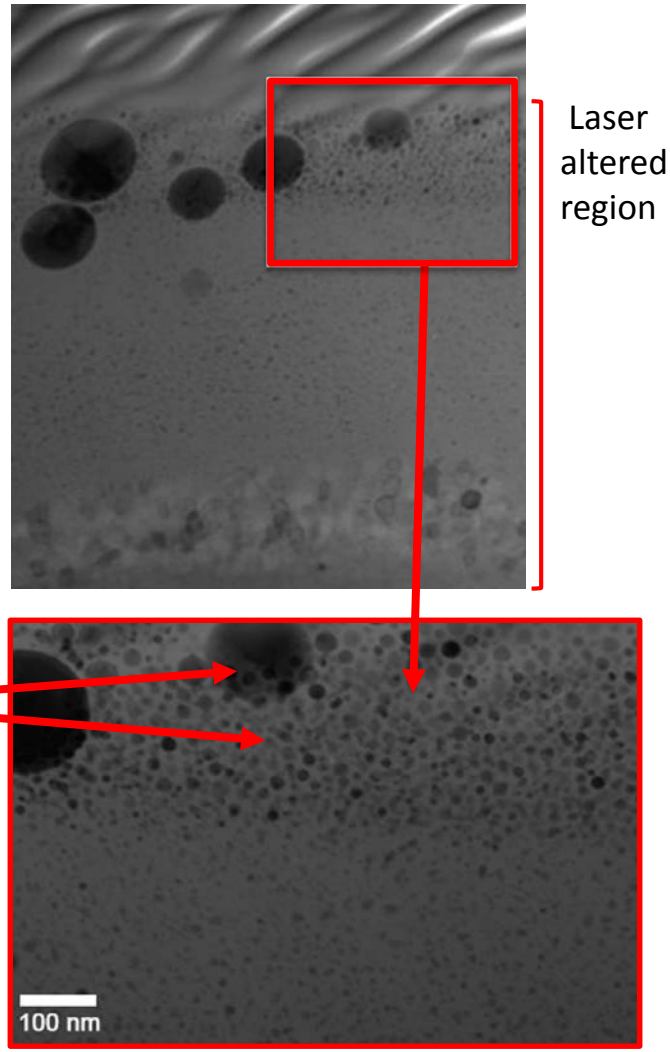
Understanding the Role of Micrometeorite Impacts on Airless Bodies

What is the science question?

Micrometeorites bombard the surfaces of the Moon and many asteroids. How do these impacts alter the properties of the surface of these airless bodies?

What were your findings?

- Laboratory studies use a pulsed laser to simulate a micrometeorite impact using olivine as a target.
- San Carlos olivine was chosen because it is similar in composition to many olivines detected on Fe-bearing asteroids.
- Irradiation causes significant chemical and structural changes in the sample:
  - Melting, evaporation, recondensation
  - Notably, two main sizes of nanophase iron are observed (black dots)



What was the impact?

Structural changes and the distribution of metallic iron could be used to identify impacted material on airless bodies.

Why does it matter to non-scientists?

Results could help with the interpretation of samples returned from upcoming (OSIRIS-REx) and recent (Hayabusa2) missions and suggest that pristine material will be below the surface.

Loeffler, Dukes, Christoffersen, and Baragiola (2016), Meteoritics and Planetary Science, 51, 261-265