EO/NASA

The ongoing melting of Alaska's Columbia glacier is shown in these Landsat images from 1986 and 2017.

EARTH OBSERVATIONS

US government reviews data fees

Images from Landsat satellites and agricultural-survey programme are freely available to scientists — for now.

BY GABRIEL POPKIN

The US government is considering whether to charge for access to two widely used sources of remote-sensing imagery: the iconic Landsat satellites operated by the US Geological Survey (USGS) and an aerial-survey programme run by the Department of Agriculture (USDA).

Officials at the Department of the Interior, which oversees the USGS, have asked a federal advisory committee to explore how putting a price on Landsat data might affect scientists and other users; the panel's analysis is due later this year. And the USDA is contemplating a plan to institute fees for its data as early as 2019.

Researchers who work with the data sets fear that changes in access could impair a wide range of research on the environment, conservation, agriculture and public health. "It would be just a huge setback," says Thomas Loveland, a remote-sensing scientist who recently retired from the USGS in Sioux Falls, South Dakota.

The Landsat programme began with one satellite in 1972, and has launched another seven since. Together, they have produced the world's longest-running data set of satellite images. The two current probes take pictures at a resolution of 30 metres up to every 8 days.

Until 2008, researchers had to buy Landsat images — and they often designed studies to limit data costs, Loveland says. "You would buy as few images as you possibly could to get an answer."

Since the USGS made the data freely available, the rate at which users download it has jumped 100-fold. The images have enabled groundbreaking studies of changes in forests, surface water and cities, among other topics. Searching Google Scholar for "Landsat" turns up nearly 100,000 papers published since 2008.

A USGS survey of Landsat users released in 2013 found that the free distribution of imagery generates more than US$2 billion of economic benefit annually — dwarfing the programme's current annual budget of roughly $80 million. More than half of the nearly 13,500 survey respondents were academics, and the majority lived outside the United States. ▶