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## Core of a Comet Lights Up January's Night Sky

By KENNETH CHANG

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**B**efore the sun rises on Sunday, the Quadrantid meteors will make their yearly appearance, about one a minute streaking across the dark sky. A California astronomer says he has finally figured out where all those streaks of light came from.

The light shows occur when Earth crosses debris trails left by comets.



The Perseids of August come from Comet Swift-Tuttle, while a 1998 flyby of Comet Tempel-Tuttle generated the impressive Leonid meteors of recent Novembers.

But the parentage of the Quadrantids (pronounced KWA-drun-tids) has been a mystery.

Then Dr. Peter Jenniskens, an astronomer at the SETI Institute in Mountain View, Calif., noticed that the orbit of 2003 EH1 — a small asteroid discovered in March — “falls snug in the shower.” He claims that this is the source of the Quadrantids and that it has not been seen until now because it has gone dark.

The asteroid, he said, is actually the burnt-out core of a comet. Its diameter is a little less than two miles, Dr. Jenniskens estimated, “which is a typical size for a comet nucleus.” He has submitted his findings to The Astronomical Journal.

The Quadrantids, discovered in the mid-1800's, are named after an obsolete constellation, Quadrans Muralis, the location in the sky that the meteors appear to shoot out of. (The International Astronomical Union phased out Quadrans Muralis in 1922.)

While they are about as intense as the Perseids, the Quadrantids are not as well known, probably because few are willing to stand outside at night in January to look for them. (People in North America should have a good view this time, though, weather permitting. The best time will be Sunday morning, after the moon sets and before the sun rises, or roughly between 5 a.m. and 7 a.m., regardless of time zone. Go someplace dark — not Manhattan — where up to 60 meteors an hour should be visible.)

Until now, the most likely candidate for the source of the Quadrantids has been Comet Machholz, discovered in 1986. But Machholz is in a different orbit, and while Jupiter's gravity could have separated it from the Quadrantids, no one has convincingly shown that they are connected.

So astronomers continued to search.

Historical records possibly mark when the comet was last seen almost whole. Between Dec. 31, 1490, and Feb. 12, 1491, astronomers in China, Japan and Korea noted a bright comet passing overhead. There are no recorded sightings of that comet before or since.

A Japanese astronomer, Dr. Ichiro Hasegawa, showed some years back that the comet's orbit resembled that of the Quadrantids. Dr. Jenniskens guesses that the 15th-century Asian astronomers may have been watching the disintegration of 2003 EH1. That would explain why the comet was so bright then but not seen at other times. “We don't know if that object had anything to do with the Quadrantid showers,” he said, but added, “There's a good chance.”

Modern observations of the meteor shower also point to a recent breakup. The outer part of the Quadrantids' orbit comes close to Jupiter's and a few close encounters with Jupiter would disperse their orbits. But photographs taken by Dutch amateur astronomers in 1995 indicate the Quadrantids are still narrowly confined, suggesting that they have not passed Jupiter many times yet. Indeed, Dr. Jenniskens' calculations conclude that the Quadrantids have been circling the solar system for only the past 500 years or so.

Dr. Jenniskens also estimates that the Quadrantids total more than 10 trillion pounds of rock and dust. “That almost certainly identifies this as a breakup of a comet,” he said. “You have a lot of mass, and you have a very young age.”

If Dr. Jenniskens is correct, the Quadrantid meteors could offer astronomers a unique look at the inside of a comet. The specific colors given off by the Quadrantids as they burn up may tell what molecules they contain. That would be of interest to scientists studying the origin of life on Earth because many of the molecular building blocks for life are believed to have formed in outer space and then were carried to Earth by comets.

That was also the impetus for NASA's Stardust mission, which, by coincidence, will fly by



Siriko Molau

The Quadrantid meteors shoot out of the sky between the Big Dipper and the Little Dipper. The meteors will appear again on Sunday.

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