

New Scientist

WEEKLY 30 December 2023

PREVIEW OF 2024

YEAR OF THE MOON
THE NEXT WAVE OF
WEIGHT-LOSS DRUGS
ARTIFICIAL UTERUSES
FOR HUMANS
EVEN MORE
EXTREME HEAT
LEGAL BATTLES
AGAINST AI

OPEN WIDE

Why the secret to good health
lives in your mouth

COSMIC STRINGS

Is the universe
threaded with
filaments
of energy?

PLUS BOOKS AND TV TO LOOK FORWARD TO / WHY SMALL RESOLUTIONS
WORK BEST / DOES A TEASPOON PREVENT CHAMPAGNE LOSING ITS FIZZ?

No3471 £6.95 CAN\$9.99



1

Far-off world

Europa Clipper will blast off to Jupiter's icy moon [this page](#) >

2

A really big deal

The next generation of weight-loss drugs will be even better [p8](#)

3

New view of the heavens

The Vera C. Rubin Observatory will start operating [p9](#)

4

Hotter than hot

Extreme temperatures will result in new global records [p10](#)

5

Goodbye fossil fuels?

The world awaits climate action after COP28 [p11](#)

6

Born in a bag

Will artificial uteruses for humans get the go-ahead? [p13](#)

7

Fight the machine

AI firms will face legal challenges over copyright [p14](#)

8

Humanity's new dawn

Our influence on the planet will be made official [p15](#)

9

Launch party

2024 will be an incredibly busy year for the moon [p17](#)



NASA/JPL-CALTECH/GREGORY M. WAIGAND

Space exploration

Destination Europa

NASA's Europa Clipper mission is due to launch in October 2024 and head towards Jupiter's moon Europa, where it will hunt for signs that this icy satellite could be suitable for life. The spacecraft won't orbit Europa when it arrives in 2030 – instead, it will loop around Jupiter in a way that will allow it to repeatedly zoom past the moon at distances as close as 25 kilometres from its surface.

"We're going to get this really comprehensive assessment of what Europa is like," says Jennifer Scully at NASA's Jet Propulsion Laboratory in California.

Of the moon's many mysteries, perhaps the most important is the structure of its internal ocean and whether it could be habitable. While Clipper won't be able to look for life itself, it will set the stage for future missions that could. ■

1

Giant telescope will take incredible pictures of the night sky

Alex Wilkins

THE Vera C. Rubin Observatory is about to begin its mission to scan the entire southern sky every three nights for nearly a decade. These images will form the Legacy Survey of Space and Time, transforming our view of any object that twinkles or changes in the night sky.

"I think people will be amazed at just the sheer number of stars and galaxies that are in these images," says Keith Bechtol at the Vera C. Rubin Observatory.

The facility is built on Chile's Cerro Pachón mountain and houses the Simonyi Survey Telescope. The telescope's systems have already undergone extensive testing over the past several years. These include cooling equipment that will keep the camera at -100°C (-150°F), powerful motors that are able to point the approximately

300-tonne telescope anywhere in under 4 seconds (in order to capture fast-changing objects) and computers capable of handling the more than 15 terabytes of data that will be produced each night.

"Taking these very deep, high-quality images of the night sky very rapidly stresses all of our technology," says Bechtol.

Once each system has been carefully checked, Bechtol and his colleagues will begin the commissioning phase in July, when they will try out the telescope's picture-taking abilities with a smaller test camera rather than its 3.2-gigapixel main camera. "Even though it's only about 5 per cent of the size of the full camera, its ability to map the sky is comparable to many existing state-of-the-art telescopes," says Bechtol.

The first images taken by this

camera will be intentionally blurry, so that Bechtol and his team can learn how to properly focus the telescope's optics. Once they are confident the telescope is performing well, they will take focused photos of high enough quality that astronomers can start using them for research, though there isn't a definitive date for when this will happen, says Bechtol.

Around August, the researchers will install the full-sized camera, which they plan to start taking pictures with in December. These images will be unlike those taken

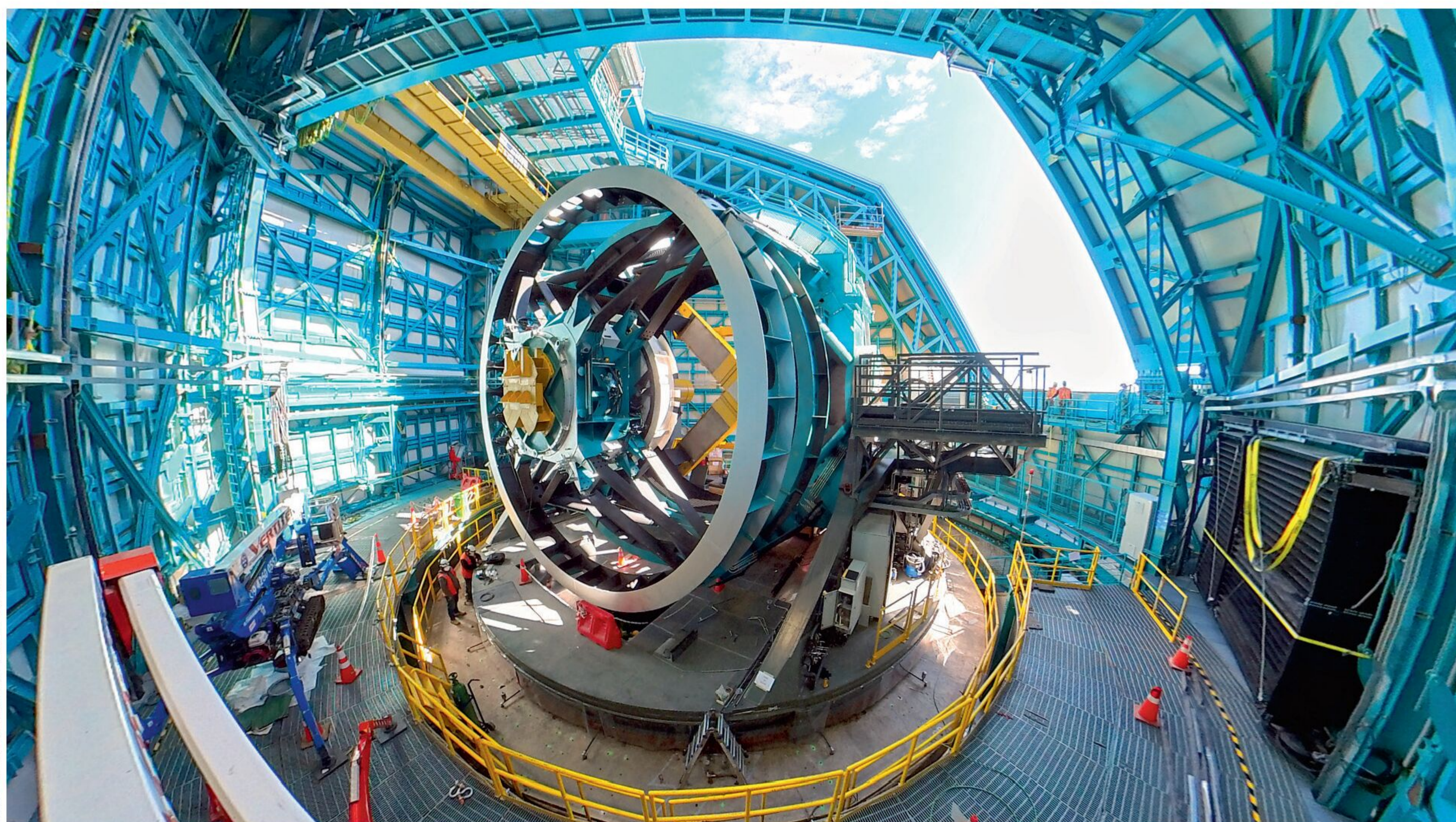
"PEOPLE WILL BE AMAZED AT JUST THE SHEER NUMBER OF STARS AND GALAXIES IN THESE IMAGES"

from any other telescope, says Bechtol. Scientists will be hit with a torrent of astronomical data almost immediately.

"The quality of the data, its variety and its size and the data rate – astronomers have never dealt with that before," says Hiranya Peiris at the University of Cambridge.

Assuming that astronomers aren't completely overwhelmed, we could start learning new things about the universe right away, she says, just as the James Webb Space Telescope quickly began making discoveries when it started operations in 2022.

"Once it starts taking data, then for discoveries I expect it to be pretty rapid, just because it opens up this new discovery space that's never been explored before," says Peiris. ■



3

A wide-angle view of the Simonyi Survey Telescope in Chile

H. STOCKBRAND/RUBIN OBSERVATORY



GAERTNER/LAMY

8

Crawford Lake in Canada has been proposed to mark the start of the Anthropocene

of Crawford Lake was announced, believes the group's definition of the Anthropocene diminishes the impact of humans before the middle of the 20th century. "It's not what the science tells us about the human age," he says.

Philip Gibbard at the University of Cambridge also opposes the proposal. "If you have a boundary in 1950, that makes me Holocene because I was born in 1949," he says. Instead, Gibbard, Ellis and others suggest that the Anthropocene should be defined as an ongoing event.

In response to such concerns, AWG member Colin Waters at the University of Leicester, UK, says humans have been affecting the planet throughout the Holocene, but "big changes consistently happen around about 1950".

At the end of October 2023, the AWG submitted a formal proposal to its parent body, the Subcommittee on Quaternary Stratigraphy (SQS), Turner told *New Scientist*. If the SQS accepts the proposal, it must pass two further rounds of voting by the International Commission on Stratigraphy and the IUGS before it is officially added to the geological timescale.

By August 2024, we may officially be living in the Anthropocene.

"Recognition of the rapidity of this global change within the last 70-odd years would be really significant," says Turner. "We're confronted by the fact that had we not burned all this fuel from the mid-20th century, we would be in a very different place."

If the proposal is rejected, however, it could appear as if we are overlooking the outsized influence of humans over the past few decades, says Waters. "It's almost akin to someone saying climate change doesn't exist." ■

Geology

Has human activity put Earth into a new epoch?

Chen Ly

WE MIGHT be thrust into an entirely new epoch in 2024, as scientific bodies make an official decision about whether the impact of humans on the planet over the past few decades is enough to mark a new geochronologic unit.

First popularised by meteorologist Paul Crutzen in 2000, the term Anthropocene broadly refers to a time of significant planetary change as a result of human activities, such as deforestation and burning fossil fuels. Some experts believe that Earth has transformed so much that the Anthropocene may have already supplanted our current epoch, the Holocene, which began 11,700 years ago.

In July 2023, the team of scientists tasked with defining the potential new epoch, called the Anthropocene Working Group (AWG), selected Crawford Lake in Canada as the site with the best geological evidence for this.

Plutonium isotopes from nuclear weapons fallout at the bottom of the lake date the start of the Anthropocene to the early 1950s.

The news came as a surprise to many, as sites chosen to mark new timescales are usually only publicised after they have been ratified by the International Union of Geological Sciences (IUGS).

"Establishing it in the media before scientists are able to vote on [the proposal] might make it more difficult to reject," says Erle Ellis, a former AWG member at the University of Maryland.

But Simon Turner at University College London, who is a current member of the AWG, says science should be an open process.

"We consider this of significant public and wider interest."

Some researchers disagree with the move to define the Anthropocene as a geological epoch. Ellis, who resigned from the AWG shortly after the selection

11,700

Years since our current epoch, the Holocene, began

1950

Approximate date proposed as the start of the Anthropocene

The lunar armada

An extraordinary number of missions are headed to the moon in 2024, with landers, orbiters and perhaps even crewed vehicles set to make the trip, says **Leah Crane**

IN 2024, the world's space agencies are shooting for the moon. More than 10 missions are headed to Earth's satellite, most of them intending to land on its surface and all paving the way for human lunar exploration.

"It is the year of the moon," says Bethany Ehlmann at the California Institute of Technology. "The number of moon missions in 2024 is really a reflection and a realisation of the momentum from the last five years or so – it's a big global push."

The barrage is set to begin in January, with the planned landing of Japan's Smart Lander for Investigating Moon (SLIM) craft, the country's first lunar lander. Around the same time, a lander developed by the US company Intuitive Machines will launch. This lunar craft, along with most of the others launching in 2024, is part of NASA's Commercial Lunar Payload Services (CLPS) initiative, in which the agency funds commercial craft going to the moon to foster future exploration and build industry partnerships.

"THE NUMBER OF MOON MISSIONS IN 2024 IS REALLY A REFLECTION OF THE MOMENTUM FROM THE PAST FIVE YEARS"

Over the course of the year, the CLPS missions will investigate and attempt to mine ice on the moon, test technology designed for future missions, work on how to deal with the sticky lunar dust and demonstrate a wide variety of new types of rover.

One such mission, called Cooperative Autonomous Distributed Robotic Exploration (CADRE), will include three rovers and a base station, all operating autonomously to take measurements at different locations across the lunar surface, working from a general mission plan.

"The autonomy aboard the robots takes that high-level objective and computes what each needs to do individually to achieve that objective without any further instruction," says Jean-Pierre de la Croix at NASA's Jet Propulsion Laboratory in California. If it works, this set-up could drastically boost the productivity of robots on future missions.

It isn't just landers headed to the moon – new orbiters will also

support them. The Lunar Trailblazer orbiter, which is part of the CLPS programme, will be particularly important to future human explorers, who will need to extract water from lunar ice. "This will provide the first maps of water at the surface that are truly actionable – you land on the surface and you know if you drive left or you drive right," says Ehlmann. "Our data will basically provide signposts that say 'go here next'."

Not all of 2024's moon missions will be sent up by NASA, of course. Along with Japan's SLIM, orbiters are being sent from Canada, Germany and Singapore, and even the Finnish electronics company Nokia is sending a rover. In May, China plans to launch the Chang'e 6 mission to return the world's first samples from the far side of the moon.

Rounding off the year, NASA's Artemis II mission is planned for November, along with two important flights of SpaceX's Starship craft near the end of 2024 – one an uncrewed moon landing and the other the dearMoon flight, which will send several artists on a flyby.

All of these missions – especially Artemis II, which will see four astronauts flying near the moon and back over the course of 10 days – are ramping up to increasingly sophisticated human lunar exploration in the coming decades. "Seeing the moon up close will really bring that perspective that, no kidding, it is a real and separate body in open space," says Christina Koch, one of those four astronauts. "Getting to be a part of that mission, doing something we haven't done in over 50 years, is just absolutely phenomenal." ■



An artist's impression of Intuitive Machines's Nova-C lunar lander

9