Wild 2 reveals its hot origins

Inner-solar system material found in comet Wild 2 samples challenges scientists' view of comet formation.

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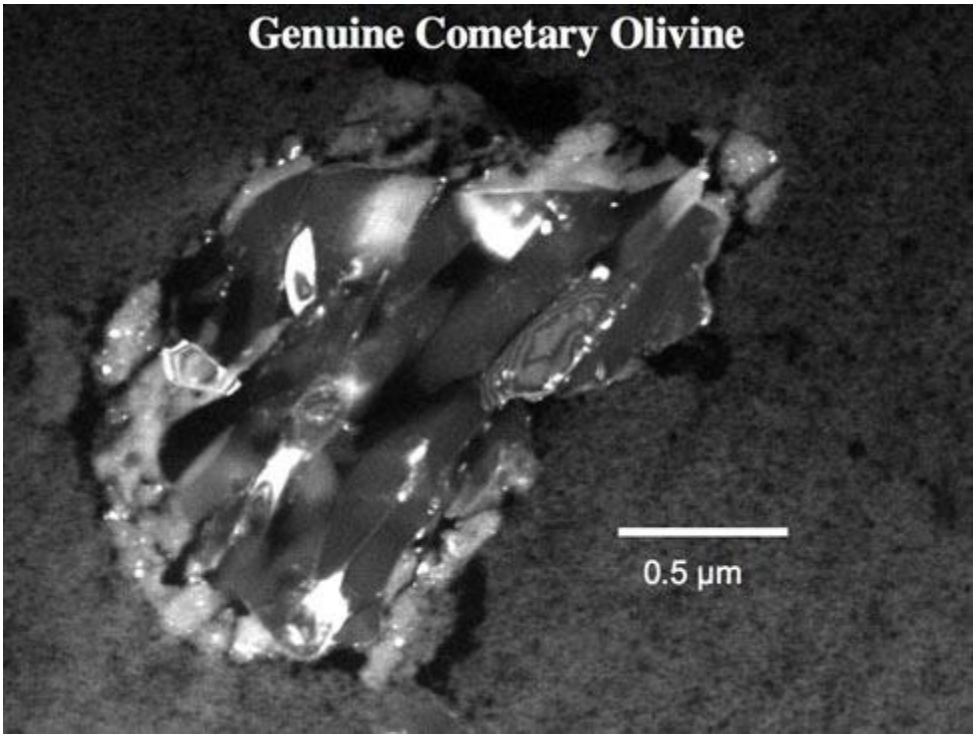

Comet Wild 2 contains olivine, a mineral scientists believe formed in the inner solar system as glass was heated by nearby stars. The olivine found in samples from Wild 2 challenges scientists' view of comet formation. *NASA / JPL / Caltech* [larger image]

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Comet Wild 2 dust samples, returned to Earth in January as part of NASA's Stardust mission, yielded a surprising finding: materials formed near the Sun or other stars somehow found their way into Wild 2 at the solar system's cold fringes. This suggests solar material ejected from the Sun early in its history traveled to the outer solar system.

Crystals of olivine — a mineral compound made mostly of magnesium and iron — found in Wild 2 samples have astronomers stumped. Olivine is thought to form from glass and heat from nearby stars, not in the outer solar system, where comets form. While scientists don't know the process by which olivine came to reside within Wild 2, astronomer Donald Brownlee of the University of Washington and principal investigator for NASA's Stardust mission, says, "It's certain such materials never formed inside this icy, cold body."

The debate surrounding comet formation grows. "It seems that comets are not composed entirely of volatile-rich materials, but rather are a mixture of materials formed at all temperature ranges, at places very near the early Sun and at places very remote from it," says Michael Zolensky, Stardust curator and coinvestigator at NASA's Johnson Space Center in Houston.

Scientists may have to rethink how comets form, what they're made of, and how those materials got there. The comet's long-standing dirty-snowball image may be replaced by the geologically active comet that contains, among other things, materials formed near the Sun.

Brownlee and colleagues presented their findings this week at the annual Lunar and Planetary Science Conference held in League City, Texas.