

Introduction to Biology. Lecture 7

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Outline

1 Where we are?

- Proofs of evolution

2 Origin of life

- Molecules of life
- Primordial living structures

3 Questions and answers

- Exam 1



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Where we are?

Proofs of evolution



Evolution is the fact and research program

- Given the amount of evidence presented, **evolution is a fact**
- Evolution is also an extremely useful, working **research program**, both in biology and medicine



Origin of life

Molecules of life



Organic chemistry: chemistry of carbon

- Carbon skeleton
- And H, O, N, P, S



Four types of biomolecules

- Lipids: hydrophobic
- Carbohydrates (sugars): multiple –OH groups
- Amino acids: N + C + O and hydrogen
- Nucleotides: cycle with nitrogen (heterocycle), sugar and phosphoric acid



Organic polymers

- Polymeric carbohydrates: polysaccharides (like cellulose and starch)
- Polymeric amino acids: proteins (like collagen in skin)
- Polymeric nucleotides: nucleic acids (DNA and RNA)



The very basic features of life

- Semi-permeable¹ membrane which consists of lipid layer with embedded proteins
- DNA → RNA → proteins²

¹Does not usually allow bigger hydrophilic molecules and ions to come through.

²First arrow is *transcription*, second is *translation*.



Origin of life

Primordial living structures

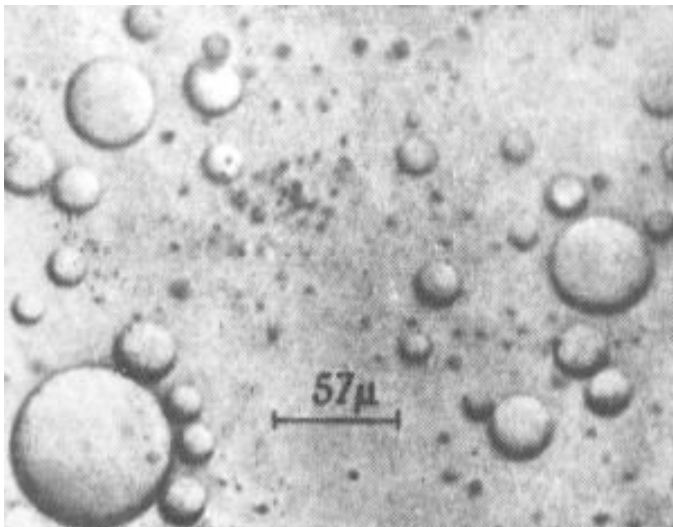


Coacervates

- Coacervates are lipid globules capable to some chemical exchange with environment
- Discovered by 1930s, used as an important proof of **abiogenesis** (Oparin's theory)



Coacervates

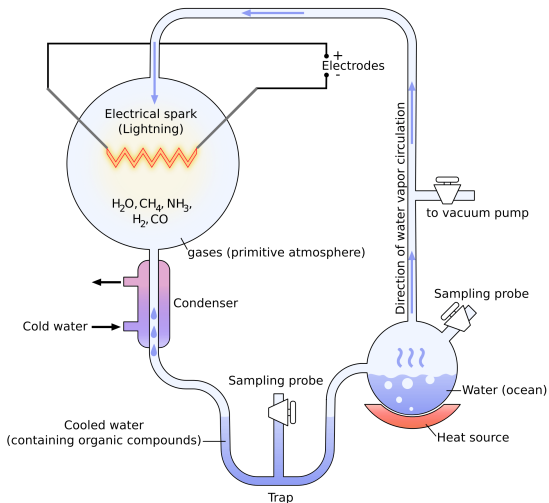


Abiogenesis of proteins

- In 1952, Miller-Urey experiment showed that formation of simple organic molecules is possible when Earth ancient atmosphere and temperature were imitated in lab
- In 1958, Fox and Harada found that “proteinoids” (short peptides) may be synthesized in similar conditions



Miller-Urey experiment



First steps, according to abiogenesis

- Primordial soup
- RNA world
- Proteins
- Cells: last universal common ancestor (LUCA)



Questions and answers

Exam 1



Questions before exam 1?



Summary

- Four types of biomolecules form biological polymers
- Abiogenesis is the most feasible theory of life origin



For Further Reading



Organic chemistry.

http://en.wikipedia.org/wiki/Organic_chemistry



Origin of Life.

<http://en.wikipedia.org/wiki/Abiogenesis>

