Jewel Cave

I. Introduction
   A. 3rd longest cave system in world and 2nd largest in US
   B. More than 195 miles & new passage continually being discovered
   C. Discovery and development
      1. 1900 – small hole in cliff wall discovered by 2 brothers
      2. walls covered by large, jewel-like crystals - hence its name
      3. began to guide visitors through the cave

II. Geologic History
   A. Deposition of rock units
      1. core of Precambrian Harney Peak Granite – intrusives within metamorphics
      2. Paleozoic deposition

   a) Cambrian: Deadwood Sandstone – sand carried into shallow seas by streams –
   b) Devonian: Englewood Limestone – thin unit as seas transgressed
   c) Mississippian: Pahasapa Limestone – deposited on floor of shallow sea
      i) Calcium carbonate and calcium magnesium carbonate (dissolves more slowly)
      ii) Thin beds of chert – resistant to erosion - forms ledges or knobs in the cave often covered with crystals
      iii) Fossils: brachiopods & corals

   B. Sea level dropped several hundred feet and exposed Pahasapa to erosion
   C. Uplift of Black Hills – Laramide Orogeny – 60 – 70 m.y.a.

      1. erosion stripped away sedimentary rocks in center of uplift

         a. carved Harney Peak Granite and metamorphics into rugged peaks

      2. erosion continued and underground water flowed through Pahasapa
      3. water table dropped and cave became air filled
      4. eroded material covered surrounding area and buried springs – water table rose and cave filled with water – calcite spars
         a. eroded material deposited to form Badlands
      5. uplift created intersected vertical joints & fractures - continuously widened by solution
      6. sequences of water table fluctuations created sediment and cave features
         a. most of the cave was formed by slowly circulating, acidic-rich groundwater
      7. today water table is 160’ below lowest point in cave and 500’ below surface

Wind Cave

I. 1881 - Bingham brothers heard a whistling sound coming from a small hole in the ground.

II. Became National Park in 1903.

- A. First cave to be designated as a national park anywhere in the world

III. Characteristics

- A. Portions are over 300 million years old: one of oldest in the world
- B. The cave is large and extremely complex.
  1. Three dimensional maze cave densest cave system in world (greatest volume/sq. mi)
- C. 148 miles of known cave
- D. The boxwork is rare and found in few other caves – 95% of world's boxwork found here
- E. Winds caused by changes in barometric pressure - over 70 mph at cave entrance

Mammoth Cave

I. History

- A. First explorers were prehistoric Indians from 3000 – 4000 years ago
- B. Saltpeter mined for War of 1812.
- C. 1838 - black slave, Stephen Bishop, became first cave guide and explorer.
- D. 1908 - German engineer was the first to map the cave.
- E. Became a national park in 1941
- F. Mammoth Cave and surrounding area declared International Biosphere Reserve in 1990.

II. Geographic setting

- A. world's longest known cave system
  1. 400+ miles explored potential for 1000 miles
  2. is the heart of the South-Central Kentucky karst
     - a. rapid subsurface drainage through limestone and cave systems
     - b. integrated set of subterranean drainage basins - more than 1,050 km^2 – 400 mi^2

III. Geologic setting

- A. Genevieve Limestone and Girkin Formation.
- B. Overlain by Big Clifty - insoluble sandstone - and shale.
- C. Change in marine to terrestrial environment

IV. Cave features

- A. Long, winding, nearly horizontal passages formed by running water
  1. scallops in cave walls tell the direction and velocity of the water flow
     - a. steep side faces the downstream direction.
- B. Green River

1. base – level stream for the cave system
2. River Styx, and Echo River (latter two are springs).
3. Very few rivers on surface because of limestone

C. Typical speleothems seen only in area where Big Clifty and shale do not cap the limestone layers.

Carlsbad Caverns

I. History

A. First explored by local ranchers
   1. Native Americans would not explore the cave because of sharp drop-off near entrance
   2. Cave existence was well-known because of the cloud of Mexican free-tailed bats that left the cave for their nocturnal feeding
      a. Cave is now a sanctuary for about 1 million of the bats

B. National Monument on October 25, 1923.

C. National Park on May 14, 1930.

D. World Heritage Site on December 6, 1995.

E. established to preserve Carlsbad Cavern and numerous other caves within a Permian-age fossil reef

F. 110 separate caves, including the nation's deepest limestone cave - 1,597 feet

II. Geologic setting

A. Permian
   1. small inland sea in the area
   2. 400 mile-long horseshoe-shaped reef – Capitan Reef
      a. remains of sponges, algae and seashells and from calcite that precipitated directly from the water.
   3. became isolated from the ocean
      a. sea evaporated and reef was buried under deposits of salts and gypsum

B. End of Mesozoic
   1. Laramide Orogeny
      a. uplifted and tilted the area to the southeast – Guadalupe Mountains
      b. reef exposed to surface water which began dissolving the limestone
      c. hydrogen sulfide gas migrated upward from oil and gas deposits beneath the ancient reef
         i. hydrogen sulfide (H_2S) and newly discovered microbes combine with oxygen in the underground water table to form sulfuric acid
         ii. dissolution of passageways occurred at the level of the water table along cracks, fractures and faults in the limestone.
   2. sequence of uplift and pauses in between account for distinct levels
      a. Guadalupe Mountains uplifted little by little

b. the level of the water table dropped in relation to the land surface
c. highly aggressive “acid bath” drained away leaving a newly dissolved cave behind