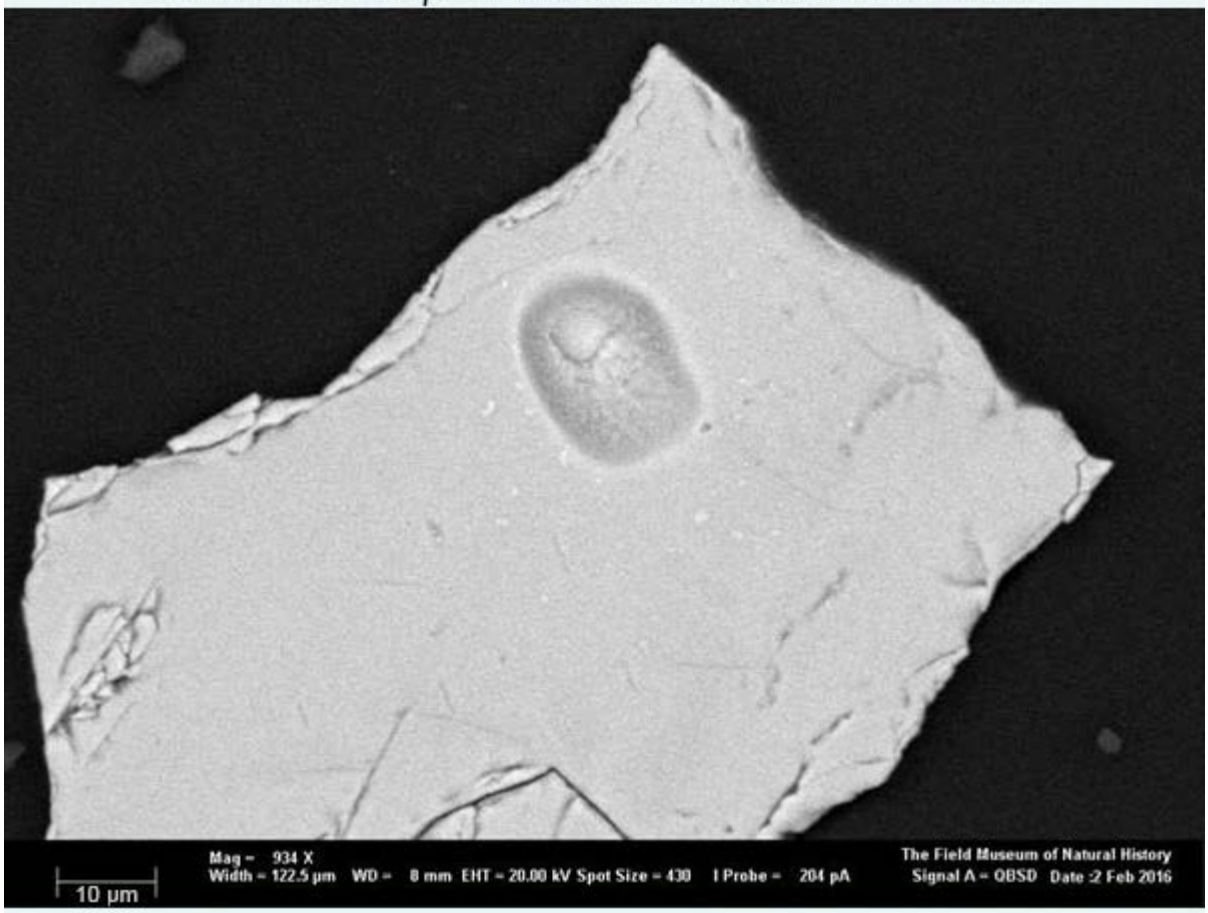
PLANETARY SCIENCE RESEARCH DISCOVERIES
CosmoSparks

Quick Views of Big Advances

When Achondrites Surpassed Ordinary Chondrites in the Meteorite Flux to Earth

H and L ordinary ***chondrites*** are the most common groups of meteorites falling to Earth today. These high-iron (H) and low-iron (L) chondrites fall in about equal proportions. Scientists, curious if this has been the case throughout history, have found the answer from studying 41 relict chrome-spinel grains with diameters >63 µm, about the diameter of a human hair. These grains were separated from ***micrometeorites*** collected from ancient sedimentary limestone rocks of Middle Ordovician age; a geologic time interval spanning 470 to 458 million years ago. The answer is no.

Relict Chrome-Spinel Grain from HED Micrometeorite



Credit: © Philipp Heck, The Field Museum.

Electron microscope image of a polished cross-section of one of the chrome-spinel grains studied by Heck and coauthors. This one came from an ***HED***-type achondrite micrometeorite.

An international science team headed by Philipp Heck (The Field Museum of Natural History, Chicago and The University of Chicago) determined that more than 466 million years ago ***achondrites*** from a variety of impact events between different ***differentiated*** asteroids were abundant meteorites falling to Earth. Elemental and oxygen-isotopic analyses of the grains led them to new insights of meteorite compositions that fell to Earth before the seminal breakup of the L-chondrite parent body 466 million years ago—the significant collisional event that produced the high flux of L chondrites to Earth. (For more read **PSRD** articles: ***Searching for Ancient Solar System Materials on the Moon, Earth, and Mars***, and ***Tiny Traces of a Big Asteroid Breakup***, and ***Meteorite Shower in Park Forest, Illinois***.)

Heck and coauthors suggest achondrites represented ~15 to 34% of the meteorite flux during the Middle Ordovician compared to merely ~0.45% today. They also suggest ***HED*** achondrites and LL chondrites were more abundant in the Middle Ordovician

than today.

Ongoing efforts are focusing on determining meteorite fluxes for other ancient times in Earth's geological history to better understand the variations in parent asteroid compositions, the dynamics of how asteroid fragments move through our Solar System, and the evolution of the asteroid belt. That means more field work to identify and collect extraterrestrial minerals from our planet's old sedimentary rocks, dynamical models of collisions, and exciting laboratory analyses.

See Reference:

· Heck, P. R., Schmitz, B., Bottke, W. F., Rout, S. S., Kita, N. T. Cronholm, A., Defouilloy, C., Dronov, A., and Terfelt, F. (2017) Rare Meteorites Common in the Ordovician Period, *Nature Astronomy,* v. 1, no. 0035, doi: 10.1038/s41550-016-0035. [***abstract***]

Written by Linda M. V. Martel, Hawai'i Institute of Geophysics and Planetology, for ***PSRD***.

[***About PSRD*** | ***Archive*** | ***CosmoSparks*** | ***Search*** | ***Subscribe***]

[***Glossary*** | ***General Resources*** | ***Comments*** | ***Top of page***] ***Share***

January 2017

http://www.psrd.hawaii.edu

psrd@higp.hawaii.edu