Biological Basis of Behavior

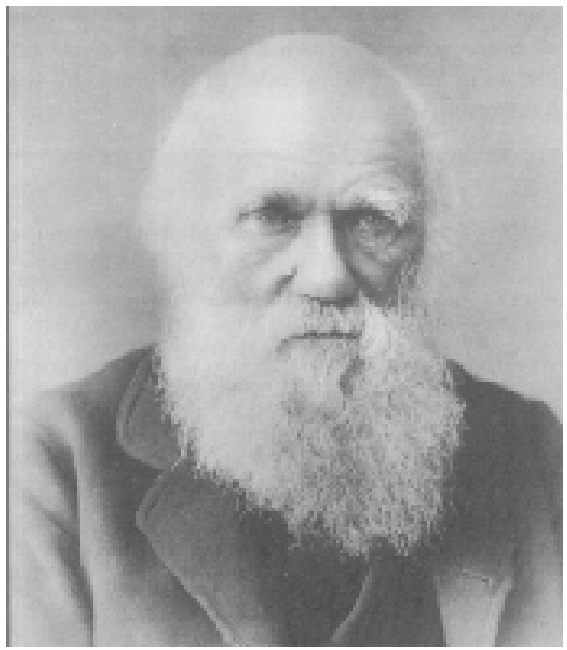


- Theory of Evolution
- Genes
- Genes, Heritability, and Evolution
- Functionalism

Today's Music Selections:

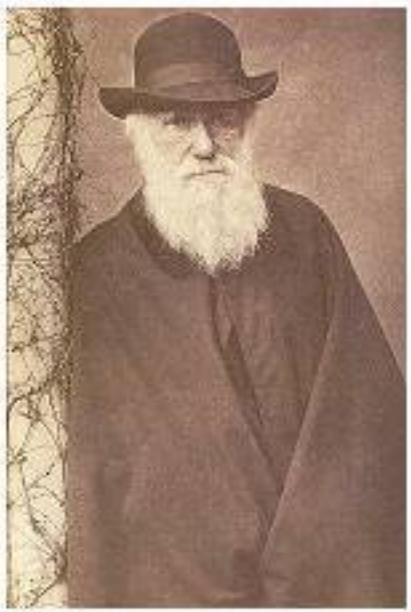
Basic idea of Evolution

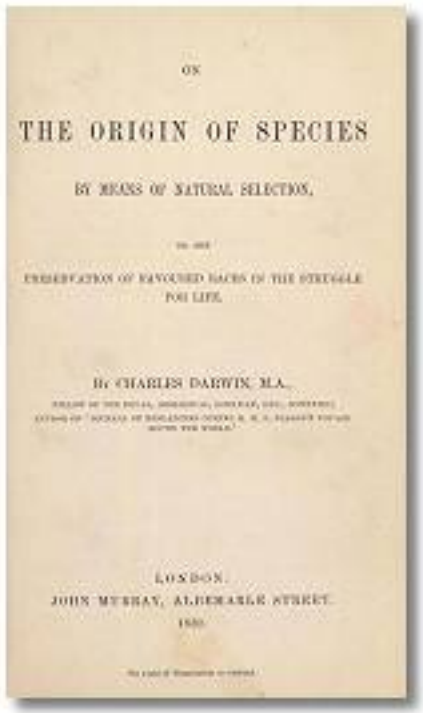
Modern forms of life came about through gradual changes from earlier forms



Darwin's Contribution

Mechanism for evolution: Natural selection





Darwin's Theory of Natural Selection

1. All living species arrived at their present biological structures through a historical process involving random inheritable changes
2. Those changes that enhanced an organism's ability to survive and reproduce were passed along in increasing numbers from generation to generation
3. Those changes that hindered survival and reproduction were lost over generations

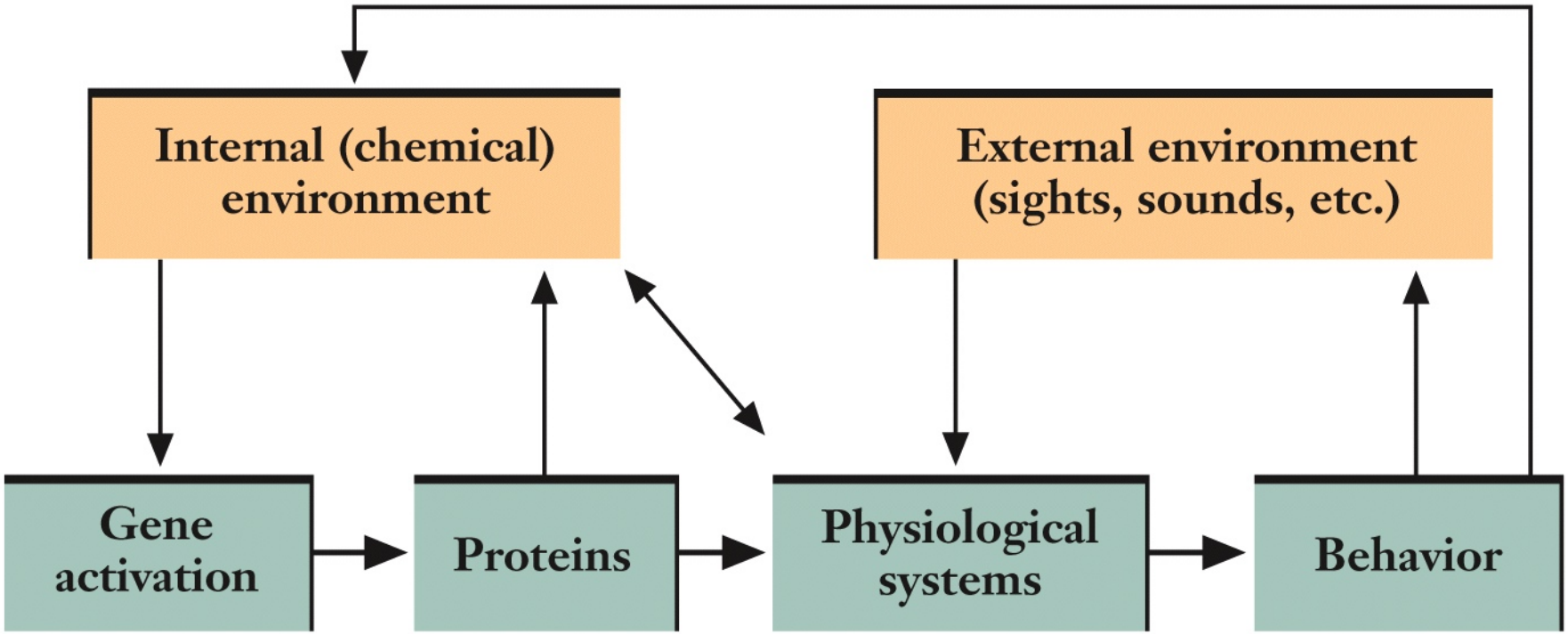
How are changes passed from generation to generation?

- Darwin did not know the mechanism
- 20th century discovery - DNA and genes
- GENES are the biological units of heredity

Genes

- Replicated and passed along from parents to offspring
- Do NOT control behavior directly
- Genes -> Bodily Structure -> Interact with Environment -> Behavior




Internal (chemical) environment
External environment (sights, sounds, etc.)
Gene activation
Proteins
Physiological systems
Behavior

Genotype: The set of genes that an individual inherits

Phenotype: Observable properties of the body and behavioral traits

Mother – Blue eyes (bb)

	b	b
B	Bb Brown	Bb Brown
b	bb Blue	bb Blue

Father Brown Eyes (Bb)

TABLE 3.1 *Genetic relatedness*

Relationship	Degree of relationship	Percent relatedness
Identical twins		100.00%
Parent/child Full brothers, full sisters Fraternal twins	First degree	50.00
Grandparent/grandchild Uncle or aunt/nephew or niece Half-brothers, half-sisters	Second degree	25.00
First cousins	Third degree	12.50
Second cousins	Fourth degree	6.25

Selective Breeding

Indirect manipulation of genes

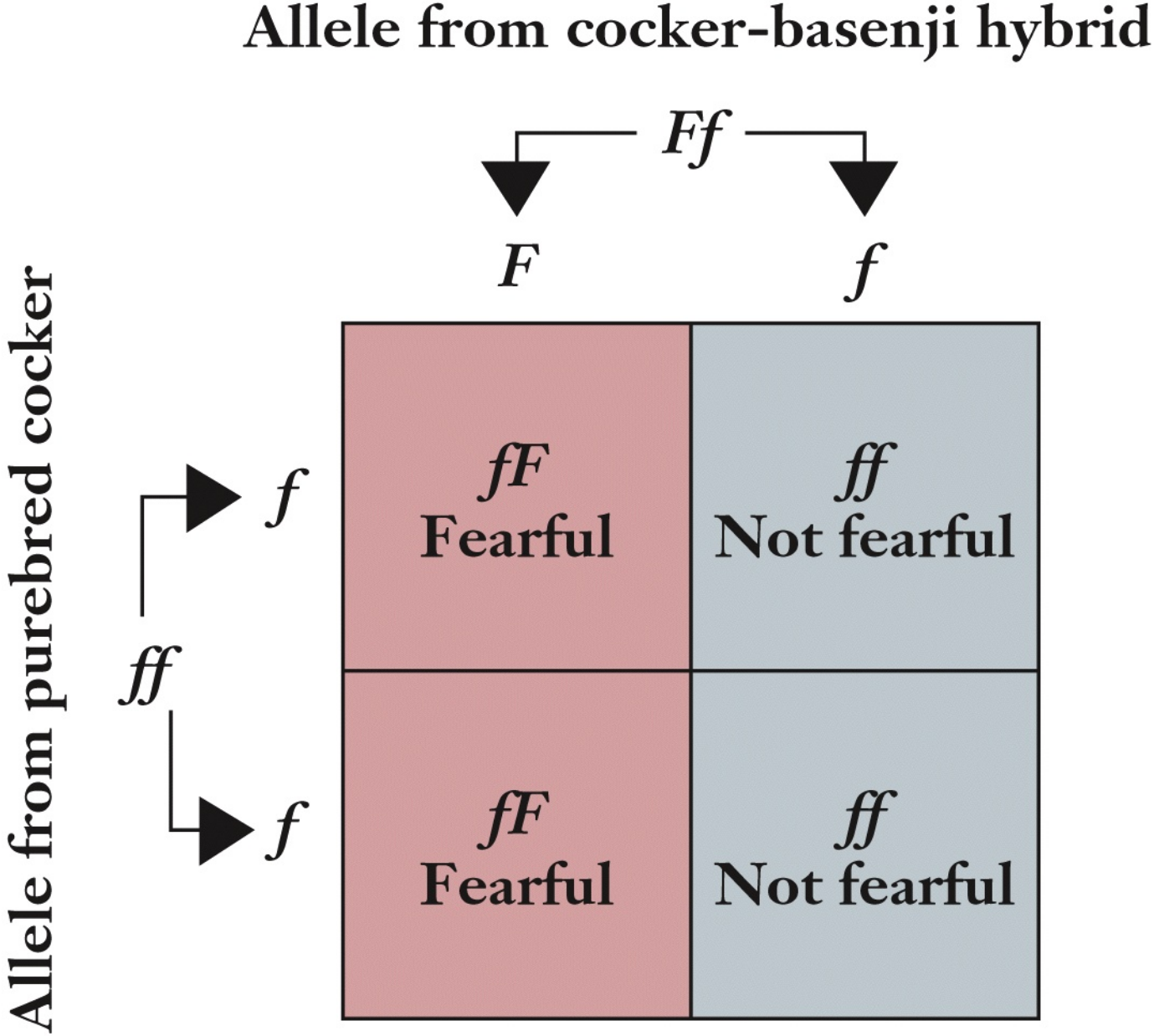




Fearful Basenji (FF)

	F	F
f	Ff Fearful	Ff Fearful
f	Ff Fearful	Ff Fearful

Non-fearful Cocker spaniel (ff)

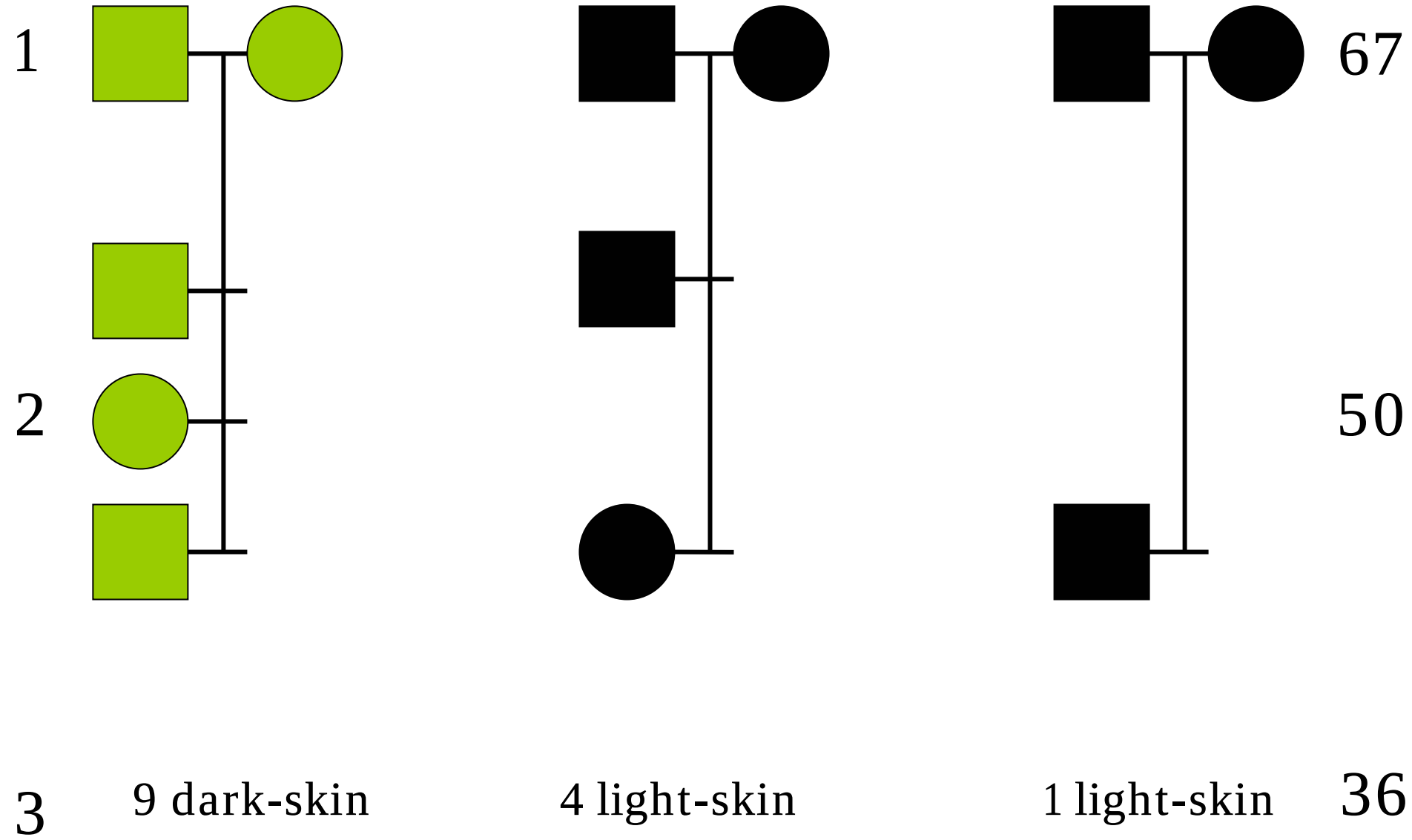

Allele from cocker-basenji hybrid
Ff
F
f
Allele from purebred cocker
f
ff
f
fF
Fearful
ff
Not fearful
fF
Fearful
ff
Not fearful

Selective breeding in nature

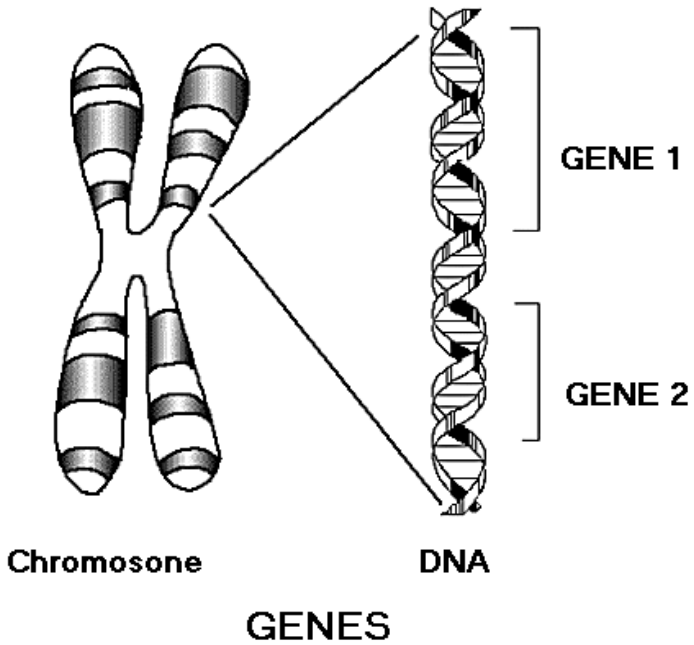
- Natural selection
- Obstacles to reproduction: predators, food supply, mate availability, etc.
- Inherited traits that increase the # of offspring will exist in higher proportion in subsequent generation
- Inherited traits that decrease the # of offspring will exist in lower proportion in subsequent generation

Imaginary Scenario

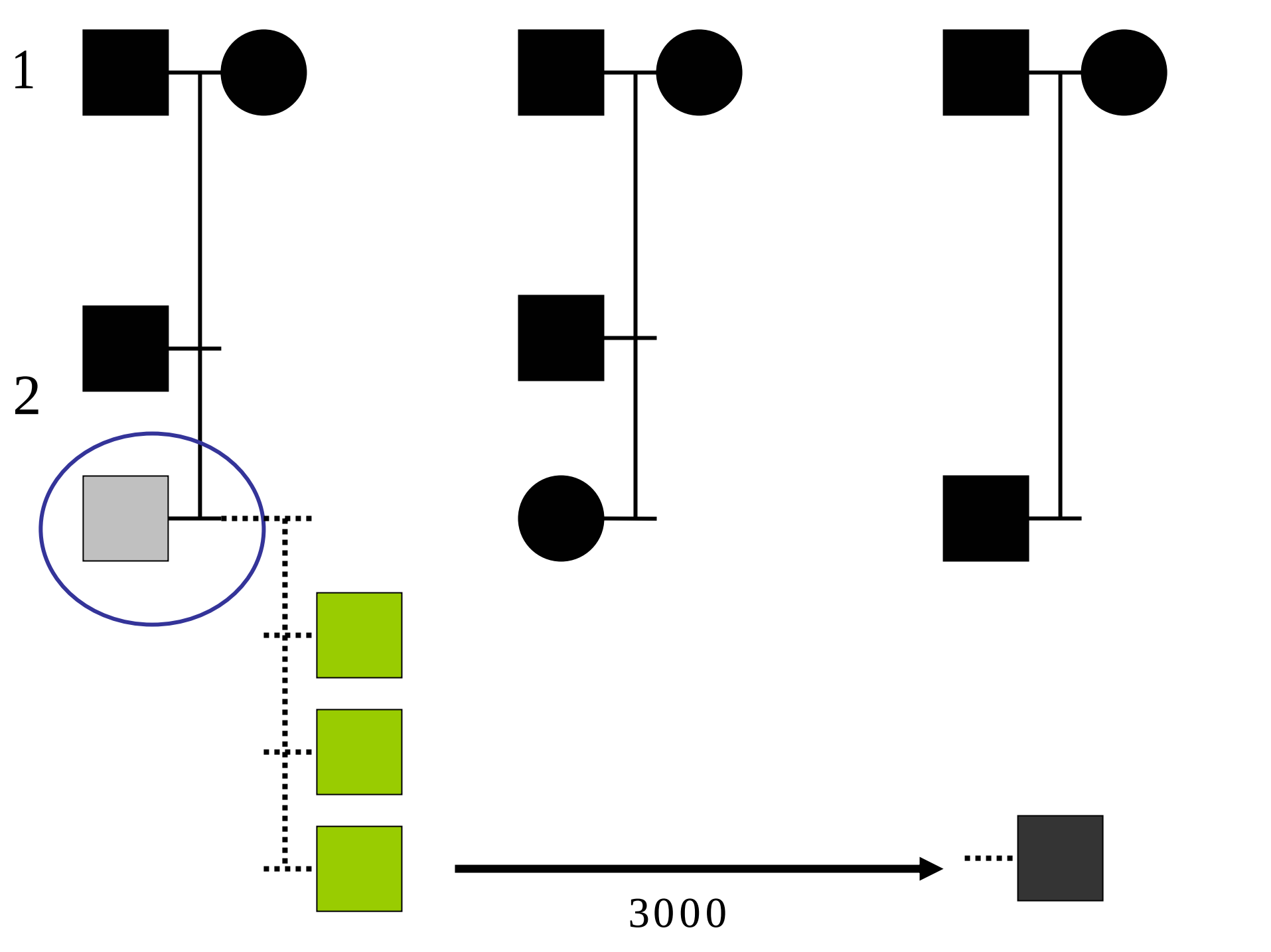
Environment shifts so that more intense sun and ultraviolet rays increase levels of impotence among people with light skin. Darker skin protects against the rays and does not increase the likelihood of impotence.


1
67
2
50
3
9 dark-skin
4 light-skin
1 light-skin
36

Genetic variability is the fodder for evolution



1. Reshuffling of genes occurs during sexual reproduction
2. Mutations – random changes in the DNA structure

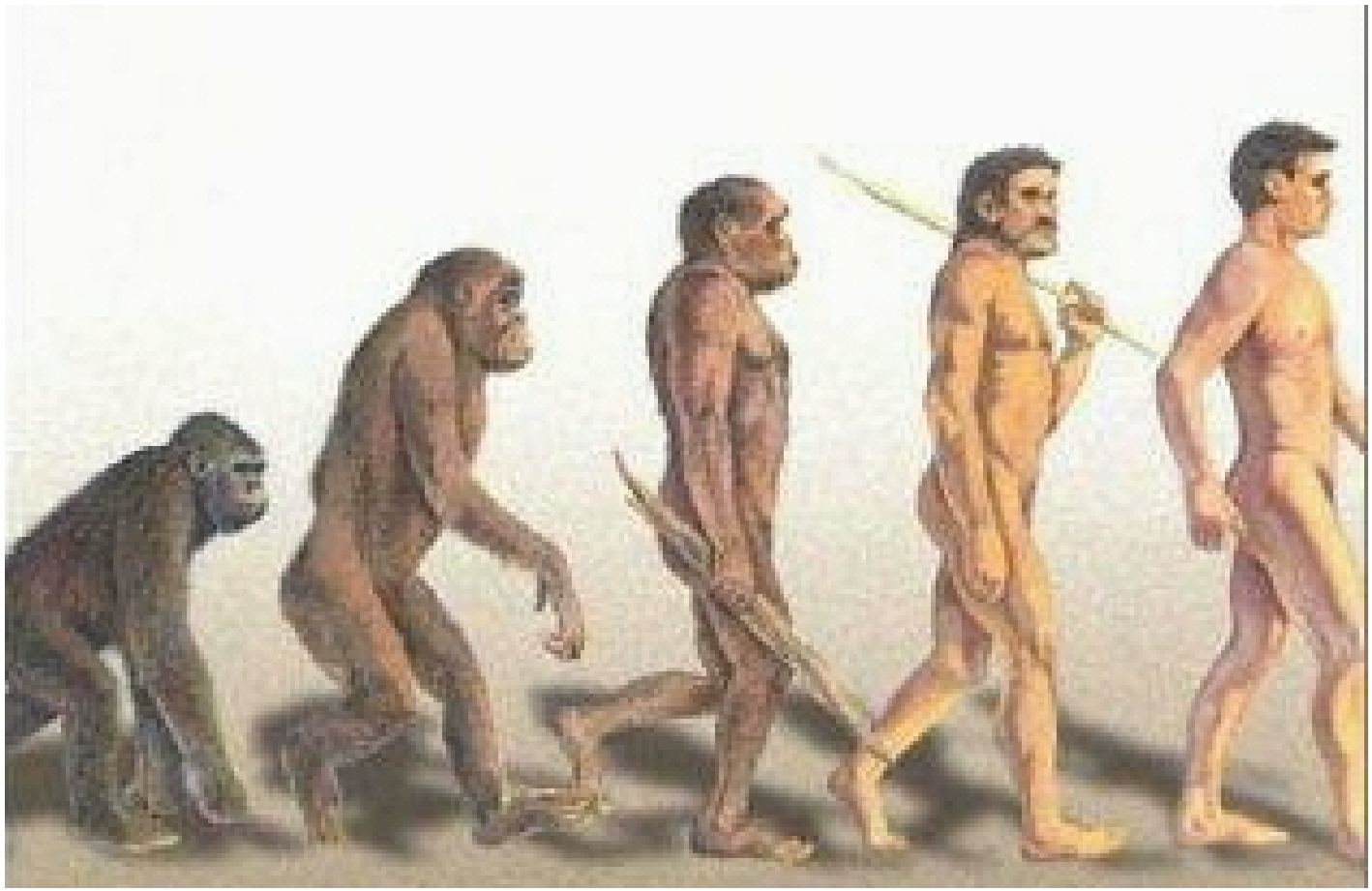

1
2
3000

Important facts

- Evolution is spurred by changes in the environment
- When conditions change, previously useful characteristics may become harmful or irrelevant
- Evolution of specific characteristics can happen slowly, quickly, or not at all depending on environment

Clarifying errant assumptions

- Evolution has no foresight
- Evolution is not a ladder
- The naturalistic fallacy



Functionalism

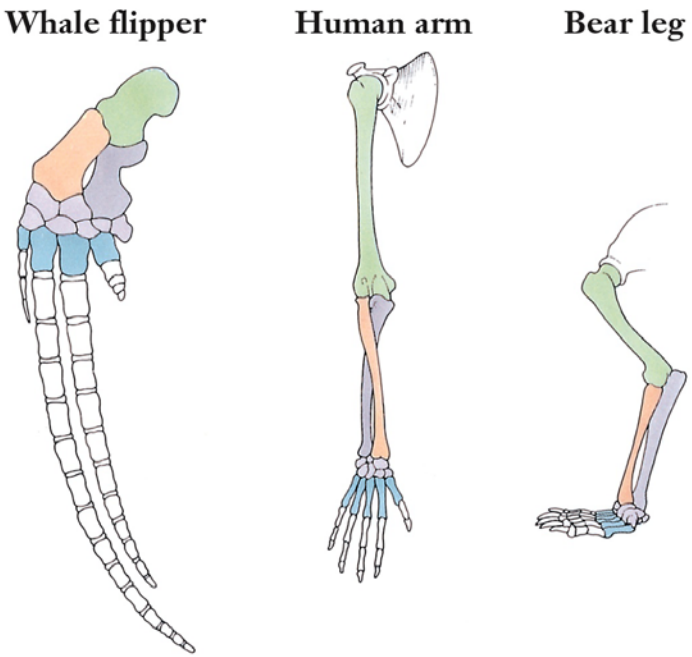
Natural selection breeds animals to be better at doing what they must do to survive and reproduce in the natural environment

So, existing psychological processes may have an adaptive purpose

Risks of overapplying functionalist explanations

- Making up reasons for how a particular psychological process might have been adaptive = easy
- Finding conclusive evidence about functionalist explanations = hard
- Not every characteristic of humans is the direct result of natural selection
  - Genetic drift
  - Side effects

Summary – Biological Basis of Behavior



Key Ideas

1. Modern forms of life came about through gradual changes from earlier forms
2. Genes are the biological units of heredity
3. Functionalism – we can think of many human characteristics in terms of how they help the individual survive and thrive in the environment

Next Time: The Brain