

Chapter Three



Genetic Influences on Behavior

- ★ Gregor Mendel (1860' s) conducted experiments on heredity
- ★ Genotype: the specific genetic makeup of the individual
- ★ Phenotype: the individual's observable characteristics

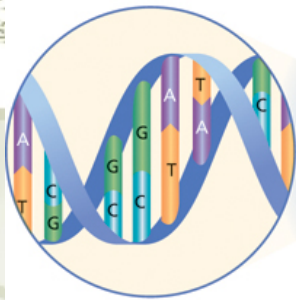


Genetic Influences on Behavior

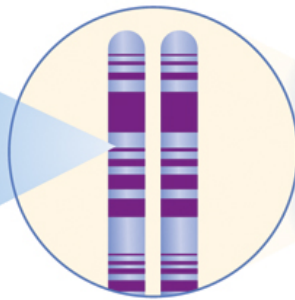
- ★ Chromosomes: a double-stranded and tightly coiled molecule of DNA
 - ★ Contains all the genetic information of heredity
 - ★ Every cell in the human body has 46 chromosomes, 23 from each parent
- ★ Genes: the biological units of heredity; contained within DNA

Genetic Influences on Behavior

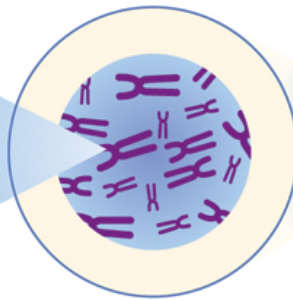
Each chromosome contains numerous **genes**, segments of DNA that contain instructions to make proteins—the building blocks of life.



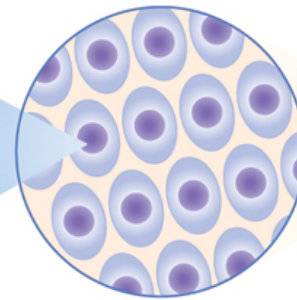
One **chromosome** of every pair is from each parent.



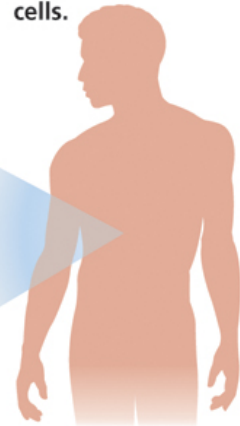
Each nucleus contains 46 **chromosomes**, arranged in 23 pairs.



Each human cell (except red blood cells) contains a **nucleus**.



The human body contains 100 trillion **cells**.





Genetic Influences on Behavior

- ★ Alleles: alternative forms of a gene that produce different characteristics
 - ✦ If the gene received from one parent is *dominant*, the characteristic that it controls will be displayed
 - ✦ If a gene received from one parent is *recessive*, the characteristic will only be displayed if the other parent also contributes a recessive gene



Genetic Influences on Behavior

Dominant

Dominant

=

Dominant

Dominant

Recessive

=

Dominant

Recessive

Recessive

=

Recessive



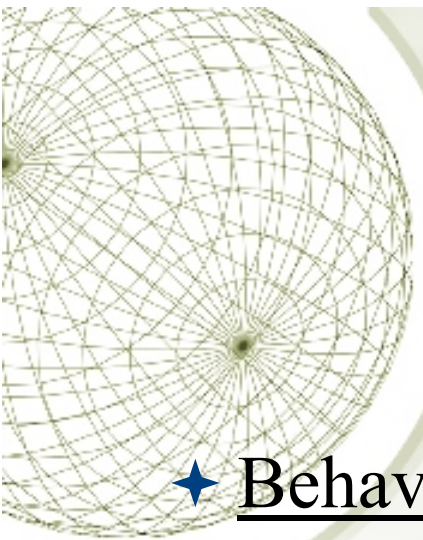
Genetic Influences on Behavior

- ★ The Human Genome Project: a coordinated effort to map the DNA of the human organism
 - ★ Began in 1990
 - ★ Genetic structure of all chromosome pairs has now been mapped
 - ★ Human genome consists of 25,000 genes



Genetic Influences on Behavior

- ★ Allen Institute for Brain Science mapped the genetic workings of a mouse brain
 - ✦ Mouse brains are 99% identical with human brains
- ★ What a cell will become and how it functions is determined by which genes are switched on
 - ✦ 80% of mouse genes are switched on in the brain

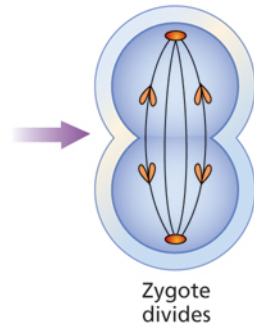
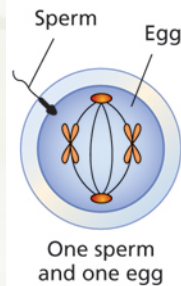


Behavior Genetics

- ★ Behavior Genetics: the study of how heredity and environmental factors influence psychological characteristics
- ★ *Family studies*: researchers study relatives to determine genetic similarity on a given trait
- ★ *Adoption studies*: adopted people are compared to both their biological and adopted parents
- ★ *Twin studies*: compare trait similarities in identical and fraternal twins

Behavior Genetics

Monozygotic twins (1 in 250 births)

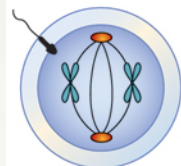
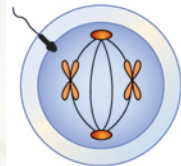


Two zygotes with identical chromosomes

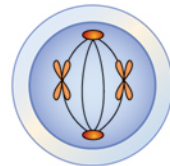


"Identical" twins

Dizygotic twins (1 in 150 births)



Two eggs and two sperm



Two zygotes with different chromosomes



"Fraternal" twins



Behavior Genetics

- ★ Heritability Statistic: estimates the extent to which the differences, or variation, in a specific phenotypic characteristic within a group of people can be attributed to their differing genes
- ★ Genetics and environment function as a single, integrated system



The Role of Learning

★ How do we learn?

★ Behaviorism: assumed that there are laws of learning that apply to virtually all organisms

★ Organism is initially a “blank slate” on which experiences are written



The Role of Learning

★ Why do we learn?

- ★ Ethology: focused on the evolutionary differences between species
- ★ Adaptive Significance: how a behavior influences an organism's chances of survival and reproduction in its natural environment
- ★ Fixed Action Pattern: instinctive behavior automatically triggered by a particular stimulus



Learning, Culture, and Evolution

- ★ Environment shapes behavior in two ways:

- ★ Species adaptation:

- ★ Influence from environment through natural selection

- ★ Personal adaptation:

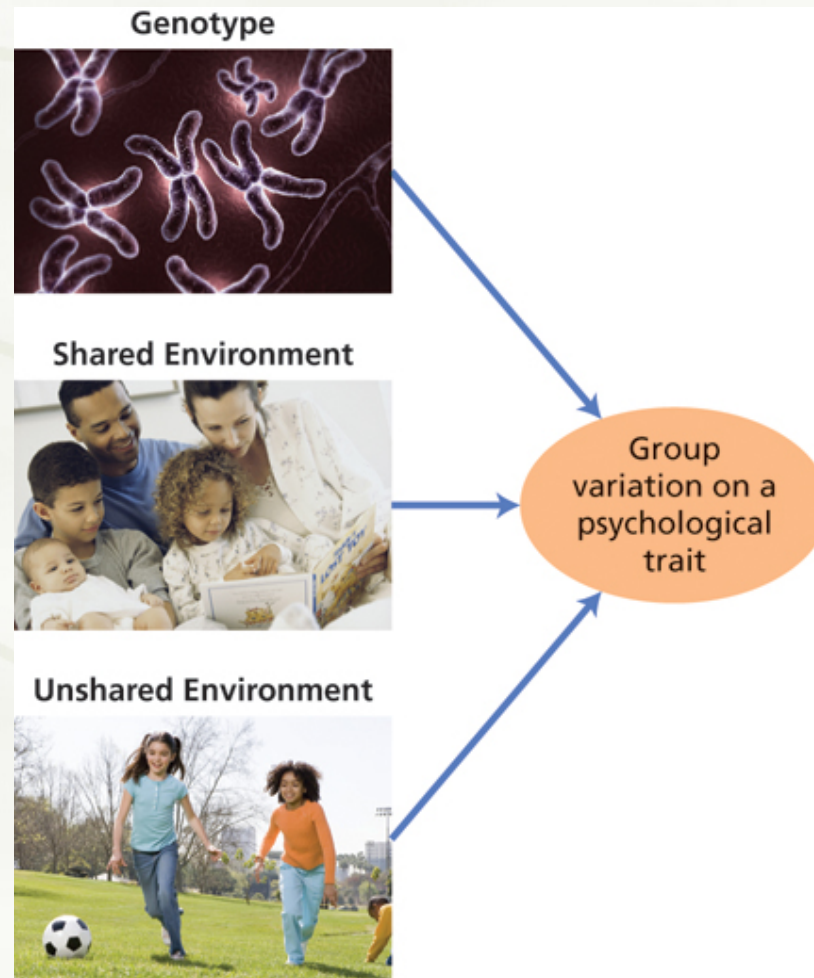
- ★ Results from our interactions with immediate and past environments
- ★ Occurs through the laws of learning

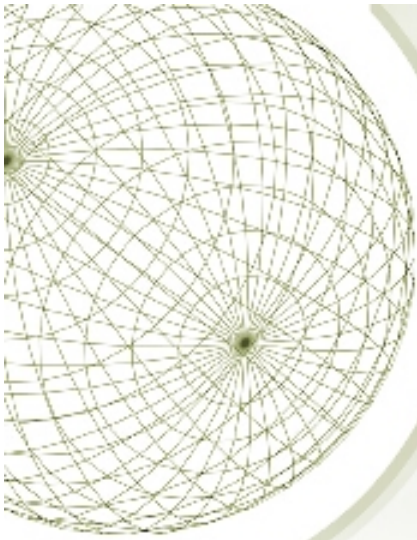


Learning, Culture, and Evolution

- ★ *Shared environment*: environments in which its members experience many common features
- ★ *Unshared environment*: experiences that are unique

Learning, Culture, and Evolution





Heritability of Intelligence

TABLE 3.2 Correlations in Intelligence among People Who Differ in Genetic Similarity and Who Live Together or Apart

Relationship	Percentage of Shared Genes	Correlation of IQ Scores
Identical twins reared together	100	.86
Identical twins reared apart	100	.75
Nonidentical twins reared together	50	.57
Siblings reared together	50	.45
Siblings reared apart	50	.21
Biological parent–offspring reared by parent	50	.36
Biological parent–offspring not reared by parent	50	.20
Cousins	25	.25
Adopted child–adoptive parent	0	.19
Adopted children reared together	0	.32

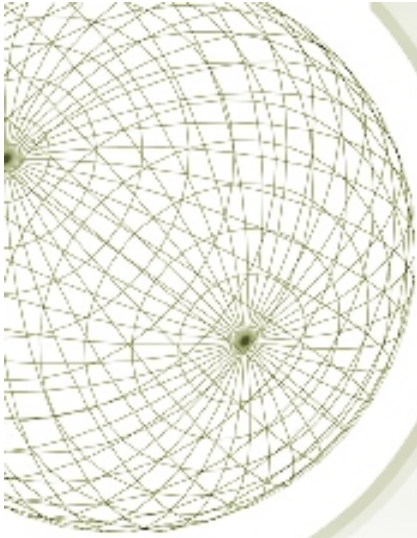
SOURCES: Based on Bouchard & McGue, 1981; Bouchard et al., 1990; Scarr, 1992.



Heritability of Personality

★ Five Factor Model:

- ★ *Extraversion-Introversion*
- ★ *Agreeableness*
- ★ *Conscientiousness*
- ★ *Neuroticism*
- ★ *Openness to Experience*



Heritability of Personality

TABLE 3.3 Heritability of the Big Five Personality Factors Based on Twin Studies

Trait	Heritability Coefficient
Extraversion	.54
Neuroticism	.48
Conscientiousness	.49
Agreeableness	.42
Openness to Experience	.57

SOURCE: Bouchard, 2004.

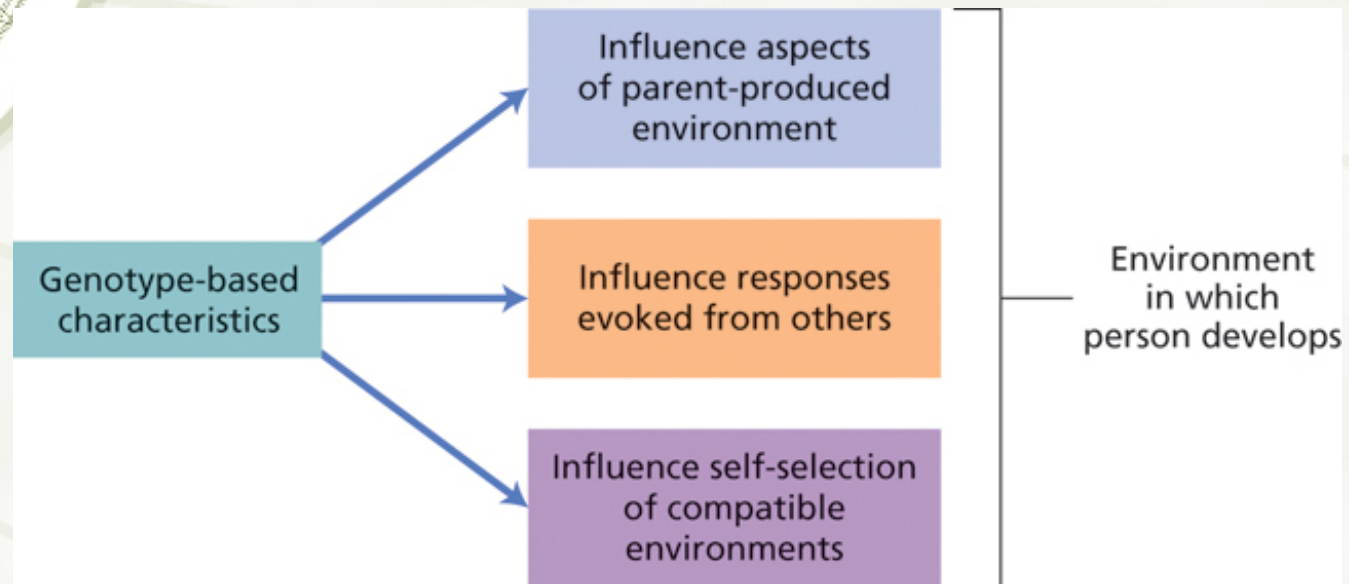


Gene-Environment Interactions

- ★ Environment influences genes
 - ★ *Reaction range*: the range of possibilities that a genetic code allows
 - ★ Environment determines where the individual falls within these boundaries



Gene-Environment Interactions





Genetic Manipulation

- ★ Transplanting genes from one species to another
 - ★ Demonstrates how closely humans are related to other living creatures
- ★ *Knockout procedure*: eliminates the particular function of a gene
- ★ *Knock-in procedure*: inserts a new gene during the embryonic stage to study its impact on behavior



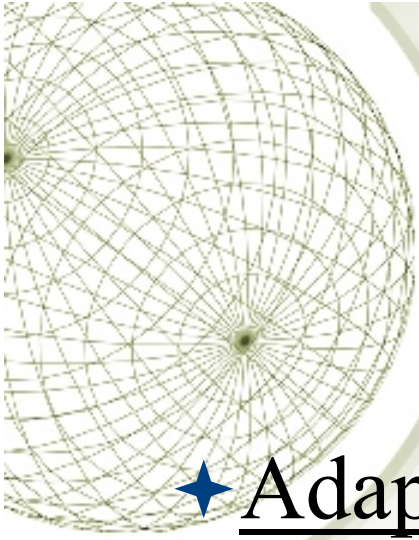
Evolution and Behavior

- ★ Biologically-based Mechanisms: the innate ability to take in, process, and respond to information, predisposing us behave, feel, and think in certain ways
- ★ Evolution: a change over time in the frequency with which particular genes - and the characteristics they produce - occur within an interbreeding population



Evolution and Behavior

- ★ Mutations: random events and accidents in gene reproduction during the division of cells
- ★ Natural Selection: characteristics that increase the likelihood of survival and reproduction will be more likely to be preserved in the population, therefore becoming more common in the species over time
 - ★ Evolutionary noise

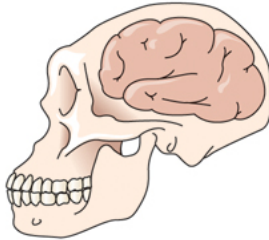


Evolution and Behavior

- ★ Adaptations: physical or behavioral changes that allow organisms to meet recurring environmental challenges to their survival, thereby increasing their reproductive ability
 - ◆ Bipedal locomotion (walking on two legs)

Evolution and Behavior

Australopithecus
(4 million years ago)



The brain capacity ranges from 450 to 650 cubic centimeters (cc).

Homo erectus
(1.6 million to 100,000 years ago)



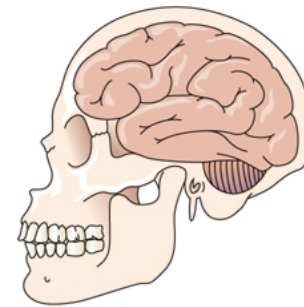
Further development of the skull and jaw are evident, and brain capacity is 900 cc.

Neandertal
(75,000 years ago)

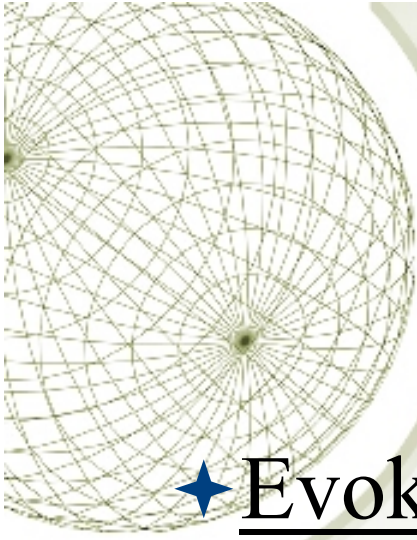


The human skull has now taken shape: the skull case has elongated to hold a complex brain of 1,450 cc.

Homo sapiens



The deeply convoluted brain reflects growth in areas concerned with higher mental processes.



Evolution and Behavior

- ★ Evoked Culture: cultures may be the product of biological mechanisms that evolved to meet specific adaptation challenges
 - ★ Cultural norms are then transmitted to members through social learning



Evolution and Human Behavior

- ★ Sexuality and Mate Preferences: men typically show more interest in short-term mating, prefer a greater number of partners, and have more permissive sexual attitudes than women
- ★ Sexual Strategies Theory: mating strategies reflect inherited tendencies, shaped over the ages in response to different types of adaptive problems that men and women faced



Evolution and Human Behavior

★ Men:

- ★ Motivated to perpetuate species
- ★ Youth as a sign of fertility

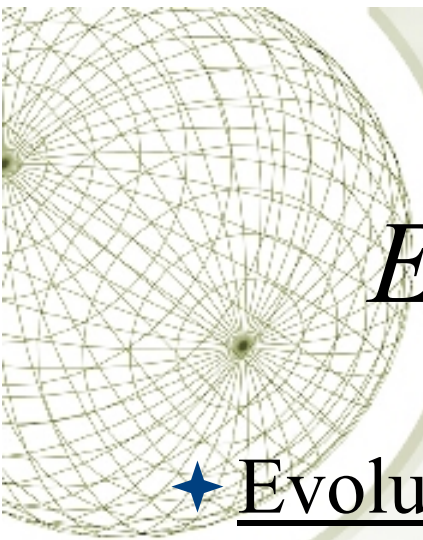
★ Women:

- ★ Greater investment in children
- ★ Reproductive success through resources

Evolution and Human Behavior


- ★ Social Structure Theory: maintains that men and women display different mating preferences because society guides them into different social roles





Evolution and Human Nature

- ★ Evolutionary Personality Theory: an approach that looks for the origin of presumably universal personality traits in the adaptive demands of our species' evolutionary history
 - ✦ Universal traits have helped us achieve physical survival and reproductive success
 - ✦ May reflect the ways in which we are biologically programmed to discriminate among people



Evolution and Human Nature

- ★ Strategic Pluralism: the idea that multiple - even contradictory - behavioral strategies might be adaptive in certain environments and would therefore be maintained through natural selection
 - ◆ Each trait has both costs and benefits that could relate to survival



Evolutionary Theory

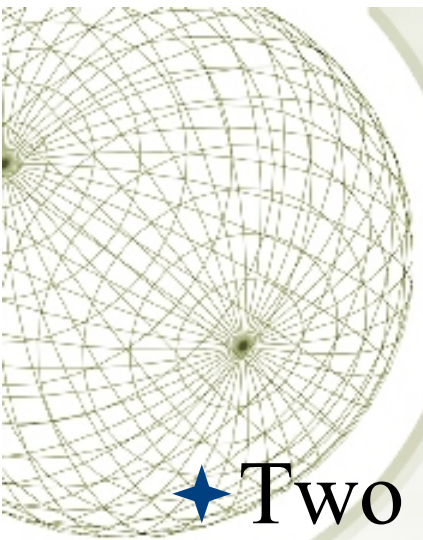
- ★ Potential problems:

- ★ Circular reasoning

- ★ Attributing every human characteristic to natural selection

- ★ Remote causes

- ★ Proximate (recent) causes



Evolutionary Theory

★ Two Fallacies:

- ★ Genetic Determinism: the idea that genes have invariant and unavoidable effects that cannot be altered
- ★ Evolution is purposeful (has a plan)