

# DYNAMIC METAMORPHISM

The brittle rocks show clearly the effect of dynamic metamorphism.

The formed texture is more important than the mineralogical change.

Two types of dynamic metamorphism:

- 1- accompanying to fault planes.
- 2- Meteorite impact.





- ▶ Mylonite: a compact, without cleavage but with a streaky or layered structure; produced by the extreme granulation and shearing of rocks which's have been rolled out during overthrusting or by the action of dynamic metamorphism generally.
- ▶ Fault breccias: A breccia formed along a fault plane.



## B2- CATACLASTIC OR SHEAR ZONE METAMORPHISM

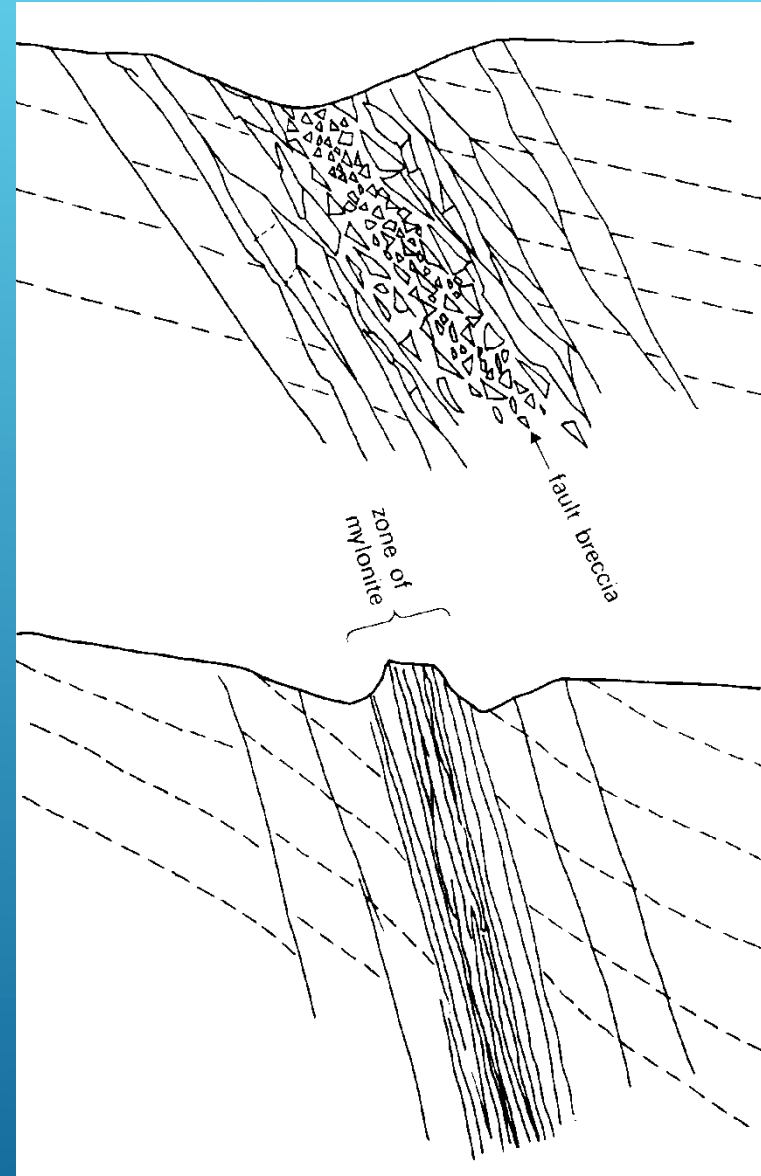
⇒ Features of cataclastic or shear zone metamorphism :


- where?: Restricted to the vicinity of faults of overthrusts in the upper crust level (brittle deformation)

-Agents of metamorphism is pressure in form of mechanical forces.

-The yielded rocks suffered crushing, granulation and pulverization (reducing in grain size).

- The yielded rocks are non-foliated and braccia-like, cataclasite, mylonite, ultramylonite to pseudotachylite.



- ▶ The granitic rocks away from the fault don't show any change in hand specimens while in thin sections:
  - ▶ Andulose extinction and lobulated form of quartz due to strain shadowing.
  - ▶ Pseudomorph of aggregate of finegrains of hornblende.
  - ▶ Bent in twin lamellae in plagioclase.
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# SHOCK METAMORPHISM

- occurs during impact events
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- yields very high pressures
- forms “shocked” rocks around impact craters

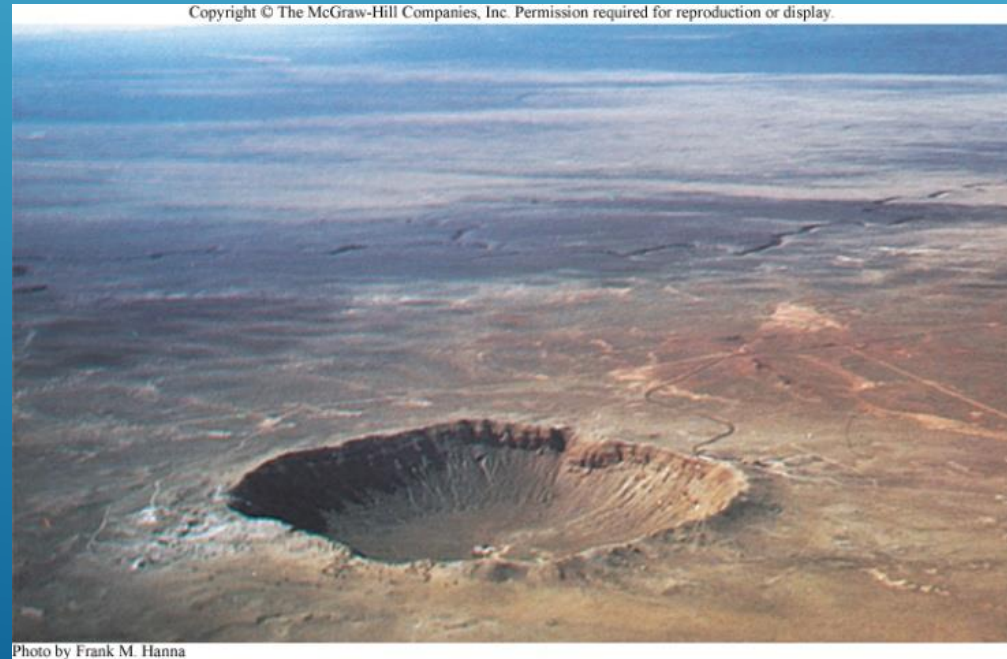


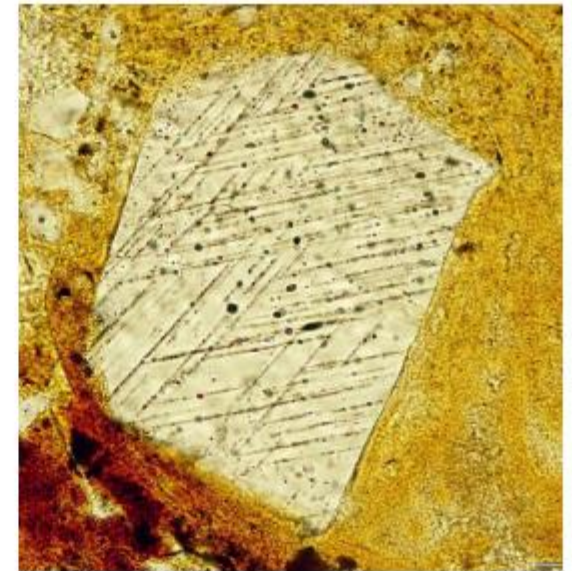
Photo by Frank M. Hanna

# Shock Metamorphism

- **Shock metamorphism** is characterized by distinctive, high-pressure minerals.
- Meteorite collisions produce shock metamorphism.



The Barringer impact crater (Meteor Crater)  
Arizona



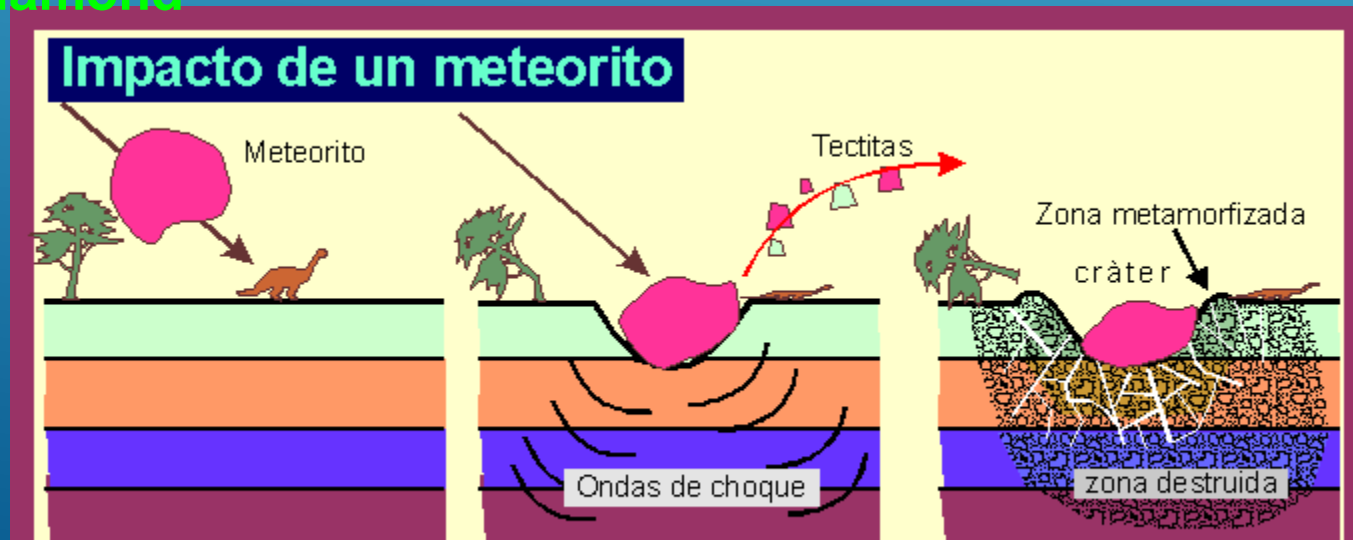
Shocked quartz from the Svasvesi  
impact structure, Finland

Photo:  
Martin  
Schmiede

## B4- IMPACT OR SHOCK METAMORPHISM


⇒ Features of impact metamorphism :

- Where?: Impact of fall meteorites with different size on the Earth's crust.
- This impact yielded shock waves with extreme higher P-T conditions, up to 1000 kbar and 5000 °C
- Duration time is very short, microsecond.
- The impacted rocks were vaporized, but in less condition, they melted to produce vesicular glass containing coesite and stishovite, as well as minute diamond





# SHOCK METAMORPHISM

- ▶ Ries Crater at Bavaria South Germany.
  - ▶ About 21-24 Km in diameter filled with Neogen sediments.
  - ▶ Fractures in quartz
  - ▶ Partial verification in feldspars
  - ▶ Weak pleochroism and birefringence at biotite.
  - ▶ Complete melting for granite.
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# METAMORPHISM AT MOON

Apollo 14-17.

Brescia formed of plagioclase and anorthosite in a groundmass of plagioclase and olivine.

