LECTURE # 1 Thursday, September 10th 2015

BIOLOGY 1130C (INTRO. TO ORGANISMAL BIOLOGY) ... PROF: JON HOUSEMAN

LABS:

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1. Buy or download lab manual (must have hard copy for all labs)
2. Know your lab section - use manual and lab number and class session
- Intro session located BSC building 3rd floor
  - time: 2:30 pm or 4:00 pm
- 4 other legit labs starting sept. 21st
- Needs
  ↳ manual
  ↳ lab coat
  ↳ combination lock
  ↳ glasses

PRE DARWANIAN BIOLOGY: "Dead Dudes Lecture"

- Understanding DNA fully was only understood 50 years ago
  ↳ Biology is a very young science
- term biology is only 200 years old (used to be called natural sciences)
- Trivianus in 1800 defines the world for first time
- human biology is always held in high regard
  ↳ used to be "medicine"

Biology
- Molecular / Biochem
- Genetics
- Physiology
- Developmental Bio
- Genomitics

} over the last 200 yrs biology has been defined seperated into different fields (more fields then this)

- Other biologists used to be called naturalists

•400 BCE - 450CE: Greek and Roman ages → age of exploration and realization of diversity through Roman infrastructure with roads, ports, universities etc. (commerce, communication, knowledge)
- Then Roman empire collapses (Goths destroyed them)
- Romans infrastructure is destroyed and start from scratch ↻

- 450 - 16th century: Medival Ages
- the return of the buildup of the Roman empire formula for infrastructure of knowledge, transport communication etc.
- 16th - 18th century: Renaissance
- The scientific revolution and return of discovery and increased knowledge (boom from mediaval ages)
- Douglas Adams
- writer of Hitchhikers guide gal.

*Four ages of Sand

First - Telescope 1608 - Looking at planets/galaxys (stars big things)
Second - Microscope 1678 - Looking at small organism (Knowledge of cells small things)
Third - Computer chip 1961 - Allowed calculations art etc. to be done much more efficiently... knowledge becomes readily available.
Fourth - Fiber optics 1980s
↳ Scientists could share and collaberate while being in different parts of the world (skype facetime)

*Four Ages are the analysis of the evolution of science.

- 400BCE - 450: Greek and Roman ages
- Hippocrates (460 - 370BCE) → He goes around and meets with doctors, practitioners and gathers information and is the editor of the first book which assembles this info! (Collecting all the wisdom)
- Creates the Hippocratis Corpus
- Aristotle (384 - 322 BCE):
  - Prominent in many domains
  - He orders the species (complex to simple) of biology
  - He put humans at the (apex) the top
  - He recognizes life birth is important to evolution
  - He puts life birth first then birth in eggs (reptiles) then squids etc. ... then plants with seeds and without
  - First person to make a speciation list
    ↳ this list is the ladder of life

• Theophrastus (371-287 BCE):
- Student of Aristotle → get excited by plants
- He writes 10 books
  ↳ based on the biology of reproduction in plants and classifies them
- His work has been copied tons of times
- 9 of his books have made it today
- Plants were important for:
  ↳ food, drugs and fibers (making ships etc.)

• Why his books are so important, gave us index of plants!

→ All the philosophers:
- Classification
- Taxonomy → Rules of classification (order to a set of objects)
  ↳ 5 different types: (limited)
    ↳ Folk → Very early ... they precede writing ... organized 500-600 objects in 3 diff. subdivisions → all the information that can be stored in the mind. (word of mouth)
    ↳ Artificial → Written lists (stuff aristotle collected

- Only 2 developped at this time period (Only two mentioned)

• essentialism was the explanation of why species stayed the same (the kept a certain essense) → Organized written lists ... not necessarily the right structure or order! (unlimited

- 450-16th century: Medival ages
- During this time Christian faith and Arab faith makes it so the great chain of being has only one god at the top instead of several!
- still have essentialism (Species don't change)

→ One difference (Cardinal Usher)
  ↳ he goes through the bible and decides it all happens
    - Oct 24, 4004 BCE (Date of creation)

→ He said the world is 5600 years old
- Accepted theory is everything (creation) was all put at once!
  ↳ Tint is the state of knowledge → end Medival ages

Med. Ages

↳ 400 - 700 (Dark Ages) Early Midd. Ages: The world is recovering from fall of empires (Roman Greek)

↳ 1000 - 1300) High Middle Ages: Building of cities, big cathedrals begins to rebuild infrastructure (cities, roads)

- 1347 → The plague!!! (3/4) of pop. is wiped out! (Step back)

↳ 1300 - 1500 Late middle ages: The rebuild once again of European culture and infrastructure

↳ Exploration marks the end of Middle Ages

• Byzantium and Islamic world

↳ Med. Ages golden age of islam

- not affected by plague they continued the study of science

Al-Jahiz (781-869) → introduces the premise of the theory of evolution during this time

Al-Dinawari (826-896): Takes Theophratus and adds more plants

Avicenna (980-1037): Adds to Aristotles book with islam teachings

Ahazen (965-1040): Develops the scientific method and the publication of foundings

Ibn al-Baitar (1197-1248): Works on a list of plants and medicinal qualities and how they should be administered and in what dosages (pharmacology introduction) relevant for many many years → Still relevant today!!!

• 16th - 18th century: Renaissance and scientific revolution

↳ Crusades → christians steal the islam teachings and incorporate them into their own findings

• Important scientists (see slide 25 of dead dudes ppt.)

↳ Mathematics and equations unifying term

* Essentialism is still the theory of biology

• Small Advancements

• Van Leeuwenhoek (1632-1723) makes first microscope!!

↳ More smaller organisms that arrived on the same damn day!

• Andrea Vesalius (1514-1564) makes a series of pictures of drawings of human body (father of anatomy)

• Harvey (1578-1657) father of physiology → The heart

- Atleast human biology is advancing
- Linnaeus' contribution to Biology (1707-1778)
  - Created a binomial nomenclature of taxonomy to classify organisms (New one)
  - He goes through major descriptions of species
- Uses Mechanical Taxonomy
  - No evolutionary component (evolution not discovered yet)
  - He gives us a hierarchical system
    - allows us to make predictions about lower organisms in the hierarchy

* phylum and family not included in his first taxonomy

- Outlines a set of defining characteristics that belong to a certain group. (Anamalia → 6 groups)

* Antapomorphies: those characteristics

King	Kingdom: Animalia
Philip	Phylum: Chordata
Came	Class: Mammalia
over	Order: Rodentia
from	Family: Castoridae
Germany	Genus: Castor
Sex	Species: canadensis

What's an animal?
Multicellular eukaryotic
indigestive heterotrove

- Binomen: Shortining down descriptions of organisms.

2 names ("The noun" "Adjective")

Honey Bee → Apis mellifera

End of the 17th century end of dead dudes →

- Genus name allways capitalized (noun) also in italic because its a foreign language.

- Physicalists - with exception of humans all living things are machines → everything obeyed laws of physics and chemistry (Descartes 17th century introduced)
- Vitalists - physical and chemical laws apply but living things have a vital force (essence)

Physical Science	Natural Science
• Inanimate objects	• Animate objects
• Physical and Chemical laws	• More than physical and chemical laws (theories)
• Universal	• Not Universal
• No diversity (No variation)	• Tremendous diversity (Variation)

Cont'd

Physical Science	Natural Science
• Based on empirical observa.	• Based on historical narritives
• experimentation preferred method	• Induction most used method (infer using a small subset of data)

* No Math

V. Deduction vs. Induction (See slide # 42)

ded → general to the specific (Physical Science) * must check every organism

induct → specific to the general (Natural Science) * check a subset conclude

- proximate cause → something that has a direct effect
- See Slides (44-45)

Physicialists \ Organicists (1930) - vital force replaced by genetic program
Vitalists — and importance of emergence (swarm behavior)