

Topics

- ◆ today Mars, Chapter 9
- ◆ next time, formation of Jovian planets
- ◆ Course grades posted on web site
- ◆ Final exams:
 - Sec 1 (Dec 11), Sec 2 (Dec 14); both 8AM
 - Review Monday Dec 10, 5-6PM, this room
 - 100 questions, worth 200 points
 - 50% review, 50% last quarter of course

The “Face” on Mars

- ◆ discovered during Viking 1 orbiter reconnaissance of Northern Plains
 - in region of buttes and mesas along escarpment separating N. plains from south
 - heavily eroded ocean bottom from Mars' Middle Period
- ◆ age: less than few billion years
 - very few impact craters in region
- ◆ probably eroded hill

Landers on Mars

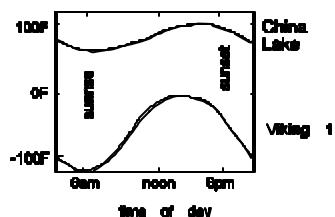
- ◆ 3 spacecraft have landed to study surface
- ◆ 2 in northern smooth plains area, one in southern highlands
- ◆ found
 - rock-strewn terrains like deserts on Earth
 - pitted rocks of volcanic origin
 - Martian soil composed iron rich clays
 - no evidence of life on Mars today
 - but strange chemical reactions took place

No ozone layer

- ◆ Solar ultraviolet light strikes surface
 - Ozone in Earth's atmosphere protects us
- ◆ Damages delicate organic molecules
- ◆ Converts oxygen-containing rocks into “superoxides”
 - Bleach-like oxidants that would burn any organic material they touched
 - These caused strange reactions detected by landers
- ◆ But simple life could survive underground

Temperatures in Two Deserts

- ◆ bigger range on Mars because greenhouse effect is less efficient



Steps to a Martian Dust Storm

- ◆ convection between night and day sides
 - caused by large temperature swing
 - produces 50-200 mph winds
- ◆ dust blown into upper atmosphere (no rain to clear air)
- ◆ sunlight blocked by dust - upper air gets warmer and surface cooler
- ◆ winds get worse, blowing more dust into air
- ◆ led to discovery of “nuclear winter”

Terraforming

- ◆ altering a planet's climate to be like Earth's
- ◆ Mars:
 - melt CO₂ to start greenhouse effect
 - this raises temperature, so rest of CO₂, water, melts
 - establish green plants, algae
 - these change CO₂ to O₂
- ◆ Venus:
 - no water (steam) - divert comets to land there

human intervention required for these steps

Mars - the big questions

- ◆ did life get started?
- ◆ is there microscopic life today?
- ◆ How long did the Middle Period last, and why did it end?