

US astronomy needs global partners to realize its full potential

Ten-year ‘decadal survey’ sets out plans for a ‘super Hubble’, powerful ground-based telescopes and opportunities for international collaboration.

Astronomers in the United States breathed a collective sigh of relief this month when a long-awaited, COVID-19-delayed, 615-page report finally landed on their desks. Issued by the National Academies of Sciences, Engineering, and Medicine, the ‘decadal survey’ of astronomy lays out a 10-year plan for the nation’s investments in astronomy and astrophysics, which run to more than US\$2 billion annually.

The United States is the world’s largest funder of astronomy and astrophysics. This report – a massive three-year, grass-roots effort that incorporates hundreds of white papers from thousands of astronomers – is essential reading for astronomers everywhere. That’s because what the United States thinks and does has an impact on scientific priorities for other countries, whose astronomers are often very keen to work with the United States.

The decadal survey is officially a recommendation – but funding agencies generally follow its guidance. It is considered particularly important because, compared with other areas of science, astronomy and astrophysics needs very expensive research infrastructure. Both the Hubble Space Telescope and its successor, the engineering marvel known as the James Webb Space Telescope, were born from recommendations made in previous surveys. Webb’s 6.5-metre-wide mirror will enable astronomers to peer back to when the first stars and galaxies assembled in the Universe, more than 13 billion years ago.

But both missions are the result of extensive international collaboration. Hubble combines the forces of NASA and the European Space Agency (ESA). The \$10-billion Webb is a collaboration between NASA, ESA and the Canadian Space Agency, and is scheduled to launch no earlier than 22 December. The next generation of telescopes will need to be similarly global affairs if they are to succeed.

The latest decadal survey makes it clear that the next decade’s priorities will include the search for habitable Earth-like worlds – and will require big facilities to pursue such themes. Those include a ‘super Hubble’ space telescope – estimated to cost at least \$11 billion – and two enormous, 25–30-metre-wide ground-based telescopes that would be the successors to the current biggest class

of telescopes, including the twin 10-metre Keck telescopes in Hawaii. Crucially, the report also identifies opportunities for the United States to coordinate with other nations and space agencies on astronomical exploration. These opportunities must be seized.

Plenty of scope

Collaboration comes in many flavours. Canada, China, India and Japan are partners in one of the next-generation ground-based telescopes, the Thirty Meter Telescope (TMT) project. They are contributing both funds and work on the telescope’s hardware. Canada, for example, is building the dome’s enclosure, and China is working on polishing mirror segments, in return for a share of future observing time.

Moreover, nations are keen to continue those collaborating roles. Last year, Canada’s astronomy community identified technical areas in which Canadian astronomers can complement the work of NASA and other large space agencies. These include the development of scientific instruments and other hardware for future NASA missions, in much the same way as the Canadian Space Agency contributed to Webb.

Such collaboration also helps to ensure that research gaps are filled and that projects do not overlap or stray into the territory of others. Europe’s astronomers, for example, will be relieved that the proposed ‘super Hubble’ will operate in ultraviolet, visible and infrared wavelengths. Had the plan been to use X-rays, the telescope would have shouldered uncomfortably into the territory of ESA’s Athena X-ray observatory, which is scheduled for launch in the early 2030s. The report does propose an X-ray mission, but it is expected to follow the super Hubble and be designed in ways that would complement rather than compete with Athena. One challenge, however, will be to develop the super Hubble quickly and efficiently enough that it is possible to continue moving down the wish list towards that X-ray mission.

ESA, in turn, has worked hard to not duplicate future NASA missions. Earlier this year, Europe used its Voyage 2050 strategy process to identify science mission themes that stake out its own discovery space, such as exploring the icy moons of the outer Solar System, where life might reside in deep buried oceans. And the pan-European Astronet astronomy road-mapping process is similarly working to identify unique areas for discovery.

Global lifelines

There’s also much potential for collaboration with other nations. For instance, addition of an India-based detector to the Laser Interferometer Gravitational-Wave Observatory (LIGO) is currently approved in principle. If India were to grant full approval, then the new detector would work in concert with two existing LIGO detectors in the United States. Likewise, Japan, a world leader in X-ray astronomy, is heading up an X-ray mission that will launch next year, in collaboration with NASA, to keep discoveries flowing until Athena is ready for business.

On the US domestic front, the decadal report does not

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weigh in on the controversial topic of where to build the TMT. Construction of this facility on the mountain of Maunakea has been halted since 2015 because of concerns that it is being done on lands that many Native Hawaiians consider sacred. If the US federal government became involved, it would further prolong the project approvals process. The report recommends only that the National Science Foundation (NSF) consider funding both the TMT and a similar telescope in the Southern Hemisphere, the Giant Magellan Telescope under construction in Chile by partners in the United States, South Korea, Brazil, Australia and Israel. This arrangement would give US astronomers a chance to apply for a portion of observing time on these ground-breaking facilities, opening up public access to what have thus far been private projects.

Now that the latest decadal survey has been released, the funding agencies that commissioned the report – NASA, the NSF, the Department of Energy and the US Air Force – will begin implementing the recommendations, working with the US Congress, which will allocate the funds. As they do, they should consider how international partners can help with – and build on – the report’s powerful vision, so that the world can push the frontiers of discovery together.

Researchers at risk in Afghanistan need help to find support

Many organizations are ready to help threatened scholars and professionals – but those in peril often struggle to locate them.

One of the main charities helping scientists to leave countries experiencing conflict has seen a spike in enquiries. Last week, the Council for At-Risk Academics (CARA), which is based in London, said it had received 40 requests from people intent on leaving Afghanistan. It was 98 in the previous week. This is a record for the organization – its highest previous peak was 20 a week in 2016, during the Syria crisis, says CARA’s executive director Stephen Wordsworth.

Three months after the Taliban takeover of Afghanistan, the country’s educational and research institutions remain closed. The Red Cross says that salaries at government-run hospitals have gone unpaid for months because of economic woes exacerbated by sanctions. Afghanistan’s economy is expected to shrink by nearly one-third this year, according to projections from the International Monetary Fund. And the United Nations World Food Programme says that almost 23 million people, out of a population of 40 million, face hunger.

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Most academic staff – particularly women and those with international links – are either in hiding or looking to leave the country. One provincial passport office that reopened earlier this month received more than 2,000 applications per day, nearly 10 times its usual daily processing capacity of 250. “The reality is that we are all trying to emigrate,” one researcher wrote in an e-mail to *Nature* last week.

CARA and Scholars at Risk, its US counterpart, connect researchers fleeing conflict with universities in safe countries who need people with specific skills. Both are working flat out to process applications and have been able to find academic jobs for a small number of people, along with safe passage for their families.

But they are just two organizations working manually to help relocate scholars. And although they are well known among university administrators, they are less familiar to research staff and the leaders of research groups, who might have PhD opportunities or vacancies they are looking to fill. What is needed now is a larger and more visible response, coordinated globally – and preferably with a strong digital component – to assist all of those whose lives are in danger. It should be a bold effort, facilitated by everyday digital tools, connecting the growing numbers of people and organizations offering support with the rising number of those at risk.

Just in the past few months, initiatives have been set up to assist women judges, lawyers, musicians and sports professionals who need to leave Afghanistan. In addition to CARA and Scholars at Risk, there’s Germany’s Philipp Schwartz Initiative, which funds universities to host researchers at risk. The coming weeks and months are likely to see the launch of more such efforts, but these will not be easy for people in Afghanistan to access unless they already know the names of the schemes, or of the people and organizations behind them.

This problem could be addressed with an organized digital portal or service. It could be a single online space for organizations and individuals to use to display what they are offering in terms of employment, support or advice. It could match them with scholars and other at-risk professionals in Afghanistan (and other countries in conflict, such as Syria and Yemen). And it would need to be built in a way that would allow identities to be verified but simultaneously kept secure. Although limited travel to and from Afghanistan has resumed, anyone with links to people or organizations outside the country is at high risk of persecution.

Academics around the world have generously opened their homes and their institutions to researchers at risk. But more needs to be done to connect those at risk with those ready to provide jobs and other forms of support, not only in universities, but in other types of organization, too.

Researchers applying to CARA to leave Afghanistan are not looking for permanent settlement, Wordsworth says. “This is not brain drain,” he emphasizes. People are frightened, but, when conditions are safe, they are determined to go back and build on the knowledge and infrastructure of higher education and research that has been created in the past 20 years, under the US-led occupation.