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Column: World View

The dark clouds over US astronomy



The proposed cancellation of NASA's latest space telescope shows the difficulties ahead. But there is a solution, says Michael S. Turner.

Michael Turner

It is barely 12 months since US astronomy was shown the future, with the release of *New Worlds, New Horizons in Astronomy and Astrophysics*, the latest decadal survey by the National Academy of Sciences. The survey offered a strategy — based on realistic budgets and leveraged by international and private partnerships — to realize dazzling opportunities, including searching for life on other planets, identifying dark matter and understanding dark energy. It also promised to reveal the evolution of the first stars and galaxies and to probe whether supermassive black holes are accurately described by general relativity.

It began well, with the Large Synoptic Survey Telescope, the highest priority for ground-based astronomy, put on a path for construction in 2014. But today, US astronomy is in disarray, community morale is low and the proposed cancellation of the James Webb Space Telescope (JWST), the cornerstone of the 2010 decadal survey, is the most glaring example of difficulties ahead. Although capabilities and budgets in Europe and Asia have largely caught up with those of the United States, the health of the US programme remains critical, not just domestically, but also to the rest of the world.

As the opportunities have soared and projects have become more complex and costly, government spending on science has been shrinking. NASA's science budget is in steady decline. The House of Representatives has said that it wants to cut another 10% from NASA for 2012 — and that was before the bill to cut domestic spending over the next decade was passed earlier this month.

This has undermined NASA's planned collaboration with the European Space Agency (ESA) on the International X-ray Observatory (IXO) and on a space-based interferometer to detect gravity waves — the Laser Interferometer Space Antenna (LISA). Both partnerships were endorsed by the decadal survey, but the Europeans are now looking at cheaper and less-ambitious missions that they can do alone.

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The decadal survey's top priority was the Wide Field Infrared Survey Telescope (WFIRST), designed to find exoplanets and probe dark energy, but budget trouble has pushed its earliest possible launch into the mid-2020s. By then, much of its key science could have been done by a similar ESA mission, Euclid. (Euclid is competing for a slot in ESA's Cosmic Vision programme, with an announcement expected this October.)

The JWST illustrates the complexity of the problems in the US astrophysics programme. With a 6.5-metre deployable mirror and powerful infrared instruments, it will be a hundred times more sensitive than the Hubble Space Telescope and a worthy successor. It will image the first stars and galaxies, and search for water and evidence of life on distant planets. Yet it is at

least US\$1.6 billion over budget, and last month the House voted to terminate it.

The JWST can still be saved, and should be. The budget for 2012 is yet to be settled and there is a groundswell of support for the telescope: professional societies around the globe have issued statements of support, online petitions have been organized and influential commentators have called for its completion. But if the JWST does launch, its cost could yet wreak havoc on the rest of the astrophysics programme.

I believe that there is a path forward for astronomy. It will involve hard choices and better international coordination, but the scientific payoffs ahead demand that we try.

First, it is essential that the United States finishes the JWST. As well as being the cornerstone of the future astrophysics programme, the telescope will transform global astronomy just as Hubble has. But NASA must spread the additional cost across the agency so that it does not cripple the rest of US astrophysics. This will not be easy, but without a clear plan for the post-shuttle era, NASA is going to need a steady stream of exciting science results to capture the public's imagination and loosen the purse strings of Congress.

Second, ESA and NASA will have another opportunity to merge their competing dark-energy missions, Euclid and WFIRST, if Euclid is selected for a Cosmic Vision slot. The agencies should do so, and next year they should seek a renewed partnership on IXO and LISA.

Third, agencies on both sides of the Atlantic have their sights set on a giant ground-based telescope, 30 metres or more in aperture, with complex adaptive optics to complement the JWST. Both sides are seeking international and private partners. A coherent strategy to build at least two of these grand machines of discovery — one for the northern sky and one for the southern — is essential. In the United States, the National Science Foundation must clarify the currently muddled situation by picking which of the competing private projects it wants for a partner. And scientists around the world must work together to develop the necessary technology and instrumentation for these billion-dollar telescopes.

We are in an unprecedented age of discovery, with opportunities to answer the biggest questions humankind can ask. Where did we come from? Where are we going? Are we alone? If the global science community can figure out how to live on leaner budgets by working together more effectively, this could yet be a golden age for astronomy.

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