

National Aeronautics and Space Administration



# Antarctic Meteorite Program Johnson Space Center (ASMET)



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[www.nasa.gov](http://www.nasa.gov)

# The mystery of meteorites



Everyone loves rocks, but there is something very mysterious about Meteorites.

It's from outer space from either an asteroid, comet, the moon or even Mars.

They are the oldest material consistently aged from between 4.45 to 4.57 billion years old to the formation of the universe  
(the moon and Mars meteorites are younger).

# Why Antarctica ?



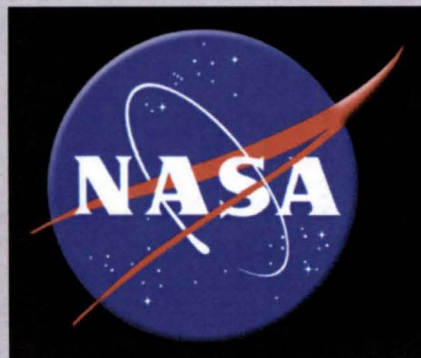
- Meteorites are preserved in the ice cap
  - Minimizes oxidation and weathering
- Concentrated by the movement of the ice- wind
- Easy to find due to few native rocks.



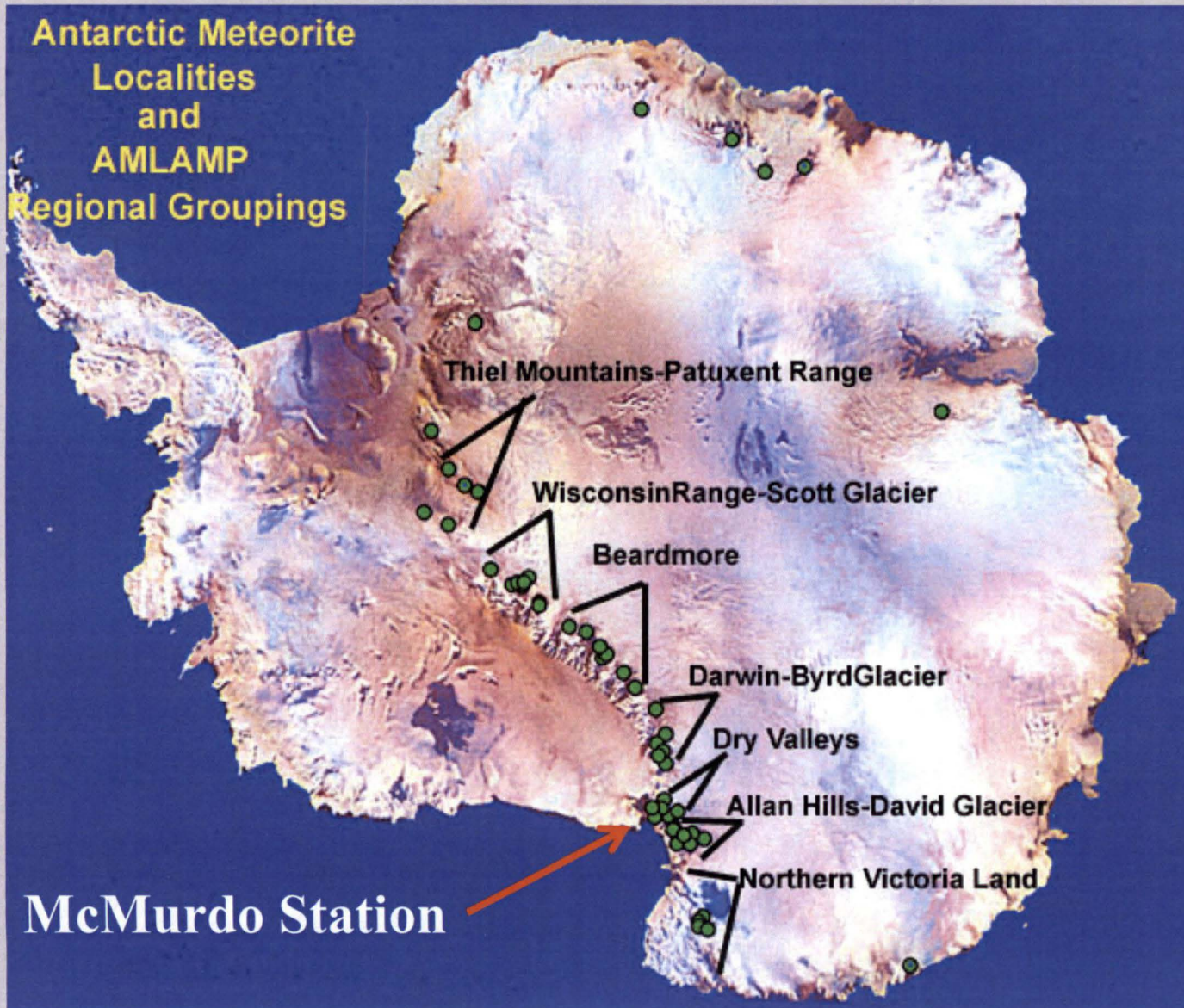
National Science Foundation  
WHERE DISCOVERIES BEGIN



Smithsonian  
Institution



# Antarctic Meteorite Ice Field Locations



# Meteorite Hills, Antarctica

*Locations of the meteorites from overlaid on a Landsat image.*



Field Season	Total Meteorites
1978-1979	29
1996-1997	39
2000-2001	738
2001-2002	324
Total	1130

Total since 1975 > 20,000  
> 3,100 request

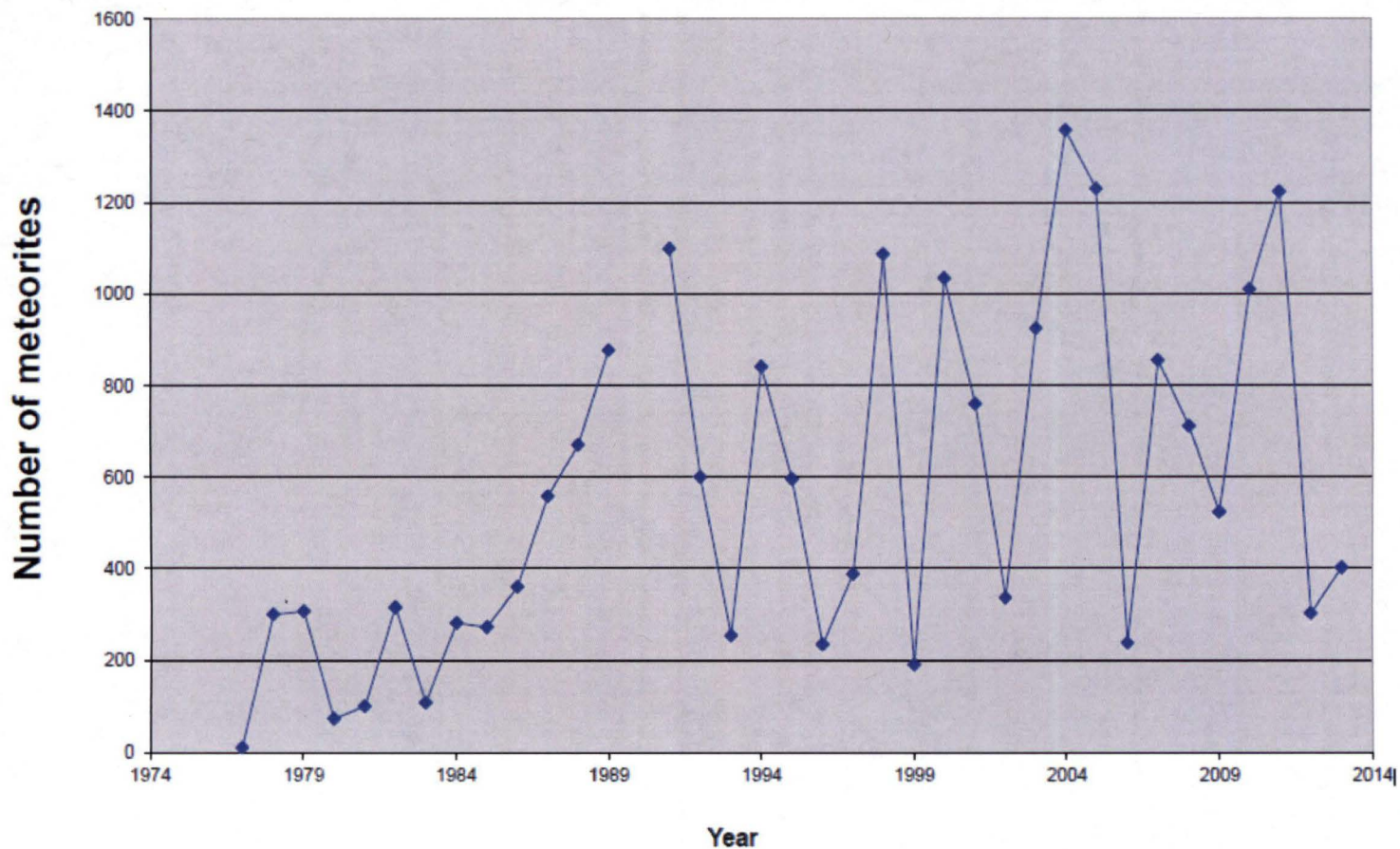
# Expedition



12.20.2003 21:



# Collection Statistics by Year



# Laboratory

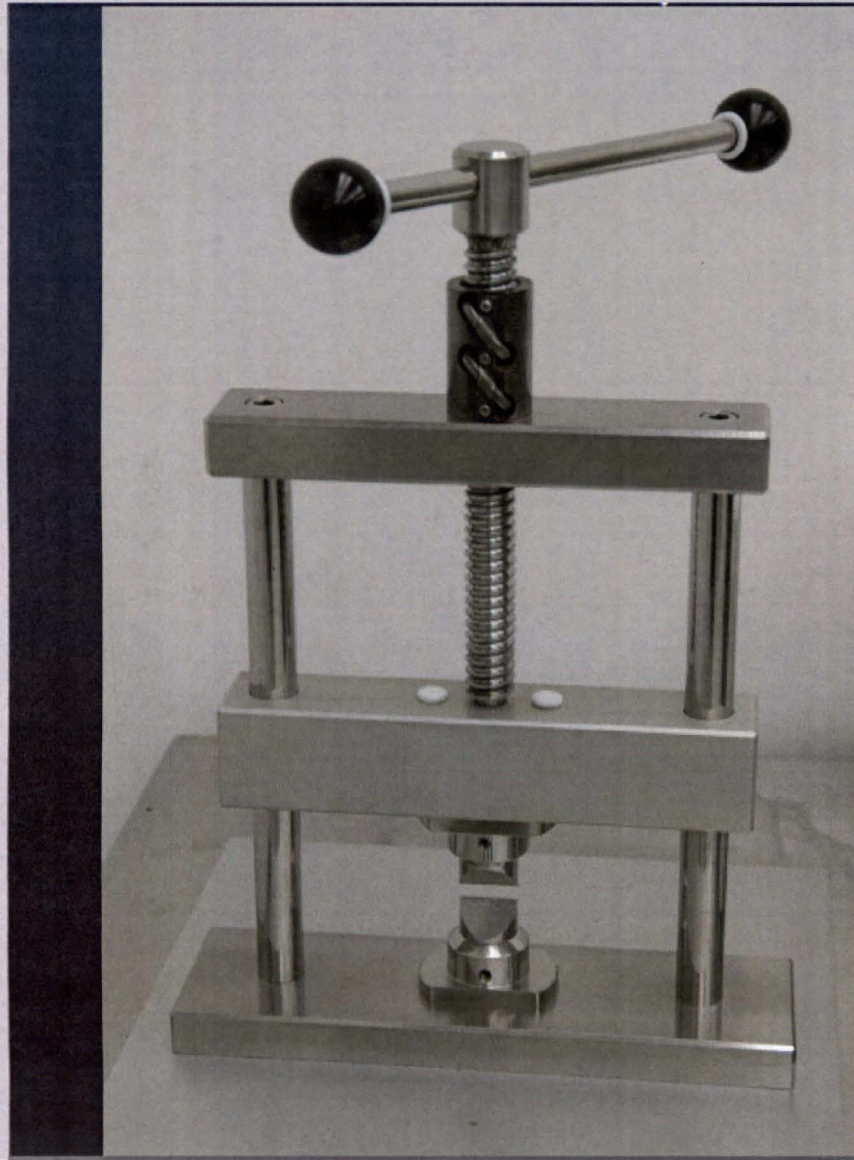


- Shipped from McMurdo Station to JSC, frozen
- Photo documentation all orientations, N, S, E, W
- Weigh
- Notes of observations
- Break-chips sent to Smithsonian
- Photos of internal structure
- Analysis Smithsonian Institution
  - Refractive index of olivine to type common Chondrites
  - Thin section for polarized light microscopy
  - SEM Microprobe elemental analysis of thin sections
  - Mineralogy composition



# Tools

*Stainless steel, aluminum and polytetrafluoroethylene*



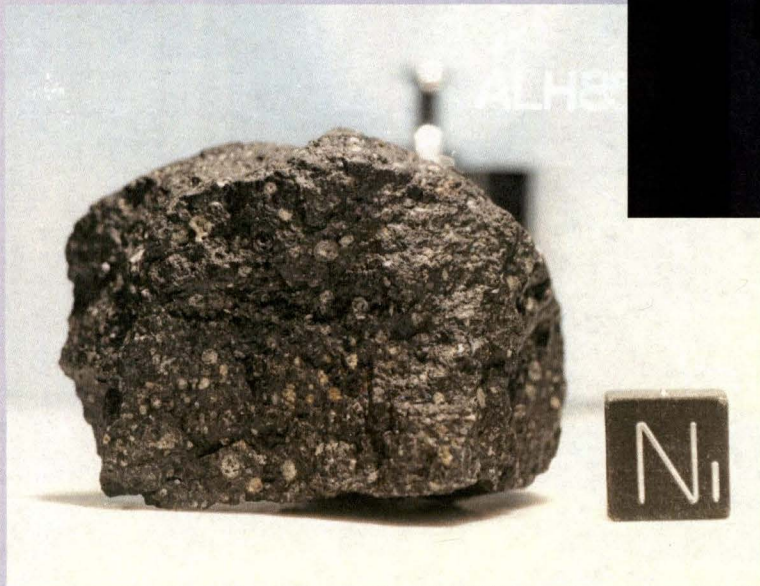
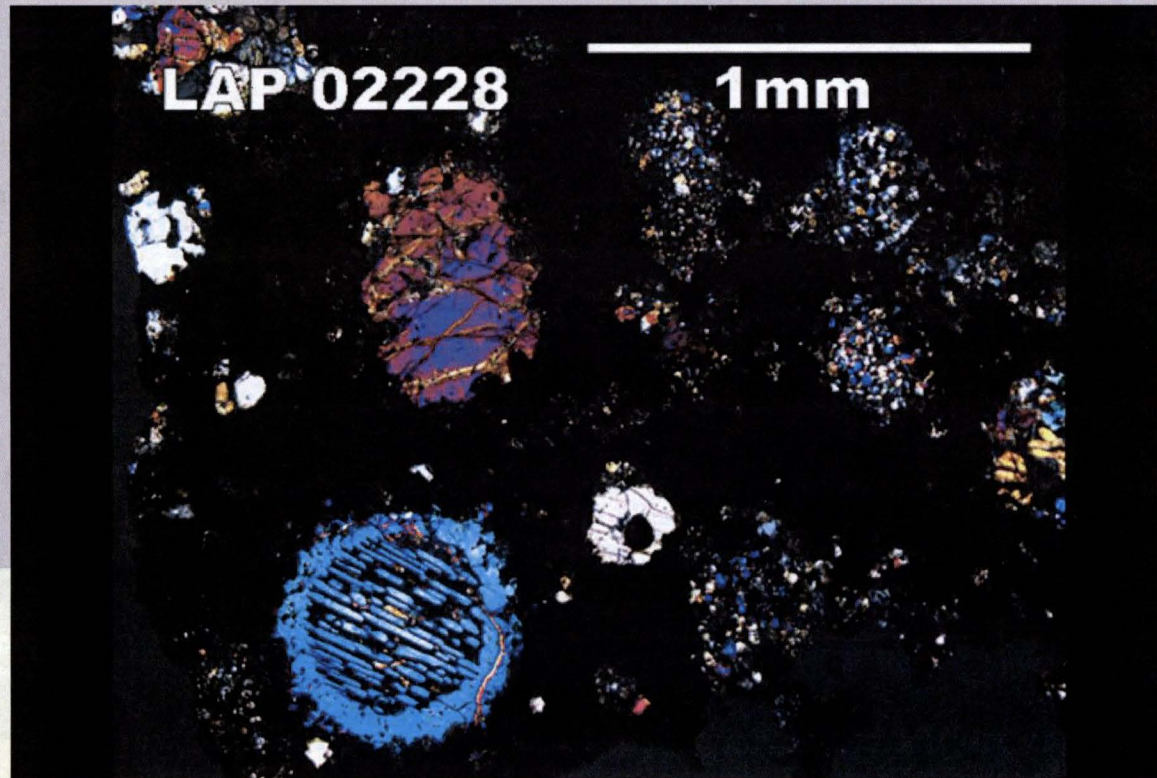
# Types of Meteorites



- Stony Meteorites
  - Chondrites 86%
  - Achondrites 8%
- Iron Meteorites 5%
- Stony-iron Meteorites < 1%

Classification of meteorites is quite complex and covers several sub classes.

# Chondrites



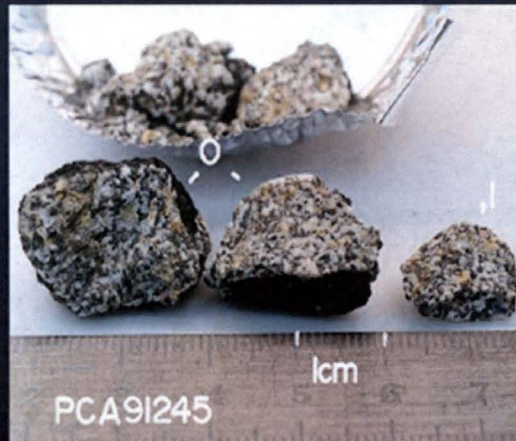
# Achondrite



- Howardite (68) – Eucrite (138) – Diogenite (43) clan



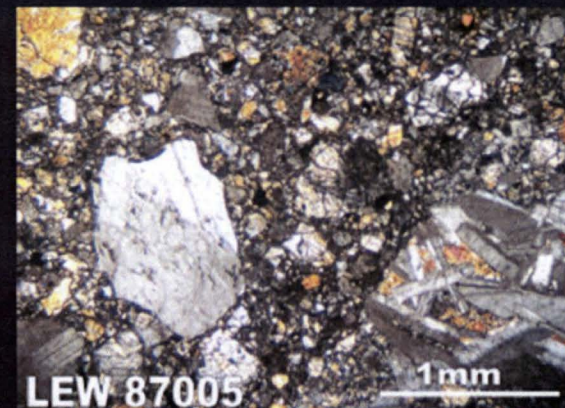
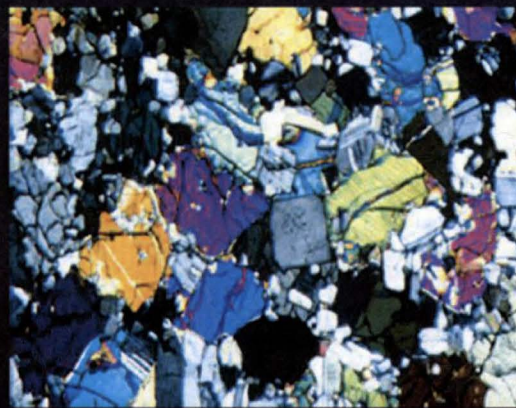
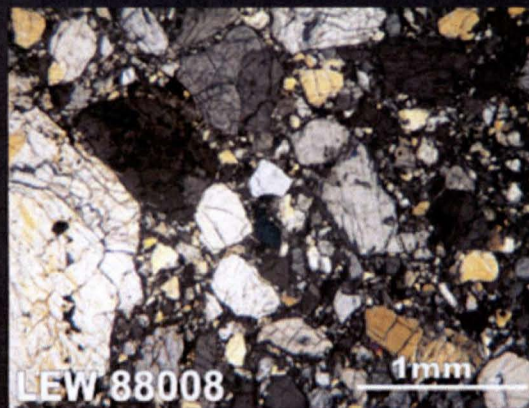
diogenite



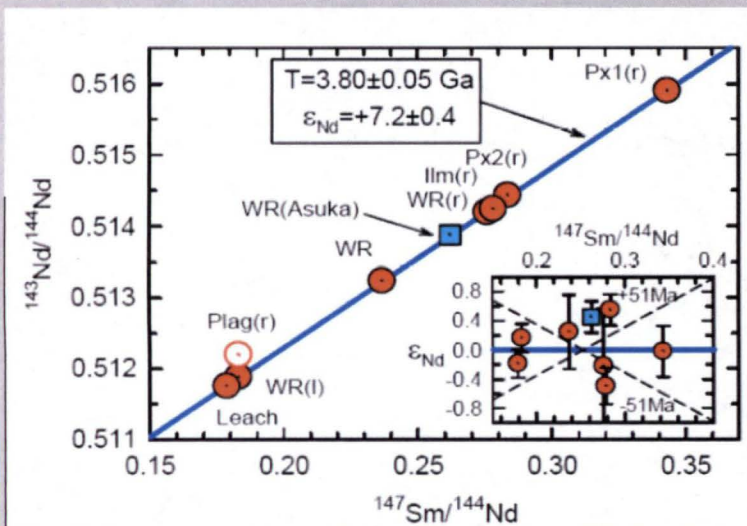
eucrite



howardite

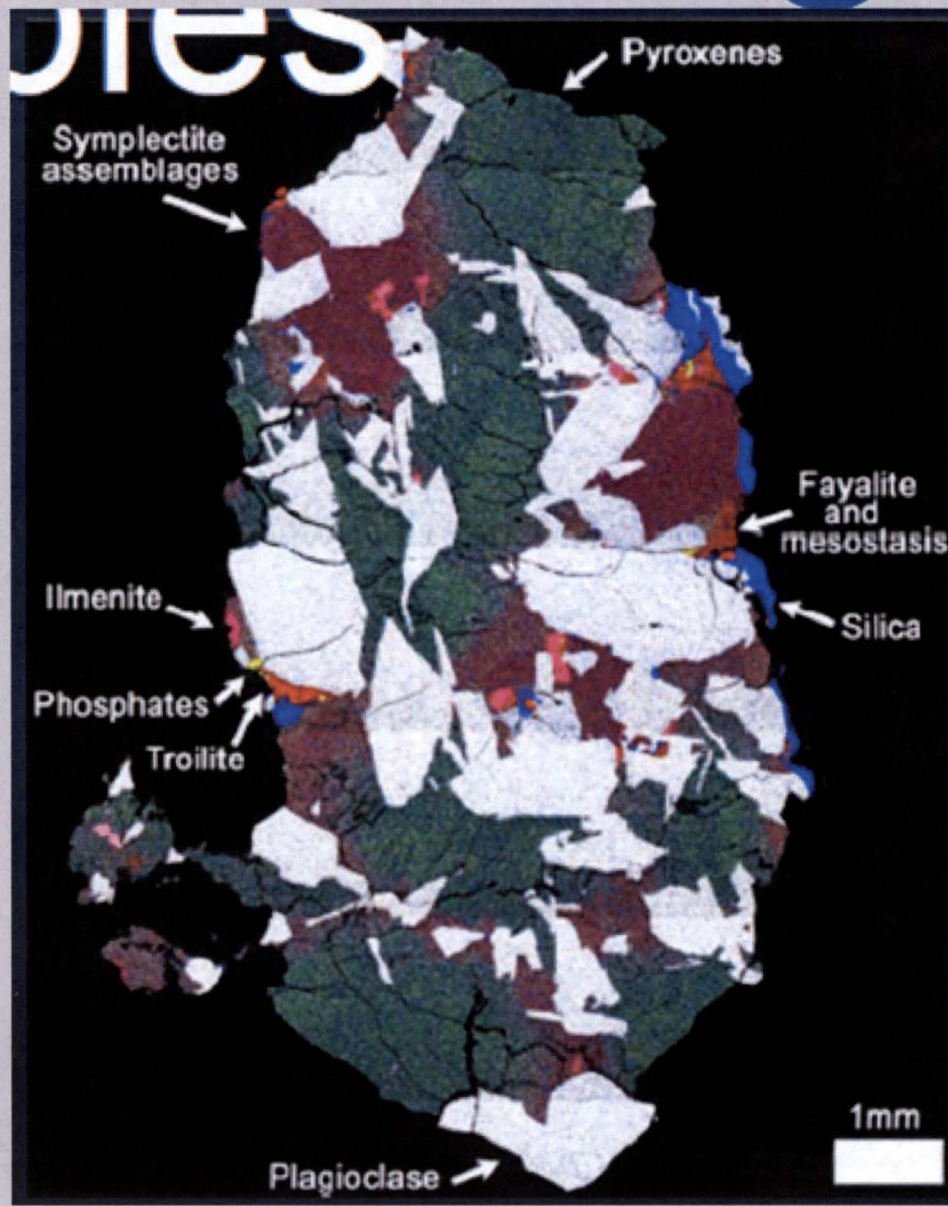


# Lunar Meteorite MIL 05035



MIL 05 035,0

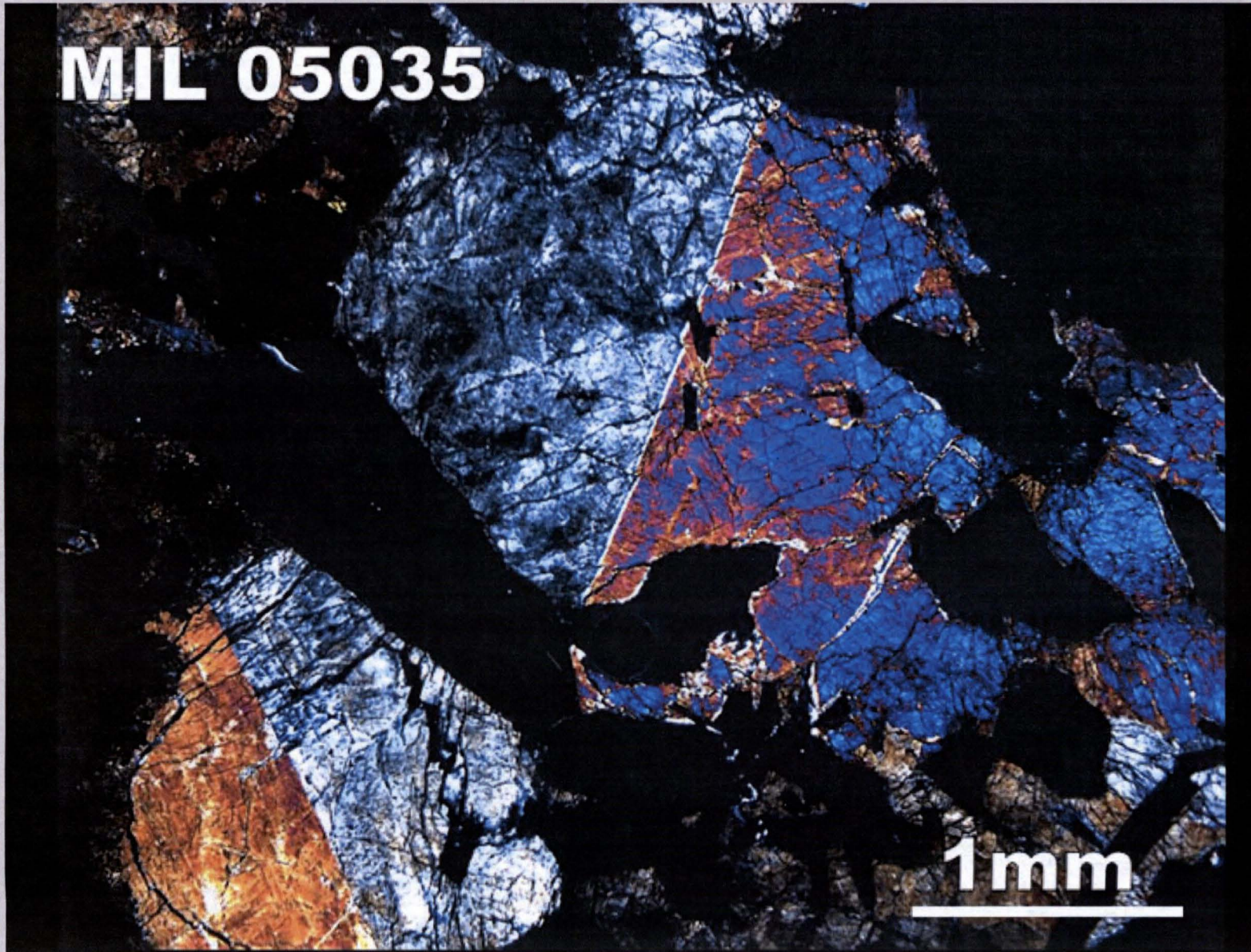
1/8/10



# Lunar- Basalt



**MIL 05035**

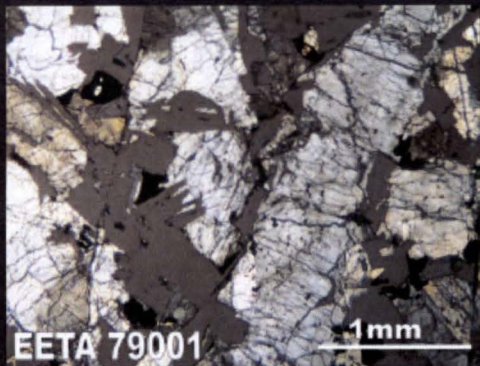
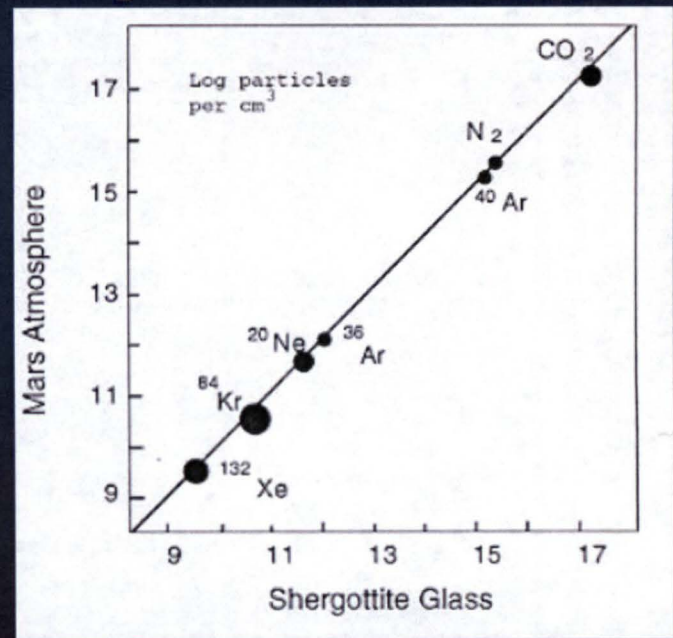


**1mm**

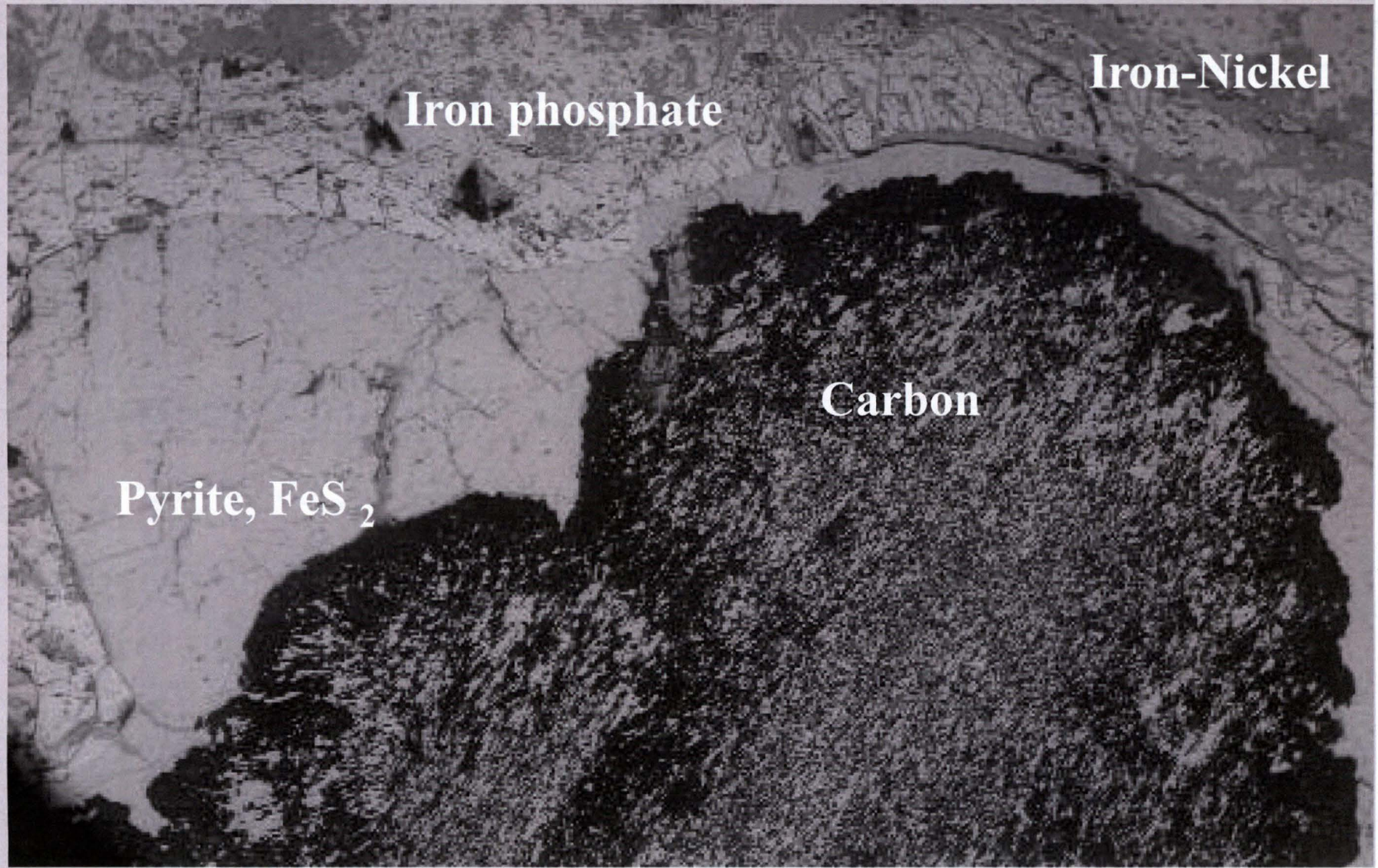
# Martian



- Martian meteorite  
EET A79001



# Iron Meteorite Odessa, TX



2mm



# JSC ANTMET Web site

<http://curator.jsc.nasa.gov/antmet/index.cfm>



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### ANTARCTIC METEORITES



The curation and collection of Antarctic meteorites is a U.S. funded, cooperative effort among NASA, the National Science Foundation (NSF) and the Smithsonian Institution.

The NSF, with decades of experience in

# Summary



- 35 years of collection efforts have lead to >20,000 planetary materials
- Cost of program is a fraction of a planetary mission
- Samples are from Moon, Mars, asteroids (Vesta), and other unknown bodies, and thus support many diverse fields of planetary science
- Samples are maintained and curated in controlled environment at NASA-JSC, available to researcher worldwide.

## *Acknowledgments*



- Johnson Space Center ASMET
- ANTARCTIC METEORITE LOCATION MAPPING PROJECT (AMLAMP) Case Western Reserve University Cleveland, OH

# Discovery



*Sunset on Expedition 15*



ISS015E10469



# *A View from Above!*



ISS007E07306



