Introduction to Biology. Lecture 11

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September 19, 2012

Outline

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Where we are?
Basics of ecology

Ways of life

- How to obtain energy?
  A. From sun light: **phototrophy**
  B. From chemical reactions with inorganic matter (“rocks”): **lithotrophy**
  C. From breaking organic molecules into inorganic (typically, carbon dioxide and water): **organotrophy**
- How to obtain building blocks?
  A. From assimilation of carbon dioxide: **autotrophy**
  B. From other living beings: **heterotrophy**

Six life styles

	Phototrophs	Lithotrophs	Organotrophs
Autotrophs	...	...	...
Heterotrophs	...	...	...

Where we are?
Ecological interactions

Two-species model

- Species I and species II may influence each other differently
- For example, species I may facilitate the increase the number of species II individuals ($+$ interaction)
- At the same time, species II could be neutral to species I (0 interaction)

Six basic ecological interactions

	+	0	−
+	mutualism	commensalism[1]	exploitation[2]
0	...	neutralism	amensalism
−	...	...	interference[3]

[1] Includes phoresy (transportation), inquilinism (housing) and “sponging”
[2] Includes predation, parasitism and phytophagy
[3] Includes competition, allelopath and aggression

Where we are?
Proterozoic challenge

Two problems

- How to escape from antibiotics?
- How to predate?

Eukaryotic cell as a response to Proterozoic challenge

- New pathways of protein synthesis
- Cytoplasm motility (flagella, phagocytosis) based on cytoskeleton $\rightarrow$ no cell wall
- Nucleus for interphase and chromosomes for mitosis (too many DNA)
- Mitochondria for ATP (we need much more ATP)

Eukaryotic cell

Organelles and their function

Membrane and cytoplasm

- Cytoplasm is constantly flowing
- Membranes are using for construction of multiple internal organelles

Cytoskeleton

- Microtubules and microfilaments
- Flagella
- Phagocytosis
- Motility
- No cell wall (but note that plants and fungi developed cell wall again)

Nucleus

- Regulatory DNA
- Cell division
- Pores

Mitochondria

- Respiration machines
- Mitochondrial DNA

Internal membrane system

- ER
- AG
- Vesicles: vacuoles, lysosomes, peroxisomes etc.

Ribosomes

- Bigger
- Associated with ER

Summary

- All life styles were exist before eukaryotic origin
- The only interaction absent in prokaryotic communities was predation
- Eukaryotic cell is a “second-level”, enhanced cell

For Further Reading

Ecological interactions.
http://en.wikipedia.org/wiki/Biological_interaction

Symbiogenesis.
http://en.wikipedia.org/wiki/Endosymbiotic_theory