Engineering Life: Organic connections between science fiction and real biomedical research

View the Official Prometheus Movie Trailer:

http://www.youtube.com/watch?v=sftuxbvGwiU

Image: www.hdwallpapers.in

Sci-fi Movie “Prometheus”

“It’s organic!”…….says an explorer upon seeing black ooze coming from mysterious alien vases…

www.prometheus2-movie.com

Those who touched the ooze did not fare well…….

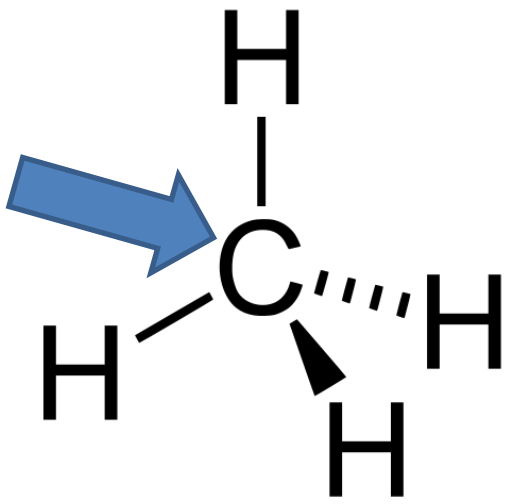
www.bloody-disgusting.com

Important Questions for Earthlings

- How did the explorer in Prometheus know the black ooze in the alien vases was organic?
- What does it mean when something is “organic”?
- What does it mean when something is “inorganic”?

Organic Matter

- Composed of compounds that have come from (or make up) living things such as animals and plants
- Organic compounds include carbon atoms. They can be molecules that make up gases, liquids, or solids

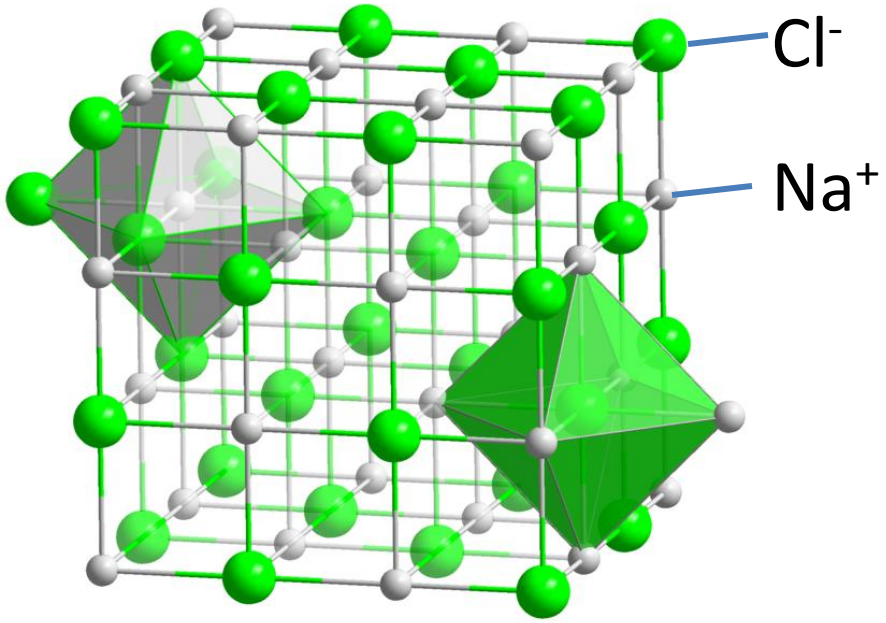


Example:
Methane gas is one of the simplest organic compounds

source:
www.wikipedia.com

Inorganic Matter

- Made of compounds that lack carbon and hydrogen atoms.
- Inorganic compounds are often viewed as being synthesized by geological systems (not biological systems).



Example:
Table Salt (Sodium Chloride)
Structure and formula:

NaCl

source: www.wikipedia.com

Biochemical Molecules

Molecules associated with chemical processes within, and relating to, living organisms

Four Main Classes:

1. Carbohydrates
2. Lipids
3. Proteins
4. Nucleic Acids

This male poison frog has every class of biochemical molecule within his body!

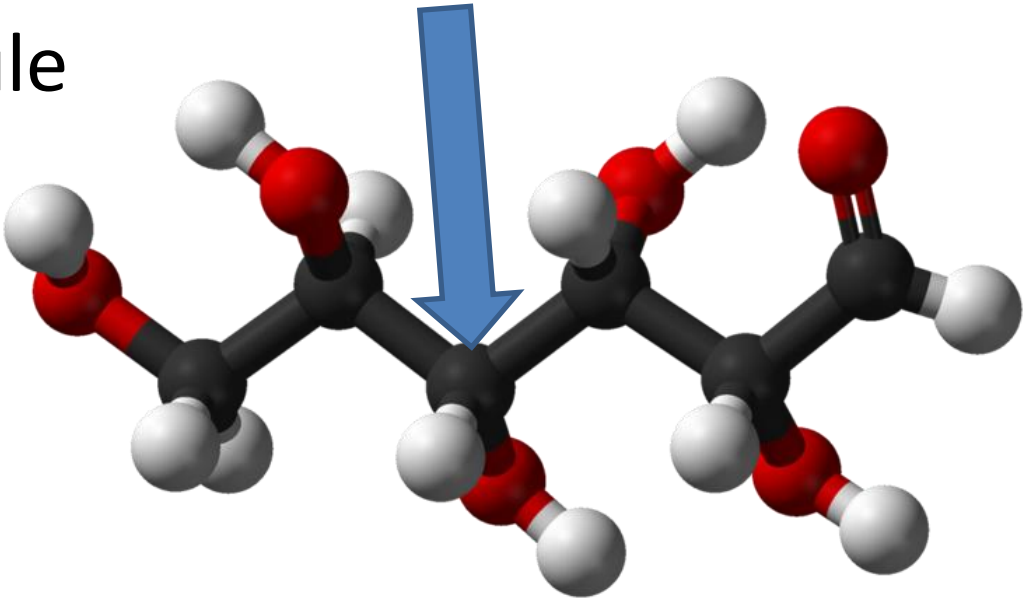
source: www.wikipedia.com

Carbohydrates

Commonly referred to as a “sugar”. Perform numerous roles in living organisms; serve for the storage of energy and as structural components in the bodies of many living things.

Example: Glucose $C_6H_{12}O_6$

An energy molecule



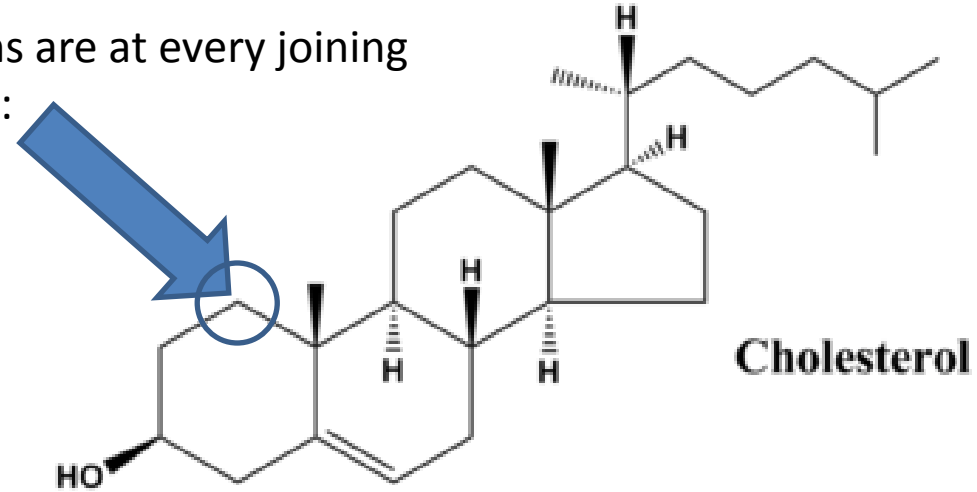
source: www.wikipedia.com

Lipids

Lipids constitute a group of naturally occurring molecules such as fats, waxes, and fat-soluble vitamins

Example: Cholesterol

Carbon atoms are at every joining unless noted:



Cholesterol

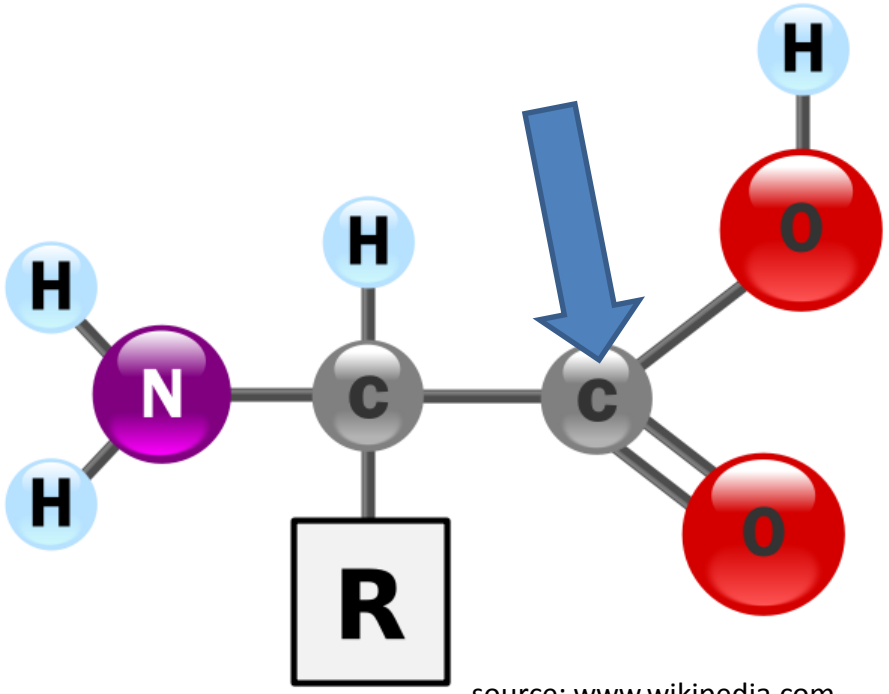
source: www.wikipedia.com

Proteins

Proteins perform a vast array of functions within living organisms, including speeding metabolic reactions, replicating DNA, responding to stimuli, and transporting molecules from one location to another

Example: Amino Acid

(make up Proteins)

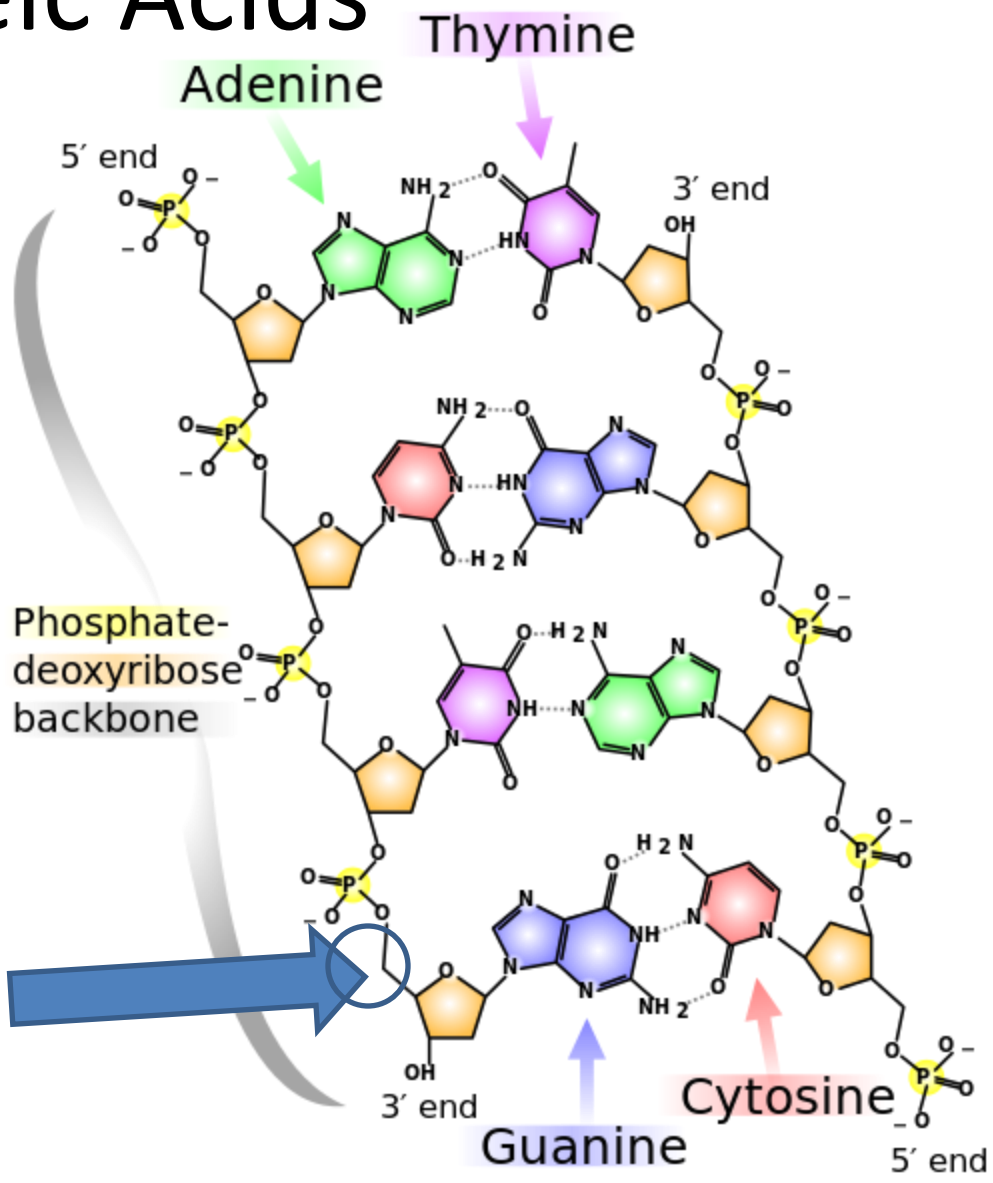


source: www.wikipedia.com

Nucleic Acids

The molecules that make up DNA, an extremely important substance that all cellular organisms use to store their genetic information.

Carbon atoms are at every joining unless noted:



source: www.wikipedia.com

Common Organic Elements

- What element (atom) do the previous examples of biochemical molecules have in common?
- Review the previous slides if necessary

Related Class Exercise

Identify Organic and Inorganic Molecules (Worksheet)

Science Fiction Theme from Prometheus…

- Life on earth (including humans) was engineered a long time ago from alien beings that were far more advanced…

Fictional Concept in Prometheus May be Inspired by Reality…

- Today, cutting edge scientists are already engineering things at the cellular level:
  - biochemical molecules
  - *systems that can detect them*
- Dr. Andrew Ellington & the Ellington Lab at the University of Texas at Austin:
  - "What evolves here changes the world…"
  - http://ellingtonlab.org/

Detecting Biochemical Molecules

Dr. Andrew Ellington's lab is working to make a *difference between life and death* for many people:

Engineering a cost-effective way to test for drug-resistant tuberculosis:

They are looking for an inexpensive way to detect a certain molecule from a disease! (something called an biochemical assay)

Ellington Lab member monitoring drug resistant tuberculosis in Afghanistan

Related Class Exercise

Explore the structure of Organic and Inorganic Molecules (Molecule Models)