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WEEKLY 12 June 2021

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Space exploration

NASA plans two Venus missions

The atmosphere and surface of Earth's toxic sibling will get a closer look

Leah Crane

THE solar system's new hot destination is Venus. NASA has announced two missions to study Earth's nearest neighbour, both expected to launch between 2028 and 2030.

The first mission is called Deep Atmosphere Venus Investigation of Noble gases, Chemistry, and Imaging (DAVINCI+). It consists of a spherical probe that will parachute through the planet's toxic atmosphere, measuring its composition and structure on its way down to the surface, where it is likely to melt within a few minutes of landing.

If all goes well on the descent, DAVINCI+ will also take pictures of strange surface features called tesserae that some researchers think will be key to understanding Venus's geological history.

The probe may also shed light on observations of phosphine gas in Venus's atmosphere, which have been controversial since they were announced in September 2020. If the spacecraft finds compelling evidence of the chemical phosphine, it may be a sign of life in the Venusian clouds.

The other mission is an orbiter called Venus Emissivity, Radio Science, InSAR, Topography, and Spectroscopy (VERITAS). "SAR" in the name stands for synthetic aperture radar, which will allow VERITAS to peer through Venus's thick atmosphere to build a 3D model of its surface. The orbiter will also look for active volcanism and liquid on the surface, and measure its composition.

A mock-up of the VERITAS orbiter, which will map the surface of Venus



These two spacecraft were selected from four finalists as part of NASA's Discovery Program, through which the agency funds relatively small and inexpensive missions. Previous Discovery missions include Mars Pathfinder, which carried the first Mars rover; the Dawn mission to Ceres and Vesta; the Kepler space telescope and the InSight Mars lander.

The DAVINCI+ and VERITAS teams will each get about \$500 million to further develop their plans. When they launch, they will mark NASA's first missions

to Venus in nearly 40 years.

"VERITAS and DAVINCI+ will not answer all our outstanding Venus questions, but they will enable us to take a massive step forward in understanding why our planetary sibling isn't our twin," says Paul Byrne at North Carolina State University.

These two missions will help us figure out why Venus and Earth are so different. While the two are similar sizes and at relatively similar distances from the sun, Earth is lush and green and Venus is an inhospitable hellscape. It's not clear exactly when or how they diverged, but understanding that could be crucial in the hunt for habitable worlds beyond our solar system.

"It is astounding how little we know about Venus, but the combined results of these missions will tell us about the planet from the clouds in its sky through the volcanoes on its surface all the way down to its very core," said Thomas Wagner, NASA's Discovery Program scientist, in a statement. "It will be as if we have rediscovered the planet." ■

Health

Colour-changing tampons could detect UTIs

TAMPONS and sanitary pads that have been modified to change colour in the presence of a fungus that causes some urinary tract infections (UTIs) could help to diagnose such conditions in places with limited access to healthcare – though the current design turns pink, which may not be very useful.

UTIs are incredibly common: worldwide, more than half of adult women have had at least one. The

standard way to diagnose a UTI is to collect a urine sample and test it in a lab, but these facilities are often less available in lower-income countries.

Now, Naresh Mani and his team at the Manipal Institute of Technology in India have created cotton fibres that can detect a yeast called *Candida albicans*, the most common form of fungal UTI.

The researchers soaked the fibres in an amino acid that breaks down in the presence of an enzyme secreted by *C. albicans*. They placed the fibres inside tampons and pads and applied a simulated vaginal discharge made from blood serum,

acids, urea and *C. albicans*. In both cases, the fibres turned a pinkish colour, signalling an infection (ACS Omega, doi.org/ggdn).

The team only tested the fibres in the lab and haven't yet trialled them in people, but Mani says that menstrual blood could obscure the change in colour. The team hopes to find an alternative amino acid that produces a more visible colour.

Mani says the final product

"Any item that could balance gender injustice would be helpful, but costs can be a concern"

should be cheap at around 20p per tampon or pad, but José Santos, a member of a missionary organisation called Casa Fiz do Mundo that tackles period poverty in São Tomé and Príncipe, says this may still be unaffordable.

"Any item that could balance gender injustice would be helpful, but costs can be a concern," he says, noting that the legal minimum wage in the country is equivalent to £39 a year. "Pads and tampons are already inaccessible to women there. This type of product is welcomed, but it has to be economically viable." ■

Bárbara Pinho