

Origin of life

Possibilities

- (supernatural)
- Panspermia
- Extraterrestrial
- Spontaneous generation
- Vs:
- Redi 1600s
- Pasteur 1800s

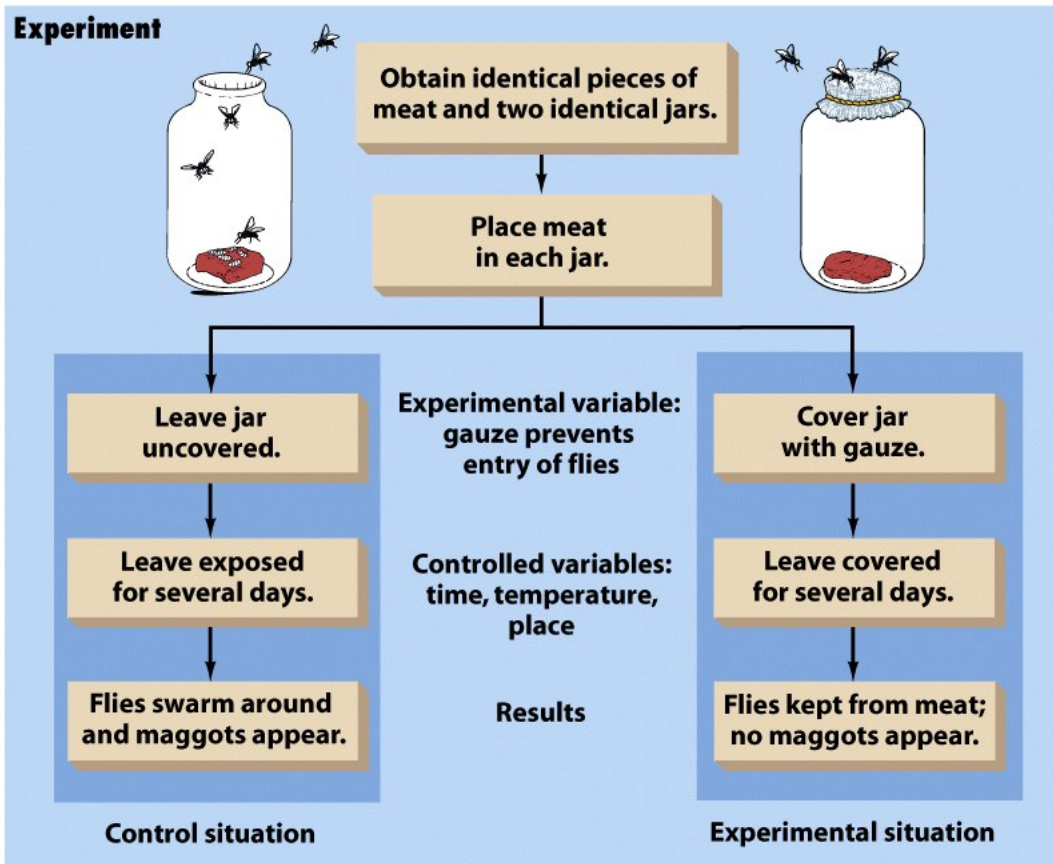
Observation: Flies swarm around meat left in the open; maggots appear on meat.

Question: Where do maggots on meat come from?

Hypothesis: Flies produce the maggots.

Prediction: IF the hypothesis is correct, THEN keeping the flies away from the meat will prevent the appearance of maggots.

Experiment



Conclusion: The experiment supports the hypothesis that flies are the source of maggots and that spontaneous generation of maggots does not occur.

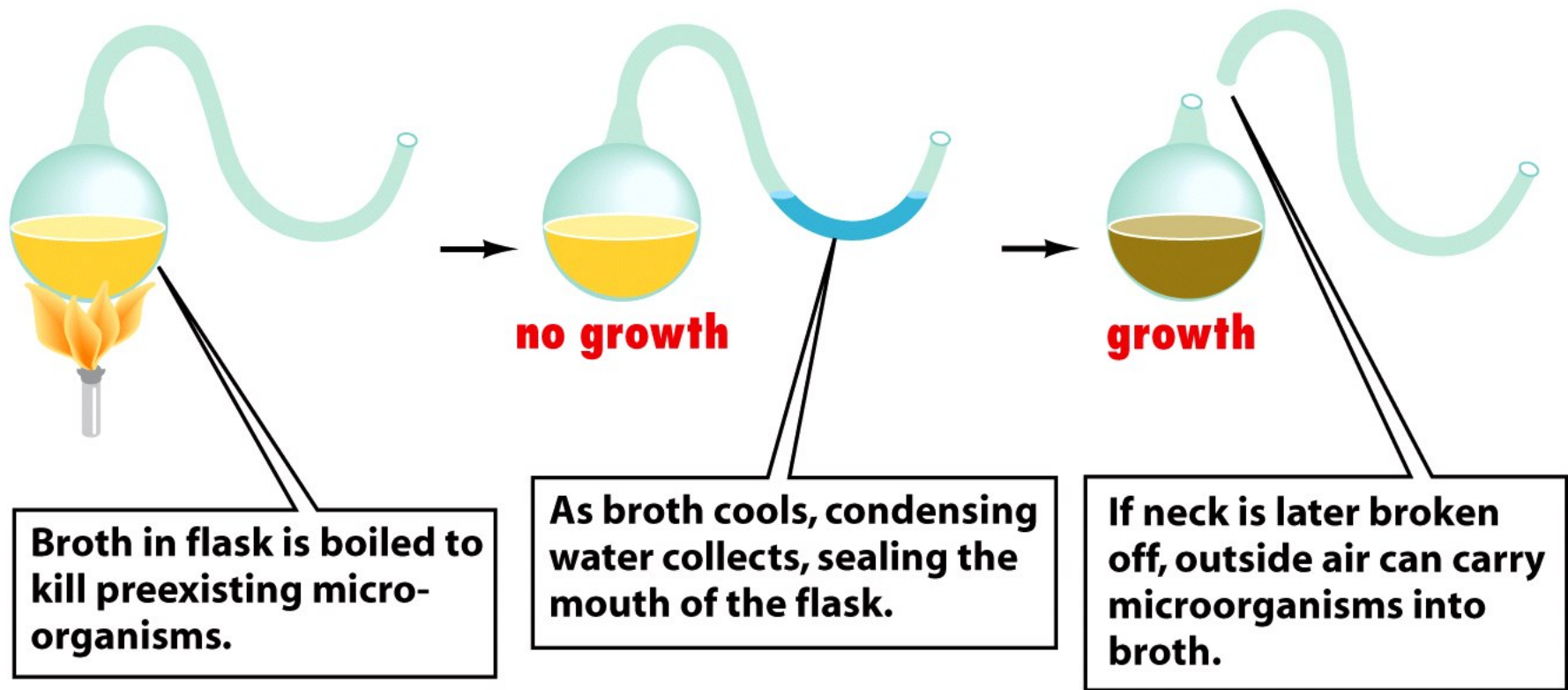


Figure 17-1 Biology: Life on Earth, 8/e
© 2008 Pearson Prentice Hall, Inc.

History of universe

- Universe 15 - 20 billion years old
- Earth 4.6 billion
- Earth has water as liquid, many heavy elements
- In past:
- Water was vapor
- Atmosphere had different gasses

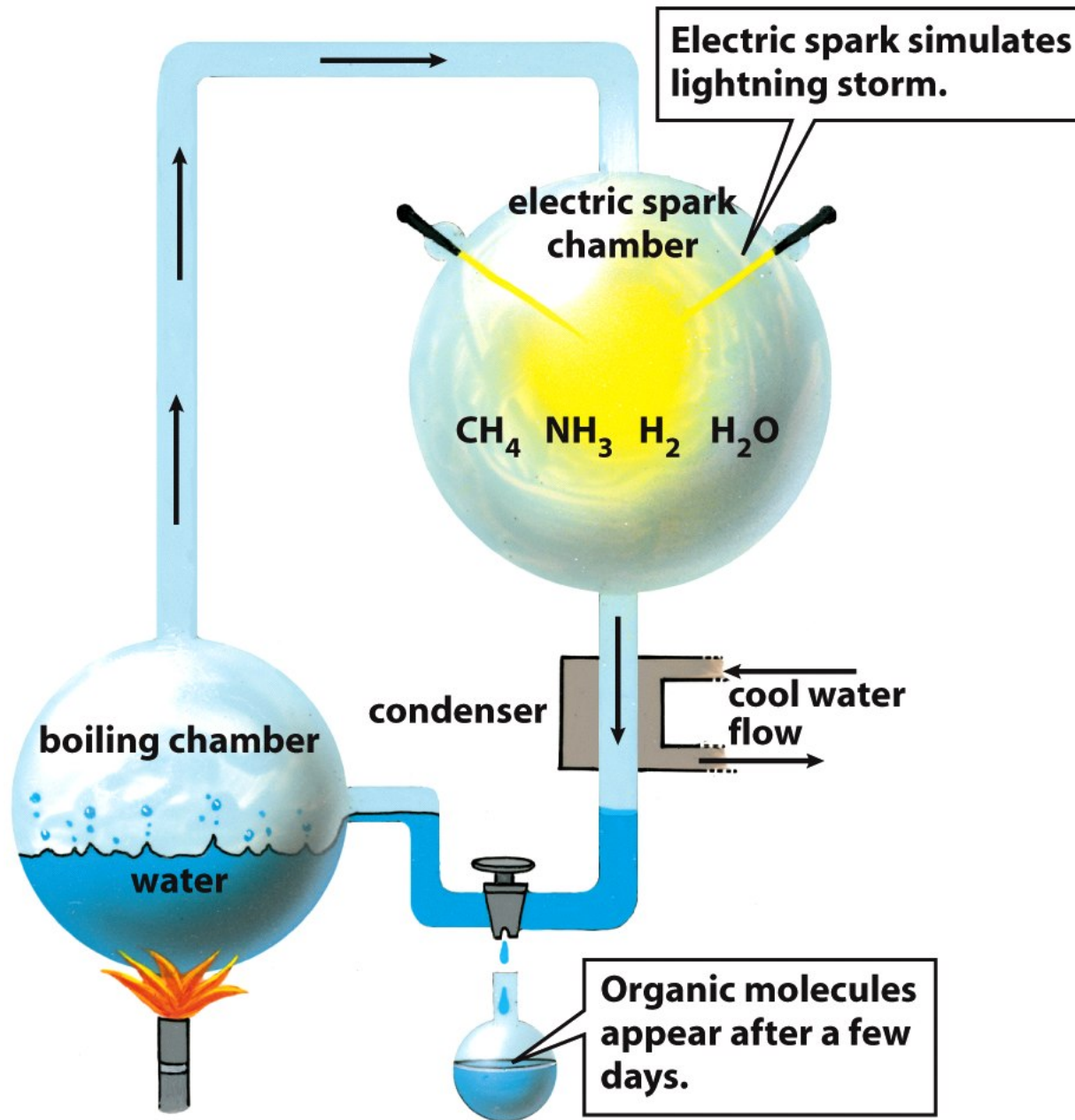


Figure 17-2 Biology: Life on Earth, 8/e
© 2008 Pearson Prentice Hall, Inc.

Early atmosphere

- (there's still some debate):
- Nitrogen (N₂),
- Hydrogen (reducing = build-up), Methane (for C, H),
- Ammonia (for N, H),
- Carbon dioxide (for C, O),
- Water (for H, O),
- also some Hydrogen - sulfide (S),
- CO (carbon monoxide)

Importantly

- No (or very little):
- Oxygen O₂ (oxidizing = break-down)
- Ozone O₃ (block UV [ultraviolet light])

now

- N₂ 78%,
- O₂ 21%,
- CO₂ 0.3%
- + others (Argon)

Chemical-biological evolution

- Primordial hot dilute soup
- amino acids hook together with "geologically relevant" heating like lava
- amino acids - proteins,
- nucleotides - RNA, DNA, ATP
- Eventually, DNA became the major hereditary molecule because it is so stable.
- Probably RNA was the first hereditary material.

Then

- Polysaccharides
- Vesicles, protocells
- In the laboratory, such protobionts have been made.
- Prokaryotes 3 & 1/2 billion years ago

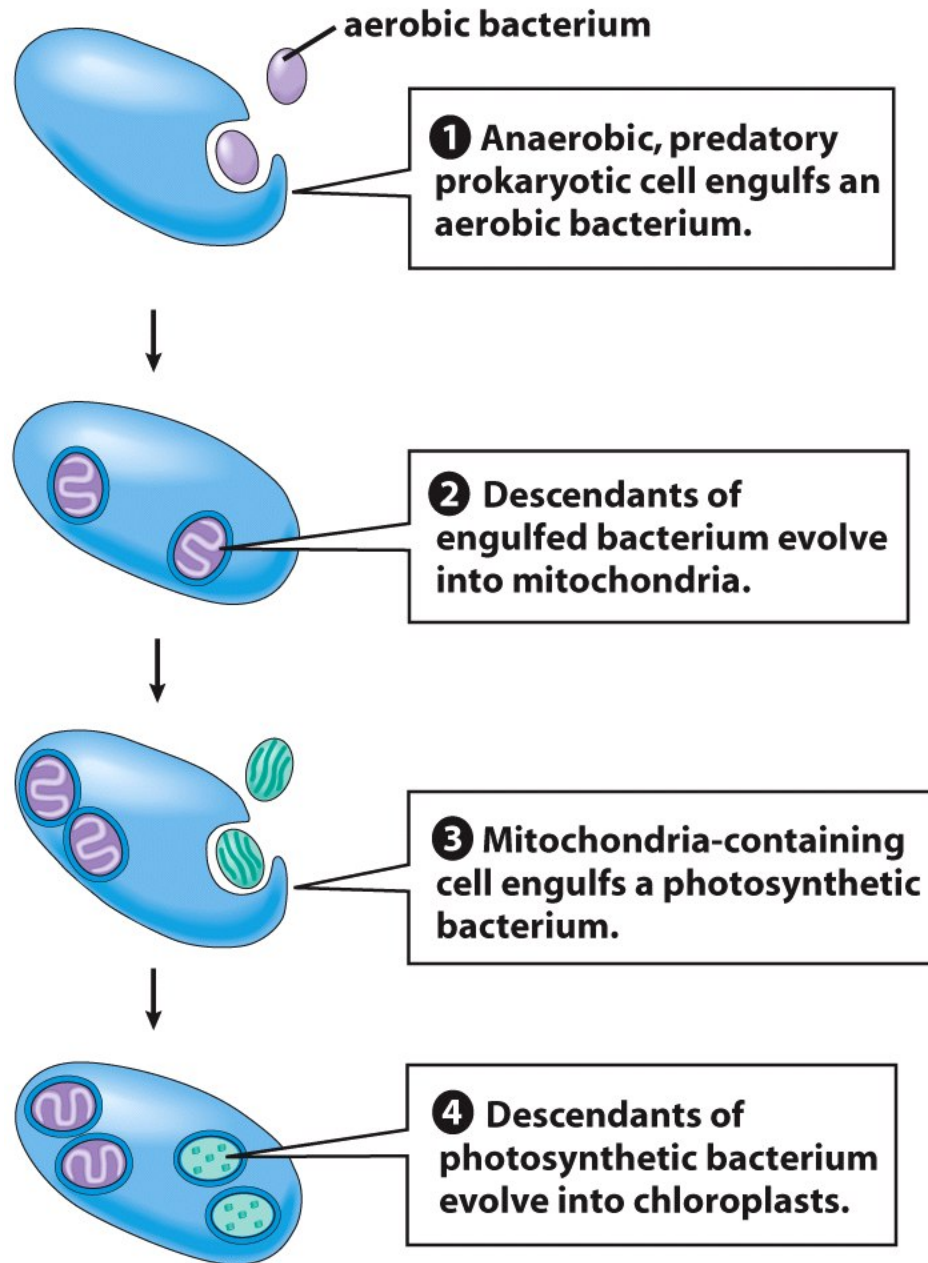


Figure 17-4 Biology: Life on Earth, 8/e
© 2008 Pearson Prentice Hall, Inc.

Major developments

- Eukaryotes (1 & 1/2 billion years ago)
- mitochondria - chloroplasts as endosymbionts
- Ferment (energy and CO₂)
- (anaerobic = w/o oxygen)
- Photosynthesis $6 \text{ CO}_2 + 6 \text{ H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6$
(glucose) + O₂
- Animals - motility, sensory
- Respiration (metabolism, aerobic)

Once there was oxygen

- Ozone (O₃) from O₂
- Prior to that, all life had to be in the sea for protection from ultraviolet light
- Current concern: O₃ depletion with freon (fluorocarbons)

Invasion of land

- special requirements:
- (1) vascular system to transport nutrients, wastes, gasses and hormones for multicellular organisms,
- (2) support on land where gravity is more of a concern
- (3) mating without water