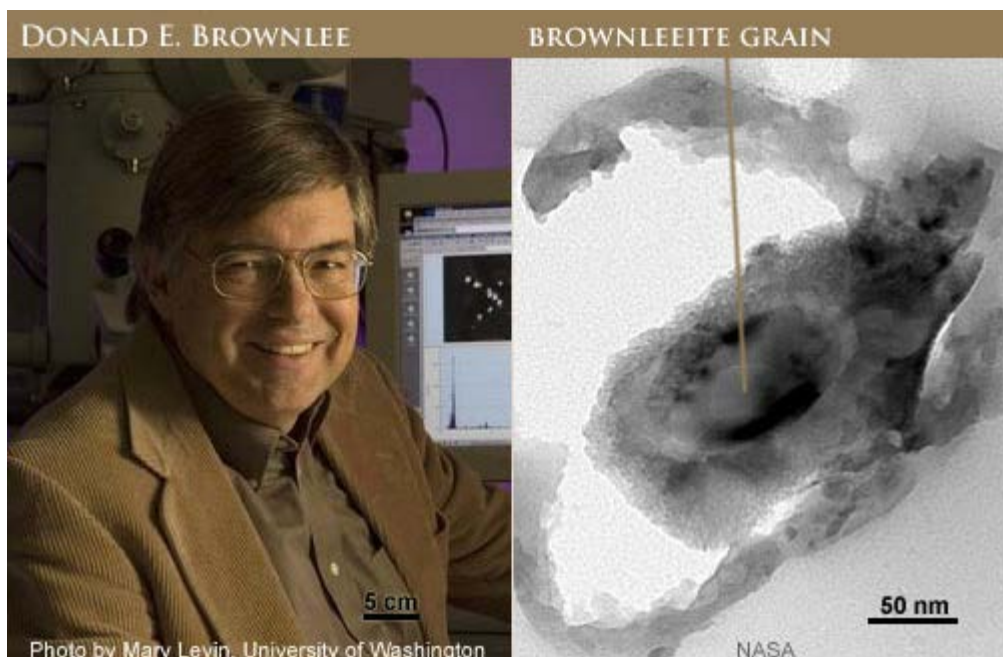


Brownleeite: The First New Mineral Identified From a Comet

More than 70 new minerals have been discovered by cosmochemists in extraterrestrial samples. A new one has joined the list, named in honor of an American astronomer, Donald E. Brownlee, a founder of the field of cosmic dust research, a leading authority on comets, principal investigator of NASA's Stardust Mission, and also a friend of **PSRD**.

Theoretically predicted to exist and manufactured synthetically by materials scientists (as a semiconductor), this particular manganese silicide, $(\text{Mn}_{0.77}\text{Fe}_{0.18}\text{Cr}_{0.05})\text{Si}$, had never been found in nature.



That is until its discovery in an interplanetary dust particle (IDP) that likely came from a comet. The discovery was made by Keiko Nakamura-Messenger (NASA Johnson Space Center) and her colleagues in the U. S., Germany, and Japan. The new mineral, named brownleeite, was approved by the International Mineralogical Association as the first natural manganese-dominant fersilicite and as the first new mineral identified from a comet.

The tiny (4-micrometer-diameter) IDP hosting the three submicrometer-sized grains of brownleeite was collected in Earth's lower stratosphere (18-20 kilometers altitude) on a specially-built collector (designed by Brownlee) mounted on a NASA aircraft during a dedicated flight campaign in 2003 to sample the dust stream of Comet 26P/Grigg-Skjellerup. Extraordinarily advanced lab techniques requiring remarkable precision allowed the science team to cut the IDP into fourteen 70-nanometer thin slices in which they found the three brownleeite grains. Not theoretically predicted to be a cometary component, the origin of brownleeite remains uncertain. After their detailed study of the texture, chemistry, and crystal structure of brownleeite, Nakamura-Messenger and coauthors suggest it may have formed as a high-temperature condensate either in the early Solar System or in the outflow of an evolved star or supernova explosion. As they so well express, "Somewhere in the universe, there are places producing brownleeite and it is supplied to Earth little by little as cosmic dust enters our atmosphere."

See: Nakamura-Messenger, K., Keller, L., Clemett, S. J., Messenger, S., Jones, J. H., Palma, R. L., Pepin, R. O., Klock, W., Zolensky, M. E., and Tatsuoka, H. (2010) Brownleeite: A New Manganese Silicide Mineral in an Interplanetary Dust Particle. *American Mineralogist*, v. 95, p. 221-228, doi: 10.2138/am.2010.3263 and the **PSRD** article [Analyzing Next to Nothing](#).

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