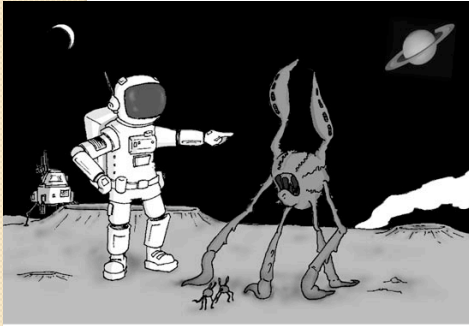


Review



How do I know you're a real alien?

Exam 2 tomorrow

Presentation next week:

Christina Smedley
Joanna Bridge
Billy Quesse

Exam 2

- Will be similar to Exam 1 (class voted for 40 questions again + 2 extra credit).
- Cover from last exam up to Thursday's lecture.
- Again, one sheet of notes will be allowed.
 - We don't care how it's made or looks, and we won't collect it.

Key ideas

- Life...
 - Basic structure of life
 - Protein and nucleic acids (DNA and RNA)
 - Progress of chemical evolution
 - History of life on Earth
- Possible places for life in our solar system
- f_i , f_s , f_l – How do we estimate them?

Basic Structure of Life

- Monomers and polymers
- What is a protein? What does it do?
 - What is the monomer for proteins?
 - What is an enzyme?
- What is a nucleic acid?
 - What is DNA? RNA?
 - What does DNA look like? What does DNA do?
 - Three basic types of monomers for DNA/ RNA?
 - What are the bases?

Basic Structure of Life – Continue

- What is the Codon code?
- What is a gene?
- What is a chromosome?
- Chirality
 - What is it?
 - What is the chirality we have?
- Murchison meteorite
 - What is it? Why is it important?

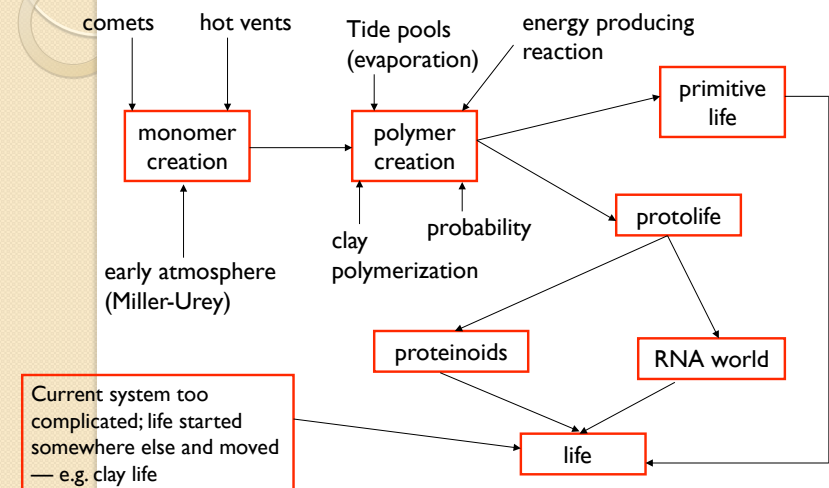
First Life

- What elements make up life? How abundant are they?
- Why does carbon play a main role?
- When did life first occur?
- What is the “chicken and egg” problem?
- Three steps for chemical evolution
 - Synthesis of monomers
 - Synthesis of polymers
 - Transition of life

Chemical Evolution

- Synthesis of monomers
 - What are the condition required?
 - Where might this happen?
 - What is the Miller and Urey Experiment?
 - What was its legacy for this class?
- Synthesis of polymers
 - What are the condition required?
 - Where might this happen?
- Transition of life
 - Two possibilities? Which one is more likely?
 - Protolife
 - Two concepts for protolife?
 - Which one is more popular?

Pathways to Life on Earth



Life – Elsewhere in the Solar System

- What are extremophiles?
- Where might we find life in the solar system?
 - Venus
 - Where? Why?
 - Mars
 - Where? Why?
 - Jupiter? Jupiter's Moon?
 - Where? Why?
 - Saturn? Saturn's Moon?
 - Where? Why?
- f_s
 - List some important factor to consider when estimating f_s
- f_i
 - List some important factor to consider when estimating f_i

Life on Earth

- Classification of life
 - Three types of life?
 - Bacteria, archaea, eukarya
 - Prokaryotes
 - Two domains? What are the definitions?
 - Eukaryotes
 - What is the definition?
 - Which one came first?
 - Which one is more closely related to humans?
- Intelligence
 - What is a good definition?
- What is the importance of sexual reproduction?

Life on Earth – cont.

- What was the early atmosphere like?
- Oxygenation of the atmosphere
 - When did it happen?
 - How did it happen?
 - Cyanobacteria
- For how long has life been on Earth?
- How long was life microscopic?
 - How do we determine the age of a fossil?
 - Radioactive dating (What is a half-life?)
 - C-14 (What does it work on? How does it work? How long can it trace back into history?)
 - K-40, U-235 (What does it work on? How long can it trace back into history?)

Life on Earth - intelligence

- What is the class definition of intelligence?
- What is the key aspect of the genetic code allows for eventual intelligence?
- Even though we have less info storage in our DNA than some animals, humans are more intelligent. Why?
- Describe hominid evolution.
- Examples of intelligence of animals other than human
 - Koko the Gorilla (What can she do?)
 - Alex the parrot (What could he do?)
- f_i
 - What are the important factors to consider when estimating f_i ?

Question

Carbon is important to life on Earth because

- A) it is part of the crucial amino group
- B) it has bonds that are nearly indestructible
- C) it performs well in solvents
- D) it is common in the Earth's crust
- E) it easily forms strong long chains

Question

Life on Earth

- A) arose quickly after the period of bombardment in the early solar system ceased
- B) is clearly the only life in the Universe
- C) based on the fossil record, primarily occurred due to viruses, the simplest form of life today.
- D) could only have been due to panspermia
- E) was an easy transition that can be followed by fossils

Question

The best type of life sustaining stars are

- A) Middle mass stars (less than 1.25 and more than 0.5 solar masses), as they live longer and don't require the planets to be too close.
- B) Binary stars, as they double the chances of life.
- C) Low mass stars (less than 0.5 solar masses), as life can exist nearer the star where more terrestrial planets are probably located.
- D) Stars off the main sequence, as they have lived the longest, they are the best chance for finding intelligent life.
- E) Massive stars (more than 2 solar masses), as they have more mass from which to form planets.

Question

DNA uses 4 possible bases in combinations of three to encode an amino acid because

- A) three is the nearest integer to pi
- B) three is the general chain of carbohydrate groups to make lipids
- C) three is more stable than two or four, so nature chose it
- D) there are only 3 amino acids in a typical protein
- E) three bases in a row allow one to encode up to 64 amino acids; two bases would only allow 16 amino acids

Question

Imagine that we receive our first ET visitor, but their stomachs do not agree with Earth food. Why might this be true?

- A) They actually eat humans, but are too polite to destroy our race.
- B) As we are farther out in the Galaxy, our food has less iron.
- C) ETs will probably be allergic to water, and our food is mostly water.
- D) Chirality: they are right handed life.
- E) None of the above.

Question

Which of the following is not a monomer?

- A) base
- B) amino acid
- C) phosphate
- D) sugar
- E) enzyme

Question

The most likely path for life on Earth was

- A) Life first started as an amino acid world.
- B) Life just arose with nucleic acid and proteins working together.
- C) Life first started as a protein world.
- D) Life first started as a nucleic acid (RNA world).
- E) Life first started as a nucleic acid (DNA world).

Question

Why is carbon important to life?

- A) It is the only element with 4 bonding sites.
- B) It's a solvent
- C) It's an amino acid.
- D) It's a polymer
- E) It allows long molecular chains

Question

Which of the following is a monomer of life?

- A) Proteins.
- B) Amino acids.
- C) DNA/RNA.
- D) Carbohydrates.
- E) Brain Neurons

Question

Which two molecules are the most important for life?

- A) enzymes and carbohydrates
- B) ribosomes and DNA
- C) DNA and RNA
- D) proteins and nucleic acids

Question

What of the following is **not** important when addressing the fraction of stars whose properties are suitable for life to develop on one of its planets (fs)?

- A) Fraction of nearby stars with Jupiter-like planets.
- B) Fraction of wide binary systems.
- C) Fraction of stars that are metal rich.
- D) Fraction of stars that have masses less than 1.25 solar masses.
- E) Fraction of stars that are young (not on the main sequence).

Question

Sex in space, or on Earth, is important because

- A) sex, although fun, also stimulates gene mutations.
- B) it allows the genetic material of the better organisms to survive.
- C) mutations can only occur in sexual reproduction.
- D) it leads to greater genetic diversity and an increase of positive mutations in the offspring.
- E) None of the above.

Question

All of the following statements about Carbon 14 are true except:

- A) It is kept in equilibrium (equal ratio to C-12) in our bodies by ingesting food.
- B) It is an unstable isotope of Carbon 12.
- C) It decays to Nitrogen 14 with a half-life of 5730 yrs.
- D) It can be used to determine the age of dinosaur fossils.
- E) It is produced in the atmosphere via cosmic rays.

Question

Which of the following places in our Solar System has the least likelihood for life?

- A) The sub-surface of Mars.
- B) The sub-surface of Io.
- C) The surface of Titan.
- D) The atmosphere of Venus.
- E) The sub-surface of Europa.

Question

Overall, the evolution of H. Sapiens was

- A) depended only upon the local environment in Africa.
- B) probably initiated by aliens.
- C) an awkward path of evolution with many surprises.
- D) simple and inevitable, after the extinction of the dinosaurs.
- E) a smooth and direct path.

Question

The early Earth had no oxygen. Where did it all come from?

- A) Cyanobacteria created it as a by-product of life.
- B) Probably an oxygen-rich comet collided with the Earth.
- C) With a reducing atmosphere, UV radiation could react with the early Earth chemistry, creating oxygen.
- D) The oxygen was frozen at the poles, which eventually evaporated into the atmosphere.
- E) The oxygen in the soil was released by plate tectonics..

Question

Jupiter's moon Europa is considered a good candidate for extraterrestrial life because it is thought to have

- A) a subsurface ocean as suggested by the surface pattern in its ice.
- B) the only liquid solvents, outside of Earth, in the habitable zone.
- C) possible fossils as found on the famous meteorite.
- D) reflection spectra that are suggestive of amino acids.
- E) hot volcanic vents that warm the atmosphere to Earth-like conditions.

Question

Which of the following was a result of Earth becoming oxygen-rich, atmospherically speaking.

- A) Lifeforms evolve into more complex creatures.
- B) The Ozone layer formed.
- C) Lifeforms could evolve with aerobic metabolism.
- D) All of the above.
- E) None of the above.

Question

DNA orchestrates the process of life by

- A) the direct production of proteins.
- B) assisting in cell fusion.
- C) the transcription of amino acids out of proteins by the order of the nitrogenous base pairs.
- D) the transcription of proteins out of amino acids by the order of the nitrogenous base pairs.
- E) the direct production of amino acids.

Question

Which of the following did we not discuss as alternative exotic life forms?

- A) Flying Spaghetti Monster-- life that uses long strands of carbohydrates instead of proteins.
- B) Galaxy Life-- life that uses stars as the monomers of life.
- C) Horta life-- life that uses silicon instead of carbon
- D) The black cloud-- a molecular cloud life form.
- E) Dragon's Egg-- life that lives on a neutron star, using the nuclear strong force.



Question

Which type of life probably came first?

- A) Eubacteria
- B) Prokaryotes
- C) Fungi
- D) Eukaryotes
- E) Fruit