

Life, the Universe and JWST

Following the nominal arrival of the James Webb Space telescope at L2, hopes are high for exciting scientific discoveries, starting from later this year and stretching for decades to come.

The launch of the James Webb Space Telescope (JWST) on 25 December 2021 from the Guiana Space Centre at Kourou, French Guiana, brought excitement and relief in equal measure. But the remaining 344 single points of failure — 75% of them related to the sunshield deployment alone — led to an extended countdown and more sighs of relief as JWST passed every performance challenge on its way to the second Lagrange point, L2, about 1.5 million km away. It arrived on schedule on 24 January 2022 with the sunshield unfolded and primary and secondary mirrors deployed. Phew.

During the commissioning period, the four instruments will passively cool down to a working range of 30 to 50 kelvin thanks to the sunshield, though the Mid-Infrared Instrument (MIRI) needs further cooling to 7 K with the help of an onboard cryocooler. The optical alignment of the mirrors will take three months. The Fine Guidance Sensor, which will allow the JWST to point precisely, will also need two to four months to come fully online.

Approximately six months from launch, the thirteen [Director's Discretionary Early Release Science](#) programmes will begin. During these five months of observations, there will be no exclusive access period on the data so that the community as a whole can quickly access and learn about the instruments' capabilities ahead of General Observer Cycle 1.

To help speed things up in this era of open data, *Nature* has announced in an [Editorial](#) that “the journal will have no embargo on any early-release science (data from the first five months of observations); nor on the first year of science, known as Cycle 1 of the General Observers programme”. This policy means that researchers can publicize JWST results before, during or after the peer-review process in the *Nature* journals. After 30 years of waiting, there is no need to postpone the celebrations, especially with public interest at an all-time high.

That said, we firmly believe that the embargo policy serves a useful purpose in providing a level playing field for all media outlets great and small. Six days before publication, our press office sends

the finalized paper under [embargo](#) to thousands of registered journalists under strict confidentiality. This short week gives these journalists equal time to read the paper, check the background and contact the authors and/or other experts for comment and clarification.

A common misconception is that authors cannot post their papers on arXiv or discuss their work at conferences — that the embargo is a blanket ban on communication. Nothing could be further from the truth. Authors are welcome to present their results at conferences and post preprints before publication. More information on our preprint policy can be found [here](#).

We do, however, clarify to what extent authors should talk to journalists before a paper is finalized, because the conclusions might change. Should a journalist contact an author, it is fine to answer questions that clarify the research or provide more context. If you're unsure, please ask your editor, or simply ask the journalist to wait until the week before publication when all the materials will be available to members of the media under embargo. But authors should not worry if someone writes about their preprint without consultation, as it won't harm the chances of publication.

Embargoes aside, we are also looking ahead in anticipation of the next steps from the Astro2020 Decadal Survey. The wide-ranging audit of the state of astronomy has balanced near-term actions against ambitious longer-term goals. Given that JWST was the flagship mission of the Astro2000 Decadal, the new Decadal noted the need for pan-decadal (or even multi-generational) projects and closer budgetary oversight. Hence the emphasis on technology maturation in the next Great Observatories mission: NASA should develop technology suitable for several mission concepts to reduce risks and costs.

The top priority for the maturation programme is a ~6 metre diameter ultraviolet/optical/infrared space telescope for an early 2040s launch. The unnamed flagship is a hybrid version of [LUVOIR](#) (8–15 metre mirror) and [HabEx](#) (3.2–4 metres), with a budget of US\$11 billion. Crucially, work will only

begin late in the 2020s to give time for the mission concept and attendant technologies to mature. Then five years after work begins on the large space observatory, the Decadal recommends that NASA starts studying the next two flagship missions, for far-infrared and X-ray studies. These are not unlike the [Origins Space Telescope](#) and [Lynx X-Ray Surveyor](#) mission concept studies.

On the ground, the highest priority recommendation is for the NSF to fund one or both US-led Extremely Large Telescopes, the Giant Magellan Telescope and the Thirty Meter Telescope, following external review. Furthermore, the next generation cosmic microwave background experiment would be important to further our knowledge of galactic ecosystems and the formation of cosmic structure. No less essential is the next generation Very Large Array (VLA) that would surpass the sensitivity of the Karl Jansky VLA and the VLBA by a factor of ten.

Although shiny new telescopes always draw a lot of attention, none of them can be dreamed up, conceptualized, built, tested and launched without the astronomers and astrophysicists who make up the professional body. The Decadal recommends a further broadening of the access to the community, to increase diversity, support early-career researchers and build an inclusive environment that nurtures and helps every member reach their full potential. The survey sets out a plan: from obtaining reliable demographic data to building in diversity in funding awards to establishing a model of engagement of the local community to treating discrimination and harassment as professional misconduct to correcting the “abysmal” level of “racial/ethnic diversity among astronomy faculty” by investing in the “development and retention of early-career faculty and other activities for members of under-represented groups”. A strongly engaged and representative professional body will not only maximize the potential of telescopes such as JWST but inspire the next generation of astronomers. Let's keep dreaming. □

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