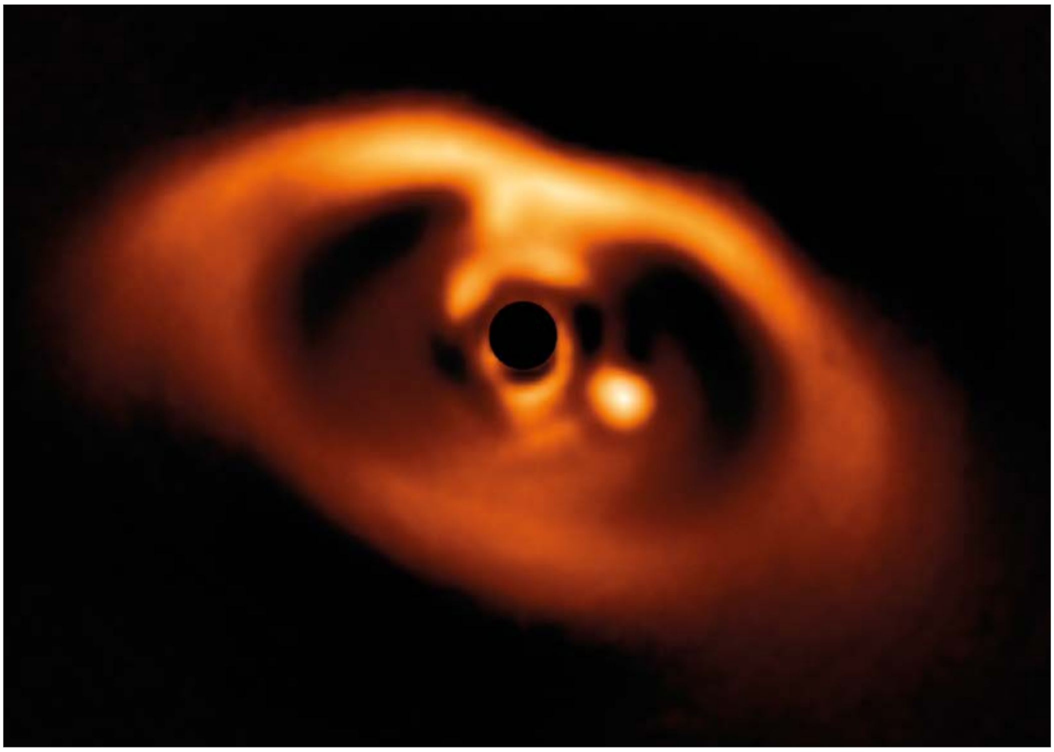
Caught in the act: SPHERE's newborn exoplanet



IMAGING The first direct image of a planet forming around another star has come from the ESO's SPHERE instrument on the Very Large Telescope in Paranal, Chile. The planet, the bright spot to the right of centre, is making a path through the dusty doughnut-shaped protoplanetary disc around young dwarf star PDS70. It is thought to be a giant gas planet a few times the mass of Jupiter, orbiting about 3 billion km from its star, the equivalent of Uranus's orbit. The planet was found by a team led by Miriaum Keppel (Max Planck Institute for Astronomy, Heidelberg, Germany), making use of the high contrast and high resolution offered by SPHERE. Another MPIA team, led by André Müller, examined the planet's spectroscopy in more detail, collating six years of data and discovering that it probably has a cloudy atmosphere. It is at least 1000 °C, in line with models of young gas giants (PDS70 formed 5.4 million years ago). (ESO/A Müller *et al.*)
https://bit.ly/2KYpKfz

Scotland supplies LISA technology

GRAVITATIONAL WAVES When the European Space Agency's Laser Interferometer Space Antenna gets to work observing gravitational waves in the 2030s, it will do so using technology developed at the University of Glasgow's Institute for Gravitational Research (IGR) and the STFC's UK Astronomy Technology Centre in Edinburgh, supported by investment of £1.7m from STFC.

"The University of Glasgow has a worldwide reputation for gravitational waves research," said Chris Lee, head of space science at the UK Space Agency. "This new funding ensures this legacy continues with the LISA mission, alongside crucial technology innovation from the UK ATC in Edinburgh. Scotland is yet again at the heart of UK space activity."

The principle behind measuring gravitational waves in space is the same as that used in ground-based gravitational observatories such as LIGO: using laser interferometry to measure the slight distortions of spacetime as a gravitational wave passes the instrument. LISA will use three spacecraft, flying in a triangular formation 2.5 million km apart, and will detect gravitational waves over a broad frequency band inaccessible from Earth: from 0.1 mHz to 1 Hz. ESA's LISA Pathfinder mission from 2015–17 tested the technology needed to isolate the test masses and used an optical bench built at the University of Glasgow. The expertise developed at the IGR, for LISA Pathfinder and for the LIGO consortium, will contribute to the development of the up to 12 optical benches for LISA; the UK ATC will develop the innovative ultra-precise robotics needed.
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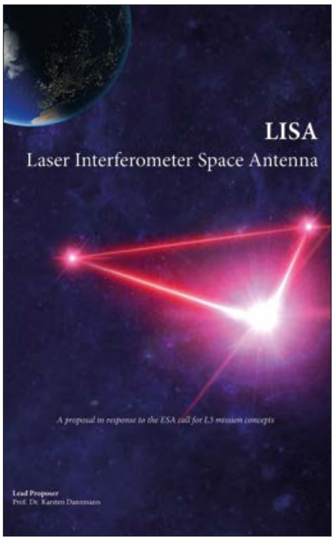

LISA proposal document, with an artist's impression of the three spacecraft. (NASA/Simon Barke)

West Antarctica is rising rapidly

EARTH'S CRUST Data from GPS and the European Space Agency's GOCE gravity mission have explained the rapid glacial rebound of West Antarctica: it's because the mantle underneath is unusually fluid.

When parts of the Earth's crust are covered with thick ice, they sink. When the ice melts, they spring back then rise more slowly over several thousand years. It is this glacial rebound that is behind the rise of northwest Scotland and parts of Scandinavia, for example. Although West Antarctica is still covered with ice, the ice is getting thinner and the crust is rising.

Researchers led by Valentina Barletta (National Space Institute, Technical University of Denmark) used GPS to measure the uplift and found it was up to 41 mm per year, four times the rate in Scandinavia. "Normally we see uplift happening slowly over thousands of years," said Barletta, "but in the Amundsen Sea Embayment we see it taking place over centuries or even decades. This tells us that the mantle below is very fluid and moves quickly when the weight of the ice has been removed."

GOCE data were used to model the mantle structure to shed light on the speedy uplift. Barletta *et al.* published the data in *Science*.
https://bit.ly/2N1mxtV

Better satnav for satellites

ISS The European GNSS constellation, Galileo, and the US Global Positioning System have been used together to achieve a precise orbit determination for the International Space Station.

The collaboration used a receiver called the Space Communications and Navigation Testbed (SCaN), on the outside of the ISS. The team developed an algorithm to take account of the high orbital velocities of the two satellite constellations and the ISS.

"Dual constellation fixes offer many advantages, providing robust and high-precision positioning," said ESA radio-navigation engineer Pietro Giordano.

The resulting precise orbital determinations will be useful for the operations of satellites such as those in the EU Copernicus programme. The more precise the orbit determination, the more accurate the environmental data that can be returned to Earth.
https://bit.ly/2NHg0Vx