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Ukrainian research has been devastated — the time to start rebuilding is now

The war is far from over, but the foundations for restoring Ukraine's research infrastructure should be laid immediately.

The year since the Russian invasion of Ukraine began has been truly desperate for Ukrainian scientists. Many researchers left their laboratories to join the front line. Some have made the ultimate sacrifice. Around 6,000 — one-tenth of all researchers in the country — have left. Some 80% of these are women, and the majority are now in Poland and Germany, with many more in France, Spain and Italy, and others in at least 16 further countries. A once fully functioning research system has been severely damaged, as *Nature* reports on page 608.

One year on from Russia's invasion, we're urging the international research community to prioritize support for not only individual researchers and their teams, but also Ukraine's science system as a whole. With the war far from over, Ukraine's diaspora of researchers must continue to be supported, but so must those who are holding the fort at home.

Some 27% (91) of Ukraine's 334 research and higher education institutes have suffered war damage; 4 institutes have been completely destroyed and 228 are so far unharmed. Both the renowned Kharkiv Institute of Physics and Technology and the world's largest decametre-wavelength radio telescope, at the Institute of Radio Astronomy in Kharkiv, were heavily damaged. Although many men aged 18–60 are conscripted, scientific research is considered an essential wartime occupation. Therefore many researchers, men and women, remain in post, often working remotely in safer parts of the country.

International institutions and research networks have started to expand the scope of their support to include research in Ukraine itself. On 2 February, the European Commission announced that it would open a research office in Kyiv this year. This follows last June's decision to associate Ukraine to the EU's flagship funding scheme, Horizon Europe. As of January, Ukraine's researchers were already participating in 49 Horizon Europe projects, with a total funding of €13 million (US$13.9 million). But an association agreement gives Ukraine's researchers the same status as those from EU states, including the ability to lead projects.

Elsewhere, the Polish Academy of Sciences and the US National Academy of Sciences have jointly launched an innovative research-funding scheme for Ukrainian principal investigators and other researchers who are currently in Poland, but whose research teams can be based in Ukraine or elsewhere. Last year, Universities UK, which represents higher-education institutions in the United Kingdom, launched a scheme funded by the UK government that connects Ukrainian and UK universities, with an explicit aim that Ukrainian science must benefit. The scheme, which is part of a £5 million (US$6 million) investment, will support a range of activities, including remote research collaborations and the use of lab space for scientists who need to come to the United Kingdom temporarily to complete parts of their work that are currently impossible to finish in Ukraine. And last month, mathematicians from Ukraine, together with European maths research institutes, announced plans to create an International Centre for Mathematics in Ukraine. These are pioneering schemes that have Ukrainian science's long-term needs as their guiding principle.

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Management science

But a more coordinated approach is needed, and one that supports not only the activity of science but also its organization and management. Last June, representatives of an international group of science academies, including ones in Ukraine, Europe and the United States, met in Warsaw and put together what they called action steps for rebuilding Ukraine's science, research and innovation. They rightly said that planning for a post-war science recovery of Ukraine should begin now. The group has created a forum, which it is calling the Ukrainian Science, Innovation, and Research Coordinating Group, to share knowledge of its support for Ukraine's research system.

One priority for Ukraine and its international partners must be to review the country's system for organizing and funding research. Ukraine has a long-established science academy and the country's research strengths include agricultural technology, energy and planetary science.

But the academy (rather than universities) is responsible for organizing and funding most research institutes, which is partly a legacy of how science was organized before Ukrainian independence in 1991, when the country was part of the Soviet Union. Research institutions were part of the state and lacked autonomy to make their own decisions, including which projects to fund, without the say-so of government officials. In the years before the war, Ukraine enacted some reforms such as the creation of an independent grant-giving body, the National Research Foundation of Ukraine, and an advisory body, the National Council of Ukraine on Science and Technology Development. But these organizations struggle to fulfil their roles.

Last November, the Ministry of Education and Science of Ukraine published a draft recovery plan for education and science. The plan includes a proposal to create a high-risk, high-reward funding agency along the lines of the US Defense Advanced Research Projects Agency (DARPA). It also calls for closer integration with the European and wider global research communities, and to harness science in the task of post-war reconstruction — similar to the US-funded Marshall Plan, in which research and researchers were integral to the

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rebuilding of Europe after the Second World War.

There should always be a place for emergency help for Ukrainian scientists who have had to leave the country. But it's also time for deeper efforts to go towards displays of solidarity with researchers who remain in the country. The international science community should start planning how best to prepare the country's research infrastructure for the end of the war. Long-term partnerships that focus on capacity-building will be crucial, particularly in the areas of management, monitoring and policy. These collaborations must try to sustain day-to-day research as much as possible now, so that the research community can hit the ground running and be much more effective as soon as the conflict ends.

Nature welcomes Registered Reports

From this week, *Nature* will be publishing an additional type of research paper – designed to encourage rigour and replication.

This year marks the 50th anniversary of *Nature*'s decision to mandate peer review for all papers. It's an appropriate time to introduce readers and authors to Registered Reports, a research-article format that *Nature* is offering from this week for studies designed to test whether a hypothesis is supported (see go.nature.com/3kivjh1).

The fundamental principle underpinning a Registered Report is that a journal commits to publishing a paper if the research question and the methodology chosen to address it pass peer review, with the result itself taking a back seat. For now, *Nature* is offering Registered Reports in the field of cognitive neuroscience and in the behavioural and social sciences. In the future, we plan to extend this to other fields, as well as to other types of study, such as more exploratory research.

Why are we introducing this format? In part to try to address publication bias, the tendency of the research system – editors, reviewers and authors – to favour the publication of positive over negative results. Registered Reports help to incentivize research regardless of the result. An elegant and robust study should be appreciated as much for its methodology as for its results.

Submitting a study

As for how it works, authors of Registered Reports are asked to make a pre-submission enquiry with their research plan before they embark on a study. Typically, this plan should include the research question being asked, an explanation of why this work fits the Registered Reports format and a brief explanation of the methods to be used and how data will be collected. The research question must meet *Nature*'s existing editorial criteria for scientific impact and the strength of the underpinning evidence. If these criteria are satisfied, the plan will be sent for peer review. Reviewers will judge submissions on the basis of a question's importance, either to a research field or more broadly (to an economy, the environment or society, for example). They will also assess the robustness of a study's design and analysis. If the reviewers are satisfied, the journal will commit to publishing the findings, as long as the methodology does not change during the course of a study.

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To be clear, Registered Reports are not new. They have been around for at least a decade[1]. The format is already offered by a number of Nature Portfolio journals, including *Nature Human Behaviour*, *Nature Methods*, *Nature Communications* and *Scientific Reports*. According to the Center for Open Science (see go.nature.com/3xhimm6), more than 300 journals already offer this format, up from around 200 in 2019. But despite having been around for a while, Registered Reports are still not widely known – or widely understood – among researchers. This must change. And, at *Nature*, we want to play a part in changing it.

The lack of awareness is partly the result of systemic factors that favour the conventional research paper. Studies in which the main emphasis is on results are valuable – and are used in assessing promotions and grant applications. They are also important to institutions, which can use them to obtain funding, for example.

Clearly, more needs to be done to emphasize the benefits of Registered Reports. The format helps to reinforce the necessity of rigour in study design and methodology. At the same time, it provides in-built opportunities for feedback. Both of these help researchers to spot problems in studies before it is too late to fix them. Registered Reports are becoming a marker of quality – peers, institutions and funders are beginning to realize that the format represents a high standard of work[2]. Moreover, the format can make the peer-review process more constructive and amicable.

Collaborative potential

Registered Reports (along with other formats) might also have a role in helping to resolve disagreements within disciplines. For example, psychology researchers have disagreed on whether individuals' subjective experiences of emotion are influenced by their own facial expressions. Researchers with different views saw the Registered Reports format as a way to collaborate to test the hypothesis. Their findings[3] were published last October.

A decade ago, *Nature* developed a reporting summary for authors of manuscripts – a checklist in which authors are asked to state, for example, whether experimental findings have been replicated or whether a sample size is appropriate. Registered Reports are a progression towards greater emphasis on rigour and study design. They are also a format that recognizes both how science is done and that good research starts well before the paper is written.

1. Chambers, C. D. & Tzavella, L. *Nature Hum. Behav.* **6**, 29–42 (2022).
2. Soderberg, C. K. *et al. Nature Hum. Behav.* **5**, 990–997 (2021).
3. Coles, N. A. *et al. Nature Hum. Behav.* **6**, 1731–1742 (2022).