

Amazon has announced plans to film the first of the Culture books.

The path from science fiction to science fact has been well explored, especially in areas such as space and technology, with inventions from satellites to iPads first imagined in stories. But can the influence go further? What if it is not the concepts described by science fiction that could have the most impact, but the act of storytelling — the creation of scientific narratives — itself?

That's the goal of something called science-fiction prototyping. Developed by Brian David Johnson at computer company Intel a decade or so ago to help the firm's engineers anticipate future demand, the approach takes scientific facts and spins them into the future to explore the societal scenarios that could emerge. Advocates say an emphasis on exploring how humans might react to technological change creates a "focused, tailored and creative way to think about possible futures around a particular issue" (A. Merrie *et al. Futures* **95**, 22–32; 2018). It differs from other forms of scenario planning, they argue, because the emphasis is placed as much on the narrative used to explore the results as on the results themselves, and because the goal is not to reach a predetermined outcome. The method has been used by researchers at the University of Essex, UK, and King Abdulaziz University in Jeddah, Saudi Arabia, to create and test a virtual-reality-based distance-learning tool originally imagined for the year 2048 that they call the BReal Lab ([go.nature.com/2fhz9za](http://go.nature.com/2fhz9za)).

Sustainability scientist Andrew Merrie at Stockholm University and his colleagues have taken this principle and applied it to a topical environmental concern: the fate of the world's oceans. The project paints four scenarios for 2050–70, each of which builds on current trends in oceans governance and the fishing industry, as well as ongoing development of marine science and technology. More-uncertain outcomes — the possible collapse of ice sheets and the formation of deep-sea dead zones as a result of onshore pollution — play out

differently for better and worse.

One scenario, called Oceans Back from the Brink, describes a public talk given in 2070 about how an artificial-intelligence system released all forms of confidential data, which prompted the collapse of existing corporate structures and renewed conservation efforts. Another, Rime of the Last Fisherman — Dispatches from a Dying Ocean, imagines a less-than happy ending, with decaying oceans, a geoengineering experiment gone badly wrong and onshore disaster.

**“Narrative has an important role in the communication of science.”**

The paper in *Futures* is accompanied by striking illustrations on the project's website ([go.nature.com/2orkrux](http://go.nature.com/2orkrux)).

Narrative has an important role in the communication of science, but can it also help in the pursuit of research? Purists may balk, but stories already feature heavily, from the promised potential of work pitched in grant applications to the case studies of impact that funders increasingly ask for when projects finish. Climate-change science has long relied on emissions scenarios that diverge according to how future societies might behave. These rely not on extrapolation of current trends, but on imagined differences in, for example, whether nations come to cooperate or opt to pursue their own agendas. And climate-change policies are being planned on the basis of stories of future technology — carbon capture and negative-emissions equipment included — that many argue are pure fiction and will never materialize.

Some of the scenarios painted — in both the fictional tales of the future ocean and the high-emissions scenarios of climate modellers — are something that society, scientists included, should be desperate to avoid. To do so, data and evidence remain the priority. But in a world where both are so easily trumped by a seductive (and false) counter-narrative, perhaps more researchers should also learn to tell tales as they look ahead. ■

## Code check

*Researchers who rely on bespoke software are encouraged to submit the programs for scrutiny.*

Computer code written by scientists forms the basis of an increasing number of studies across many fields — and an increasing number of papers that report the results. So, more papers should include these executable algorithms in the peer-review process. From this week, Nature journal editors handling papers in which code is central to the main claims or is the main novelty of the work will, on a case-by-case basis, ask reviewers to check how well the code works, and report back.

The move builds on growing demand in recent years for authors to publish the details of bespoke software used to process and analyse data. And it aims to make studies that use such code more reliable. Computational science — like other disciplines — is grappling with reproducibility problems, partly because researchers find it difficult to reproduce results based on custom-built algorithms or software.

This policy is the latest stage in the evolution of our editorial processes, which aims to keep up with technological change across the research community. All Nature journals, for example, already require that authors make materials, data, code and associated protocols promptly available to readers on request, without undue qualifications. In 2014, the Nature journals adopted a “code availability” policy to ensure that all studies using custom code deemed central to the conclusions include a statement indicating whether and how the code can be accessed, and explain any restrictions to access.

Some journals have for years gone a step further and ensured that the new code or software is checked by peer reviewers and published

along with the paper. When relevant, *Nature Methods*, *Nature Biotechnology* and, most recently, journals including *Nature* and *Nature Neuroscience* encourage authors to provide the source code, installation guide and a sample data set, and to make this code available to reviewers for checking.

To assist authors, reviewers and editors, we have updated our guidelines to authors ([go.nature.com/2d2i80d](http://go.nature.com/2d2i80d)) and have developed a code and software submission checklist ([go.nature.com/2h9ouaj](http://go.nature.com/2h9ouaj)) to help authors compile and present code for peer review. We also strongly encourage researchers to take advantage of repositories such as GitHub, which allow code to be shared for submission and publication.

According to the guidelines, authors must disclose any restrictions on a program's accessibility when they submit a paper. *Nature* understands that in some cases — such as commercial applications — authors may not be able to make all details fully available. Together, editors and reviewers will decide how the code or mathematical algorithm must be presented and released to allow the paper to be published.

Occasionally, other exceptions will be made — for example, when custom code or software needs supercomputers, specialized hardware or very lengthy running times that make it unfeasible for reviewers to run the necessary checks. We also recognize that preparing code in a form that is useful to others, or sharing it, is still not common in some areas of science.

Nevertheless, we expect that most authors and reviewers will see value in the practice. Last year, *Nature Methods* and *Nature Biotechnology* between them published 47 articles that hinged on new code or software. Of these, approximately 85% included the source code for review.

As with other scientific fields, the impact of computational tools is determined by their uptake. Open implementation increases the likelihood that other researchers can use and build on techniques. So, although many researchers already embrace the idea of releasing their code on publication, we hope this initiative will encourage more to do so. ■