

# Unit III

## Biological Bases of Behavior

### Overview

At the core of what it means to behave and have mental processes is our biology. The brain's intricate and complex arrangement is what drives, compels, quiets, and consoles us. Unit III explores the mechanisms and processes by which we move our body, think about a friend, aim for a lofty goal or handle daily setbacks. The basics of neuroanatomy and neural transmission begin the unit, which then turns to a discussion of the nervous system as a whole. The endocrine system's role in regulating hormonal control of our body is discussed in detail, followed by a review of the various brain structures and their functions. Michael Gazzaniga's classic work with split-brain patients serves as the jumping off point to discuss hemisphere lateralization, plasticity, and neurogenesis, and both genetics and evolution are investigated as key foundations to the modern-day brain.

### Modules

- 9** Biological Psychology and Neurotransmission

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- 10** The Nervous and Endocrine Systems

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- 11** Studying the Brain, and Older Structures

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- 12** The Cerebral Cortex

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- 13** Brain Hemisphere Organization and the Biology of Consciousness

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- 14** Behavior Genetics: Predicting Individual Differences

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- 15** Evolutionary Psychology: Understanding Human Nature

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### Tip #3

### Use Mnemonic Devices to Remember Key Material

This unit is by far one of the most vocabulary-rich in the course. As you learned in Unit I, making useful and meaningful vocabulary cards with examples and references, questions and observations is a sure fire way to master the terminology. In addition, you will want to develop key mnemonic devices (memory tricks) to learn the structures and functions of the brain and nervous system. One such device is called the Method of Loci. (Loci is the plural of the Latin locus, meaning place or location.) You begin by visualizing a location you know well, such as your home. Then you insert items you wish to recall into various rooms and places in your 'home'. For instance, in this module you will be learning about the amygdala, a structure in the brain that plays a key role in extreme feelings such as rage and anger. Perhaps, in your visual 'home' you place an image of the amygdala (it doesn't have to actually look like an amygdala, try just placing the word) in your diary next to your bed. A diary is a place you might record emotions such as rage and anger. Following this idea, you might place your hypothalamus in the refrigerator. Any guesses as to the function of the hypothalamus? You'll find out in this unit!

# Module 9

## Biological Psychology and Neurotransmission

### Before You Read

#### Module Summary

Module 9 revisits the early Greeks' philosophies as they relate to the mind-body connection and discusses the work of Franz Gall as one of the pioneers of the exploration of the brain and mind. The early contributions of the Greeks are debunked as the science of modern brain studies is introduced. A thorough discussion of neural transmission segues into neuroanatomy and neuronal function and ends with a brief introduction to neurotransmitters, agonists, and antagonists.

Before beginning the module, take a moment to read each of the following terms you will encounter. You may wish to make vocabulary cards for each.

#### Key Terms

biological psychology

neuron

dendrites

axon

myelin sheath

action potential

refractory period

threshold

all-or-none response

synapse

neurotransmitters

reuptake

endorphins

agonist

antagonist

### While You Read

9-1

Answer the following questions.

1. Where in the body did Plato believe the 'mind' was located?
2. How did Aristotle disagree with Plato?



Remember your charts from Module 1? Return now and add this additional information about Plato and Aristotle to make your chart more complete.

3. How did Franz Gall contribute to the mind-body question?

4. In what way was Franz Gall incorrect? In what way was he correct?

**9-2**

Answer the following questions, and complete the diagram and chart below.

1. What happy fact allows us to study animal brains to learn about human brains?

2. Fill in the chart below with the functions of these neural structures.

Structure	Function
dendrite	
cell body	
axon	
terminal branches	
myelin sheath	

3. Describe what the action potential is and why it is important to neural communication.

4. Use page 79 and Figure 9.3 to help you complete this paragraph describing the process of the action potential:

The fluid outside the axon membrane is largely made up of \_\_\_\_\_ charged ions but the fluid inside the membrane is primarily made up of \_\_\_\_\_ charged ions. This state is referred to as the \_\_\_\_\_. We refer to the axon's surface as \_\_\_\_\_ permeable since it will only allow particular ions to pass through. When a neuron fires, the axon membrane becomes permeable and \_\_\_\_\_ sodium ions flow into the cell. This \_\_\_\_\_ that part of the axon and then causes the next section of the membrane to become permeable. This occurs over and over down the line of the axon and serves to push the nerve impulse down the neuron. During the \_\_\_\_\_, the \_\_\_\_\_ ions are pumped back out of the cell and the axon returns to the original state of polarity, called the \_\_\_\_\_, prepared to fire again.

5. What is the difference between an excitatory nerve signal and an inhibitory nerve signal?

6. What is a threshold?

7. What happens when the level of neural stimulation above the threshold is increased? Why?

8. Create a metaphor or simile for the process of neural transmission.

Neural transmission is like . . .

**9-3** Answer the following questions.

1. What is a synapse?
2. How do neurons communicate with each other?
3. What is reuptake?

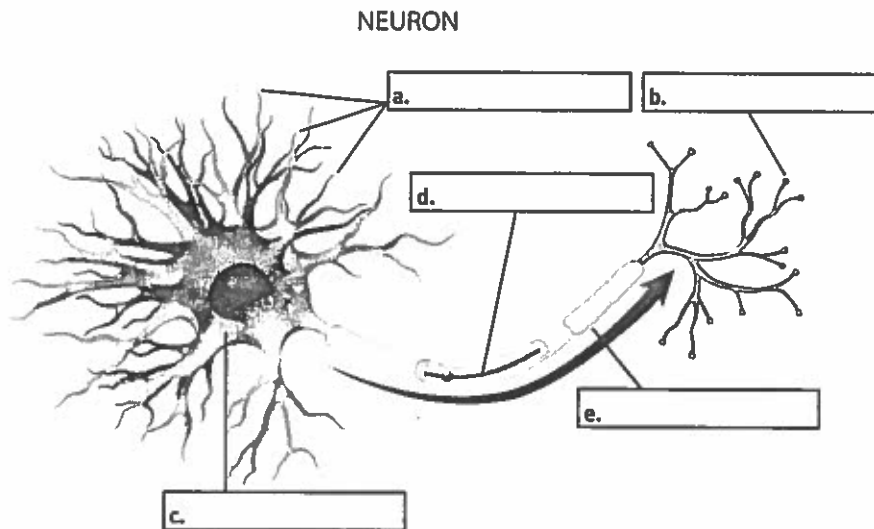
**9-4** Answer the following questions/prompts.

1. Give an example of an agonist and describe how it functions in the nervous system.
2. Give an example of an antagonist and describe how it functions in the nervous system.
3. Describe how Botulin functions as an antagonist for acetylcholine.
4. What effect does the release of endorphins have on the body?

## After You Read

### Module 9 Review

Complete the diagram, then the section of matching questions below to see if you have mastered the basics. Label and describe the function of the five main parts of the neuron.



*Terms*

- \_\_\_\_\_ 1. biological psychology
- \_\_\_\_\_ 2. neuron
- \_\_\_\_\_ 3. dendrites
- \_\_\_\_\_ 4. axon
- \_\_\_\_\_ 5. myelin sheath
- \_\_\_\_\_ 6. action potential
- \_\_\_\_\_ 7. refractory period
- \_\_\_\_\_ 8. all-or-none response
- \_\_\_\_\_ 9. threshold
- \_\_\_\_\_ 10. synapse
- \_\_\_\_\_ 11. neurotransmitters
- \_\_\_\_\_ 12. reuptake
- \_\_\_\_\_ 13. endorphins
- \_\_\_\_\_ 14. agonist
- \_\_\_\_\_ 15. antagonist

*Definitions*

- A. Molecule that binds to a receptor and inhibits a response
- B. Chemical messengers that cross the synapse between neurons
- C. Level of physical stimulation required to trigger an impulse
- D. Study of the links between biological and psychological processes
- E. Reabsorption of the neurotransmitter by the sending neuron
- F. Brief electrical charge that travels down an axon
- G. Opiate-like neurotransmitters linked to pain control
- H. Basic building block of the nervous system
- I. A period of inactivity after a neuron fires
- J. Receives neural messages and sends impulse to cell body
- K. The junction between the axon tip of the sending neuron and the dendrites of the receiving neuron
- L. Extension of neuron that passes messages through its branches to other neurons, muscles or glands
- M. Neural reaction of either firing or not firing
- N. Molecule similar to a neurotransmitter that triggers a response
- O. Fatty tissue layer encasing the axon

# Module 10

## The Nervous and Endocrine Systems

### Before You Read

#### Module Summary

Module 10 lays out the divisions and subdivisions of the nervous system and describes how each division helps us function. In addition, the nature and function of the endocrine system is discussed.

Before beginning the module, take a moment to read each of the following terms you will encounter. You may wish to make vocabulary cards for each.

#### Key Terms

nervous system

central nervous system

peripheral nervous system

nerves

sensory (afferent) neurons

motor (efferent) neurons

interneurons

somatic nervous system

autonomic nervous system

sympathetic nervous system

parasympathetic nervous system

reflex

endocrine system

hormones

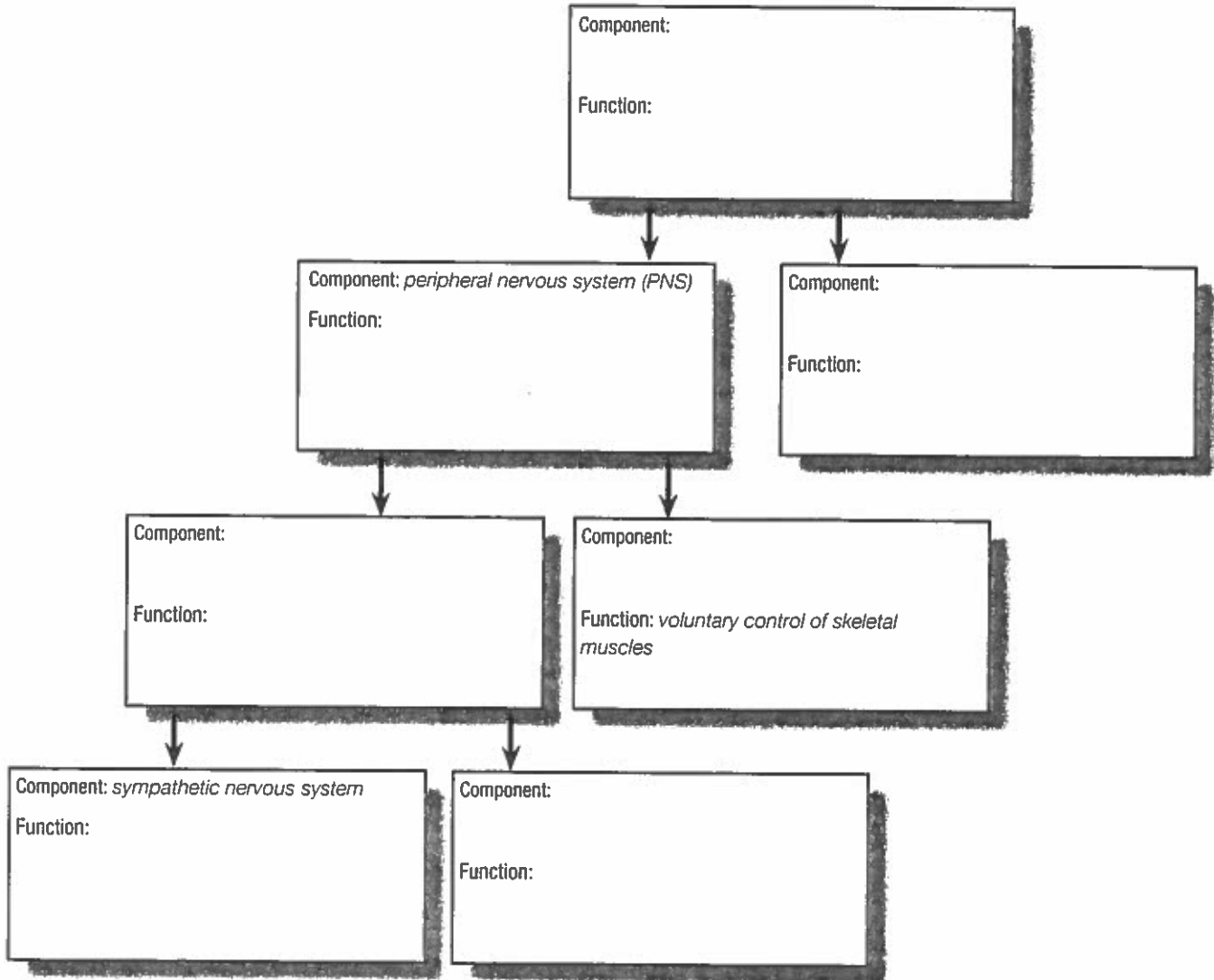
adrenal glands

pituitary gland

## While You Read

**10-1** Complete the diagram and answer the prompts below.

1. Using the information from your text on the functional divisions of the human nervous system and Figure 10.1, fill in the chart below.



2. Provide an example from your own life of when each of the subdivisions of the nervous system would be involved.

a. peripheral:

e. sympathetic:

b. central:

f. parasympathetic:

c. autonomic:

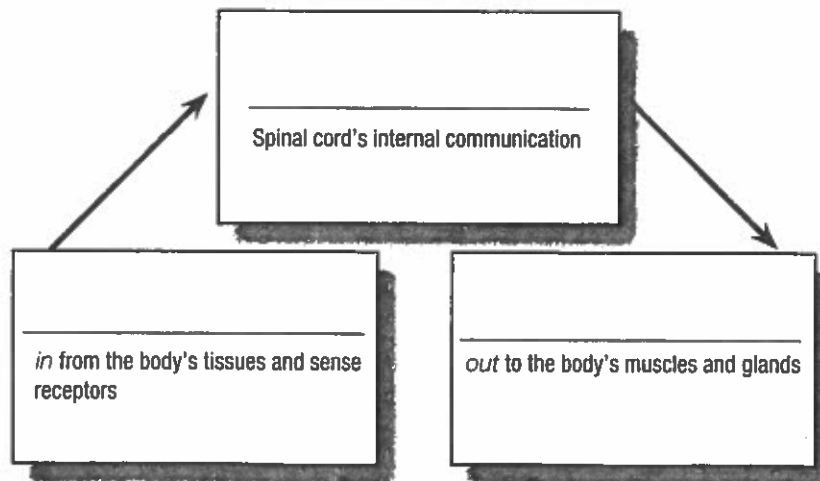
d. somatic:



3. Use Figure 10.2 to complete the chart below describing the physiological changes that occur when the sympathetic and parasympathetic nervous systems are stimulated. A few have been filled in for you.

	Effect When Sympathetic Nervous System Is Stimulated	Effect When Parasympathetic Nervous System Is Stimulated
Pupil of the eye		
Heart		
Stomach		
Liver	<i>Glucose is released by the liver</i>	<i>No effect</i>
Gallbladder	<i>No effect</i>	
Adrenal glands		<i>No effect</i>
Bladder		<i>Contracts</i>
Sex organs		

4. Label the diagram below with the three types of neurons used to carry reflex information to and from the spinal cord.



**10-2** Answer the questions and complete the chart below.

1. In what ways do the endocrine and nervous systems act similarly? In what ways do they act differently?

2. How does the endocrine system's release of hormones influence us?

3. Use the information from your text and Figure 10.5 to complete the chart of endocrine system structures and functions below.

Structure	Function
Hypothalamus	
	secretes female hormones
Adrenal glands	
	releases growth hormone, oxytocin, and other hormones
	affects metabolism
Testis	
	regulates the level of sugar in the blood
Parathyroid	

4. Why is the pituitary gland referred to as the "master gland"?

## After You Read

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### Module 10 Review

Complete the questions below to see if you have mastered the basics.

1. After placing your hand on a hot stove, pain signals are sent from the sense receptors in your skin through \_\_\_\_\_ to the spinal cord where the signal is processed by \_\_\_\_\_ and finally to the muscles in your hand via the \_\_\_\_\_, causing you to remove your hand from the stove.
2. When the morning announcements call for you to rise to recite the Pledge of Allegiance, the signal to stand up on your feet is sent by way of which system?
3. The control of your heartbeat is regulated by which system?
4. While taking your first AP<sup>®</sup> exam, a test that is causing you great anxiety, what physical reactions will your body have due to the sympathetic nervous system?
5. After finishing the AP<sup>®</sup> Exam and realizing you probably scored a 5 because you worked so hard to prepare this year, what physical reactions will your body have due to the parasympathetic nervous system?

# Module 11

## Studying the Brain, and Older Brain Structures

### Before You Read

#### Module Summary

Module 11 begins the two-module exploration of brain structures by introducing the more primitive structures of the hind- and mid-brain. The functions of the brainstem structures, and the more evolved limbic system structures, are explained through detailed diagrams and examples. In addition, this module contains a thorough review of the scanning technologies that allow us to view inside the brain.

Before beginning the module, take a moment to read each of the following terms you will encounter. You may wish to make vocabulary cards for each.

#### Key Terms

lesion	medulla
electroencephalogram (EEG)	thalamus
CT (computed tomography) scan	reticular formation
PET (positron emission tomography) scan	cerebellum
MRI (magnetic resonance imaging)	limbic system
fMRI (functional MRI)	amygdala
brainstem	hypothalamus

### While You Read

Complete the charts and answer the questions.

11-1

1. What does it mean to lesion the brain? Why is this procedure important in studying the brain?

2. As you learn about each of the methods used to scan the brain, complete the chart below.

Full name of brain scan technology	Abbreviation	Method Used to Produce Image
		electrodes placed on the scalp
	CT	
Positron emission tomography		
		magnetic fields and radio waves
	fMRI	

3. What do each of the brain scanning methods reveal or show us about brain function?

EEG:

CT:

PET:

MRI:

fMRI:

## 11-2

1. In general, what are the functions of the brainstem structures?

2. Complete the chart of brainstem structures below:

Structure	Function	Mnemonic Device to Remember Structure/Function
Medulla		
Pons		
Thalamus		
Reticular formation		
Cerebellum		

**11-3**

1. In general, what are the functions of the limbic system structures?

2. Complete the chart of limbic system structures below:

Structure	Function	Mnemonic Device to Remember Structure/Function
Amygdala		
Hippocampus		
Hypothalamus		
Nucleus accumbens		

3. What have experiments revealed about a dopamine-related reward pathway in humans??

☞ Use Figure 11.11 on page 101 to check your two charts above. Combine the information from the text and the diagram to make sure your chart is as complete as possible.

## After You Read

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### Module 11 Review

Complete the questions below to see if you have mastered the basics.

#### *Terms*

- \_\_\_\_\_ 1. EEG
- \_\_\_\_\_ 2. CT scan
- \_\_\_\_\_ 3. PET scan
- \_\_\_\_\_ 4. MRI
- \_\_\_\_\_ 5. fMRI

#### *Definitions*

- A. Shows brain activity by tracking glucose absorption
  - B. Reveals brain damage through use of X-rays
  - C. Depicts brain structures through the use of magnetic fields and radio waves
  - D. Provides an amplified readout of brain waves by using electrodes on the scalp
  - E. Reveals brain activity and functioning by tracking increased oxygen-laden bloodflow
6. Use your knowledge of the hindbrain and limbic system structures to identify which structure(s) would be involved and what role they would play in the following task/function.
- a. punting a football
  - b. hearing your stepdad call you home from playing outside
  - c. a cat arching its back and hissing at a potential predator
  - d. learning a set of new geometry theorems
  - e. returning again and again to a video game that you are having increased success playing

## Multiple Choice

Circle the correct answer.

1. Identify the correct brain structure-function pairing.
  - a. amygdala: thirst, sex and hunger
  - b. cerebellum: conscious memories
  - c. medulla: breathing and heart rate
  - d. pons: aggression and fear
  - e. hypothalamus: breathing and heart rate
  
2. In the final seconds of the Georgia-Florida game, the field-goal kicker accurately sends a 55-yard kick into the goal to score and GEORGIA WINS! Most likely, the precision and accuracy of this challenging kick was a result of neural functioning in the
  - a. hippocampus
  - b. hypothalamus
  - c. medulla
  - d. cerebellum
  - e. amygdala
  
3. Which of the following senses does not send neural messages through the thalamus?
  - a. taste
  - b. smell
  - c. touch
  - d. sight
  - e. hearing
  
4. In the climax of the Alfred Hitchcock thriller, *Psycho*, you are in a state of extreme fear. If viewed on a PET scan, which area of your brain would be bright white (or highly stimulated)?
  - a. thalamus
  - b. hippocampus
  - c. cerebellum
  - d. pons
  - e. amygdala
  
5. At the movie theater, you feel a strong urge to eat popcorn and buy a drink. Most likely, this area of your brain is sending neural impulses influencing your thirst and hunger.
  - a. hippocampus
  - b. nucleus accumbens
  - c. thalamus
  - d. hypothalamus
  - e. amygdala



# Module 12

## The Cerebral Cortex

### Before You Read

#### Module Summary

Module 12 explores the lobes and association areas of the cerebral cortex. Detailed examples and illustrations elaborate on the motor and sensory functions of our brain's complex control center. The module concludes with a discussion of plasticity.

Before beginning the module, take a moment to read each of the following terms and names you will encounter. You may wish to make vocabulary cards for each.

#### Key Terms

cerebral cortex  
glial cells (glia)  
frontal lobes  
parietal lobes  
occipital lobes  
temporal lobes  
motor cortex  
somatosensory cortex  
association areas  
plasticity  
neurogenesis

#### Key Names

Paul Broca  
Carl Wernicke

### While You Read

Answer the following questions.

**12-1**

1. In general, what are the functions of the various cortex regions?

2. How do glial cells support neurons?
  
  
  
  
  
  
  
  
  
  
3. What are the four lobes of the cortex and what basic function does each serve?
  
  
  
  
  
  
  
  
  
  
4. A homunculus (literally meaning “little man”) is a scaled figure used to illustrate physiological functions. In Figure 12.2, a somatosensory and motor homunculus is drawn to explain which functions of the body take up more or less space on the cortex. Using that diagram, answer the following questions:
  - a. Which area(s) of the body is/are depicted as overly large in the motor cortex shown on the left of the diagram?
  
  
  
  
  
  
  
  
  
  
  - b. Why would these structures need greater space in the motor cortex?
  
  
  
  
  
  
  
  
  
  
  - c. What area(s) of the body is/are depicted as overly large in the somatosensory cortex shown on the right of the diagram?
  
  
  
  
  
  
  
  
  
  
  - d. Why would these structures need greater space in the somatosensory cortex?
  
  
  
  
  
  
  
  
  
  
5. In which lobe is the motor cortex located? How does the location of the motor cortex help us to better understand the function?



**12-2**

1. What is plasticity and what are two instances in which it could occur?
2. What is the significance of plasticity?
3. Give two examples from the text of the brain's ability to reorganize or reassign brain functions.
4. How is neurogenesis different from plasticity?

## After You Read

### Module 12 Review

Complete the matching questions below to see if you have mastered the basics.

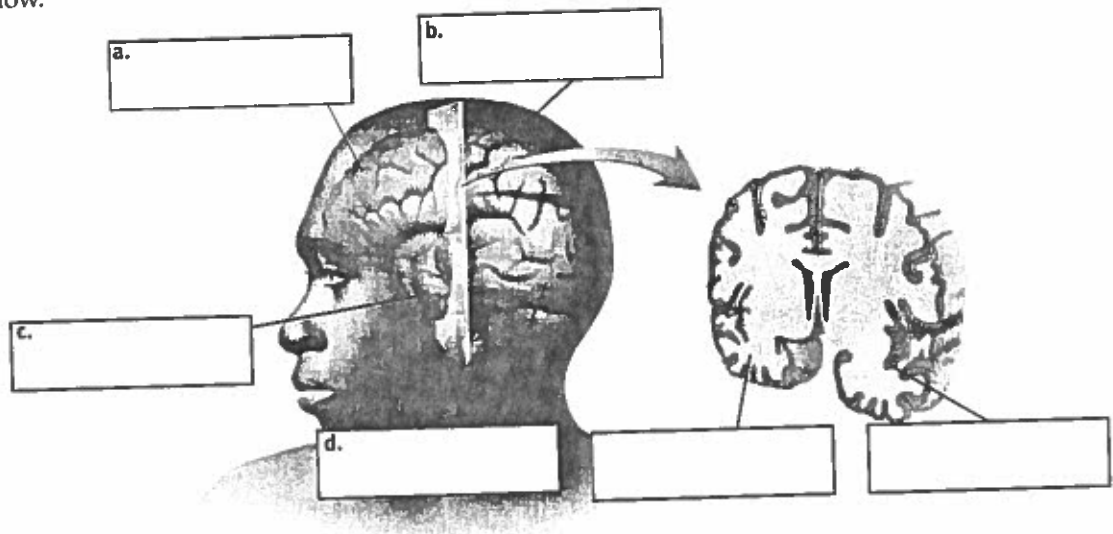
#### Terms

- \_\_\_\_\_ 1. cerebral cortex
- \_\_\_\_\_ 2. glial cells
- \_\_\_\_\_ 3. motor cortex
- \_\_\_\_\_ 4. somatosensory cortex
- \_\_\_\_\_ 5. association areas
- \_\_\_\_\_ 6. plasticity
- \_\_\_\_\_ 7. neurogenesis

#### Definitions

- A. Area at the rear of the frontal lobes that controls voluntary movements
- B. The body's ultimate control and processing center that covers the cerebral hemispheres
- C. Area at the front of the parietal lobes that processes body touch and movement sensations
- D. Areas of the cortex involved in higher mental functions such as learning and speaking
- E. Cells that support, nourish, and protect neurons
- F. The brain's ability to reorganize after damage or build new pathways based on experience
- G. The formation of new neurons

Label the lobes and identify the brain's hemispheres in the cross-section. Then, briefly describe each lobe's function below.



a.

c.

b.

d.

# Module 13

## Brain Hemisphere Organization and the Biology of Consciousness

### Before You Read

#### Module Summary

Module 13 discusses the early and now classic work in split-brain patients that yielded vast information about the lateralization of the brain hemispheres. Detailed graphics and diagrams assist in conveying the key aspects of right- and left-brain functions. The module closes with the biology of consciousness and the explanation of dual processing.

Before beginning the module, take a moment to read each of the following terms and names you will encounter. You may wish to make vocabulary cards for each.

#### Key Terms

corpus callosum  
split brain  
consciousness  
cognitive neuroscience  
dual processing

#### Key Names

Michael Gazzaniga  
Roger Sperry

### While You Read

Answer the questions and complete the charts below.

13-1

1. What is lateralization, and why is it important in the way our brain functions?
2. What is meant by the term *split brain*? Is it correct to refer to this condition as "having two brains"?

3. Fill in the chart below with some of the tasks served by each hemisphere of the brain. As you continue to read this module, return to this chart and add new information as you learn it.

Left Hemisphere Functions	Right Hemisphere Functions

4. Why do the tasks listed above lend themselves to the myth that we are "right-" or "left-"brained? Using the information regarding the brain structures and association areas you learned in the last two modules, address why this myth is erroneous.

5. What role does the corpus callosum play in relation to the two hemispheres?

6. Using Figures 13.2 and 13.3, and your knowledge of brain structures, explain step-by-step why Gazzaniga's patients were able to:

a. say the word "ART"

b. point to the word "HE" with their left hand

7. What is the relationship between handedness and speech processing?
  
8. How does split-brain research help us to understand the functions of our two brain hemispheres?

**13-2**

1. How is cognitive neuroscience changing the way we understand mental processes?
  
2. How does consciousness help humans survive?
  
3. What is dual processing? Give an example from the text of dual processing. Give an example from your own life of dual processing.
  
4. How does the example of the hollow face illusion (Figure 13.7) demonstrate dual processing?



## After You Read

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### Module 13 Review

Answer the questions below to see if you have mastered the basics.

1. Jonathon undergoes an MRI and his doctor discovers a tumor in the left hemisphere of his brain. Which of the following functions may be impacted by this tumor?
  - a. Jonathon's perceptual abilities
  - b. the control of the left side of Jonathon's body
  - c. Jonathon's ability to speak
  - d. Jonathon's ability to understand subtleties and inferences in literature or poetry
  - e. Jonathon's understanding or "sense of self"
2. Myung Li was involved in a car collision and suffered severe injuries to the right side of her head. Her doctor has been giving her a battery of tests to determine to what extent her various functions are affected. In a remote-associates test in which Myung Li views three words (such as butter, fire and fruit) and is asked to produce a fourth word that would be able to pair with each of the three words to produce a new word, Myung Li is likely to
  - a. modulate her speech when producing the answer.
  - b. be able to quickly draw a picture of the word with her left hand.
  - c. quickly produce the required word.
  - d. be able to rapidly write the answer with her left hand.
  - e. be unable to make the inference necessary to produce the word.
3. In Michael Gazzaniga's classic "HEART" experiment with split-brain patients, he found that patients were able to
  - a. use their right hand to point to the word "ART."
  - b. use their right hand to point to the word "HE."
  - c. verbally express the word "HE."
  - d. verbally express the word "HEART."
  - e. use their left hand to point to the word "ART."
4. In a controlled replication of Gazzaniga's experiment, when shown an image of a frog in the left visual field and an image of a football in the right visual field, split-brain patients were able to correctly
  - a. use their left hand to point to a picture of a football.
  - b. use their right hand to point to a picture of a frog.
  - c. use their left hand to point to a picture of a frog.
  - d. use either hand to point to both the frog and the football.
  - e. verbally express the word "FROG."
5. In order to reduce or eliminate epileptic seizures in patients, surgeons Philip Vogel and Joseph Bogen severed
  - a. the amygdala.
  - b. the corpus callosum.
  - c. the hypothalamus.
  - d. the limbic system.
  - e. the cerebellum.

# Module 14

## Behavior Genetics: Predicting Individual Differences

### Before You Read

#### Module Summary

Module 14 defines genes, and describes how behavior geneticists explain our individual differences. The potential uses of molecular genetics research are explored and the concept of heritability is explained. The interaction of heredity and environment and the relationship of heritability to individuals and groups are discussed.

Before beginning the module, take a moment to read each of the following terms you will encounter. You may wish to make vocabulary cards for each.

#### Key Terms

behavior genetics

environment

chromosomes

DNA (deoxyribonucleic acid)

genes

genome

identical twins (monozygotic)

fraternal twins (dizygotic)

molecular genetics

heritability

interaction

epigenetics

### While You Read

Answer the following questions/prompts.

14-1

- Using key terms from the text, complete the three analogies below:
  - Your book of life: \_\_\_\_\_
  - \_\_\_\_\_ : the chapters in your book
  - words in the chapter: \_\_\_\_\_
- Using #1 as a model, create your own analogy for the relationship between genes, chromosomes, and DNA.

3. Genes can either be \_\_\_\_\_ or \_\_\_\_\_. What does this mean?
  
4. Why are psychologists interested in variations found at particular gene sites in humans?
  
5. Identical twins form from a \_\_\_\_\_ fertilized egg cell and are \_\_\_\_\_ identical. What are two important qualifications to the statement above?
  
6. Fraternal twins form from \_\_\_\_\_ fertilized eggs. They share a \_\_\_\_\_ but are genetically no more similar than \_\_\_\_\_.
  
7. How are identical twins behaviorally more similar than fraternal twins?
  
8. Discuss the findings of Bouchard's twin studies.
  
9. What is a criticism leveled at Bouchard's studies?
  
10. According to the text, what is the rather counterintuitive finding regarding adoptive families versus biological families?
  
11. The environment shared by a family's children has virtually \_\_\_\_\_ discernible impact on their personalities.
  - a. Describe what is meant by this statement, and why people are often surprised by this finding.
  
  - b. In what ways does the statement above seem true for your family, extended family, or friends and their siblings?

## 14-2

1. What is molecular genetics? Why is it important to the study of human behavior?
2. What are some ways in which DNA gathering techniques are being used to help humans?

## 14-3

1. How is heritability defined?
2. As environments become more similar, heredity as a source of difference becomes \_\_\_\_\_.  
Why is this the case?

## 14-4

1. "Heredity deals the cards; environment plays the hand." -C. Brewer, 1990 (p. 131)  
How does Charles Brewer's quote above explain the interaction between heredity and environment?
2. How is the example of two babies born with different genetic personalities used to explain how heredity and environment work together?

3. What does it mean to say that genes “react”? How might this cause differences between traits of identical twins?
4. What example from your own life can you give to show how heredity and environment work together

## After You Read

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### Module 14 Review

Complete the questions below by noting whether the answer is *high* or *low* to see if you have mastered the basics of heritability.

1. Conor and Aidan, fraternal twins raised in the same home, have many traits in common. Both boys are outgoing, interested in building puzzles and playing soccer. However, Conor is compliant and easy-going, while Aidan is stubborn and rigid. Psychologists would gauge the heritability of this personality difference as \_\_\_\_\_ .  
*high or low*
2. Students attending Japanese schools are often reported as having higher math and science scores than students attending American schools. The heritability of these math and science differences would likely be \_\_\_\_\_ .  
*high or low*
3. Olivia and Dantelle are identical twins that were separated at birth and raised in two different homes. Olivia grew up in Georgia and Dantelle was raised in New York City. They each enjoy unflavored yogurt, pickles and horseradish, and both laugh with a distinctive throaty sound. Yet, Olivia is curious and inquisitive, while Dantelle seems uninterested in learning new things. The heritability of their personality differences would likely be \_\_\_\_\_ .  
*high or low*
4. True or False? As environments become more similar, heritability of differences between groups from those environments increases.
5. True or False? If differences among people are mostly attributable to genes, then the heritability is closer to 0.

# Module 15

## Evolutionary Psychology: Understanding Human Nature

### Before You Read

#### Module Summary

Module 15 discusses the concept of natural selection and adaptation in an evolutionary context and explores some of the work evolutionary psychologists do. The criticisms of evolutionary psychology and the responses from those that work in the field are presented. Lastly, the biopsychosocial approach to explaining behavior and mental processes is presented and explained.

Before beginning the module, take a moment to read each of the following terms and names you will encounter. You may wish to make vocabulary cards for each.

#### Key Terms

evolutionary psychology

natural selection

mutation

#### Key Name

Charles Darwin

### While You Read

Answer the following questions/prompts.

15-1

1. How were researchers Belyaev and Trot able to produce domesticated foxes?
2. What are the larger implications of Belyaev and Trot's study?

3. No more than 5 percent of the genetic differences among humans arise from population group differences. Some 95 percent of genetic variation exists within populations. (Rosenberg et al, 2002 in Myers, p. 136)

a. How does the text's author explain the statement above using the examples of Icelandic villagers and Kenyans?

b. How might this statement be explained using a different group, for example, males and females?

4. How do contemporary scientists feel about Darwin's theory of natural selection?

5. What is the "second Darwinian revolution" and why is it significant?

6. How does evolutionary psychology explain behavior tendencies?

**15-2**

1. What arguments do evolutionary psychologists make that support men's increased interest in sex?
2. What arguments do evolutionary psychologists make that support women's increased interest in partnering and pairing?
3. What is significant about these presumed gender differences in mating preferences?

**15-3**

1. List three criticisms of evolutionary psychology.

**15-4**

1. Using Figure 15.1, discuss the three influences on individual development according to the biopsychosocial model.



2. Using the trait of aggressiveness, list possible

a. biological components:

b. social components:

c. psychological components:

2. Why do you think the text author included this section in this module?

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## After You Read

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### Module 15 Review

Complete the matching questions below to see if you have mastered the basics.

*Terms or Names*

- \_\_\_\_\_ 1. evolutionary psychology
- \_\_\_\_\_ 2. natural selection
- \_\_\_\_\_ 3. mutation
- \_\_\_\_\_ 4. biopsychosocial approach
- \_\_\_\_\_ 5. Charles Darwin

*Definitions or Descriptions*

- A. Evolutionary theorist
- B. The study of the gradual change over time of behavior and the mind
- C. A random error in gene application that leads to a change
- D. The principle that inherited traits that contribute to reproduction and survival will most likely be passed on to succeeding generations
- E. The belief that we are products of our genes, our environment, and our psychological decisions

**✓ Check Yourself**

Now that you have mastered the basics, work through the problems below to see if you can *synthesize*, *evaluate*, and *analyze* what you have learned.

Samuel is a cross-country runner for your school and has qualified for the state cross-country meet. He has been training for years and is in top shape for the event. In order for Samuel to successfully perform at the meet, several key biophysiological functions will occur simultaneously—from the neural impulses his brain sends and the release of key neurotransmitters, to the structures of the central and peripheral nervous systems and endocrine systems.

1. Describe the neural transmission occurring in Samuel's body while he is warming up for the race. Be sure to include how a message moves through each part of a neuron and how messages communicate between neurons.
2. What neurotransmitters are likely being released at the synapse while Sam is competing at the meet?
3. Choose four brain structures and discuss how each structure is active in Samuel as he runs. Be sure to include how these particular brain structures are associated with Samuel and the cross-country meet.
4. What function are the three types of neurons serving as Samuel hears the signal to start the race?
  - a. sensory (afferent) neurons:
  - b. interneurons:
  - c. motor (efferent) neurons:





## Before You Move On

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Use the checklist below to verify your understanding of the unit's main points.

- Do I know the structures and functions of each part of a neuron?
  - Do I know how neural transmission works within and between neurons?
  - Can I accurately describe the processes involved in the action potential?
- Do I understand the influence of drugs on neurotransmitters?
- Reuptake?
  - Agonists?
  - Antagonists?
- Do I know the divisions and subdivisions of the nervous system?
  - Do I know the structures of the hind-, mid- and fore-brain and their functions?
  - Can I name and identify the functions of the lobes of the brain and the cortexes included within each?
  - Do I understand hemisphere lateralization and the information revealed from research on split-brain patients?
  - Do I know the role of neuroplasticity in brain injury?
  - Do I understand heritability?
  - Do I understand how heredity and environment work together to drive behavior?
  - Do I understand the evolutionary nature of our brain's development?
  - Can I identify key contributors in the field of biopsychological research?