

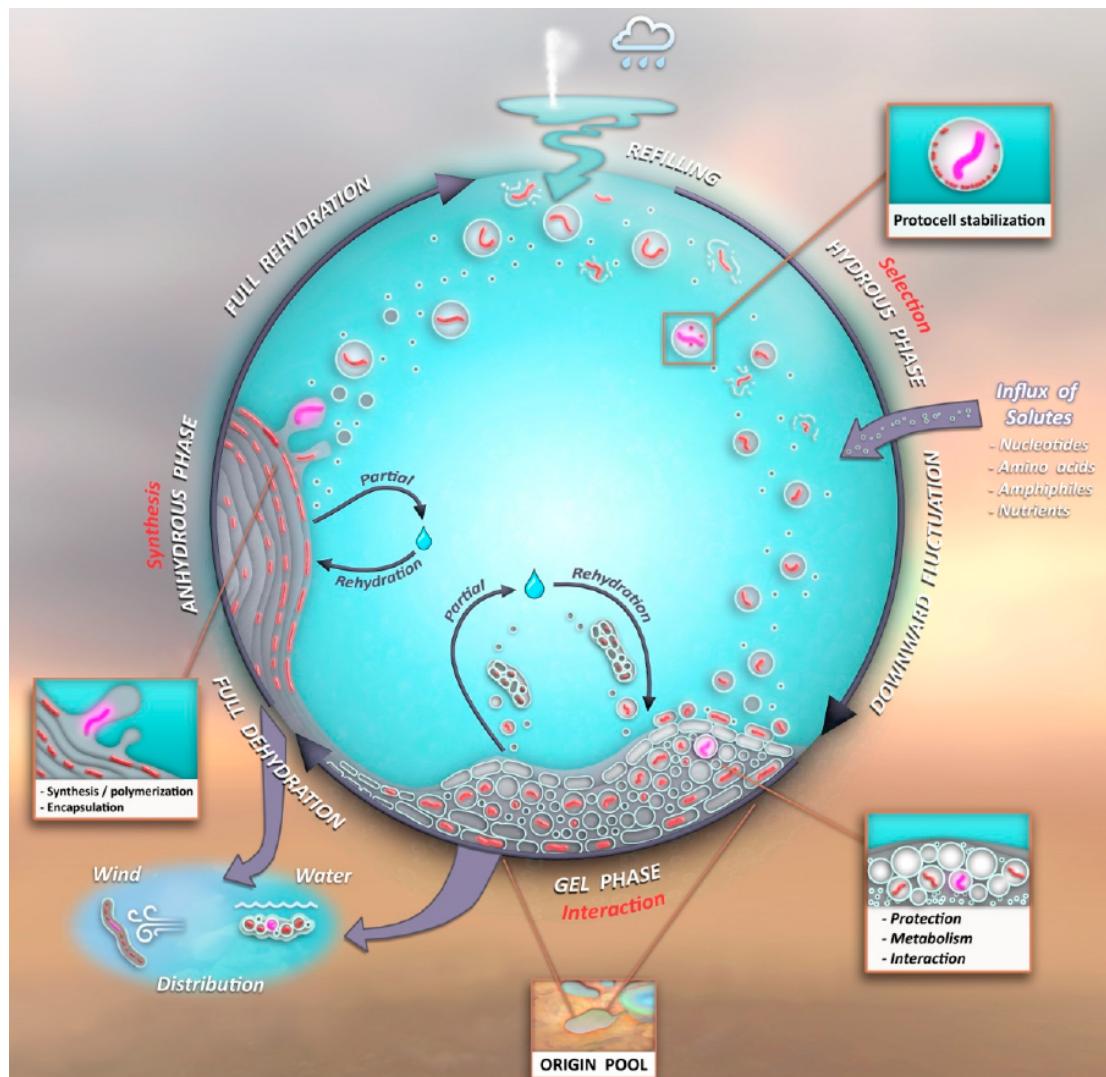
Origins of Life Course – Peer Review Assignment

The following assignment aims to encourage a primary goal of the course: to bring new and synthetic thinking to the field of origins of life.

1. Early systems chemistry

The figure below shows an early protocell cycle. Identify the following parts that are required for a biological life cycle within the figure:

- What is the individual? **(1 point)**
- Where in the cycle are metabolic processes occurring? **(1 point)**
- How does selection occur? **(1 point)**
- Is there reproduction? Why or why not? **(2 points)**
- What is one energetic input found in this system? **(1 point)**



From: Damer, B. A Field Trip to the Archaean in Search of Darwin's Warm Little Pond. *Life* 2016, 6, 21, doi:10.3390/life6020021

2. *Time machine*

Some physicist and engineers on a top secret project for NASA have asked you to weigh in on their newest mission. They have a time machine, that can only be used once (and will possibly consume an entire Universe in energy. Not ours, they assure you.). They need to pick a time in the past to go to and look for evidence of the first biological systems to better understand the origins of life. They will be able to bring back one sample.

- a) What time, in billions of years ago would you recommend they visit? Provide one justification. **(2 points)**
- b) What type of information would you want from the early Earth conditions at that time? Provide two types of information. **(2 points)**
- c) Is there a specific location/latitude you would recommend, or environment to sample from? **(1 point)**
- d) What criteria would you use to tell if the sample was “alive” or once was alive? **(1 point)**

3. *Phylogenetic tree building* (instructions included in “how to generate phylogenetic trees”)

- a. Generate a phylogenetic tree based on a single protein (or nucleotide) sequence **(1 point)**
- b. Generate a phylogenetic tree based on the known taxonomy **(1 point)**
- c. Compare your protein and taxonomic trees. Do you notice any differences? (Include at least 1 difference, or state that they are identical). **(1 point)**
- d. What are the challenges with building these trees? (Provide a minimum of 2 challenges) **(2 points)**