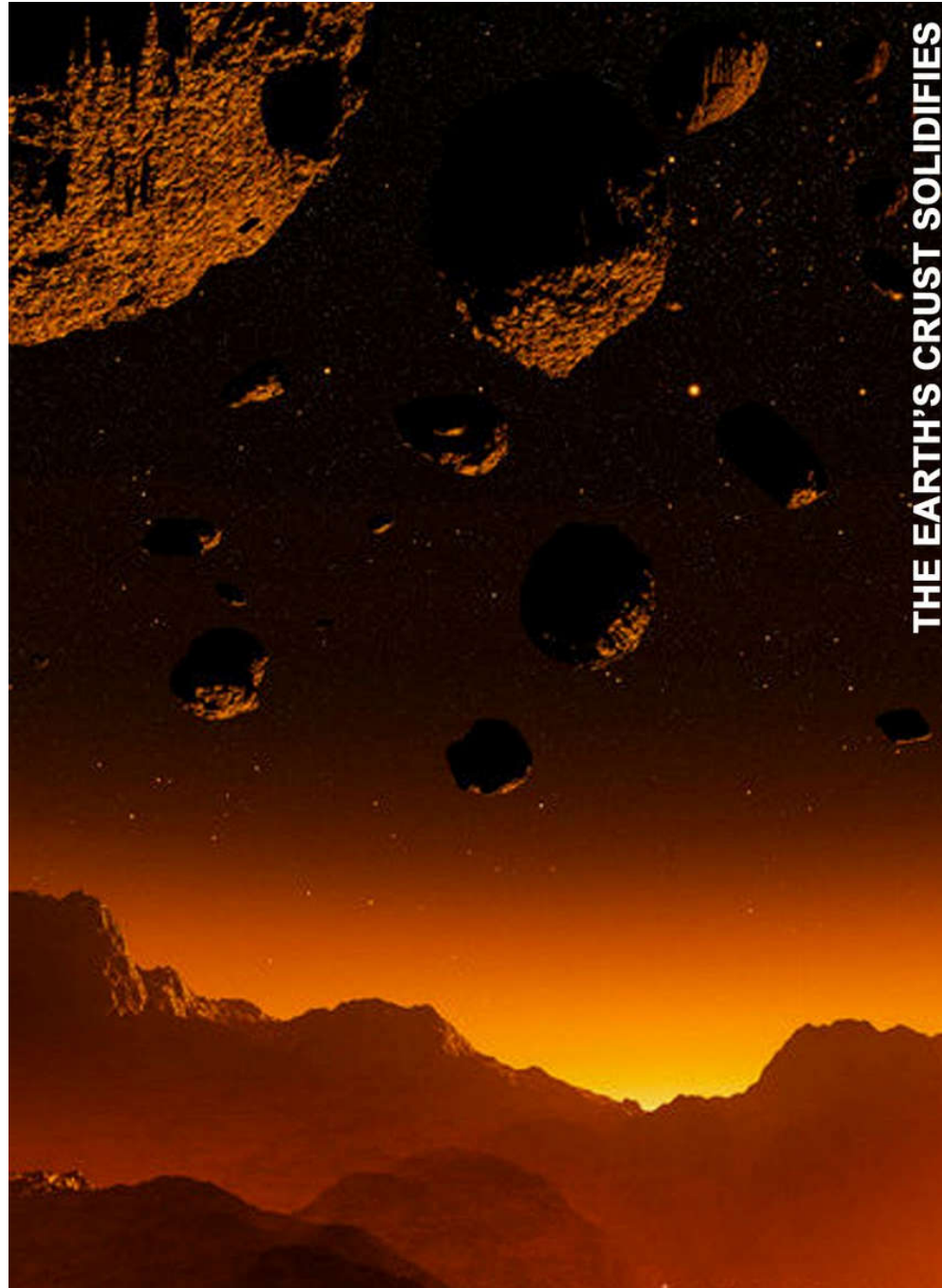


Origin of Life

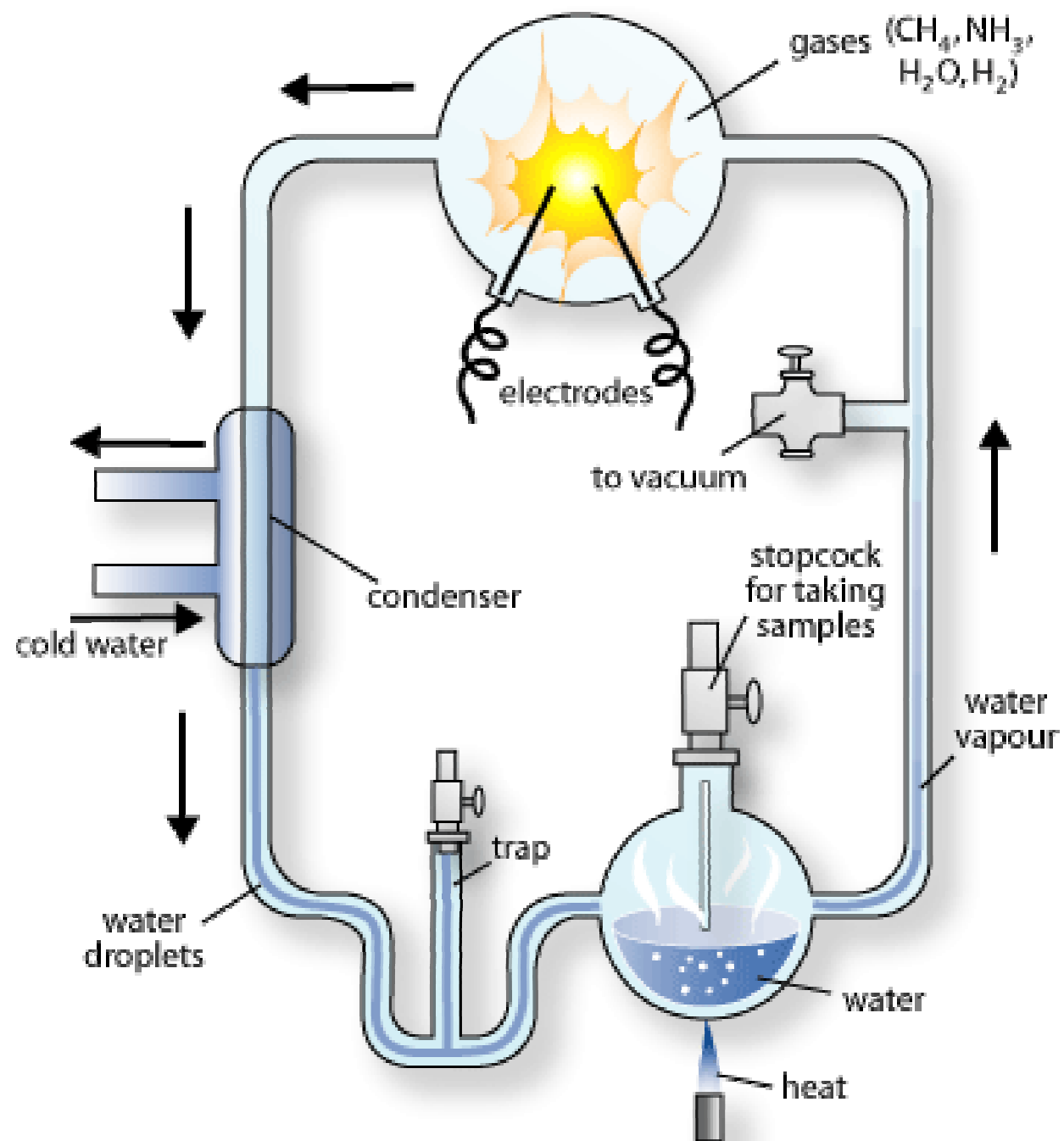
ศราวุธ คลอวุฒิมันตร์
สาขาวิชาชีววิทยา
คณะศิลปศาสตร์และวิทยาศาสตร์
มหาวิทยาลัยเกษตรศาสตร์

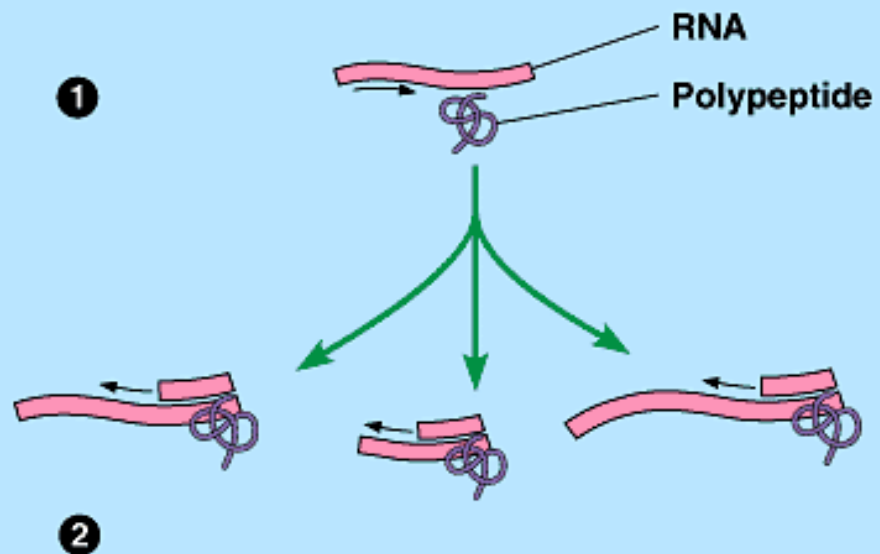
THE EARTH'S CRUST SOLIDIFIES



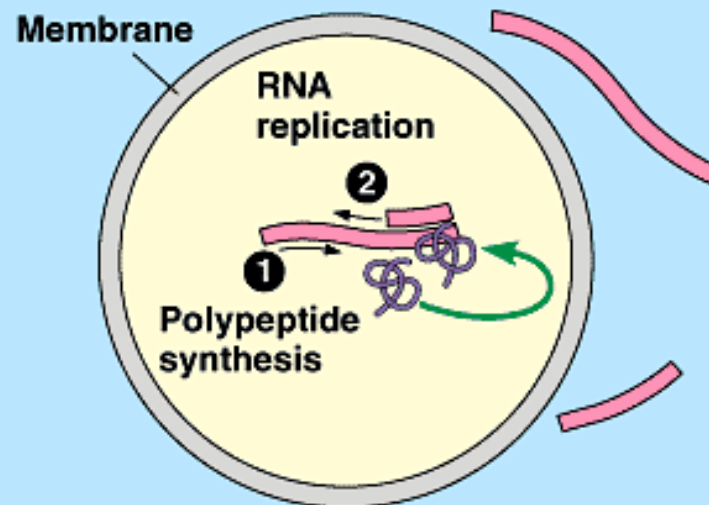
HADEAN EON when the Earth cooled down and the Earth's Crust were formed, accompanied by violent outgassing, planetesimal bombardment, and extended periods of rain, which cooled the crust and formed the oceans where the first life would eventually take shape.



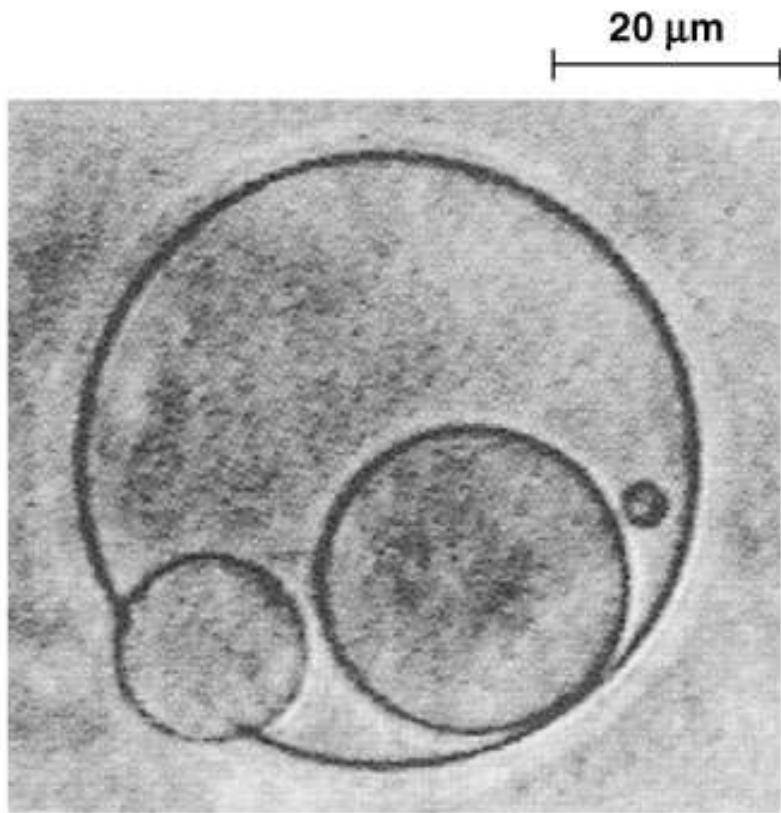




(a) A molecular "free-for-all" in the prebiotic soup of organic molecules.

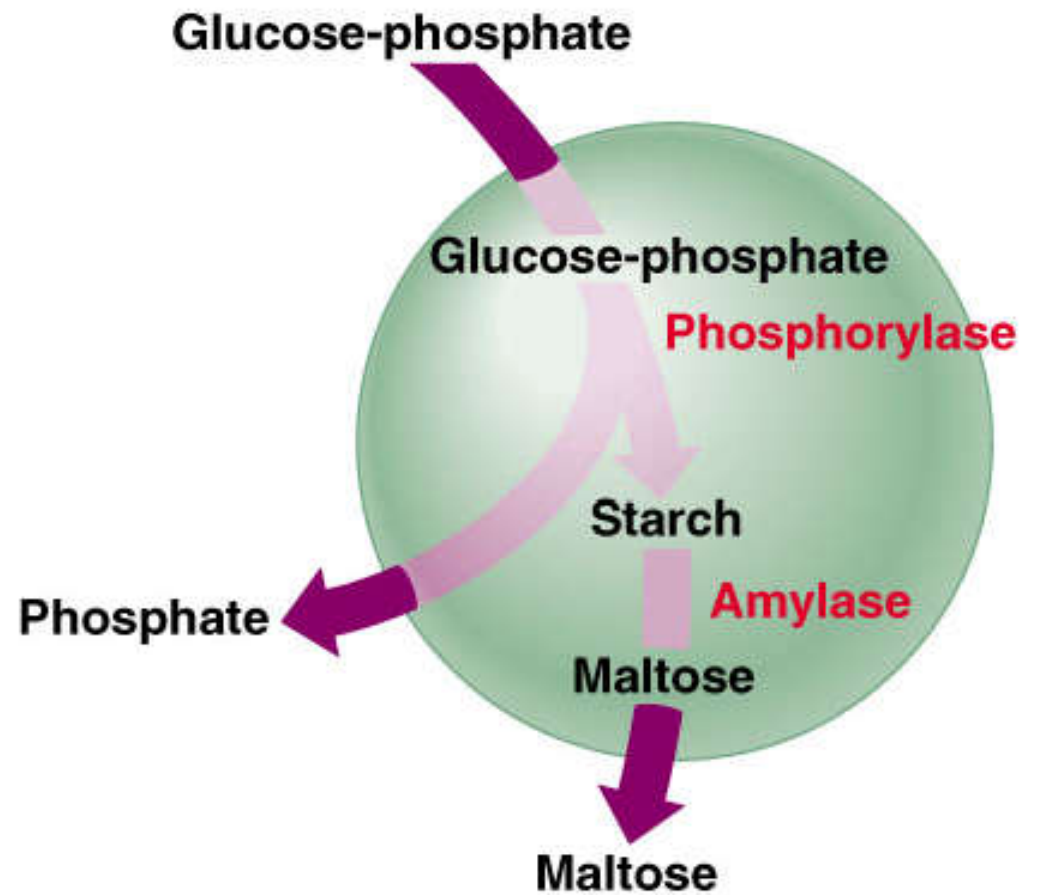


(b) Exclusive cooperation among membrane-enclosed molecules.

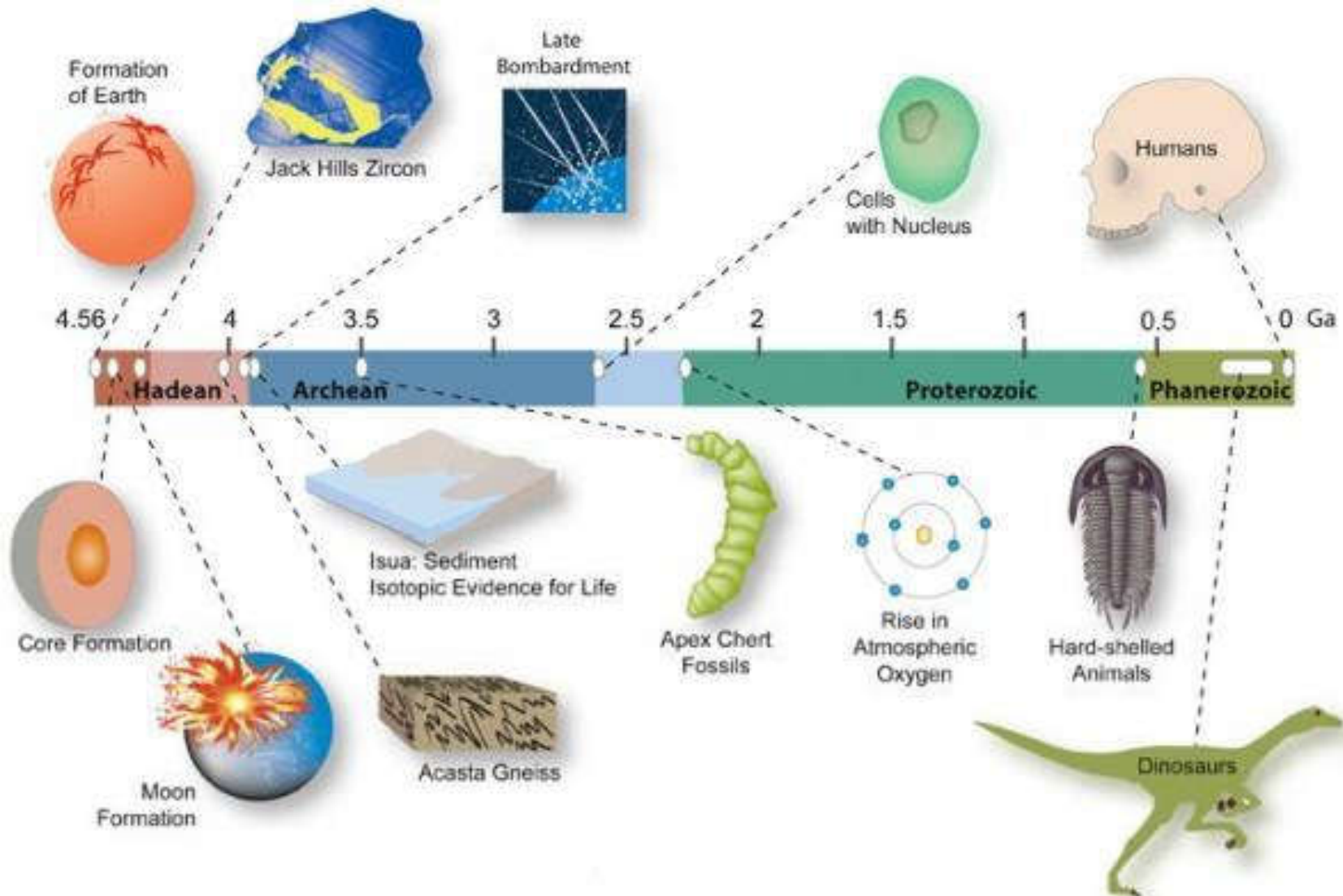


(a) Simple reproduction

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(b) Simple metabolism



Precambrian

Cambrian

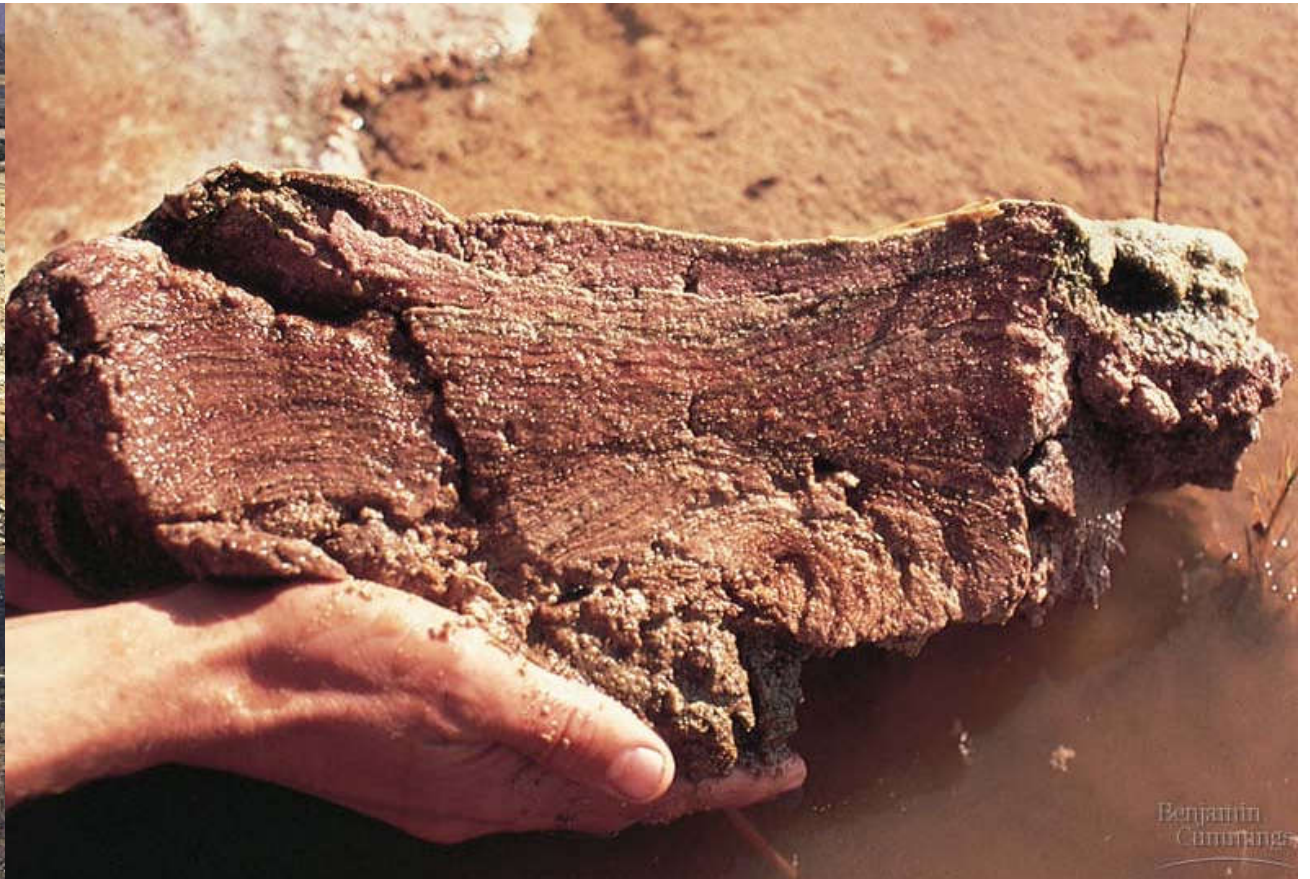
Early and modern prokaryotes



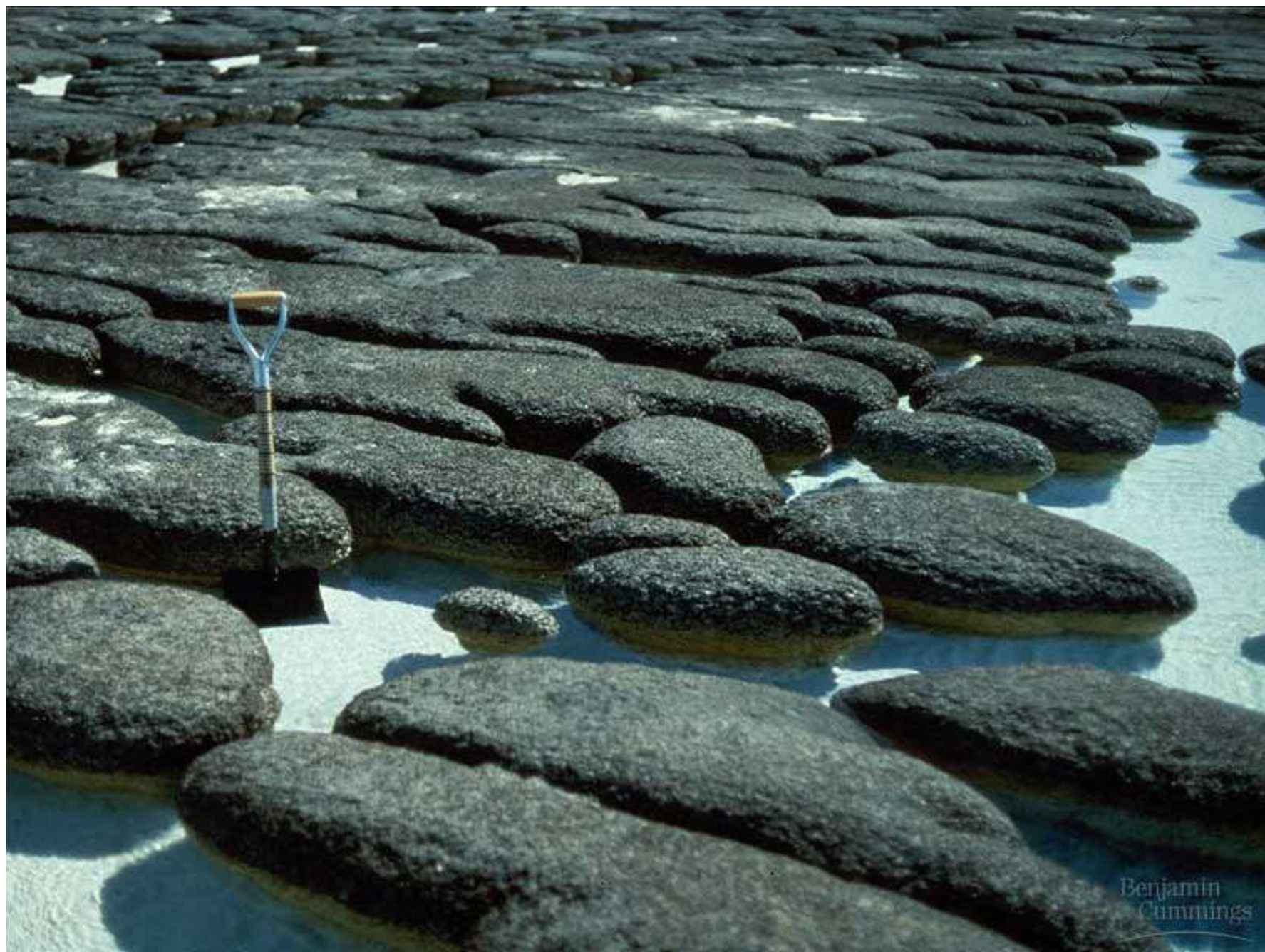
หลักฐานฟอสซิลของแบคทีเรีย

- Stromatolites
 - เป็นแบคทีเรียจำนวนมากที่อาศัยเป็นผืนและกลายเป็นฟอสซิล
 - มักมีลักษณะเป็นชั้น ๆ ทับกัน

แผ่นแบคทีเรีย และstromatolites

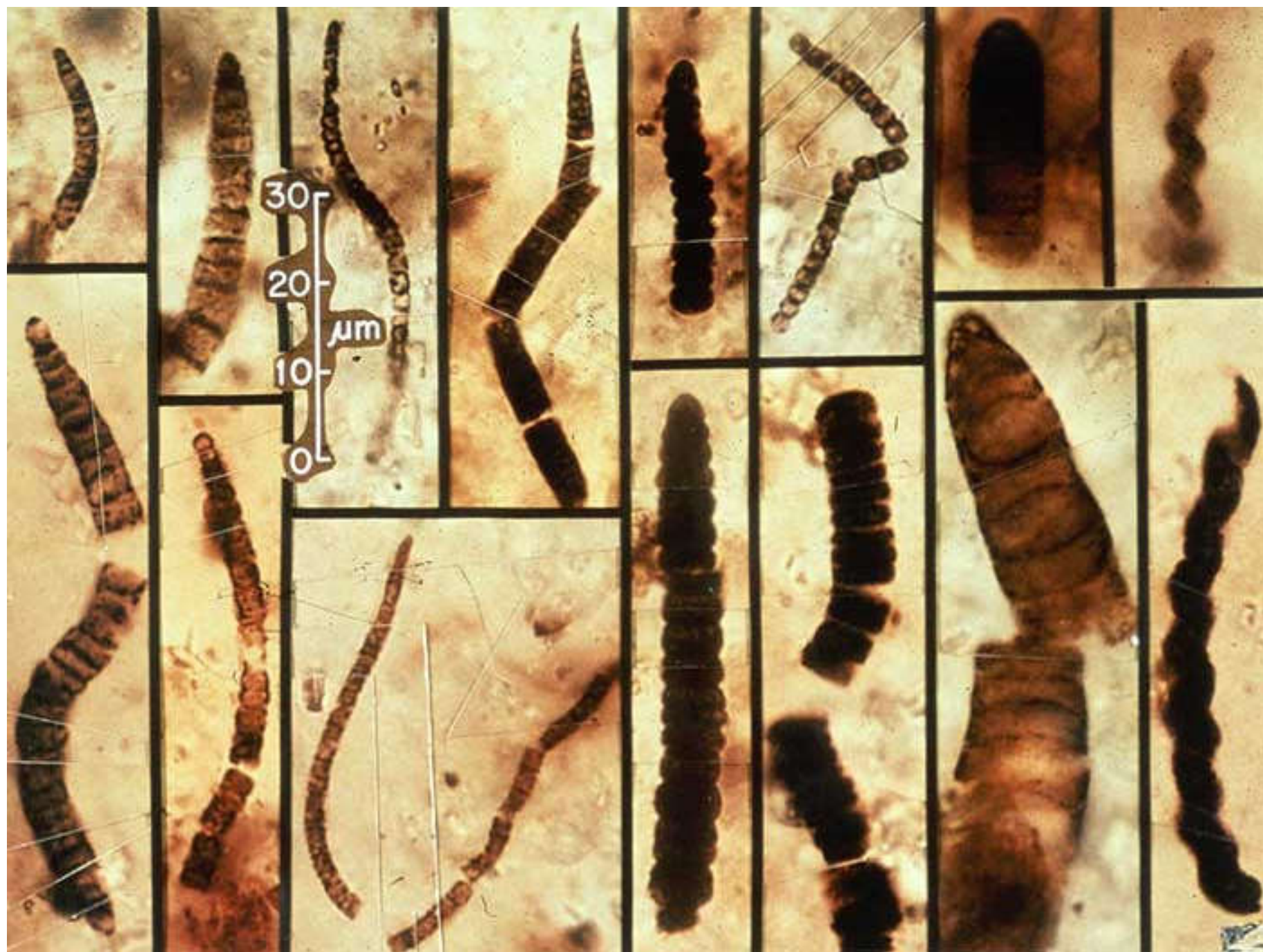


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แถบของเหล็ก (สีแดง) แสดงยุคที่มีการสร้างออกซิเจน
จำนวนมาก (ในภาพอายุราว 2 BYA)

Prokaryotic cell

1 The protective cell wall was lost.

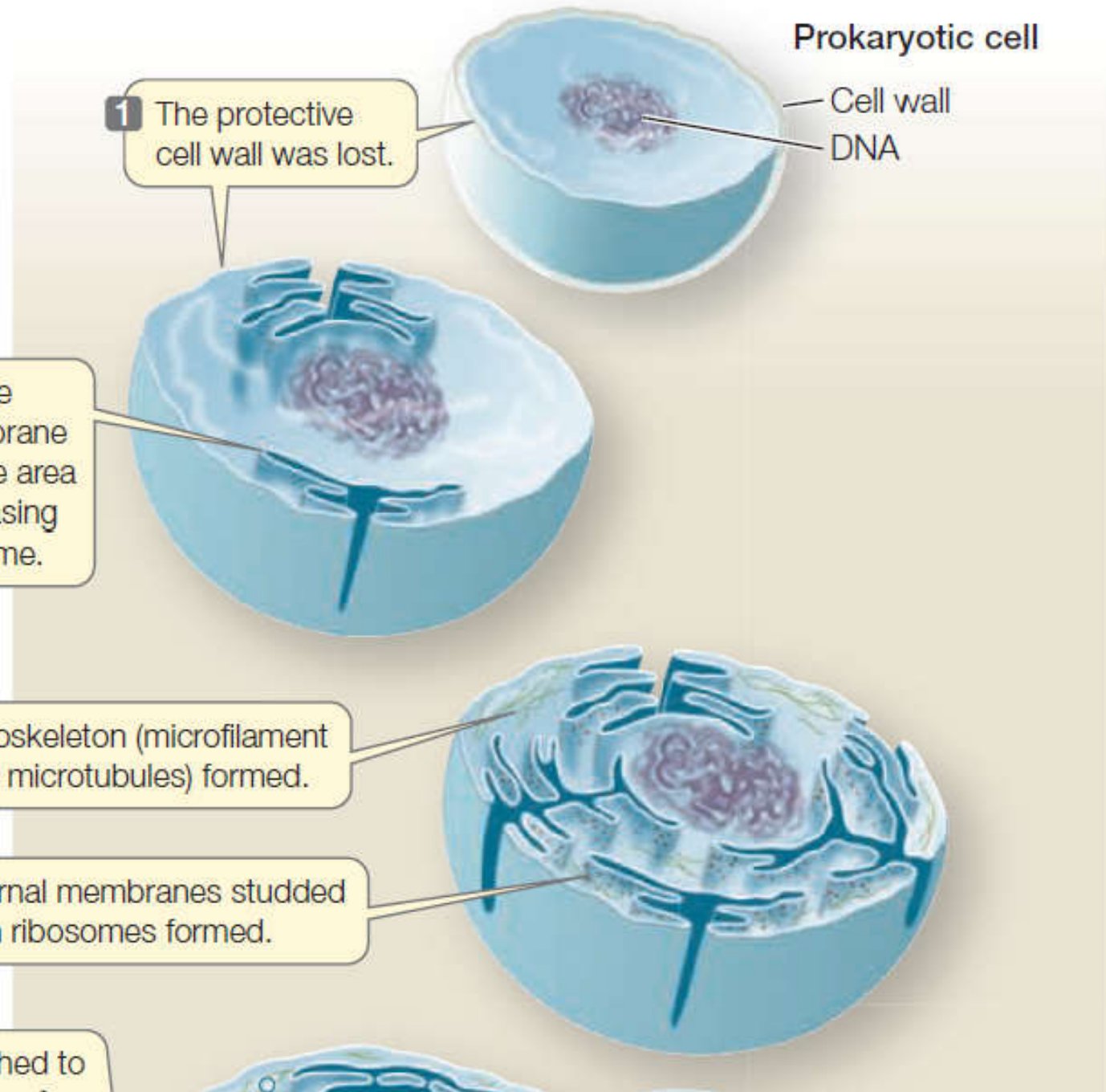
Cell wall
DNA

2 Infolding of the plasma membrane added surface area without increasing the cell's volume.

3 Cytoskeleton (microfilament and microtubules) formed.

4 Internal membranes studded with ribosomes formed.

5 As DNA attached to



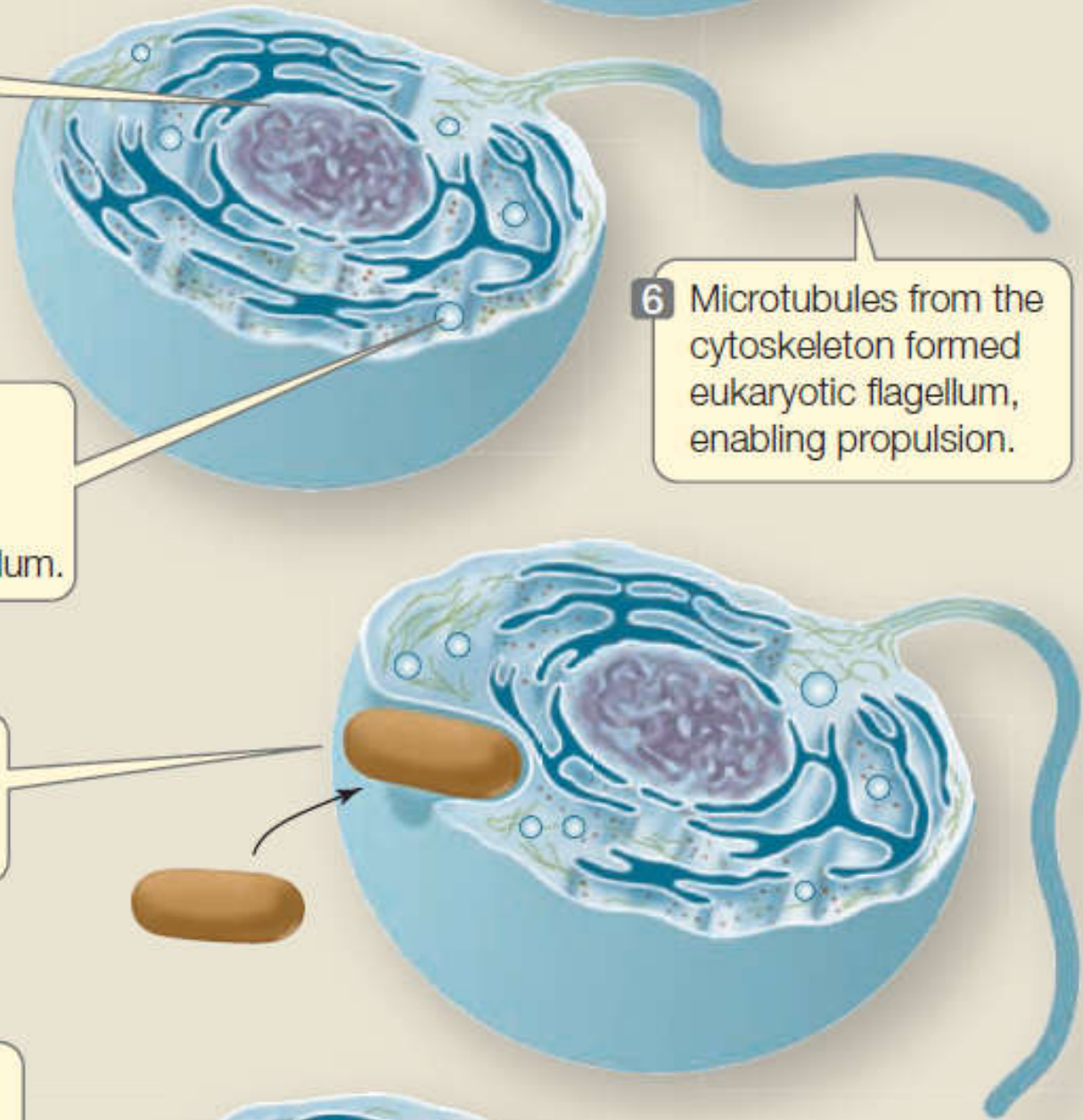
5 As DNA attached to the membrane of an infolded vesicle, a precursor of a nucleus formed.

7 Early digestive vacuoles evolved into lysosomes using enzymes from the early endoplasmic reticulum.

8 Mitochondria formed through endosymbiosis with a proteobacterium.

9 Endosymbiosis with cyanobacteria led to the

6 Microtubules from the cytoskeleton formed eukaryotic flagellum, enabling propulsion.



- 9 Endosymbiosis with cyanobacteria led to the development of chloroplasts, which supplied the cell with the means to manufacture materials using solar energy (see Figure 27.4).

