New Scientist

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Zoology

Why birds' eyes can be blue, green, pink or orange

Sofia Quaglia

BIRDS often have vibrant plumage, but the dazzling diversity in their eye colour also seems to be important for their success.

Many birds have brightly coloured eyes. The black-and-red-broadbill (*Cymbirhynchus macrorhynchos*), for instance, has sapphire blue or vivid emerald eyes. Some species of green pigeon (in the genus *Treron*) have magenta eyes and the bank cormorant (*Phalacrocorax neglectus*) sports a "sunset" iris, where the top half of its eye is orange and the bottom half is teal.

To investigate why this happens, Eamon C. Corbett at Louisiana State University and his colleagues analysed more than 250 previously published studies. One idea was that eye colour aids vision and so boosts birds' ability to find food. But the new review suggests evidence for this hypothesis is lacking.

Instead, the studies generally point towards another factor. "I think the strongest driver of eye colour variation in birds is signalling," says Corbett. In other words, birds use eye colour to communicate (*International Journal of Avian Science*, doi.org/k2pv).

For instance, some of the studies Corbett's team analysed demonstrated that male Queen Carola's six-wired birds-of-paradise (*Parotia carolae*) use their yellow irises to attract mates. And a study in yellow-eyed penguins suggested that birds with brighter yellow eyes had more breeding success.

Communication can also be about intimidation. For instance, a study of jackdaws revealed that the birds were more hesitant to approach a nest containing an image of a jackdaw with bright eyes, but they weren't deterred by an image of a jackdaw with darker eyes.

There may be even more factors behind variation in bird eye colour, says Juan José Negro at the Spanish National Research Council. ▮

Space

Odd cosmic explosion may break our understanding of space

Alex Wilkins

THE unexpectedly powerful light from the brightest space explosion ever seen may mean that space is more transparent than we thought.

Last year, astronomers witnessed a flash of gamma rays that was brighter than anything they had previously measured. By comparing it with other gamma ray bursts, researchers estimated that such a bright event would happen only once every 10,000 years.

This flash, called GRB221009A, was made of up of photons (or light particles), some of which were so energetic they couldn't be detected by Earth-based telescopes.

Now, Cao Zhen at the Chinese Academy of Sciences in Beijing and his colleagues have detected extremely energetic photons from GRB221009A indirectly, by looking for showers of particles produced when such photons hit Earth's atmosphere (arXiv, doi.org/k2px).

Gamma ray photons are unique in that they can be reflected by other photons. Because of this, the photons observed by the researchers should have been reflected by light that fills the universe from star formation – called extragalactic background light – long before they reached Earth.

"It could mean the universe is more transparent than we thought"

"If I take the James Webb Space Telescope, I can look back and see optical and infrared photons all the way back to the very early universe, but I can't see the very high-energy photons that far because those photons themselves scatter off other photons," says Andrew Levan at Radboud University in the Netherlands. "It's like looking through a mist."

There is a chance that the showers of particles the astronomers detected aren't actually caused by photons, but by different particles like energetic muons, says Levan. Or the photons might not be as high energy as they appear, because detecting these particles through atmospheric showers is difficult.

If the photons really are as energetic as they seem to be, it would mean the universe is more transparent than we thought, with less extragalactic light.

Another explanation could require new physics. For example, the photons could have been converted into a different type of particle that doesn't interact with extragalactic light for their journey across space.

That might be a hypothetical ultralight particle called an axion, which could explain a swathe of mysteries such as dark matter or symmetry violations in particle physics.

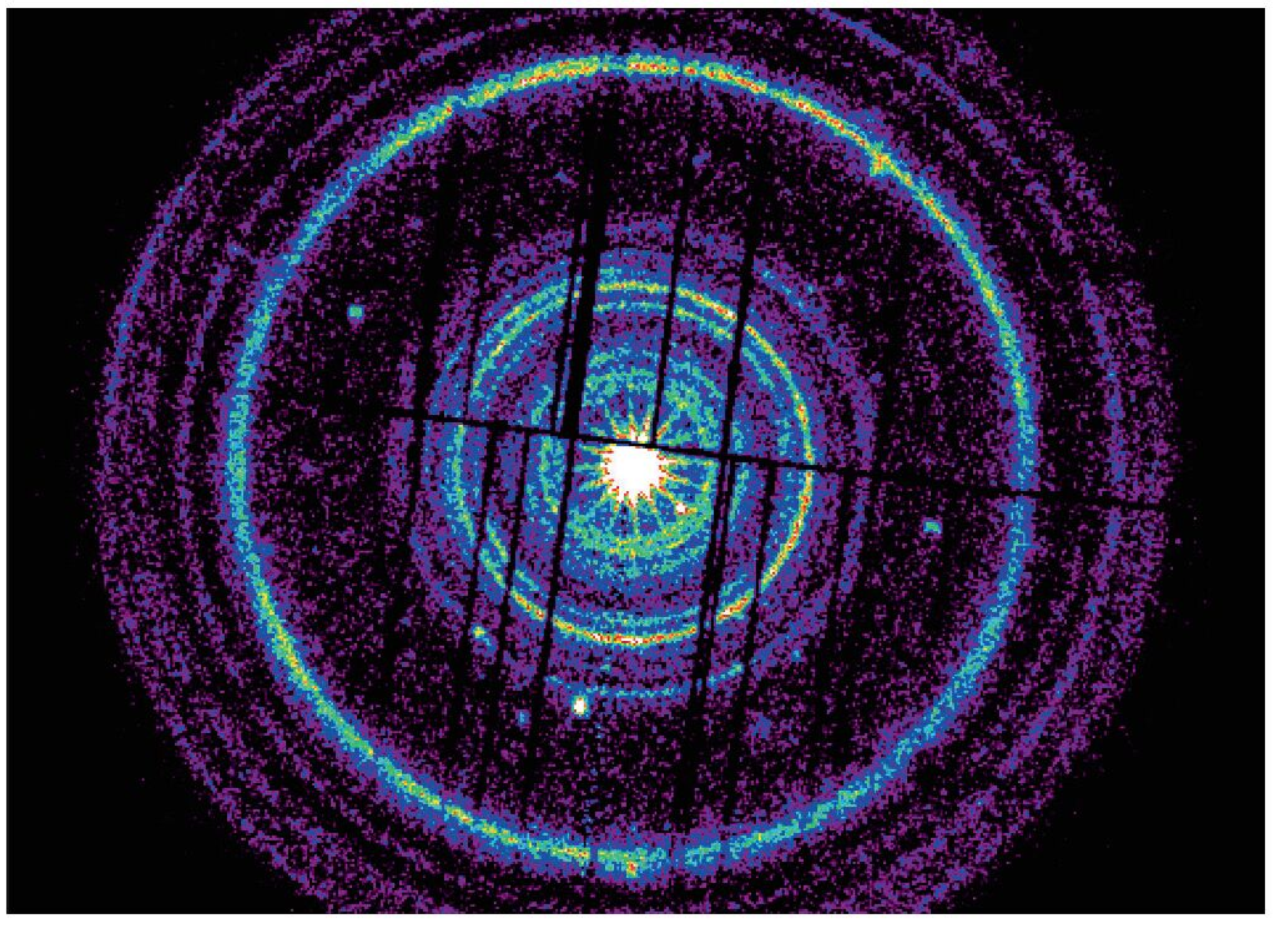
This axion would interact with the magnetic field of a galaxy, such as the Milky Way, and convert back into a photon once it reaches that galaxy.

"It has the same net observational effect – it makes the universe more transparent," says Andrew Mummery at the University of Oxford. "You can have as much extragalactic background light as you want, effectively, if you've got an axion travelling through it rather than a high-energy photon."

The astronomers who made the measurements estimate there is roughly a 5 per cent chance the photons were actually something else, such as cosmic rays, so we will need many more measurements of high-energy photons before new physics can be invoked, says Mummery.

Unfortunately, that requires a certain degree of luck, because events that produce photons with energies this high are exceedingly rare, he says. ▮

The gamma ray burst known as GRB221009A surrounded by dust rings



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