Bio

Microevolution
Evolutionary changes that result from changes in allele frequencies in a population, or in chromosome structure or numbers due to mutation and recombination

Important terms
Allele
Phenotype
Genotype
Homozygous
Heterozygous
Dominant and recessive

Hardy-Weinberg
- Applied percentage frequency of alleles in a population to a punnett square
- No natural selection
- Random mating - no sexual selection
- No genetic drift - population is large
- Gene flow
- No mutation
- Basically attempt to prove populations in equilibrium. No change or evolution occurring, tru

- When heterozygotes mate, you get 1:2:1 ratio of homozygous, hetero, homo
- 25% of heterozygous alleles is gone with each generation so eventually all offspring become homo again lol

Nonrandom Mating - Sexual dimorphism
- Males are generally more flashy, due to the need to appeal to females All of these attributes (bigger size, more vibrant colors, etc) show that they are better at acquiring and putting use of food you know
- Females typically produce fewer and fewer eggs and show more care towards the fewer young up to the mammals who only produce one offspring
- Males are just wandering bags of sperm. There is no cost of production/no limit
- 2 types of sexual selection: female choice(in which males compete) and male choice(also in which males compete)

Sperm competition
- In insects, sperm is stored in a storage unit in the female after sex
- Ex: in a copulatory wheel (damsel flies) the male chooses a female, and injects sperm into the female and then hold on until he's sure that the sperm is in the storage organ.

- If a more fit male comes along, it detaches the less fit male, scrapes out his sperm and injects his own

Infanticide

- When the alpha male is dethroned, the new alpha kills all the old alpha's offspring
- This is so that the females don't have to nurse anymore. Therefore they can mate once again

Genetic Drift

- Bottleneck effect: if sample size is too small, results may not be accurate
- Founder effect: the loss of genetic variation that occurs when a new population is established by a very small number of individuals from a larger population

Gene Flow

- migration: may result in change in allele frequency within the population that remains
- carries out conservation strategies

Every time a human sperm connects with an egg with their respective paternal and maternal alleles, there are over 4,000,000 possible combinations

Polyploidy and speciation

Autopolypoid: increasing number of chromosomes

Alloploidy: coming from separated species

Section II

Major Eons

- Phanerozoic (543 Ma to present time)
    - multicellular organisms

- Proterozoic (2500 - 542 Ma)
    - oxygen atmosphere, single celled aerobic organisms
    - bacteria can make energy out of a lot of things
    - splitting of water molecules creates more oxygen eh

- Archaean (3800 - 2500 Ma)
    - anaerobic bacterial life, oxygen starts to accumulate

- Hadean (4600 - 3800 Ma)
    - formation of the solar system and planet, ends with the origin of life

Phanerozoic

1. Cenozoic (65Ma to present time)
    - dinosaurs disappear; mammals and birds remain
2. Mesozoic (251-65Ma)
    - flowering plants, dinosaurs, even more insects
3. Paleozoic (543-251Ma)
    - marine invertebrates, algae, “Cambrian explosion”, first land plants and insects

    - Proterozoic (2500 - 543 Ma)
    - Archaean (3800 - 2500 Ma)
    - Hadean (4600 - 3800 Ma)

Our solar system:

- It is believed that 99.9% of the mass in our solar system comes from our sun.
- Helium and Hydrogen = energy exerted by Sun
- Heavy metal planets close to the sun (earth for example) and lighter gas planets further away
- Jupiter and Saturn develop 2:1 ratio of rotations and this affects Uranus and Neptune which in turn affects the debris and materials from outside the solar system
- This is why the moon has craters

- Jupiter and Saturn are so large that they can ‘catch’ foreign objects in their gravitational fields so that they won’t reach the inner planets

Building phase and Stabilizing phase in Hadean Eon

- water comes via foreign things such as meteorites
- water vaporizes because earth is hot but then it all falls back down and forms oceans
- heat sterilization of water^

Origins of life on Earth

- Special creation
    - God created the world and put organisms on it 6000 years ago
- Extraterrestrial origins (Panspermia)
    - small bacteria-like structures on some meteors
    - many bacteria can withstand extreme conditions
- Chemical evolution
    - change in chemicals on Earth
    - change developed ‘life’ as we know it

Water

- Polarity of water makes it ‘wacky’
- Positive side on one water (hydrogen) attaches to negative side of other water (oxygen) and forms a hydrogen bond
- Surface of water is strong compared to the rest of it… (some bugs can even walk on it)
- Cohesion of water molecules means it’s hard to pull connected molecules apart (as water on plant leaves evaporates, it pulls the water from the stem to the leaf)
- Solvent properties of water are useful. For example, when NaCl is added to water, the Cl^- and Na^+ ions are surrounded by water molecules
- When water goes from solid to liquid or liquid to gas, it means that heat is added, therefore the motion of particles increases and the space between molecules become larger
- Water forms a perfect lattice structure around 4-0^oC due to the hydrogen bonding

Origins of organics (monomer)

- prebiotic soups
- hydrothermal vents
- interstellar organics

Biopolymers

- Proteins
- Nucleic acid
- Carbohydrates
- Lipids

Central Dogma of Biology

- DNA contains a strand that sends a message to code for amino acids
- Replication → Transcription → Translation
- DNA → RNA → Protein

Biotic Chemistry

- Panspermia
- The RNA world
    - Ribozymes
- Proteins first
- Clays (assisted in connecting long chains)

Bubble hypothesis for cells

- Microsphere
    - when you shake oil and aqueous vinegar and the oil disperses in little droplets throughout the vinegar
- Micelles (liposomes)
    -
- Protobionts (protocells)
    - phospholipids shaken become bilipid layer

What makes a cell LIVING

- Organize
- Metabolizing: capturing and releasing energy
- Self regulation: A delicate balance (homeostasis)
- Reproduce: life from life
- Evolving: adapting and changing
- Responding: sensing and interacting with the surrounding world
- Growth: increasing in size