

## 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

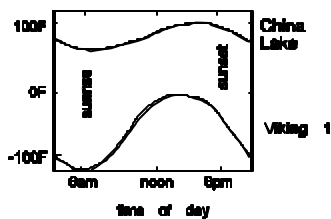
- ♦ 3 spacecraft have landed to study surface
- ♦ 2 in northern smooth plains area, one in southern highlands
- ♦ found
  - rock-strewn terrains like deserts on Earth
  - pitted rocks of volcanic origin
  - Martian soil composed iron rich clays
  - no evidence of life on Mars today
  - but strange chemical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

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- ◆ altering a planet's climate to be like Earth's
  - ◆ Mars:
    - melt CO<sub>2</sub> to start greenhouse effect
    - this raises temperature, so rest of CO<sub>2</sub>, water, melts
    - establish green plants, algae
    - these change CO<sub>2</sub> to O<sub>2</sub>
  - ◆ Venus:
    - no water (steam) - divert comets to land there
- human intervention required for these steps

## Mars - the big questions

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