NEWS

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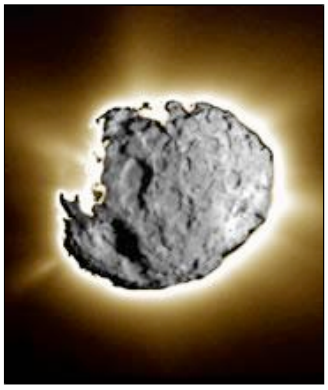
Comet born of our own Sun

Solar material in comet dust brings confusion about Solar System modelling.

Katharine Sanderson



A composite image of comet Wild 2 taken by the Stardust mission.

JPL/NASA

When scientists first analysed comet dust collected by the Stardust spacecraft earlier this year, they were surprised that the grains seemed to have all originated in very hot environments - the heart of a star (see 'Comet chasers get mineral shock'). Astronomers were confused at the idea that the star in question could be our own Sun. How was this material transported from the hot interior of our early Solar System to the cold, outer reaches where the comet actually coalesced? Their models of the Solar System, they feared, might have to be rethought.

An isotopic analysis of the grains has made that fear come true. A large chunk of comet Wild 2 does indeed come from the beginnings of our own Sun. But how it got there remains a mystery.

The samples, collected from a comet in 2004 and returned to Earth in January of this year, have revealed a mixed bag of material. "We have seen materials that predate the Solar System and were formed around other stars or in interstellar space," says Don Brownlee of the University of Washington in Seattle, who co-authored a raft of seven papers outlining the

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main results from Stardust to date in *Science* this week[1-7]. "But the surprising thing is that we also find large components that formed in the inner regions of the solar nebula."

Just the one

Only a single grain of dust found in the sample so far seems to have been sourced from a cold place beyond our Solar System many years before its birth. Prior to the Stardust mission there was a theory that the entire comet would be made of these pre-solar grains, but early analysis found none. "There was a sigh of relief when we found the grain," said Frank Stadermann, at Washington University in St Louis and part of the isotope analysis team. One such grain is better than none, when it comes to trying to understand where the comet came from.

Pre-solar grains are now estimated to make up a small part — only 100 parts per million — of the comet.

As for the material that came from our own solar nebula, how the material got as far out as Pluto (where the comet Wild 2 originated) remains a puzzle. It shows that the mixing of particles within our Solar System was far more extensive than expected, says Michael A'Hearn, who led the Deep Impact mission to probe a different comet in 2005.

It also means that analysing a comet's material won't necessarily tell much about the bit of space where it was actually born. "This will make it much harder for us, in future, to say that the composition of a comet tells us uniquely about the place in the solar system where... the comet formed," says A'Hearn.

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