Phoenicid meteor shower from dead comet sighted again after 58 years

August 25 2017

A bright member of the Phoenicid meteor shower appears at the bottom left of this photo taken at 02h15m39s UT on December 2, 2014. The Moon is captured to the lower right of center in the photo. Camera: Pentax K-3 + SIGMA 4.5mm F2.8, 3 second exposure time, at Sandy Point, North Carolina, U.S.A. Credit: Hiroyuki Toda/NAOJ

The Phoenicid meteor shower (named after the constellation Phoenix) was discovered by the first Japanese Antarctic Research Expedition on December 5, 1956, during its voyage in the Indian Ocean. However, it has not been observed again. This has left astronomers with a mystery: Where did the Phoenicids come from and where did they go?

Two Japanese teams have found an answer to these questions by linking the Phoenicid meteor shower to a vanished celestial body, Comet Blanpain. This comet first appeared in 1819 and then disappeared. In 2003, astronomers discovered a minor body moving along the same orbit that Comet Blanpain had over 100 years ago, and showed that it was the remains of the comet. The coma and tail of a comet are made of gas and dust that escaped from the surface of the nucleus. The reason why Comet Blanpain reappeared as an asteroid was probably because all the gas and dust have escaped from its central body. Now, rather than calling the object a comet, it might be more accurate to refer to it as an asteroid.

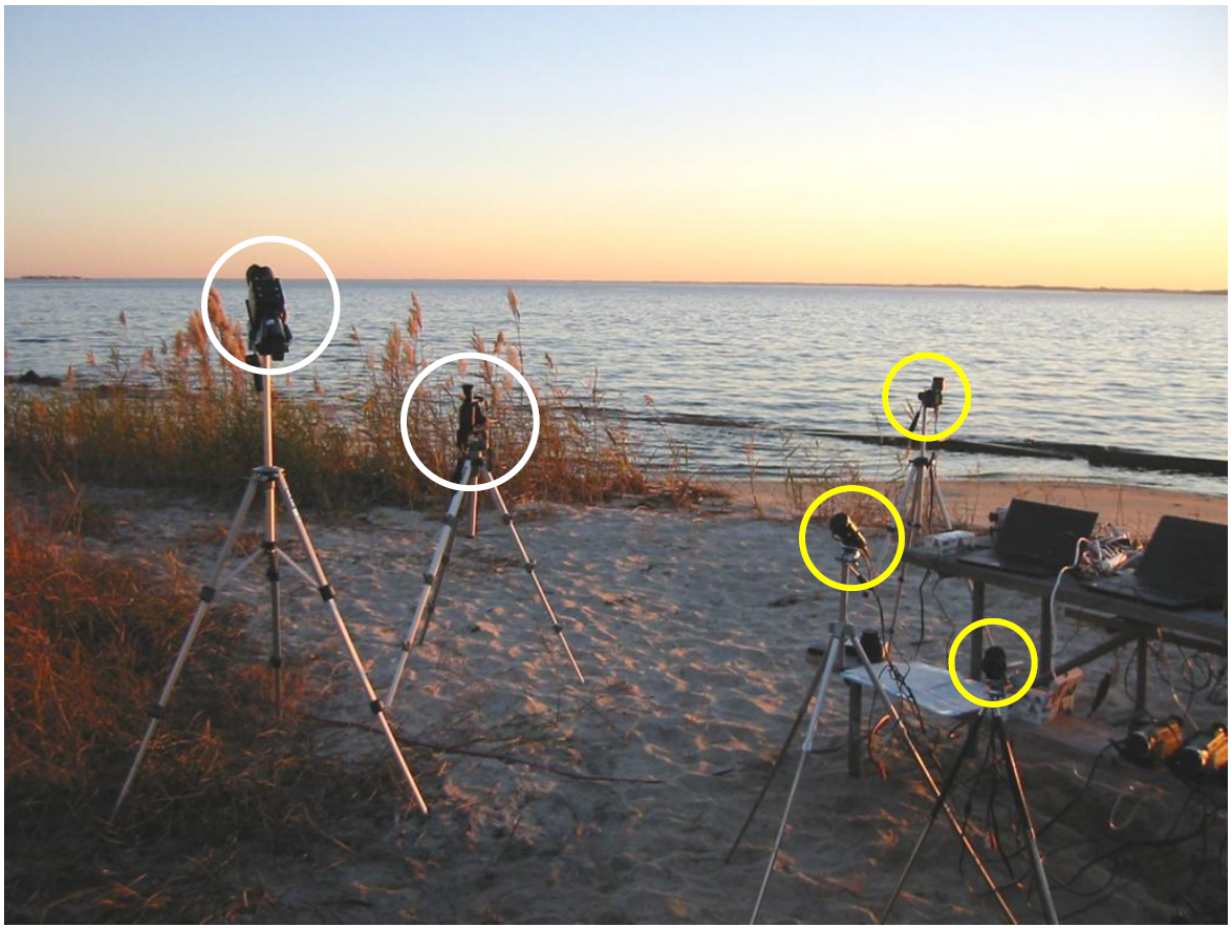
Although all of the gas and dust have escaped from Comet Blanpain into space, they now form a dust trail that revolves along almost the same orbit as Comet Blanpain itself, and gradually spread along the orbit. When the Earth passes through such a dust trail, the dust particles impinge into the atmosphere and ablate, and are observed as meteors.

Assuming that Comet Blanpain is the parent body of the Phoenicids, the teams performed calculations and predicted that the Phoenicids should be observed again on December 1, 2014. Following this prediction, the two teams of Japanese astronomers carried out a campaign of observation. One team traveled to North Carolina, U.S.A., and observed there. The other team visited La Palma Island in the Spanish territory off the West coast of Africa. The weather conditions at the former site were comparatively good, but more clouds covered at the latter site. Therefore, the team used supplementary data from other sources such as NASA's All Sky Fireball Network and radar observations at the

University of Western Ontario, Canada.

Earth is bombarded by a constant background of sporadic meteors every night. In order to distinguish Phoenicids from sporadic meteors, both teams analyzed the data by back tracing each meteor trail to distinguish the meteor shower. If many meteors come from the same point in the sky, then they are part of the same meteor shower. Out of the 138 meteors observed at North Carolina, 29 were identified as Phoenicids. The Phoenicid activity peaked between 8 p.m. to 9 p.m. local time, very close to the predicted peak of the Phoenicid meteor shower, which was 7 p.m. to 8 p.m. This supports the idea that the observed meteors back traced to the Phoenicid radiant are surely from Phoenicid meteor shower. The data collected by the other sources also supported this result.

But not everything matched the predictions. One discrepancy between the prediction and the observations was that the number of Phoenicids observed was only 10 percent of the prediction. This indicates that Comet Blanpain was active, but only to a limited extent when the observed meteors were released from the comet during its solar approach in the early 20th Century. To summarize, the observed meteor shower is the first example of the evolution of a comet being estimated. First author Yasunori Fujiwara says, "We would like to apply this technique to many other meteor showers for which the parent bodies are currently without clear cometary activities, in order to investigate the evolution of minor bodies in the solar system."



White circles show high-sensitive video cameras with image intensifiers. Yellow circles show small high-sensitive CCD video cameras. 2014 Dec. 1, at Sandy Point, N.C., USA. Credit: SOKENDAI

Fujiwara's research is being published in the *Publications of the Astronomical Society of Japan*, and second team lead Mikiya Sato's research will appear in the journal *Planetary and Space Science* very soon.

More information: Yasunori Fujiwara et al, Optical observations of the Phoenicid meteor shower in 2014 and activity of comet 289P/Blanpain in the early 20th century, *Publications of the Astronomical*

Society of Japan (2017). DOI: 10.1093/pasj/psx035