

Hypothesis based science: scientists attempt to explain observations by testing hypotheses.

Example:

Proposed answer:

Categories of scientific/ empirical knowledge

Observations: empirically verifiable “facts” as agreed upon by rational observers (data)

Questions:

Inductively derived conceptualizations Generalizations

(typically descriptive) Hypotheses (usually

explanatory) Theories (synthetic and explanatory)

Predictions:

What characterizes a good question in science?

A question that is specific and that can be answered empirically.

Logic- Two forms: induction (general principles) and deduction (specific instances).

“Robin eggs are blue” is a statement of scientific knowledge.

-a descriptive generalization. Statement above is inductively derived.

(But robin eggs may be different shades and intensities of blue.) Statement is legitimate.

The problem is have we ever seen all robin eggs? We have seen robin eggs of the future.

Why are they a different shade of blue? Possible hypothesis: Diets cause different shades of blue.

Male robin eggs example: Male robin eggs are more diligent in caring for their kids if the eggs are a bright shade of blue.

What characterizes a good hypothesis in science? Specific to the question.

Consistent with the data.

Naturalistic explanation.

Consistent with other tested and supported knowledge and understanding.

We all form test and hypotheses. Question-Hypothesis. Scientific hypothesis are testable and falsifiable.

Central themes in the study of life

A hierarchy of organization with emergent properties at each level. Emergent properties idea that at different levels ...? "the whole is greater than the sum of its part"

Structure and function are correlated at all levels of biological organization. The structures of life have order.

-The continuity of life is based on inheritable information in the form of DNA.

- Order- life is not a simple joke, there's patterns that are beautiful
- Structure and function are correlated at all levels of biological organization. The Wright brothers analyzed birds and their structures to design their plane, birds have hollow bones.
- DNA the continuity
- Organisms are open systems that interact continuously with their environments.
- Regulatory mechanisms ensure a dynamic balance in living systems: feedback systems.
- Diversity and unity are the dual faces of life on Earth. Unity at the basic level we are connected with everything by DNA. An example of unity underlying the diversity of life: the architecture of eukaryotic cilia. All organisms (built the same way)
- Evolution is the core theme, the central unifying theme of biology. Evolution adaptation example mimicry. Evolutionary divergence, lines of species diverge-speciation.

An astronomer can tell there is life on earth by seeing water, they could also figure out of seasons by the changing colors of leaves, they could detect high levels of oxygen (oxygen is highly reactive), also we send a huge number of electrical signals into space.

Possible other locations of life in our solar system: Mars and Jupiter's moon Europa.

Exoplanets, planets close to the sun with no water, it's too hot for life.

Monomer- building block, when joining together covalently they form hydrogen bonds

Polymer- Macromolecules:

Carbohydrates- polymers composed of glucose molecules. Energy storage and structure.

Cellulose- most abundant carbohydrate on earth (plant carb) we can't digest cellulose, it is fiber to us. It goes straight out without giving us energy. Cows, animals, termites can all process cellulose. Why can cows process it but we can't?

Cows have 5 stomachs which have bacteria that can process cellulose, without that bacteria, they wouldn't be able to process cellulose. Evolution and adaptation caused this. Coevolution- we have bacteria and so do cows.

Lipids: energy storage of fat and hormones Glycerol, fatty acids, tri

Fatty acids: basic carbons unsaturated and saturated Monounsaturated: one double bond between carbons Polyunsaturated: more than one double bond between carbons.

Steroids: estrogen, testosterone and cholesterol. Very little differences in the molecules. Small differences can have substantial functional differences. Woman vs man.

Lipids are non-polar hydrophobic.

Phospholipid: both polar and non-polar. It has a polar head and a non-polar tail. (Hydrophobic tail) (Hydrophilic head)

Proteins: are made up of amino acids, there are only 20 and they differ in their side groups/chains.

Nucleic acids: monomers are nucleotides and consist of a phosphate a sugar and a nitrogenous base and they are covalently bonded to form chains of DNA. Two basic nucleic acids DNA and RNA. Each of the classes of molecules DNA and RNA has 4 bases, they share 3 but they differ on one molecule. DNA is double stranded and the two strands are complementary so if you have the sequence to one you'll know the next, they are held together by hydrogen bonds.

Primary protein structure: sequence of a chain of amino acids.