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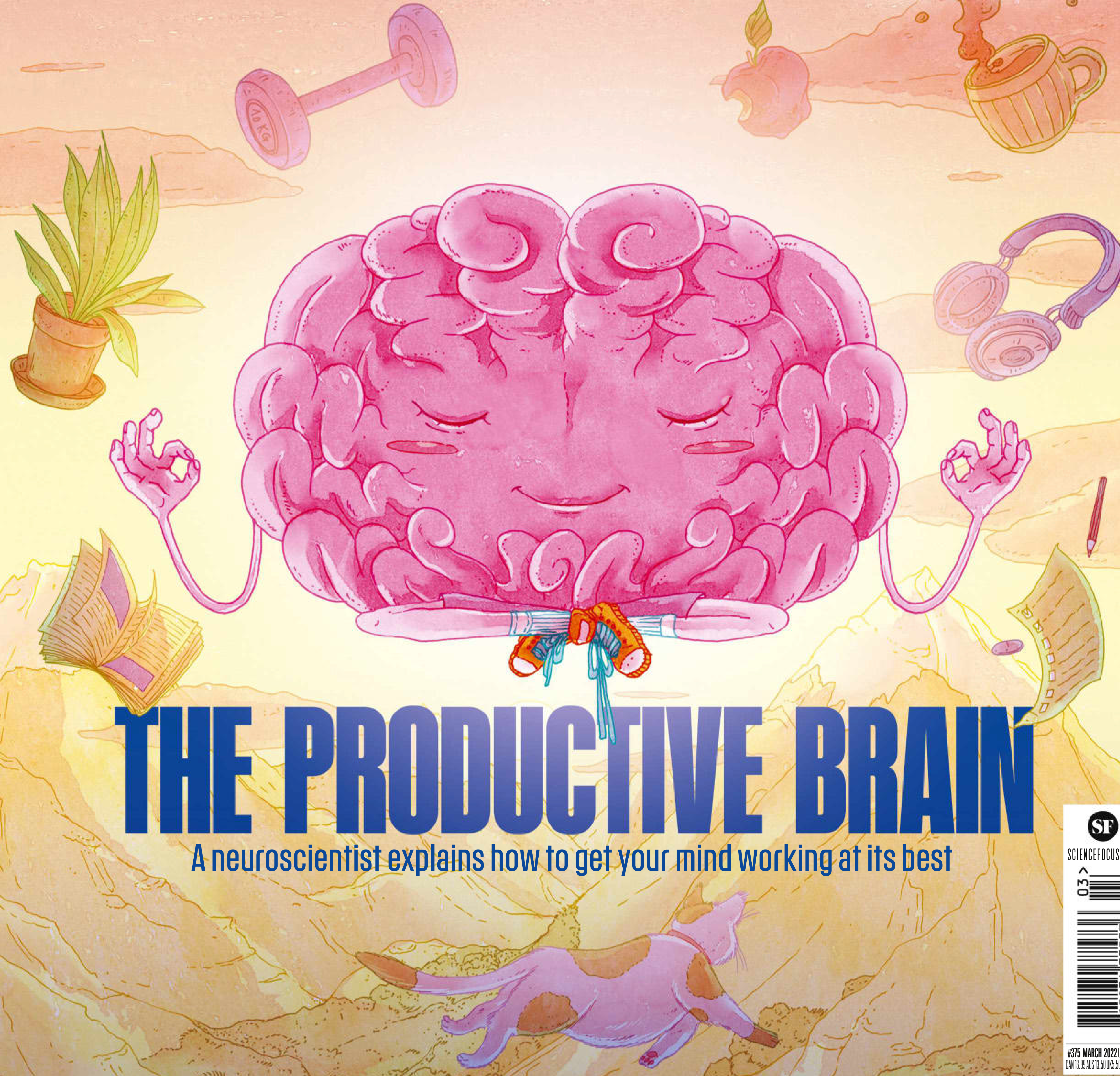

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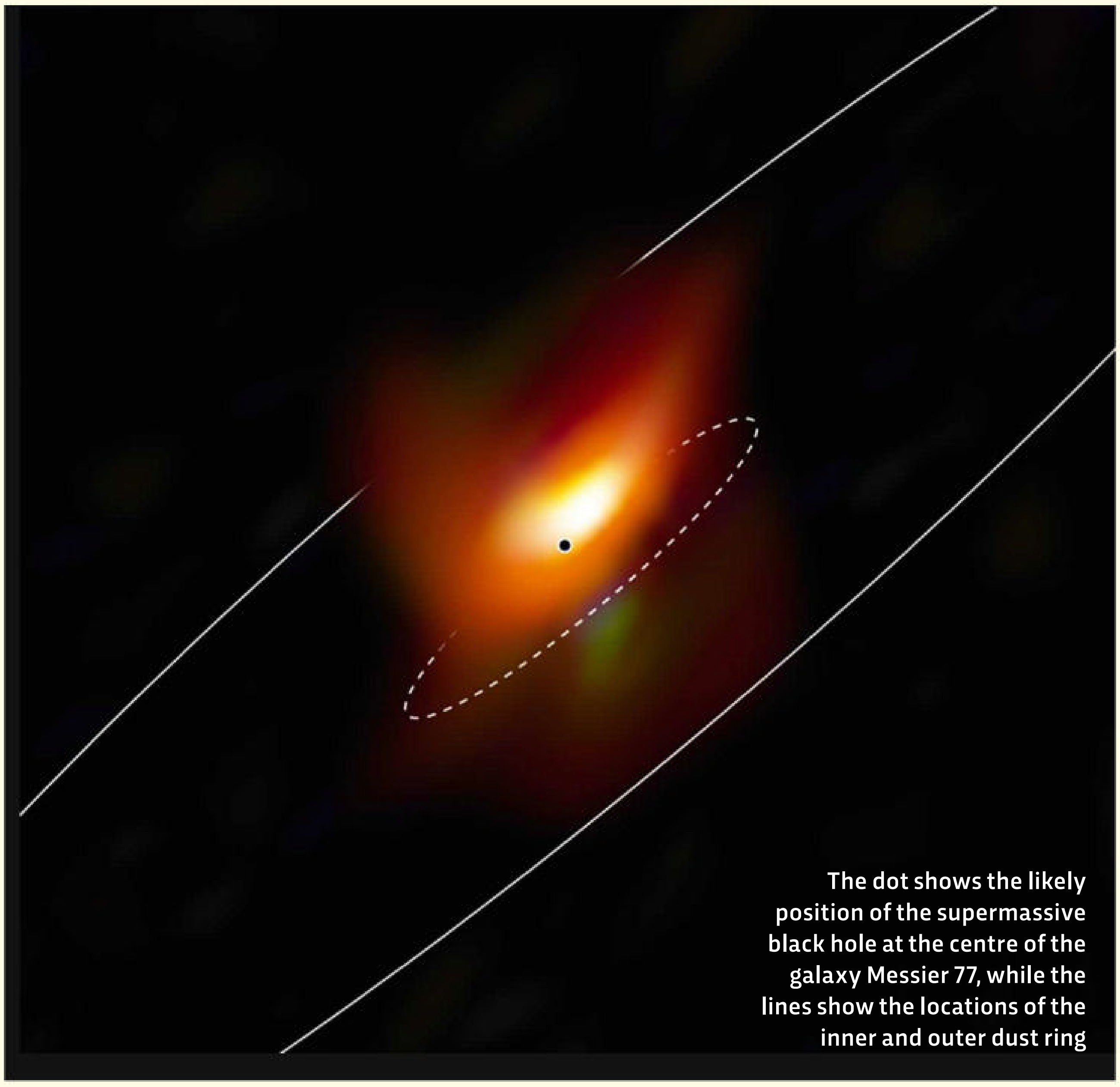
SPACE

New perspective of black hole confirms 30-year-old prediction



The dot shows the likely position of the supermassive black hole at the centre of the galaxy Messier 77, while the lines show the locations of the inner and outer dust ring

Observations by Europe's Very Large Telescope could help us to shed light on the history of the Milky Way

Since they were first spotted in the 1950s, active galactic nuclei, or AGNs, have puzzled astronomers. In the night sky, an AGN is a bright, compact region at the centre of a galaxy that gives off much more light than would be expected to be produced by stars.

The source of this luminosity is thought to be supermassive black holes, or more precisely the matter that swirls around their edges at close to the speed of light before getting sucked into the black hole's event horizon.

Although it's thought that supermassive black holes are the source of all AGNs, it's not clear why some are less energetic (bright) than others. But now astronomers have their answer, thanks to some observations of a supermassive black hole in a galaxy not so far away.

The Unified Model of AGNs, which was first theorised 30 years ago, states that although some AGNs appear to emit radio bursts, others visible light, and others still X-rays, they all consist of supermassive black holes surrounded by a ring of cosmic dust that emit electromagnetic radiation not originating from stars. The difference in appearance between the AGNs is simply caused by the orientation at which we can see the black hole through the ring from Earth – some are more obscured by the dust than others.

Close-up observations taken by the European Southern Observatory's Very Large Telescope Interferometer (ESO's VLTI), located in Chile's Atacama Desert, have now provided evidence to support this model.

The team made the discovery by studying Messier 77, a spiral galaxy situated 47 million light-years away from Earth in the constellation Cetus, using the VLTI's Multi AperTure mid-Infrared SpectroScopic Experiment (MATISSE).

By mapping out the changes in dust temperature – which vary from room temperature to a blistering 1,200°C – caused by the radiation emitted by the black hole, they were able to piece together a picture showing where the black hole must lie. What they found was as predicted by the Unified Model: a supermassive black hole surrounded by a thick disc of cosmic dust.

"The real nature of the dust clouds and their role in both feeding the black hole and determining how it looks when viewed from Earth have been central questions in AGN studies over the last three decades," said lead researcher Violeta Gámez Rosas from Leiden University in the Netherlands. "Whilst no single result will settle all the questions we have, we have taken a major step in understanding how AGNs work."

The researchers are now looking to use ESO's VLTI to further confirm the Unified Model of AGNs by observing a larger number of galaxies.

"Our results should lead to a better understanding of the inner workings of AGNs," said Gámez Rosas.

"They could also help us better understand the history of the Milky Way, which harbours a supermassive black hole at its centre that may have been active in the past."

ESO/JAFFE/GAMEZ-ROSAS ET AL, GETTY IMAGES