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Finding the Crater

The Day the Mesozoic Died

Evidence left from the asteroid impact

- Alvarez, Smit, and colleagues proposed that a 10-km asteroid struck Earth 66 million years ago.
- The impact would have left behind a massive crater and a lot of other physical evidence.

Evidence found in 66-million-year-old rock layers

- Signs of the impact can be found at the boundary between the Cretaceous and Tertiary periods (the **K–T boundary**) — the time of the asteroid impact.

The K–T boundary is rich in iridium

- **Iridium** is an element rare in Earth's crust but relatively abundant in asteroids and comets.
- The K–T asteroid was vaporized on impact. Fine particles of iridium traveled high into the atmosphere and were then distributed all over Earth.

Deposits at the K–T boundary hold other clues

- Many K–T event deposits worldwide contain pieces of melted or crushed rocks that were blasted from the impact site, which are called **ejecta**.

Ejecta include spherules and tektites

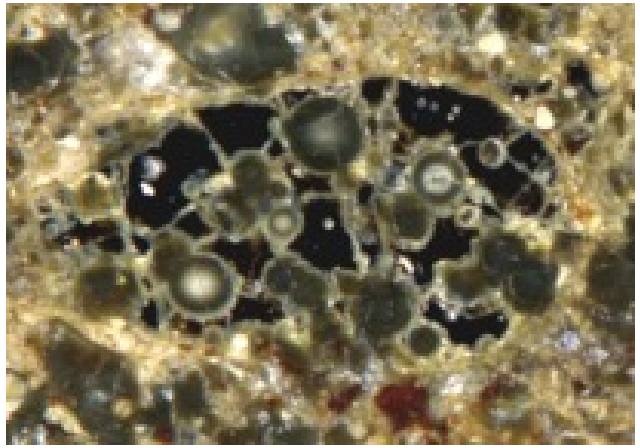
- When the asteroid struck, some of the rock in Earth's surrounding crust melted as it was ejected from the impact site.
- As these melted rock particles fell back to Earth and cooled, they formed glassy objects called **spherules** and **tektites**.

Spherules are found in K–T sites worldwide

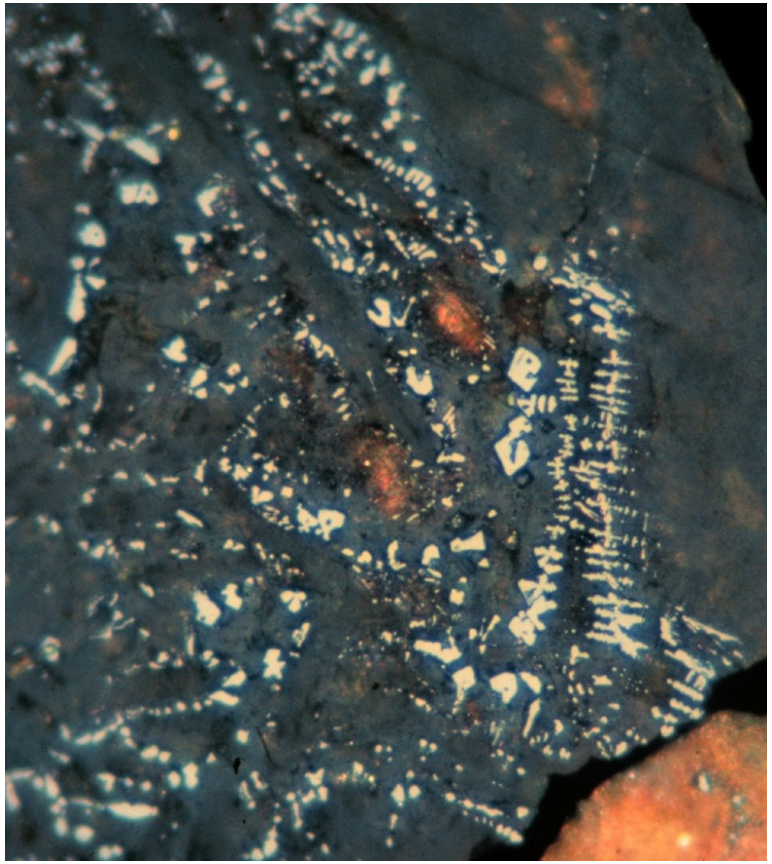
- **Spherules** are glassy spheres that range in size from less than 0.1 mm to up to 2 mm.
- Spherules are found both close to and far from the asteroid impact site.

Tektites are closer to the impact site

- **Tektites** are 2 to 3 cm in size, are made entirely of glass, and have more irregular shapes than spherules.
- Tektites are typically found in K–T boundary deposits close to the asteroid impact site.

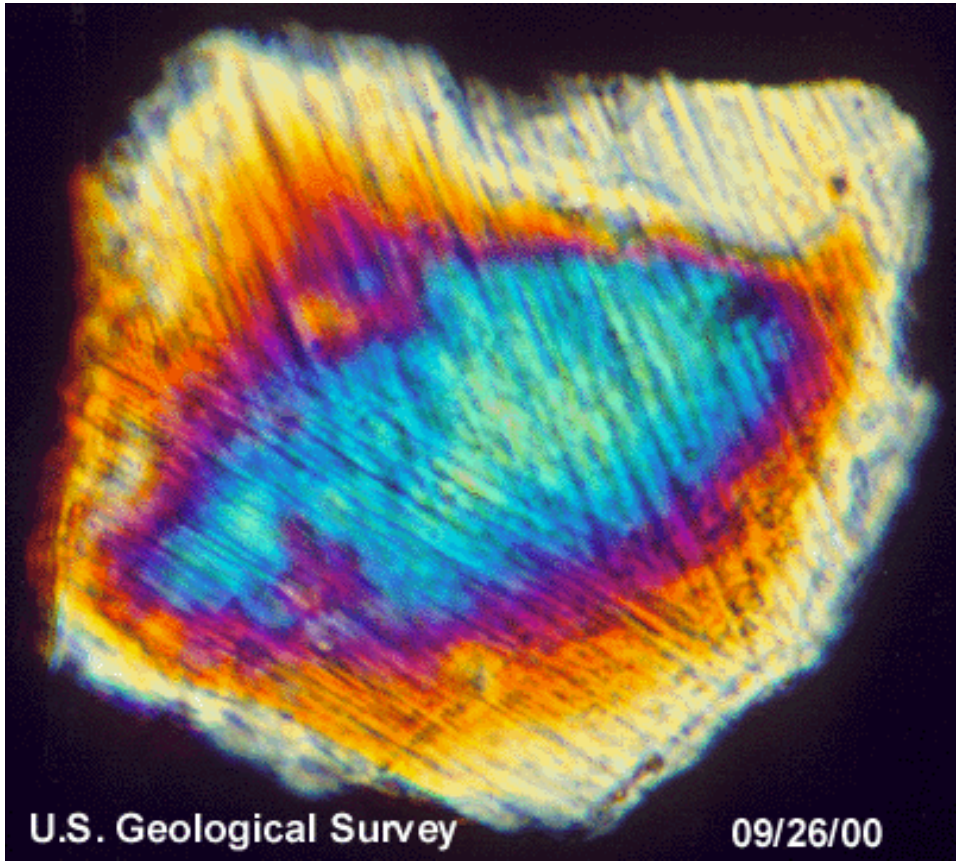


Some spherules contain nickel-rich spinels



- Nickel-rich **spinels** are a type of mineral formed by fusion and oxidation of asteroid material as the asteroid passed through Earth's atmosphere.
- Nickel-rich spinels are found in K–T deposits worldwide.

Ejecta debris also includes shocked quartz



- The extremely high pressure of an asteroid impact caused quartz grains at the impact site to shatter and fracture internally as they were blasted into the air.

Quartz grain size reveals distance from impact

- Shocked quartz grains bigger than 0.5 mm are abundant in K–T deposits closer to the impact.
- Smaller grains (less than 100 microns in size) are found at the other locations, and they are not as abundant.

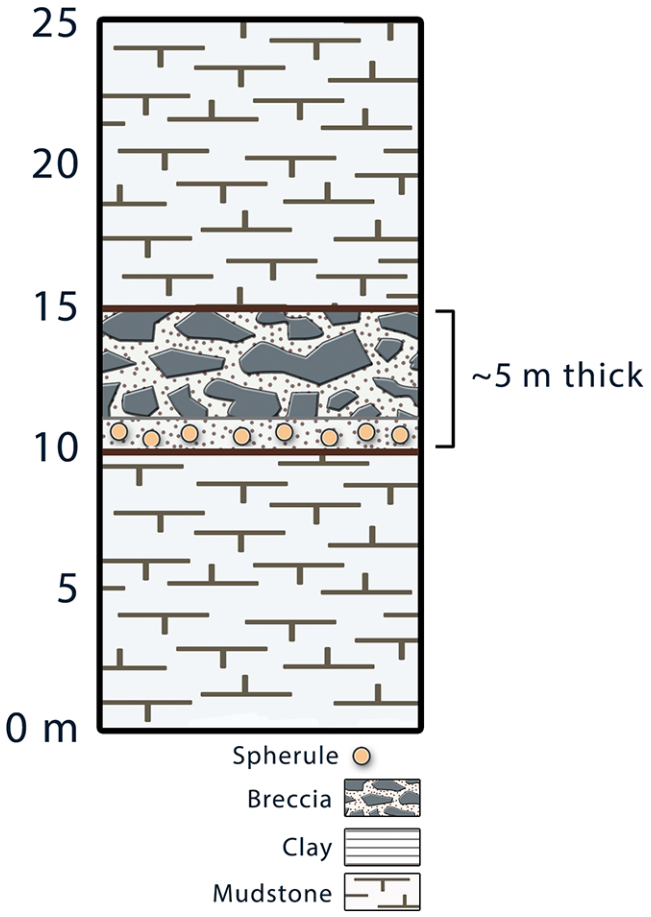
Broken-up rock is found close to the impact site

- K–T event deposits very close to the impact site may contain large chunks of broken-up rock, called **breccia**.
- Breccia represents parts of Earth's crust that were crushed by the asteroid impact.

Tsunami deposits also found close to the impact

- Some K–T event deposits also contain large rocks and boulders mixed with the ejecta.
- The rocks were carried there by giant waves generated by the force of the impact.

Deposit thickness depends on distance from impact



- In general, K–T boundary locations closer to the impact site have thicker deposits than sites farther away.

Evaluating the evidence

- K–T event deposits are found at sites all over the world — at varying distances from the crater.

Classification of sites

Close

- Deposit thickness greater than 10 cm.
- May contain breccia.
- May contain spherules, tektites, large and small shocked quartz grains, nickel-rich spinels, and iridium.

Intermediate

- Deposit thickness 1 to 10 cm.
- Does not contain breccia.
- May contain spherules, tektites, large and small shocked quartz grains, nickel-rich spinels, and iridium.

Distant

- Deposit thickness less than 1 cm.
- Does not contain breccia.
- May contain spherules, small shocked quartz grains, nickel-rich spinels, and iridium.

Today’s activity

- Today, you will evaluate K–T event deposits at 10 different K–T sites.
- You will map each site and determine whether it is close to, an intermediate distance from, or distant from the impact site.
- You will then propose the general location for the impact crater.
- Write down the iridium concentration for each site, if available.