



Lamont-Doherty Earth Observatory
COLUMBIA UNIVERSITY | EARTH INSTITUTE



OPEN HOUSE

SATURDAY, OCTOBER 7, 2017

#LamontRocks

THE PLACE TO LEARN ABOUT CLIMATE SCIENCE.



Climate and Life



Changing Ice,
Changing Coastlines



Extreme Weather
and Climate



Anticipating
Earthquakes



Real-Time Earth

Internships and Peekskill Meteorite

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Barakat Abdul:
Leadership School
of East Harlem



Kyra Herzberger:
Pascack Hills High
School

Summer Internships for High School and College Students *using the example of a project on the Peekskill Meteorite* *by Dr. Dallas Abbott, Intern Program PI, Columbia University*



Dionne Hutson:
City College of
New York



Alyssa Marrero:
Kingsborough
Community College

Why a Summer Internship?

- 1) Internships are the first thing potential employers look at after you graduate.
- 2) It's a way to build employable skills.
- 3) It's more interesting than working at McDonalds.
- 4) Paid college internships can pay a stipend of 5K for 10 weeks with free housing and travel.
- 5) It's a way to find the best career for you.

What organizations offer paid internships in science and engineering?

LDEO- We have both high school and college programs

NASA

National Science Foundation

NOAA

DOE (Dept. of Energy)

NIH (National Institute of Health)

Your College or University (ask your professors about a summer job in research)

A Typical Summer Research Project at LDEO: Can We Find Fragments of the Peekskill Meteorite in the Hudson River?



Why Did We Want to Research the Peekskill Meteorite 25 Years Later?

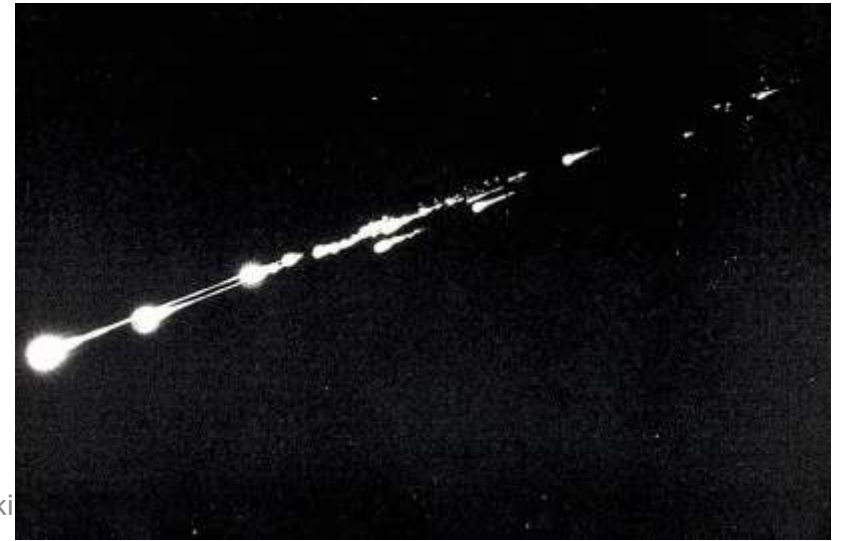
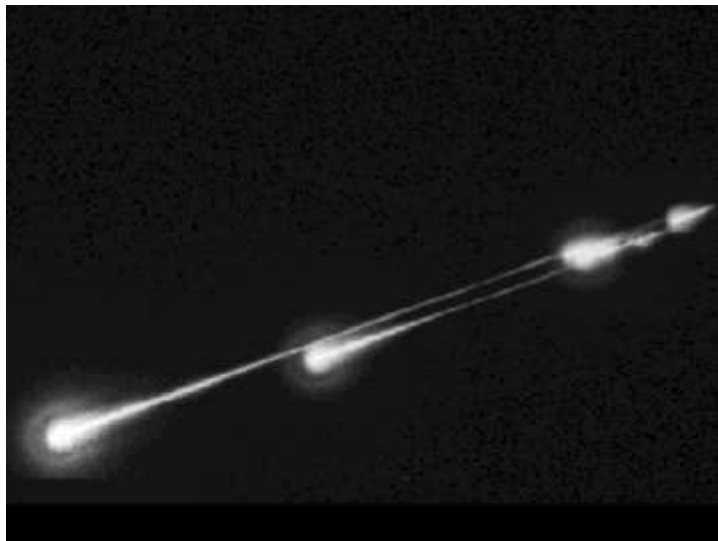
- 1) If we found pieces of the meteorite, we would know the age of the layer in the Hudson- Oct 9, 1992. Geologists need dates and Hudson sediments are difficult to date.



Peekskill meteorite with polished surface displayed at the Museum of Natural History in New York City

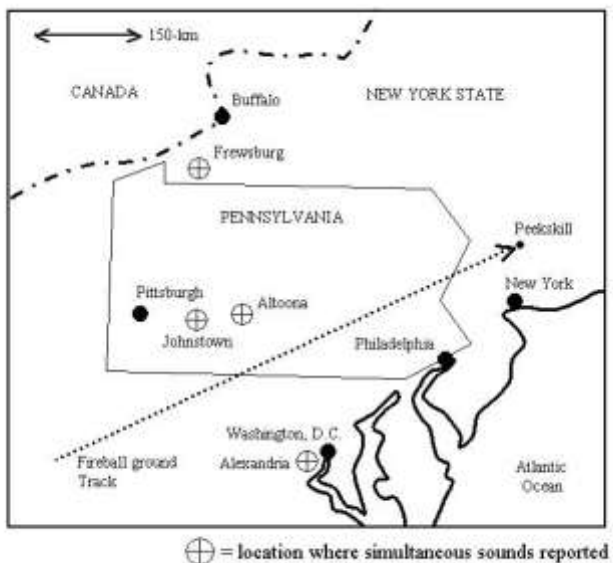
Why Did We Want to Research the Peekskill Meteorite 25 Years Later?

2) The Peekskill parent body broke into over 37 pieces
some perhaps nearly as large as the meteorite OR the
parent body produced 1000 1 gram size pieces.

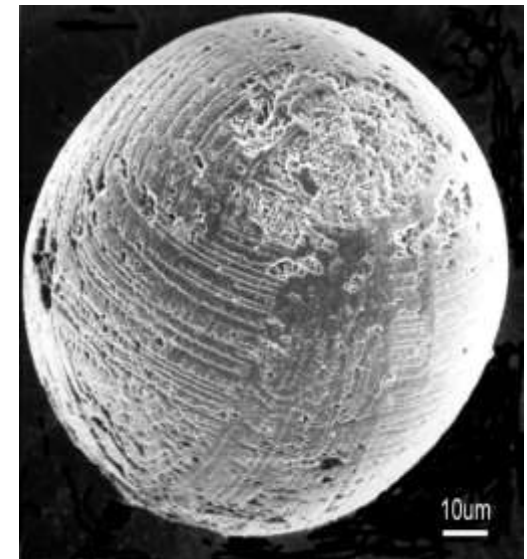


Why Did We Want to Research the Peekskill Meteorite 25 Years Later?

3) The Peekskill meteorite crossed over the Hudson River and we might be able to find its fine dust.

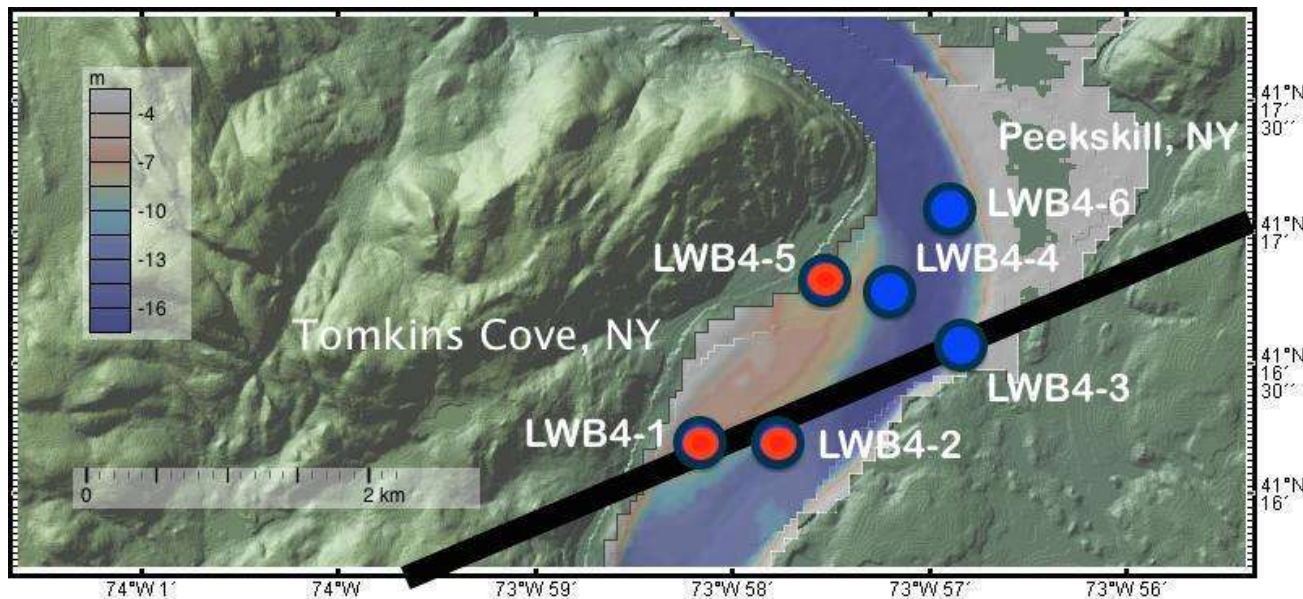


I type
cosmic
spherule
-smaller
than dot
here .



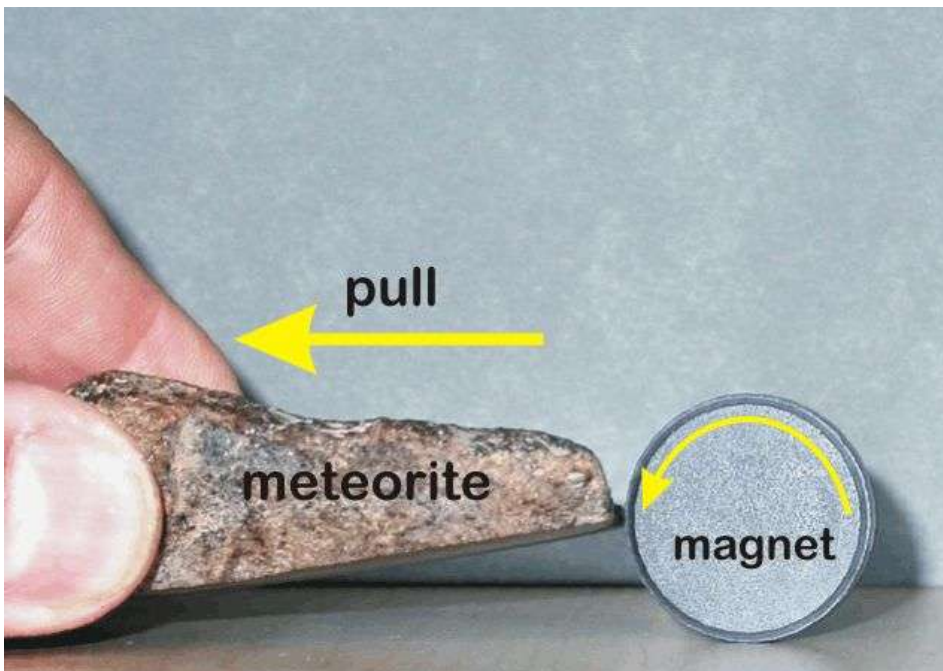
Why Did We Think We Might Find Something 25 Years Later?

1) Before the summer started, we found cores with unusual magnetic properties.



Red dots:
Cores
measured 2- 3
times because
highly
magnetic

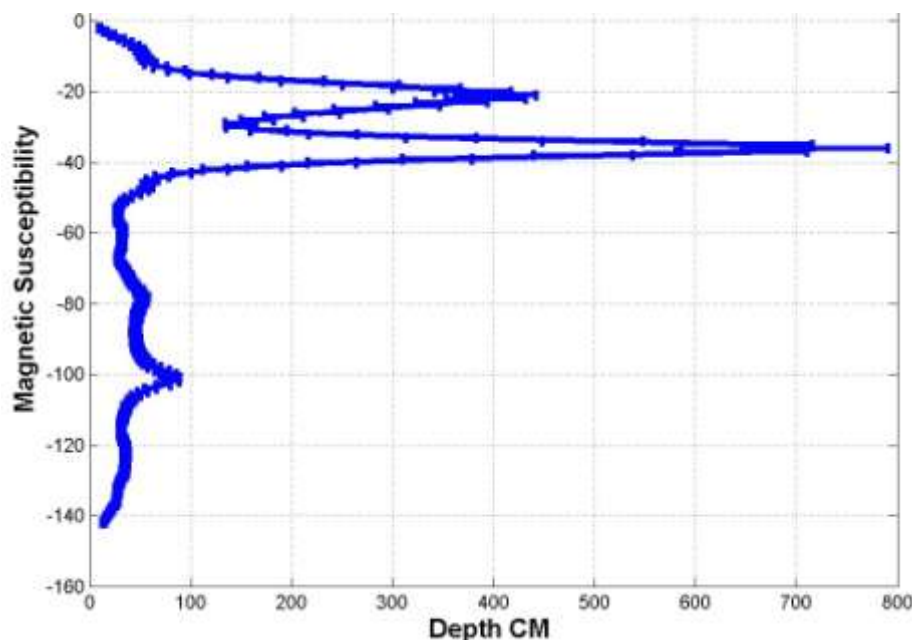
Why Did We Think We Might Find Something 25 Years Later? Meteorites are VERY magnetic.



Even a cheap
magnet will
be strongly
attracted to
most
meteorites

Why Did We Think We Might Find Something 25 Years Later?

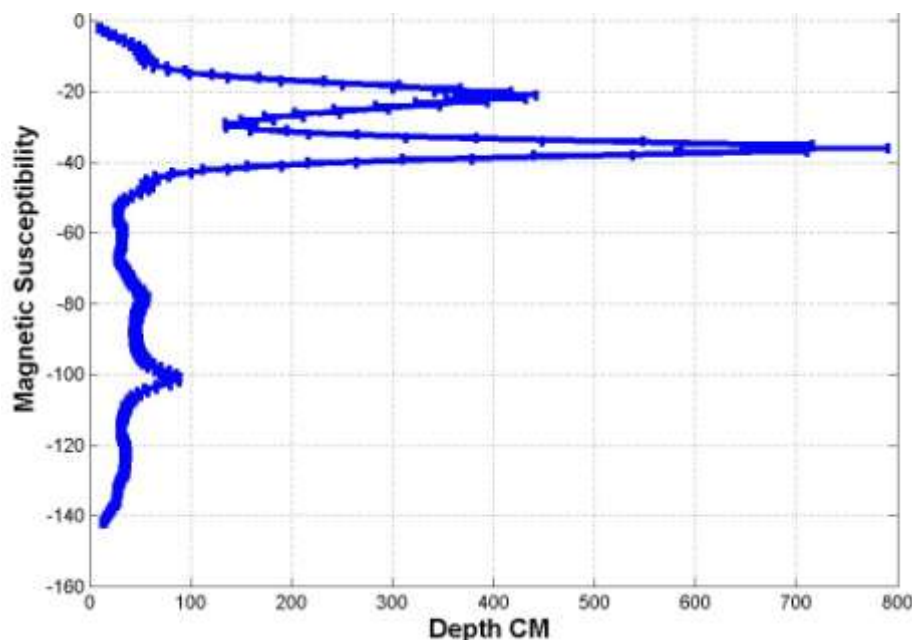
2) An unusual magnetic layer started at about the
right depth in core LWB4-5 to be from the year 1992.



Counted annual
layers from cycles in
Mn: Mn higher in
spring,
lower in late summer

What Were the Surprises and Discoveries?

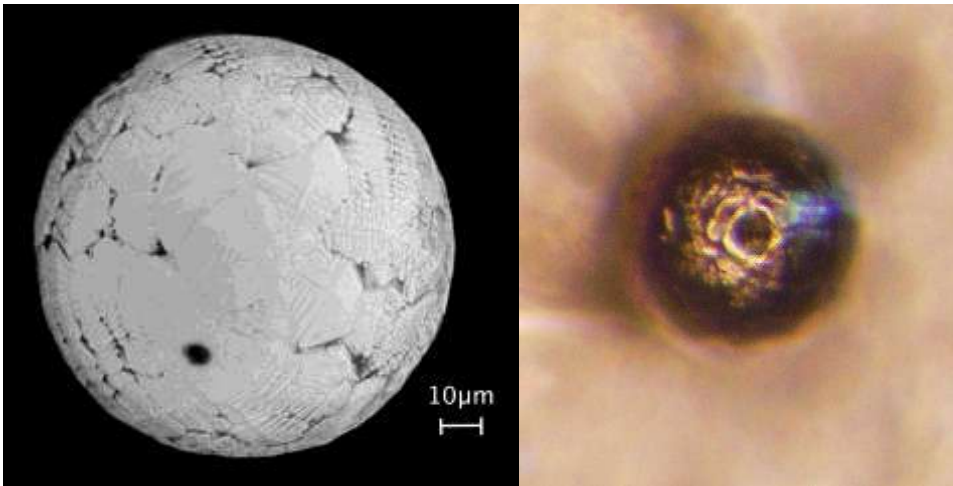
- 1) The unusual magnetic layer was about 30 cm thick and had two peaks, one at depth-unexpected



Why two peaks,
perhaps some denser
material sank?
Yes, Hudson river
mud is low density
compared to
meteorites!

What Were the Surprises and Discoveries?

2) The unusual magnetic layer contained tiny magnetic spherules resembling cosmic spherules



Small magnetic spherules, as expected for meteorite dust

Explanation:

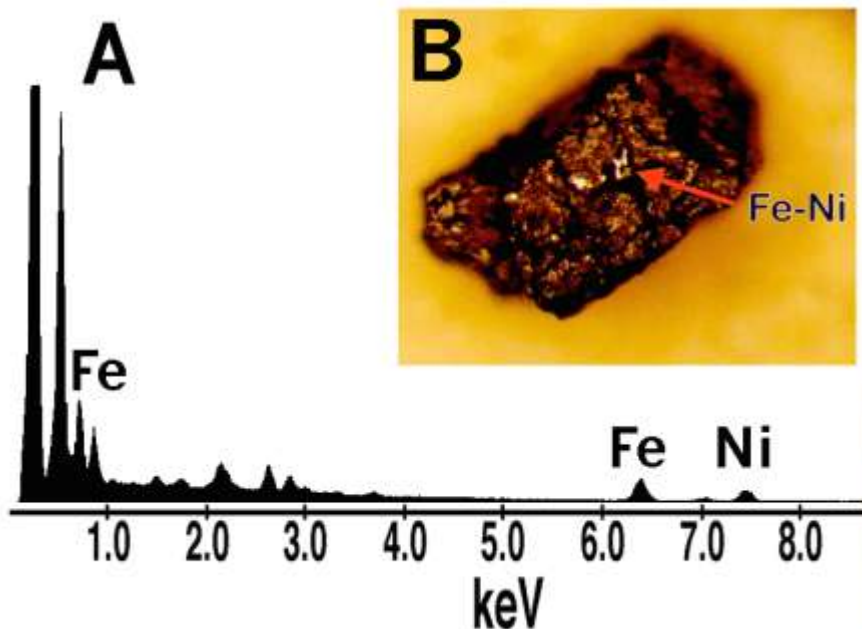
Tiny magnetic spherules come
from melting of the outer rind of a meteorite



Meteorite from Africa
with dark fusion
crust-composed of
melted meteorite-
usually made of iron
oxide. Iron oxide is
also magnetic.

What Were the Surprises and Discoveries?

- 3) The unusual magnetic layer contained large magnetic particles—one with enough Ni to be meteoritic



Explanation:

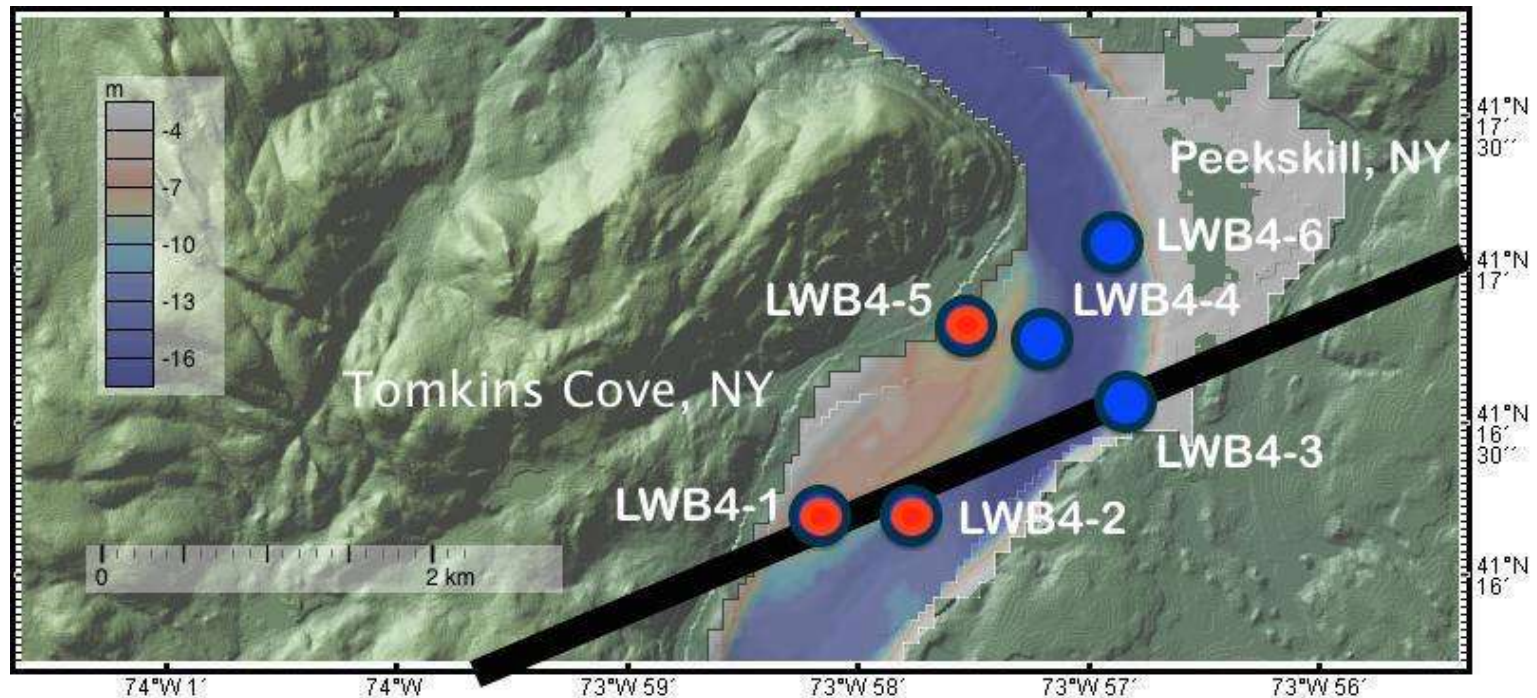
High Ni (without high Cr) is a marker for extraterrestrial material like meteorites



About 95% of all meteorites contain iron-nickel (FeNi) metal. "Iron-nickel" means that the metal is mostly iron but it contains 4-30% nickel as well as a few tenths of a percent cobalt. Iron-nickel metal in meteorites also has high concentrations (by terrestrial standards) of rare metals like gold, platinum, and iridium. It's usually easiest and cheapest to test for nickel, however, because it's more abundant than the rare metals.

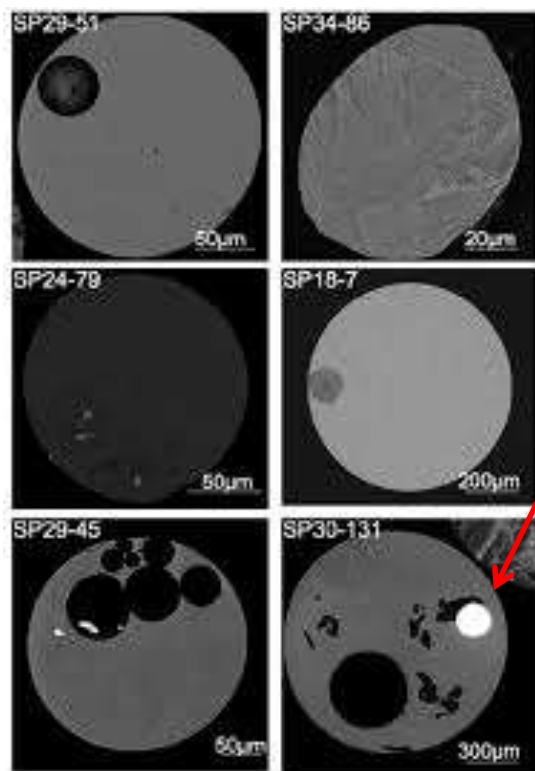
What Next?

- 1) Oral History and Interviews- Is anyone here from Tomkins Cove, NY?

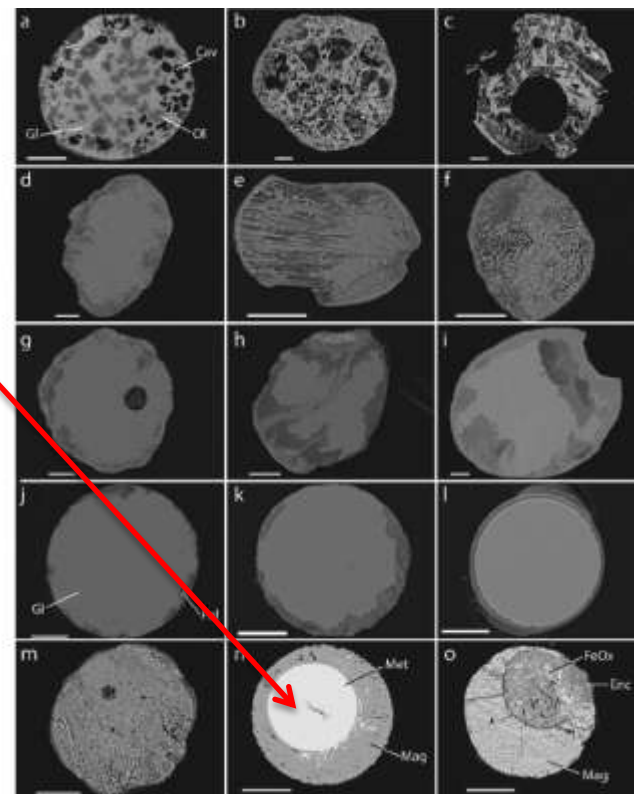


Why Didn't We Find More Ni-rich grains?

melting of Ni bearing meteoritic material forms Fe
oxide crust- Ni is inside spherules

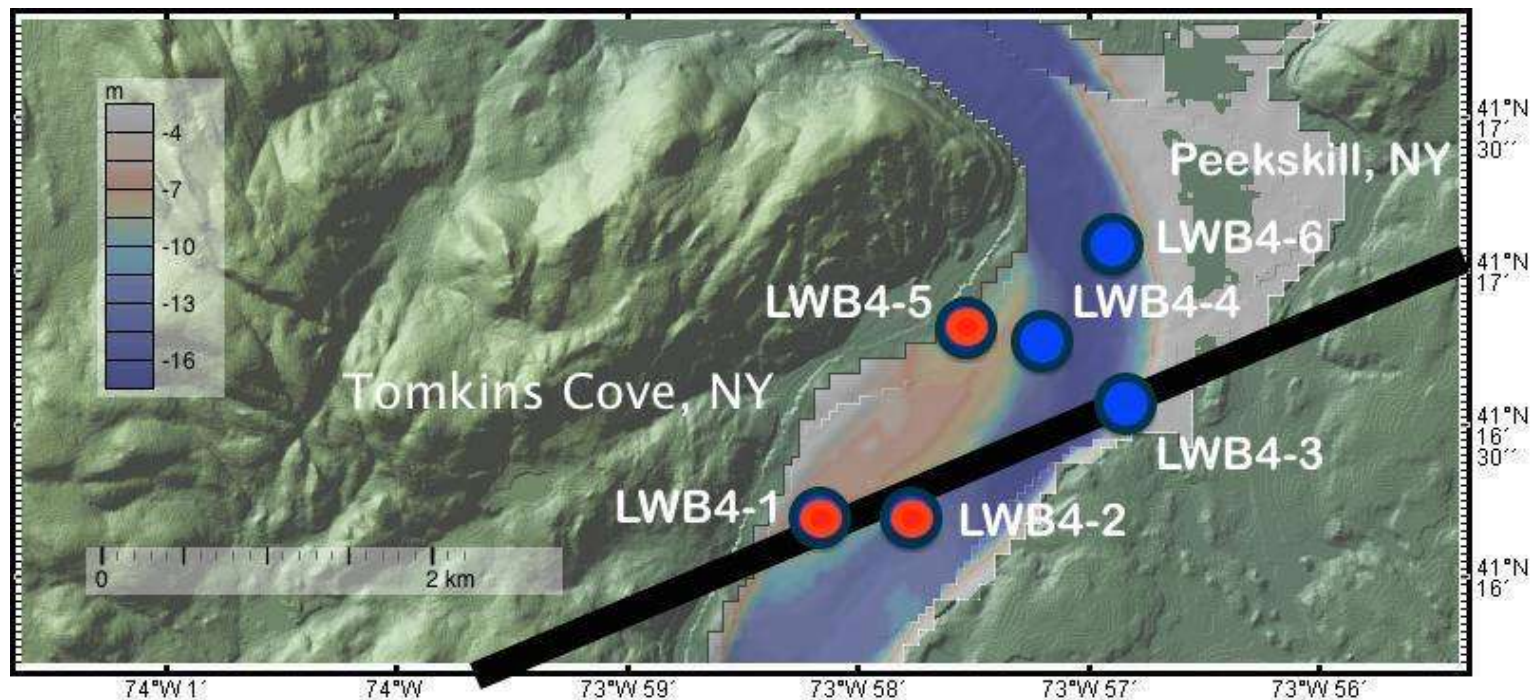


Fe-Ni
interior
Cosmic
Spherule



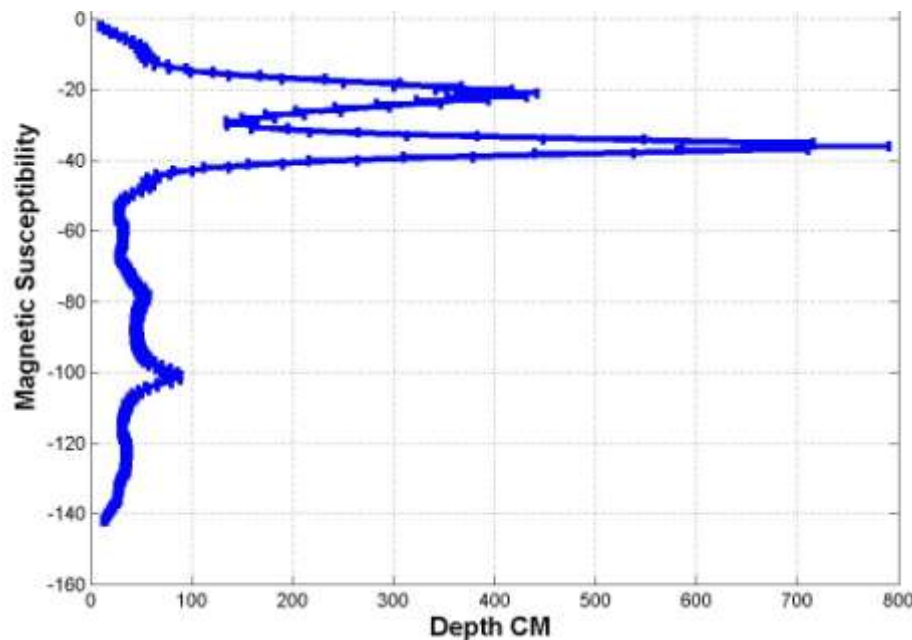
What Next?

2) Examine more cores-all data from one Core- LWB4-5. Two more are unusual.



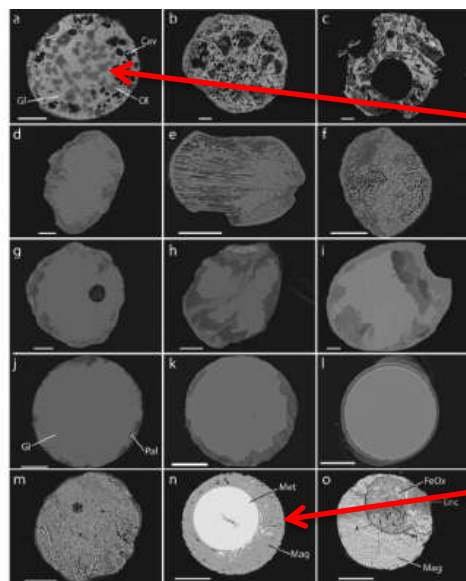
What Next?

3) Measure Ir in sediments from magnetic layer-Ir marker for meteorites



What Next?

4) Make thin sections of our samples and analyze interiors with quantitative methods



Olivine

Fe-Ni grain

Peekskill Meteorite is just
One summer internship project.
Many other disciplines at LDEO have
Intern projects:
Paleoclimate, Earthquake Studies,
Volcano Studies, Oceanography,
Marine Biology, Studies of Piermont
Marsh (high school program)

How to Apply for Internships

You will need:

Two letters of recommendation from
faculty at your school.

Transcript of your grades.

Statement of interest.

Fill out the online application form.

Suggestions for Good Letters of Recommendation

- 1) Tell faculty what types of internships you are applying for.
- 2) Remind faculty about your history: what classes you took with them and when.
- 3) Let faculty know about your extracurricular activities, including the number of hours you work each week.
- 4) If necessary, explain why parts of your transcript are less stellar (illness, family problems?)

Strategies for a Great Application

- 1) Contract references and transcript office at least two weeks before the deadline.
- 2) If the application form doesn't tell you (ours does), check that all materials were received.
- 3) Take time with your statement of interest, it should be at least 2 paragraphs long and it should be well-written.
- 4) If you can, read and comment on papers by scientists you wish to work with- this is rare.

Do you have questions about internships or the Peekskill meteorite? If you are interested in Internships be sure to take the one page handout with more information (see links on following page)



Abbott-Menke family
Christmas picture 1992
with Peekskill
meteorite

Links to more resources on internships

<https://scied.ucar.edu/soars/reu/running-an-reu/what-is-an-reu>

<http://www.ldeo.columbia.edu/education/programs/summer-internship/lamont-summer-intern-program>

<http://www.ldeo.columbia.edu/SSFRP/>

[http://pathwaystoscience.org/pdf/Applying LettersOfRecommendation.pdf](http://pathwaystoscience.org/pdf/Applying_LettersOfRecommendation.pdf)