Collisions in the solar system

Collisions have played a major part in both the formation and the evolution of the solar system

Q: Can you give a number of pieces of evidence for collisions and impacts (a) In the early solar system? (b) Ongoing impacts?

Collisions early in solar system history

• The differing tilt of planetary rotation axes is best explained by a period of giant collisions



Evidence for early collisions:

 Craters and other features on Moon and Mercury (no tectonics to resurface)



Crater formation

- Shock reflection can form peak in center of crater
- Rocks can be crushed (breccia) or even melted if impact is energetic enough





The Moon's composition

- Apollo astronauts brought back samples of Moon rocks. They are *very* similar to rocks found on the surface of the Earth
- Current theory is that the Moon was formed from debris left from a giant collision between a Marssized object and the Earth



Chicxulub Impact Tsunami Impactor Diameter: 10 km Water Depth at Impact: 140 m



Impactor Energy: 3.1 x 10²³J

Tsunami Energy: 7.6 x 10¹⁷ J



Steven Ward UCSC



Yellow circles show estimated peak height in meters



Ongoing collisions:

Arizona meteor crater: 1 km wide, 50,000 years old





 Wolf creek crater in Australia, 1km diameter, 300,000 years old



More recent collisions:

 Tunguska, Siberia, 1908: (no crater) large cometary fragment thought to have exploded in atmosphere just above Earth's surface





