

also elides a body of research on abortion policy, writing that it's "hard for anyone – and in particular for a court – to assess" the effect of the right to abortion on women's lives.

Such an attitude suggests that the justices see research as secondary to the question of whether the US Constitution should protect abortion. But the outcome of this ruling isn't an academic puzzle. The Supreme Court needs to accept that the consensus of research, knowledge and scholarship – the evidence on which societies must base their laws – shows how real lives hang in the balance. Already, the United States claims the highest rate of maternal and infant mortality among wealthy nations. Should the court overturn *Roe v. Wade*, these grim statistics will only get worse.

1. Shah, P. S. et al. *Matern. Child Health J.* **15**, 205–216 (2011).
2. Moaddab, A. et al. *Obstet. Gynecol.* **131**, 707–712 (2018).
3. Stevenson, A. J. *Demography* **58**, 2019–2028 (2021).
4. Miller, S., Wherry, L. R. & Foster, D. G. *NBER working paper No. 26662* <https://doi.org/10.3386/w26662> (2020).

Why NASA should lead humanity's return to the Moon

The Artemis programme plans to send astronauts to the Moon in 2025 – a worthy goal for science and humanity in bleak times. The US Congress should cough up the cash.

It's half a century since astronauts walked on the Moon, leaving boot prints in the lunar dust and capturing iconic views of Earth. If NASA has its way, it will soon be sending people back: its Artemis programme is scheduled to carry out its first test of a rocket capable of reaching the Moon this year, and to culminate in a human mission to the unexplored southern polar region in 2025. It will be the first time people have set foot on the Moon since NASA's Apollo programme ended in 1972. Named after the twin sister of the Greek god Apollo, Artemis aims to rekindle the wonder of humans visiting other worlds.

Scientists are excited. A rich range of scientific questions can be answered through human exploration of the Moon, such as how much water is frozen in the shadowy craters near its poles and how the Earth–Moon system formed in an ancient cosmic collision. But sending astronauts to worlds beyond Earth transcends pure research. Apollo, which put 12 men on the Moon over the course of several years from 1969, boosted *Homo sapiens'* spacefaring credentials and is one of humanity's great achievements. Going back is crucial to developing the skills and technologies needed for people to push onwards to goals such as Mars.

Since Apollo ended, NASA has struggled to regain momentum in human space flight. Subject to the whims

of changing presidential administrations and Congress, it has sent dozens of astronauts to the International Space Station, but has not managed to break beyond Earth orbit to send astronauts into deep space. Meanwhile, so far only the United States has sent people to the Moon.

This year, NASA plans to launch its long-awaited deep-space rocket, the Space Launch System. With no crew, it will be the first test flight of the Artemis programme, which aims to put the first woman and the first person of colour on the surface of the Moon (see page 212). Congress should give NASA the resources it needs.

Artemis faces formidable stumbling blocks, such as how to build new-generation spacesuits that can protect astronauts in the frigid temperatures of the lunar south pole. Another unknown is the type of spacecraft that will carry the astronauts on the final leg of their journey, down to the lunar surface; the 1960s-era Apollo landing module will not work with NASA's new-generation rocket. The private company SpaceX, based in Hawthorne, California, is responsible for designing and building the Artemis lander, but few details of it have emerged so far.

Solving these problems will require large sums of money. Each of the first four Artemis launches, which include three crewed flights, is estimated to cost US\$4.1 billion, according to a report from NASA's office of the inspector general, which puts the total cost of Artemis up until the mid-2020s at \$93 billion. Although a huge sum, this is comparable to the Apollo programme, which included six crewed Moon landings and cost \$25.8 billion – \$257 billion in 2020 dollars (C. Dreier *Space Policy* <https://doi.org/hs4b>; 2022).

It could be argued that NASA should not keep building incredibly expensive rockets to repeat an incredibly expensive venture. Its Moon-rocket programme is years behind schedule and tens of billions of dollars over budget. Why reward such inefficiency, especially when private companies such as SpaceX are developing their own deep-space rockets?

The answer is that NASA has the knowledge, stability and standing as a publicly funded agency to lead the way into deep space. What's more, human space exploration is a global endeavour and Artemis is an international effort, with the European Space Agency providing a key part of the Orion spacecraft that will carry a crew to the Moon. China is also currently working to fly astronauts to the lunar surface, and a range of nations and companies plan to launch uncrewed missions soon (see page 208).

But Artemis's funding is still far from guaranteed. NASA has funded some parts of the programme, such as the upcoming uncrewed test flight, from its \$24-billion annual budget. But it is now asking Congress for more than \$7 billion to fly a second, crewed Artemis flight and then prepare for the Moon landing.

Now is the time to make Artemis happen. Like other nations, the United States faces a host of challenges – from the pandemic to the war in Ukraine to climate change – that demand attention and strain the public purse. But Congress should lift its eyes to the skies. Humanity will return to the Moon, a worthy scientific destination and a ray of light in dark times. NASA is best placed to lead the way.

NASA has the knowledge, stability and standing to lead the way into deep space.”