XVI. Comets

A. Introduction

1. Fuzzy stars with tails

2. Small to moderately small, ice-rich bodies
3. Usually have highly elliptical orbits

4. Appear in the sky without warning & move relatively quickly

5. Can be bright enough to see in daytime
6. Abundance

B. Anatomy of a comet

1. Comet head
2. Nucleus

3. Coma

4. Comet tail - only develops relatively close to the Sun

a. Ion tail (often fluoresces bluish)

b. Dust tail (light-colored; often yellowish)

C. Some famous comets since 1900

1. **Halley's Comet (1910)**
2. **Comet Ikeya-Seki (1965)**
3. **Comet West (1976)**
4. **Comet Hyakutake (1996)**
5. **Comet Hale-Bopp (1997)**
6. **Comet Ikeya-Zhang (2002)**
7. **Comet McNaught (2007)**

D. Source of comets

1. **Short-period comets (periodic comets)**
   - **orbit the Sun regularly, on time scales of 200 years or less (can be as short as 3 years)**
   - **orbits usually prograde & close to the plane of the ecliptic**

2. **Long-period comets**
   - **very long-duration orbits (thousands to tens of thousands to millions of years)**
   - **may only visit the inner Solar System once**
   - **come in from any & all directions**

E. Some comets go into the Sun

F. Geology of comet nuclei - 6 have been visited & imaged (Halley, Tempel 1, Wild 2, Hartley 2, Borrelly, and Churyumov-Gerasimenko)

1. Shapes

2. Sizes

3. Density

4. Have dark-colored, organic-rich, surface crusts

5. Can break apart into many smaller pieces

6. Comet Churymov-Gerasimenko
~5 x 4 kilometers in size
- 2 distinct lobes (= separate comets that gently collided)

7. Comet Wild 2
~3 x 4 x 5 kilometers in size
- relatively pristine nucleus

8. Mineralogy & chemistry

a. Olivine

b. Pyroxene

c. Plagioclase feldspar

d. Pyrrhotite

e. Pentlandite

f. Ices (water ice, hydrogen peroxide ice, dry ice, carbon monoxide ice, ammonia ice)

g. Alcohols (methanol, ethanol, propanol, butanol, pentanol)

h. Petroleum gases (methane, ethane, propane, butane, pentane, hexane, heptane, probably octane as well)

i. Acids (formic acid, acetic acid, benzoic acid, hydrobromic acid, hydrochloric acid, hydrofluoric acid)

j. Noble gases (argon, krypton, xenon)

k. Lots of other chemicals, too

G. Possible rock from a comet