

## Giant Impacts

- Impacts long ago in the Solar System?
- Recent impacts?
- Likelihood of a life-threatening impact with Earth?
- What would happen?



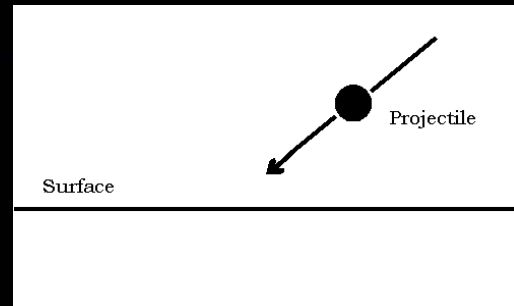
What happens when chunks of rock or ice hit planets?

## EVIDENCE FOR IMPACTS: CRATERS

- Craters plentiful on many solid surfaces throughout SS

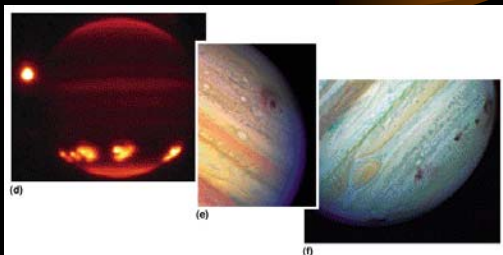


## CRATERS (ctd)



## Recent Impacts: 1994

- Comet hit Jupiter



Impacts still occur in the present!!

## GIANT IMPACTS ON EARTH: "RECENT" and FUTURE

- Could Earth be hit by a comet or asteroid?
- Craters \*do\* exist on Earth
- Arizona: 50,000 yr-old, ~1-mile wide crater from asteroid ~1/2 size of football field



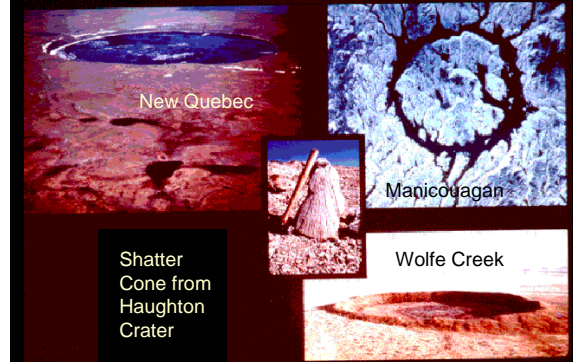
Meteor Crater: Arizona

## IMPACT BASICS

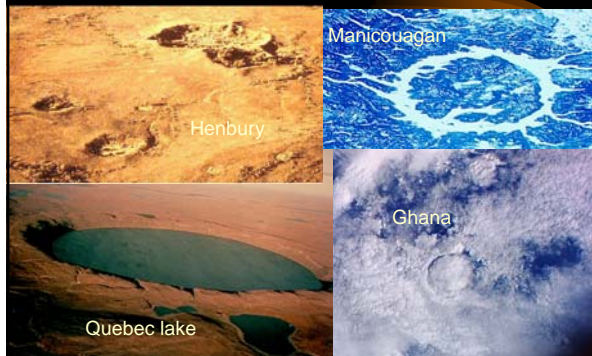
- Craters much bigger than impact object
- Barringer (Arizona) crater (~1 mile wide) produced by 50-ton or 50-m rock



## OTHER EARTH CRATERS



## OTHER EARTH CRATERS (2)



## Encounters in Human History

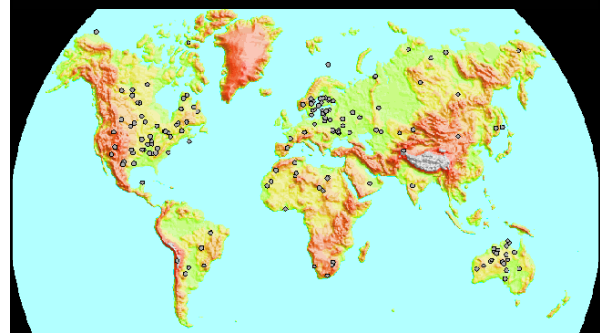
- Atmosphere protects us some, but
  - even objects ~1m in size can reach the ground
  - *Meteorite damages building every few years*
- October 9, 1992:
  - Meteorite smashed through rear end of car in Peekskill, NY
  - No one hurt, but Chevy Malibu not as lucky
  - [Peekskill fireball](#)
- Odds of being hit during your lifetime:
  - Without protection, crude calculation gives odds of ~ 1 in 1 billion

## Tunguska, Siberia, 1908:

- 50-m object caused a huge explosion in the atmosphere
- 2000 square km of flat trees
- Even 8km from ground zero trees flattened



## Map of Earth Craters



- Expect one crater > 50 km in size every ~10 million years!
- Expect one dino-killing impact every ~ 100 million years!

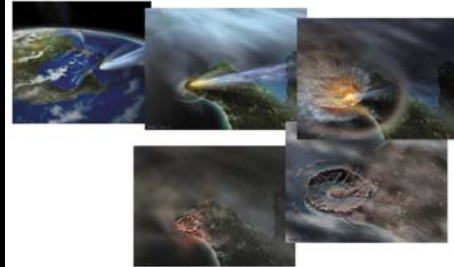
## *IMPACTS: Consequences*

<http://janus.astro.umd.edu/astro/impact/>

- 0.2-1km asteroid (bigger than Arizona crater maker):
  - Broil creatures within eyesight of atmospheric fireball
  - Fiery debris blasted into space, plummets back to Earth triggering huge fires
  - Skies darkened by soot/dust → block sunlight
  - Formation of poisonous gases
  - Huge earthquakes
  - If hits water instead, raise 35-km high splash in 40 seconds; tsunamis over area size of Pacific Ocean

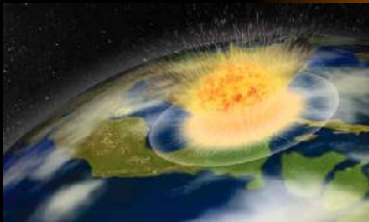
## *Impacts and Dinosaur Extinction on Earth*

- How does giant impact lead to death of the dinos?
  - debris in atmosphere blocks sunlight; plants die...animals starve
  - poisonous gases form in atmosphere



## *Want to know more about impact effects?*

- Another simulator at <http://www.lpl.arizona.edu/impacffects>



- Examples at <http://www.ece.arizona.edu/~rmarcus/examples.html>