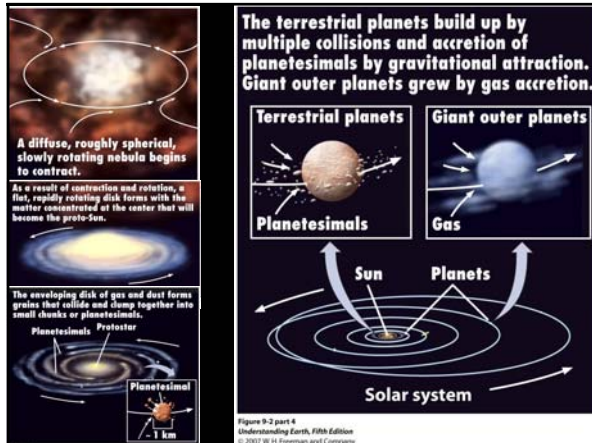


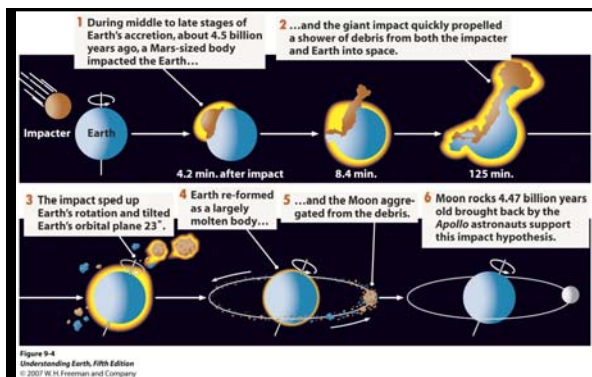


Chapter 9 Opener
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G-100 Lecture

The Early Earth, Planets, & Life





Collision of Earth with Mars-sized body 4.5 b.y. ago melts Earth (magma ocean); forms moon

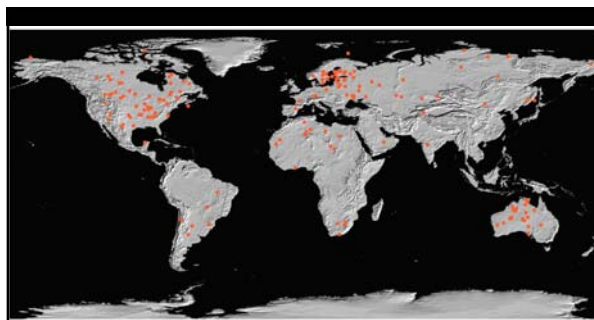
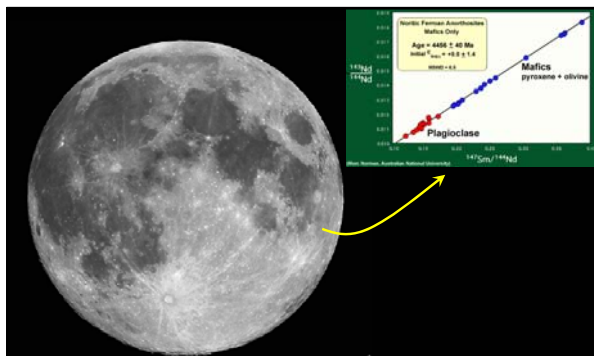
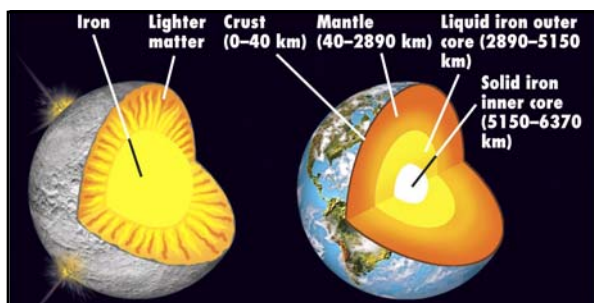


Figure 9-18
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Location of impact craters on Earth



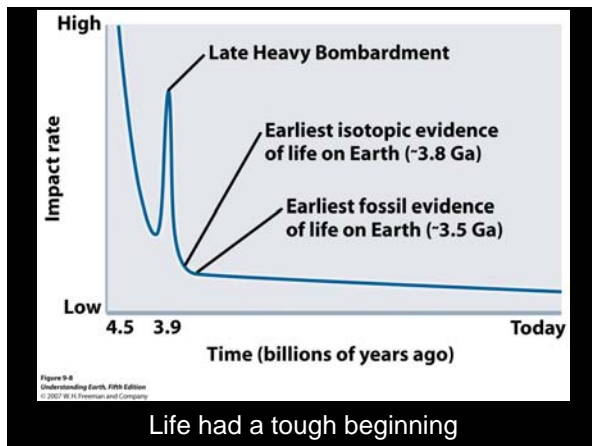
Ages of meteorite bombardment comes from radioisotopic dating of moon

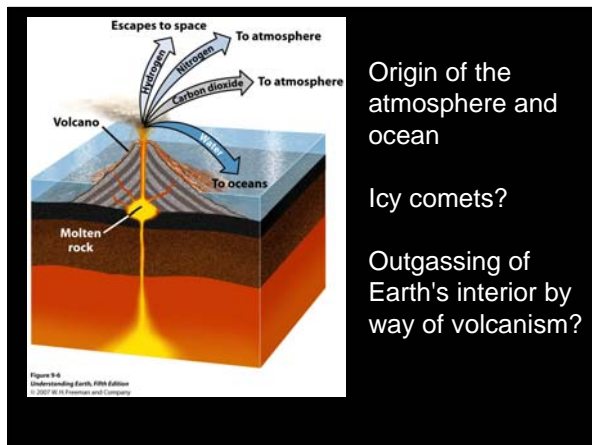


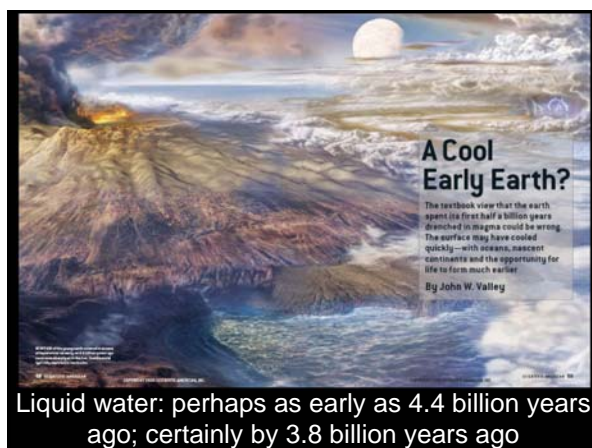
During differentiation, iron sank to the center and lighter material floated upward...

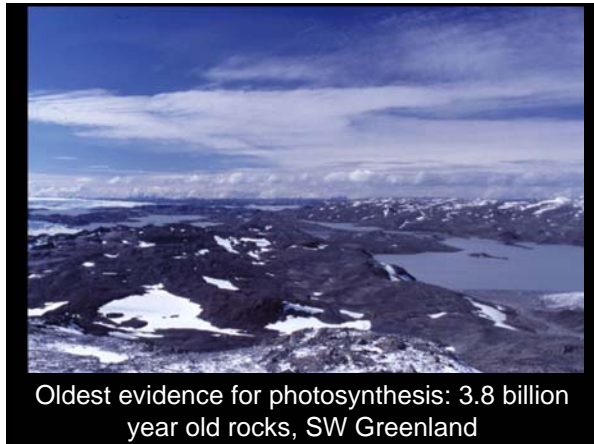
...to give us Earth as a zoned planet.

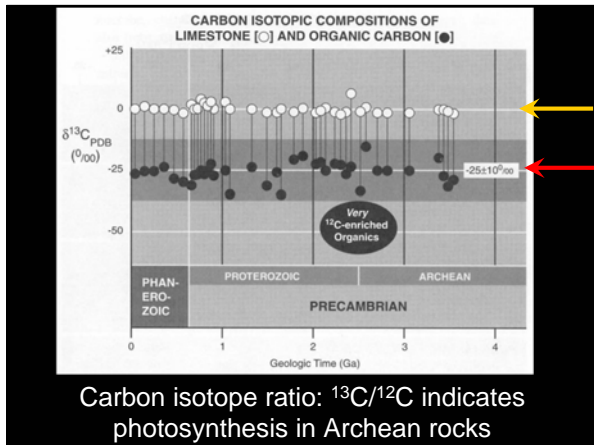
Figure 9-5
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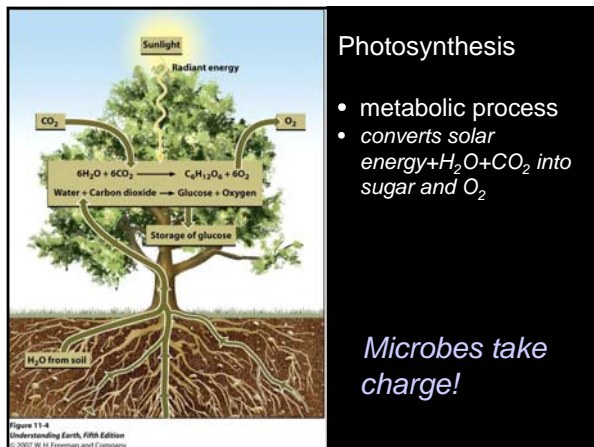













Modern stromatolites in Shark Bay, Australia, grow in the intertidal zone.



A cross section of this stromatolite reveals layering similar to that seen in ancient stromatolites.





Figure 11.12a
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Ancient stromatolites (over 1 billion years old) in cross section form columns, northern Siberia, Russia.



Microbial mats in Archean and Proterozoic rocks



Microbial metabolisms


Producers-make own food

Type	Energy Source	Carbon Source	Example
Photoautotroph	Sun	CO ₂	Cyanobacteria
Photoheterotroph	Sun	Organic compounds	Purple bacteria
Chemoautotroph	Chemicals	CO ₂	H, S, Fe bacteria
Chemoheterotroph	Chemicals	Organic compounds	Most bacteria, fungi, and animals, including humans

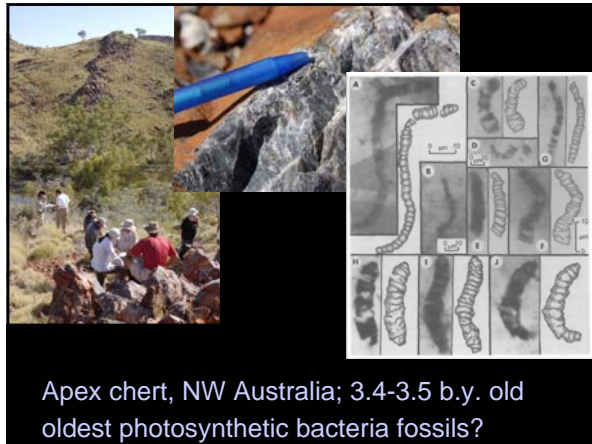
Table 11.1
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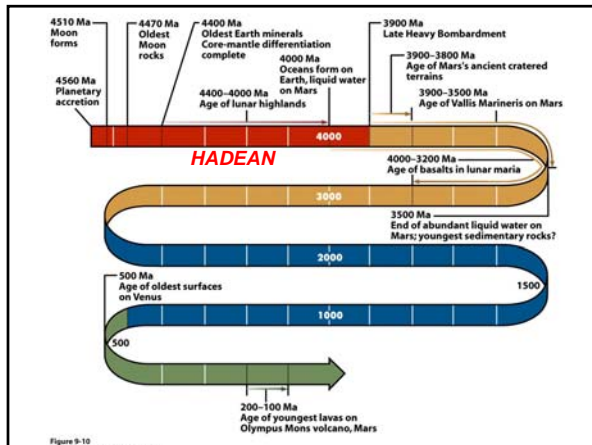
Consumers-feed on producers

Chemoautotrophs & Chemoheterotrophs can live on rocks



Iron respiring bacteria on iron oxide mineral (hematite Fe₃O₄)





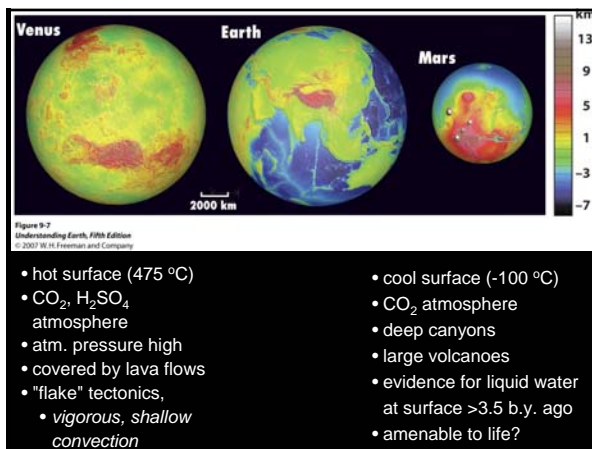




Figure 9-19

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<http://www.jpl.nasa.gov/videos/mer/mer20070104/mer20070104-480.mp4>

Mars Exploration Rovers (Spirit) June 2003-today!

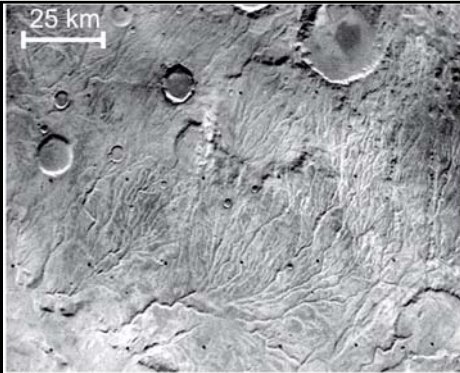


Figure 9-22

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Viking lander (1970's): dry river channel networks

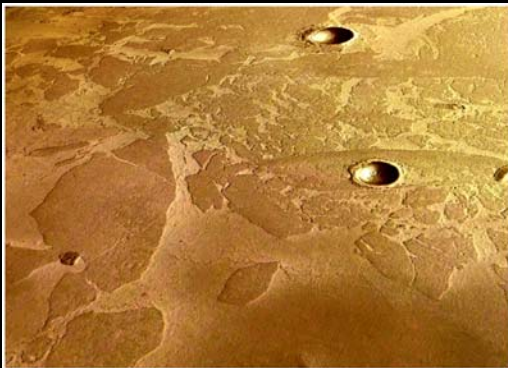
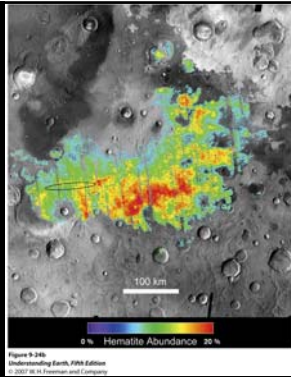


Figure 9-20

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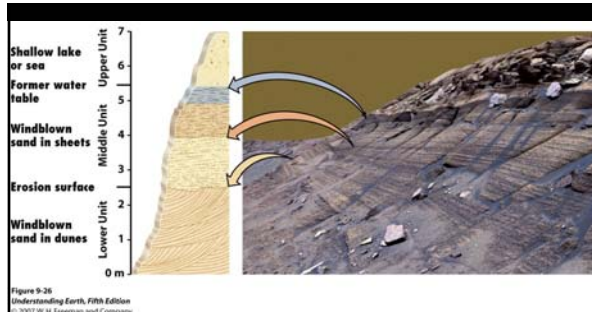
Mars Express orbiter: dust covered frozen sea



Mars Exploration Rover (Opportunity)
landing site: plains with hematite



Mars Exploration Rover (Opportunity)
sulfate-rich sedimentary rock



Mars Exploration Rover (Opportunity)
stratigraphy of Endurance crater
