

# New Scientist

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Space exploration

# A chance to catch a comet's tail

A European Space Agency mission may be about to have a lucky encounter

Jonathan O'Callaghan

A RECENTLY launched spacecraft may cross paths with a comet that began disintegrating last month, which could help us learn more about these icy objects.

Geraint Jones at University College London and his colleagues have calculated that the Solar Orbiter spacecraft will pass behind comet C/2019 Y4 (ATLAS) at a distance of about 30 million kilometres in a matter of weeks ([arxiv.org/abs/2005.03806](https://arxiv.org/abs/2005.03806)).

The European Space Agency (ESA) probe, which was launched on 10 February, may pass through the comet's two long tails, allowing it to perform unprecedented studies of debris from the object.

"At the end of May, there's a chance that Solar Orbiter may cross the ion tail," says Jones. "And then a few days later, on 6 June, it'll cross the comet's orbital plane, and that's where the dust tail is."

The ion tail of a comet consists of the electrically charged particles, or ions, pushed behind it for many millions of kilometres by charged particles from the sun, the solar wind. The dust tail, meanwhile, comprises grains of dust that have been dislodged from the comet and follow its orbit.

Solar Orbiter has a suite of instruments designed to study the sun, including those to take the first-ever images of its poles. Some of these instruments could also examine the tails of comet ATLAS.

The ESA was unaware of this opportunity before the craft launched, so is now looking into what can be achieved. "The decision should be taken in the next days," says Yannis Zouganelis, the deputy project scientist for the Solar Orbiter mission. "If positive, the measurements would start as

soon as possible and last for as many days as needed to cover the entire period of interest."

The spacecraft is currently in a commissioning phase, testing out its different instruments, and this isn't expected to be completed until 15 June – too late for the rendezvous. But there is a chance some will be all set before that.

"Three of our instruments will

**The blue-green comet C/2019 Y4 (ATLAS), captured by a telescope**

most likely be ready and able to make measurements," says Zouganelis. "These are the magnetometer, the [radio] waves instrument and the energetic particle detectors." A fourth instrument, designed to study the solar wind, could also be fully tested in time.

The spacecraft could probe the structure of the comet's ion tail and see if a shock wave believed to form as the comet's head pushes through the solar wind also passes behind it.

It could also measure the mass of grains in the dust tail, and could even detect pristine material emanating from the comet's broken innards. "The ions would be potentially coming from inside the nucleus," says Jones. It isn't thought that any of the material could damage the spacecraft.

Whatever happens, Solar Orbiter looks set to become one of just a handful of spacecraft to travel through a comet's tail. NASA and the ESA's Ulysses spacecraft, which launched in 1990, passed through at least three comet tails. But these traverses went unnoticed until after they occurred. "Now we know what to look for," says Jones. ■



Pollution

## We may have missed half the microplastic in the ocean

WE HAVE underestimated the amount of microplastic in the ocean, by a factor of 2.5 at least. Many of the smallest pieces are thin fibres.

Millions of tonnes of plastic waste enter the ocean every year. Much of this is tiny fragments, known as microplastic, which are invisible to the naked eye.

"When we started looking for

microplastic in the sea, people used traditional plankton nets," says Penelope Lindeque at Plymouth Marine Laboratory in the UK. These have holes about 333 micrometres across, so they don't catch fragments smaller than that.

Lindeque and her colleagues trawled the ocean surface with three kinds of net with holes 500, 333 and 100 micrometres wide. They repeated the study in two widely separated regions: the Gulf of Maine and the English Channel.

The nets with 100-micrometre

holes collected 2.5 times more microplastic than the standard plankton nets. The researchers extrapolated from their data to estimate how much microplastic would be caught by a net with 1-micrometre holes. Their calculations suggested there are 3700 pieces of microplastic in every cubic metre

**"Estimates suggest there are 3700 pieces of microplastic in every cubic metre of seawater"**

of seawater (*Environmental Pollution*, [doi.org/dvvn](https://doi.org/dvvn)).

That is far more than thought. An influential 2015 study estimated there are 15 to 51 trillion particles of microplastic in the ocean. "They always admitted that that budget is very conservative," says Lindeque, because it was based on studies that used 333-micrometre nets.

The real total could "easily" be 10 times more, she says. These smaller fibres may come from fishing rope, textiles and clothes. ■  
Michael Marshall