FOUR FORCES
- Natural Selection
- Mutation
- Genetic Drift
- Gene Flow

NATURAL SELECTION

Driving Force – DIRECTIONAL
Acts on variation in population
Therefore, most be VARIATION to begin with
Where does variation come from?
Ultimate source?

MUTATION
We think of mutation as deleterious,
but NO – must have or no evolution
Some mutations are advantageous
Natural Selection operates on both kinds of MUTATION
Also affecting variation is:

GENETIC DRIFT
Definition: RANDOM FLUCTUATIONS IN THE FREQUENCY OF AN ALLELE FROM GENERATION TO GENERATION
IF the variation is neutral –
then just RANDOM CHANCE if the allele is passed on
-sometimes is passed on, sometimes not- 50/50 odds
IF few people have the allele, just by CHANCE could disappear
The smaller the population,
the greater the chance the allele will disappear
For example: Population with 10% Blue Eyes

- earthquake - just by chance 10 people with blue eyes die

  if population is 1 million, 100,000 people have blue eyes
  no effect

BUT if population is 100 and 10 die, blue allele decreased A LOT

NOTE: eye color is a NEUTRAL VARIATION -
  not affect likelihood of dying in an earthquake

GENETIC DRIFT affects NEUTRAL ALLELES
  General tendency is to reduce variation

INTERESTING KIND of GENETIC DRIFT: FOUNDER’S EFFECT
Subset of a large population leaves and starts its own population
BIG GROUP leaves: chances that allele frequencies will be the same
SMALL GROUP leaves:
increase chances allele frequencies will be different (sampling)

Mutiny on the Bounty, Pitcairn Island
  M&Ms
GENE FLOW
(Also called admixture)
result of: MIGRATION and INTERBREEDING
Smaller populations are MORE AFFECTED by gene flow
-like with Genetic Drift
10 people with blue eyes migrate to a population of:
1 million people - no effect
100 people - big effect
GENE FLOW: introduce variation
THE FOUR FORCES:
not only cause small changes from generation to generation,
but cause NEW SPECIES to evolve
SPECIATION
Species: potentially mate and produce viable offspring
-must be fertile offspring
-pretty straightforward for living species
fossils a problem
fossils evolve

Australopithecines Homo erectus Homo sapiens
One replaces another
result of accumulation of genetic changes over time: chronospecies
MODEL 1: straight line = anagenesis
MODEL 2 divergent evolution,
branching bush = cladogenesis
Convergent evolution results in superficial resemblance
DARWIN ENVISIONED
evolution occurring slowly and gradually, but . . .