Neuroscience and Behavior

Pages 53-61

-Explain why psychologists are concerned with human biology, and describe the ill-fated phrenology theory.

Everything psychological is simultaneously biological. Without your body- your genes, brain, appearance- you are nobody. To think, feel or act without a body would be like running without legs. The brain, its component neural systems, and their genetic instructions. Plato-located mind in head. Aristotle- located mind in heart which pumps warmth and vitality to body. Brain falls in love, heart doesn't. Phrenology: popular/ill-fated theory claims bumps on skull could reveal mental abilities and character traits. People actually gave skull readings. It was bogus. Phrenology focused on the idea that various brain regions have particular functions. In last century: nerve cells conduct electricity and communicate through chemical messages and that processed in different brain systems. Sights and sounds, meanings and memories, pain and passion. Biological psychologists are gaining a better understanding of sleep/dreams depression/schizophrenia/hunger/sex/stress/disease. Study psychology at biological roots.

I. **Neural Communication:** What is it, how does it work, and what does it do?

-info system = billions of interconnected cells called neurons. We are biopsychosocial systems (cells into organs into humans into communities.) We need to study how these bio-psych-social-cultural systems work and interact to understand behavior. Information systems of humans and other animals operate so similarly that one couldn't distinguish the difference between small samples of brain tissue of a monkey and a human. This allows researchers to study animals and make discoveries about humans. Like cars. There are different models (species) but they all have the same basic structure (cell systems.) Same principles are followed.

A. **Neurons**: What are the different parts and what do they do?

-Neuron= a nerve cell; the basic building block of the nervous system. Each neuron consists of a cell body and its branching fibers called dendrite fibers, which receive info and conduct it toward the cell body. The axon fibers pass the message along to other neurons or to muscles or glands. "Axons speak. Dendrites listen."

-Axons can be long, dendrites are short. Motor neurons control muscles and are huge. Myelin sheath insulates axons of neurons and helps speed impulses, and it is very important in multiple sclerosis in which the sheath degenerates and muscle speed and control is lost.

-Neural impulse speed ranges from 2 mph to 200 mph plus. This is 3 million times slower than that of electricity through a wire. Brain=milliseconds and computer= nanoseconds. Brain is more complex than a computer but not faster at execution of simple responses. --

-Neuron fires impulse when receives signals from sense receptors simulated by pressure, heat, or light, or chemical messages from neighboring neurons. The impulse is called action potential and is a brief electrical charge that travels down the axon. Neurons generate electricity from chemicals.

-Chem to electricity involves exchange of ions. Fluid interior of resting axon has excess of - ions while fluid outside axon has + ions. Positive-outside/ negative-inside state is

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II. **The Nervous System:** What is it and how does it work?
- Neurons are the basic components of our nervous system, our body's speedy electrochemical information network. CNS= central nervous system – brain and spinal cord. PNS= Peripheral Nervous System –links the CNS with the body's sense receptors, muscles, and glands. Axons carry pns info bundled up into electrical cables known as nerves. Info travels in nervous system through 3 types of neurons: Sensory neurons (send info from body tissue and sensory organs to the CNS which process info.) Motor Neurons (CNS sends out instructions to body's tissues through these.) Interneurons (between sensory input and motor output, info is processed by the CNS's internal communication through these.) we have a few million sensory, few million motor, and billions and billions of interneurons.

I: Nervous system
- A) Peripheral B) Central (Brain and spinal cord)
- 1a. autonomic (controls self-regulated action of internal organs and glands.)
- 2a. Somatic (Controls voluntary movements of skeletal muscles.
- --1a1. Sympathetic (arousing)
- --1a2. Parasympathetic (calming)

A. **The Peripheral Nervous System**: What is it and how does it work?
- 2 main components- Somatic and autonomic. Somatic enables voluntary control of skeletal muscles. Autonomic nervous system controls glands and muscles of internal organs. Autonomic nervous system is made up of sympathetic nervous system which arouses and the parasympathetic nervous system which calms you.

B. **The Central Nervous System:** What is it and how does it work?
- CNS enables our humanity in tens of billions of neurons.

1. The Spinal Cord and Reflexes
-CNS Spinal cord is info highway connecting the PNS to the brain. Ascending send up sensory info and descending send back motor- control information.
- Neural pathways govern our reflexes (responses to stimuli illustrate cord's work.) spinal reflex pathway made of 1 sensory neuron and 1 motor neuron that communicate through interneuron.
-pain reflex enabled by sensory neurons to interneurons in spinal cord which respond by activating motor neurons to muscles in place being hurt.
-Simple pain reflex runs through spinal cord before brain can process information. To produce bodily pain or pleasure, the sensory information must reach the brain.

2. The Brain and Neural Networks: What is a neural network?
- Brain receives info, interprets it, and decides responses like a computing machine.
- Neural networks are neurons clustered together into work. They communicate through short fast connections.
-Our own neural network is complicated, connecting with other networks that do different things with no direction but they have specific functions.

D. **The Endocrine System**: What is it and how does it work?
-It's the body's slow chemical communication system; a set of glands that secrete hormones (chemical messengers produced in one tissue and affect another) into the bloodstream. Hormones originate in one tissue, travel through the bloodstream, and affect other tissues including the brain, and influence interest in sex, food, and aggression.
-Some hormones linked to neurotransmitters. Both the endocrine and nervous systems secrete molecules that activate receptors elsewhere. Endocrine system takes a few seconds to go to the brain, unlike the nervous system. However, the effects of the endocrine message outlast the effects of the neural message.
-Hormones affect growth, reproduction, metabolism, and mood. They try to keep things in balance. The adrenal glands increase heart rate, blood pressure, and blood sugar, giving us energy in a state of emergency.
-Pituitary gland is a pea-sized gland in the core of the brain controlled by the hypothalamus, and releases hormones that influence growth and also influence the release of hormones by other endocrine glands. The pituitary is the master gland, and triggers your sex glands to release sex hormones, which influence brain and behavior.
- Brain → pituitary → other glands → hormones→ brain. This feedback system reveals connections of the nervous and endocrine systems. The nervous system directs the endocrine secretions which affect the nervous system, and the distinction between the 2 systems sometimes blur. Researchers. Discovered that neurotransmitters can drift in brain fluid to nerve receptors at distant sites, thereby affecting overall alertness or mood, in which the distinction between neurotransmitters and hormones isn't clear. The brain conducts it all.

III. Nature, Nurture, and Human Diversity (pages 95-105)

- We are all different, but family members have same common behavioral tendencies. Behavior genetics= relative effects of our genes (nature) and our environments (nurture) on our individual differences in behavior and mental processes. Together, our genes and environments design our unique body-mind system and define the things that make us different.
Evolutionary psychology= behaviors, emotions, thinking capacities that allow ancestors to survive and pass them to our generations.
Parents, peers, and culture influence our beliefs and values, our interests, and food tastes and our language and appearance.
Gender influences how others perceive us and how we think about ourselves.

A. **Behavior Genetics: Predicting Individual Differences**
-Environment= every external influence from maternal nutrition in womb to social support nearing the tomb.
Behavior geneticists study our differences and weigh the relative effects of heredity and environment.

a. **Genes: Our Codes for Life**
Book of life = 46 chapters, 23 donated by mother's egg, 23 donated by fathers sperm. Chapters= chromosomes, each composed of a coiled chain of the molecule DNA (deoxyribonucleic acid). Genes, small segments of giant DNA molecules, form the words of these chromosome books. Each person has about 30,000 genes.
I share 99.9% of the same DNA with everybody else. Genome researchers have discovered the common sequence within human DNA. We share 96% of our DNA sequence with chimpanzees. Variations in particular gene sites in DNA can define a person's uniqueness. Human traits are influenced by gene complexes; many genes acting in concert. Growth influenced by one group of genes, behavior influenced by another.

b. **Twin Studies**
-To disentangle the threads of heredity and environment, behavior geneticists often use two sets of tweezers: twin studies and adoption studies.
1) Identical Versus Fraternal Twins
-control home environment with varying heredity to study influences of environment and heredity. Study twins. Identical=single fertilized egg that splits into 2 are genetically identical. Natures own human clones. Fraternal=develop from separate fertilized eggs and are no more similar than any other brother or sister. If one twin gets alzheimers then the other twin has a 60% chance of getting alzheimers also. On both extraversion (outgoingness) and neuroticism (emotional instability,) identical twins are much more similar than fraternal twins. Risk of divorce is 50% attributable to genetic factors. Identical twins reported being treated alike more than fraternal twins.
2) Separated Twins

mother. Parents can shape our differences: abused become abusive, neglected become neglectful, loved but firmly handled become self-confident and socially competent. But in personality measures, shared environmental influences typically account for less than 10 percent of children's differences. Two children in the same family are as different from one another as are pairs of children selected randomly from the population. Parents should be given less credit for kids who turn out great and blamed less for kids who don't. Parental nurture is like nutrition. It helps to have someone we belong so, someone who cares about us.

B. Peer Influence

Children are subject to group influences. The conformity behavior of children seeking to fit in with various groups is a significant influence on day-to-day behavior. (pre k kid hates food, puts on table when group of kids like it.)
-Knowing that lives are formed by influences beyond parental control. If they are beyond sculpting, we can just relax and accept and love them for who they are. Powerful parental influence may occur indirectly (group of parents influence peer group. Parents'-group-to-children's-group effects. Parental influence occurs when parents help select their children's neighborhood and peers. Parents are more important when it comes to education, discipline, responsibility, orderliness, charitableness, and ways of interacting with authority figures.

time. What can baby see hear smell and think? Babies prefer sights and sounds that facilitate social responsiveness. We prefer to look at objects 8-12 inches away which happens to be the approximate distance between nursing infant's eyes. We gaze longer at more complex objects. Perceptual abilities develop during first months of life. Neural networks stamped with smell of mother's body and bra. We as young infants see what we need to see, smell, and hear well and we are already using our sensory equipment to learn.

IV. Developing Through the Life Span (pages 144-154)

B. Infancy and Childhood

-newborn to toddler to teenager, neural hardware and cognitive software develop together.

a. Physical Development

-biological development underlies infant's psychological development.

a1. Brain Development

-womb: neural cells form at ¼ million per minute. Peaks at 28 weeks and subsiding to 23 billion. Day of birth= most brain cells one will ever have. Nervous system= immature at birth. 3-6 neural network sprouts most rapidly in frontal lobes. Last parts to develop are association areas. After puberty the pathways supporting language and agility proliferate after which excess connections shut down and others strengthen.

-maturation= biological growth processes that enable orderly changes in behavior, relatively uninfluenced by experience. It decrees many commonalities and sets basic course of development.

a2. Motor Development

-Developing brain enables physical coordination and as muscles and nervous system mature, more complicated skills emerge. It's universal. Roll over into sit into crawl into walk. Timing may differ. 25% can walk by 11 months. 50% within a week after 1st birthday. 90% by age 15 months. Back-to-sleep position has been associated with later crawling but not walking.

-genes play a major role as twins develop motor patterns on the same day. Biological maturation creates readiness to learn walking at about age 1. Experience before that time has a limited effect, which is true for other physical skills.

a3. Maturation and Infant Memory

-Earliest memories rarely predate 3rd birthday. Studies confirm that average afe of earliest conscious memory is 3.5 years. 4-5 years childhood amnesia gives way to remembered experiences. We organize memories differently at age 3 or 4. As brain cortex matures, toddlers gain a sense of self and their long-term storage increases. Infants' preverbal memories don't easily translate into their later language.

-Childhood amnesia is discomforting to parents because they won't remember their parents if the parents die before age 4.

-Although we consciously recall little before age 4, some memories exist during and beyond early years. What conscious mind doesn't know and can't verbally express, the nervous system somehow remembers.

b. Cognitive Development

work out solutions to problems by no longer thinking aloud. They say what is on their mind.

3. Concrete Operational Stage
-concrete operational stage is the stage of cognitive development from 6 or 7 – 11 years of age, during which children gain the mental operations that enable them to think logically about concrete events. Children fully gain the mental ability to comprehend mathematical transformations and conservation.

4. Formal Operational Stage
- By age 12, reasoning expands from purely concrete to encompass abstract thinking. As children approach adolescence, many become capable of solving hypothetical propositions and deducing consequences: if this then that. Formal operational thinking is the stage of cognitive development which people begin to think logically about abstract concepts.

b2. Reflecting on Piaget's Theory
-Stage theory has been influential, and gets high marks in some aspects. But today's researchers see development as more continuous that did Piaget. They see formal logic as a smaller part of cognition that he did. Time magazine said he was one of the century's 20 most influential scientists and thinkers and ranked in a survey of British psychologists as the greatest 20th century psychologist. His emphasis was less on ages at which children reach specific milestones than on their sequence.
-Piaget contended that children construct their understanding from their interactions with the world and they aren't passive receptacles waiting to be filled with teacher's knowledge. Teachers would do better to build on what children already know. Children's cognitive immaturity is adaptive, and is nature's strategy for keeping children close to protective adults.

-Self-focused reason during early teen years. Gradually most achieve formal operational stage, and become capable of abstract logic. Ability to reason enables them to detach inconsistencies in others' reasoning and to spot hypocrisy.

b2. Developing Morality
- Discerning right from wrong and developing character = crucial adolescence task.

1. moral Thinking
- Piaget: children's moral judgments build on cognitive development. Moral reasoning is the thinking that occurs as we consider right and wrong. 3 Basic levels of moral thinking (preconventional, conventional, and postconventional.)

Preconventional morality: Obey either to avoid punishment or gain concrete rewards.

Conventional morality: morals evolve to more conventional level that cares for others and upholds law because rules are rules.

Postconventional morality: affirms people's agreed-upon rights or follows what one personally perceives as basic ethical principles.

2. Moral Feeling
-mind makes moral judgments as it makes aesthetic judgments- quickly and automatically. According to Jonathan Haidt's social intuitionist, moral feelings precede moral reasoning. Moral reasoning aims to convince others of what we intuitively feel. Moral judgment is more than thinking; it is also gut-level feeling.

3. Moral Action
- Our moral thinking and feeling surely affect our moral talk. Talk is cheap and emotions are fleeting. Morality involves doing the right thing. Empathy is taught to todays children. Those who learn to delay gratification become more socially responsible, academically successful, and productive.

Sensitivity in dim light	Low	High
Color sensitive?	Yes	No
Detail Sensitive?	Yes	No

c. Visual Information Processing

- Visual information percolates through progressively more abstract levels. At the entry level, the retina- which is actually brain tissue that migrates to the eye during early fetal development- processes info before routing it via the thalamus to the brain's cortex. The retina's neural layers pass along electrical impulses and also help to encode and analyze the sensory information. Info moves from the retina's receptor rods and cones is received and transmitted by the ganglion cells, whose axons make up the optic nerve and shoots info to the brain. Any given retinal area relays its info to a corresponding location in the occipital lobe – the visual cortex in the back of your brain. That sensitivity that allows retinal cells to fire messages can lead them to misfire as well. (rubbing your eyes when they're closed).

1. Feature Detection

When individual ganglion cells register information in their region of the visual field, they send signals to the occipital lobe's visual cortex. Feature detector: nerve cells in the brain that respond to specific features of the stimulus, such as shape, angle or movement. Neurons receive that info and respond to a scene's specific features. Temporal lobe area behind right ear enables you to perceive faces. The brain activity that underlies perception combines sensory input with our assumptions and expectations.

b1. Parallel Processing

- our brain engages in parallel processing. Parallel processing: the processing of several aspects of a problem simultaneously; the brain's natural mode of info processing for many functions, including vision. To recognize a face, the brain integrates info that the retina projects to several visual cortex areas, compares it to stored info, then enables you to recognize the image as the person you know. Destroy or disable the neural workstation for a visual subtask and something peculiar results. You can't perceive movement.

d. Color Vision

- What we see is actually everything that object is not. A tomato isn't red, it's everything but red. The tomato reflects wavelengths of red. Light rays are not colored. 1/50 is color-deficient and usually male. Young-Helmholtz trichromatic (three-color) theory: the theory that the retina contains three different color receptors- one most sensitive to red, one to green, one to blue – which when stimulated in combination can produce the perception of any color. These are the primary colors, red, green and blue. Most color-deficient people aren't actually "colorblind." They simply lack functioning of red- or green- sensitive cones, or

b. Taste

- Sense of taste involves several basic sensations. Receptor for what we know is a fifth other than sweet, sour, salty, and bitter. The fifth is the meaty taste of umami, best experienced as the flavor enhancer monosodium glutamate. Taste exists for more than pleasure. Pleasureful tastes attract us to energy-rich foods that help us survive. There is biological wisdom for picky eating. To ancestors, plants and meat were toxic. Taste is a chemical sense. Taste buds have pores that catch food chemicals and these molecules are sensed by 50-100 taste receptor cells, some of which respond mostly to sweet-tasting molecules and others to salty sour or bitter tasting ones. Taste receptor cells reproduce themselves every week or two (burned tongue sensation ceases.) Taste sensitivity decreases with age, which is why adults enjoy stronger tasting foods that children resist.
- Emotional responses to taste are hard-wired. Bitter or sweet substance on newborn's tongue and baby's tongue and face reacts like an adult's.
- People without tongues can still taste through receptors in back and on roof of mouth. If you lose taste sensation from one side of you tongue, you probably won't notice because the other side will become correspondingly supersensitive and the brain doesn't localize taste well.
- We don't taste or smell most nutrients, but we do quickly learn a liking or aversion to the taste and smell of other food components that prove nutritious or sickening.
-Taste buds are essential for taste, as well as your nose. Sensory interaction underlies the rubber hand illusion where vision influences the sense of touch. Seeing, hearing, touching, tasting, and smelling are not totally separate channels. Brain blends their inputs. Sensory interaction: the principle that one sense may influence another, as when the smell of food influences its taste.

c. Smell

Breaths come in pairs except at two moments: birth and death. Each day you inhale and exhale nearly 20,000 breaths of life-sustaining air, bathing your nostrils in a stream of scent-laden molecules resulting in smell (olfaction). Smell is chemical. There are 5 million receptor cells at the top of each nasal cavity, called olfactory receptor cells, which wave like sea anemones, responding selectively. They instantly alert the brain through their axon fibers. Infants quickly learn their mother's scent. That's how pups find their mother seals. Odor cannot be separated into more elemental odors like light can into its spectral colors. Olfactory receptors recognize odors individually. 350 receptor proteins recognize particular odor molecules. They are embedded on the surface of nasal cavity neurons, and the smells slip into the receptors like keys into a lock. Ability to smell declines in early adulthood. We aren't good at describing scents like we are at discriminating them. We each have our own identifiable chemical signature. Animals that have more receptors than us use their sense of smell to communicate and navigate. Salmon, Sharks, moths. Etc. Smell is primitive, and used to be used by our ancestors to sniff for food and predators. We have a remarkable capacity to recognize long-forgotten odors and their associated personal episodes. The smells and taste of things bears unfaltering in the tiny and almost impalpable drop of their essence, the vast structure of recollection.

VI. Perception (Pages 237-244)

- We perceive objects through our senses, with our mind. To construct the outside world inside our heads we must detect physical energy from the environment (bottom-up) and then encode it as neural signals (a process traditionally called sensation). We must also select, organize, and interpret (top-down) our sensations (in a process called perception). We perceive sights, sounds, tastes, and smells.

A. Selective Attention

- Our conscious attention is selective. Selective attention: the focusing of conscious awareness on a particular stimulus, as in the cocktail party effect. Our 5 senses take in 11,000,000 bits of information per second, of which we consciously process about 40. Yet, we intuitively make great use of the other 10,999,960 bits. (Your shoes are pressing against your feet and your nose is in your vision. Aaaaand now you notice. The Cocktail Party Effect is your ability to attend to only one voice among many.
- At the level of conscious awareness, our attention is divided. Talking while driving, switching gears, noticing traffic signals while talking, they are all affected.
- We select just a few of the immense array of visual stimuli to process. Inattentional blindness: failing to see visible objects when our attention is directed elsewhere. Change blindness and change deafness can also occur (being oblivious to talking to another person when giving directions because if it's out of sight, it's out of mind.) Choice-blindness blindness is being blind to your own blindness.

B. Perceptual Illusions

- Illusions reveal the ways we normally organize and interpret our sensations. Visual Capture: the tendency for vision to dominate the other senses. Hearing can also capture another sense.

C. Perceptual Organization

- We must organize sensory information into meaningful perceptions. Gestalt: an organized whole. Gestalt psychologists emphasized our tendency to integrate pieces of information into meaningful wholes. In perception the whole may exceed the sum of its parts. Our brains do more than merely register information about the world. Perception is not just opening a shutter and letting a picture print itself on the brain. We constantly filter sensory information and infer perceptions in ways that makes sense to us. Mind matters.

a. Form Perception

-What abilities does your eye/brain system need to recognize faces at a glance.

1. Figure and Ground

- Our first perceptual task is to perceive any object called the figure as distinct from its surroundings called the ground. Figure-ground: the organization of the visual field into objects that stand our from their surroundings.

2. Grouping

VIII. Learning (Pages 326-332)

C. Operant Conditioning

- Classical conditioning is one way of teaching, but another is operant conditioning. Operant conditioning – a type of learning in which behavior is strengthened if followed by a reinforce or diminished if followed by a punisher. Both classical and operant conditioning involve acquisition, extinction, spontaneous recovery, generalization, and discrimination. Difference is, Classical conditioning forms associations between stimuli (a CS and the US it signals). It also involves respondent behavior – behavior that occurs as an automatic response to some stimulus; Skinner's term for behavior learned through classical conditioning. Operant conditioning involves operant behavior – behavior that operates on the environment, producing consequences. Is the organism learning associations between events that it doesn't control (classical conditioning) or is it learning associations between its behavior and resulting events (operant conditioning)?

a. Skinner's Experiments

- Skinner (1904-1990) became modern behaviorism's most influential and controversial figure. Law of effect – Thorndike's principle that behaviors followed by favorable consequences become more likely, and that behaviors followed by unfavorable consequences become less likely. Skinner's work elaborated on this. He developed behavioral technology. Skinner designed an operant chamber for the pigeon and a rat. These experiments have explored the precise conditions that foster efficient and enduring learning.

c1. Shaping Behavior

-Skinner's experiments used shaping – an operant conditioning procedure in which reinforcers guide behavior toward closer and closer approximations of the desired behavior. Successive approximations mean you reward responses that are ever closer to the final desired behavior and ignore all other responses. Experiments show that some animals are remarkably capable of forming concepts; they demonstrate this by discriminating between classes of events or objects. Discriminative stimulus means that it signals that a response will be reinforced. Examples of reinforcers are gold stars on paper with 100% on them. This is a positive reinforcer because you add something to increase behavior. If a kid needs a shoe tied and he cries for help and the dad helps, that is a negative reinforcer. He increased good behavior by stopping or reducing negative stimuli (shoe laces that are untied).

c2. Types of Reinforcers

- Skinner has a concept of reinforcement. Reinforcer- in operant conditioning, any event that strengthens the behavior it follows. There are a few types of reinforcement. Positive reinforcement, and negative reinforcement are two of them.

conditioning, a reinforcement schedule that reinforces a response only after a specified time has elapsed. This is like people checking more frequently for the mail as delivery time approaches. Variable-interval schedules – in operant conditioning, a reinforcement schedule that reinforces a response at unpredictable time intervals. This is like the "you've got mail" that finally rewards persistence in rechecking for email. Slow steady responding occurs.

information deemed “relevant to me” is processed more deeply and remains more accessible.

B2. Visual Encoding

- We struggle to remember formulas, definitions, but can remember what we wore yesterday because mental pictures are easier to remember. Imagery – mental pictures; a powerful aid to effortful processing, especially when combined with semantic encoding. We remember picture evoking words better than we remember low imagery words. Memory for concrete nouns is aided by encoding them both semantically and visually. Two codes are better than one. We have mental snapshots of old memories because of imagery. Imagery is at the heart of many memory aids. Mnemonics – memory aids, especially those techniques that use vivid imagery and organizational devices. Mnemonic is the Greek word for memory. A modern study of star performers in the World Memory Championships showed them not to have exceptional intelligence, but rather to be superior at using spatial mnemonic strategies. Other mnemonic devices involve acoustic and visual codes lie one is a bun, two is a shoe, three is a tree, four is a door, five is a hive, six is sticks, seven is heaven, eight is a gate, nine is swine, ten is a hen. Then these peg-word jingles help you remember. Bun shoe tree door hive sticks heaven gate swine hen. Such mnemonic systems are used by memory whizzes who repeat long lists of names and objects and they can also help you.

B3. Organizing Information For Encoding

- Meaning and imagery enhance our memory partly by helping us organize information. When Bransford and Johnson's laundry paragraph because meaningful, we could mentally organize its sentences into a sequence. Mnemonic devices help organize material for our later retrieval.

1. Chunking

- We can more easily recall information when we can organize it into meaningful units or chunks. Chunking – organizing items into familiar, manageable units; often occurs automatically. We all remember information best when we can organize it into meaningful arrangements. This also aids our recall of unfamiliar material by encoding the first letters of to-be-remembered words as sentences or as words. Take ROY G BIV. For example. Or HOMES (Huron, Ontario, Michigan, Erie, and superior, the five great lakes). It helps with remembering digits as well, when you group a list into chunks of four digit dates. 1-4-9-2-1-7-7-6-1-8-1-2-1-9-4-1 can be remembered as 1492, 1776, 1812, and 1941, various war dates in American history. Donatelli has magnificent memory as well. He fell back to about a seven-item capacity by remembering cross-country running times and ages.

2. Hierarchies

- He clustered these in a hierarchy. When people develop expertise in an area, they process information not only in chunks but also in hierarchies composed of a few broad comcepts divided and subdivided into narrower concepts and facts. This

cards	correct, 26 points for one mistake.	
Speed numbers	Most random numbers memorized in one minute.	324 digits
Names and faces	Most first and last names memorized in 15 minutes after being shown with faces (1 point for every correctly spelled first or last name, ½ point for every phonetically correct but incorrectly spelled name)	167.5 names
Binary digits	Most binary digits memorized in 30 minutes when presented in rows of 30 digits.	3705

<u>D. Storing Memories in the Brain</u>

- Flashbacks of elderly appear to be invented, not relived. Karl Lashley provided evidence that memories don't reside in single, specific spots. He taught rats a maze, cut out part of their cortexes, and then reintroduced the maze. The rats knew it. Memory researchers argue forgetting occurs as new experiences interfere with out retrieval and the physical memory trace decays. But what is memory trace? Ralph Gerard trained hamsters to turn right or left to get food, then lowered their body temperature until the electrical activity in the brain ceased. Then their body temperature was brought back and the long-term memories survived the electrical blackout. Recently, the search for the physical basis of memory – for information incarnated in matter – has focused on the synapses.

D1. Synaptic Changes

- Neuroscientists are expanding the search for the location of memories by exploring changes within and between single neurons. Given increased activity in a particular pathway, neural interconnections form or strengthen. Eric Kandel and James Schwartz observed changes in the sending neurons of the California sea snail, Aplysia. They pinpointed the changes by observing the neural changes before and after conditioning. The snail releases more serotonin at certain synapses, which become more efficient at transmitting signals. <u>Long-term potentiation (LTP) – an increase in a synapse's firing potential after brief, rapid stimulation. Believed to be a neural basis for learning and memory.</u> Drugs blocking LTP interfere with learning. One approach is developing drugs that boost production of the protein CREB, which can switch genes off or on. Genes code the production of protein molecules. With repeated neural firing, a nerve cell's genes produce synapse-strengthening proteins, enabling long-term memories to form. Boosting CREB production may help with the production of those proteins. After LTP occurs, passing an electric current through the brain won't disrupt old memories, but it will wipe out recent memories.

D2. Stress Hormones and Memory

- The stress hormones that humans and animals produce when excited or stressed make more glucose energy available to fuel brain activity, signaling the brain that

IX. Memory (Pages 382-390)

VI. Memory Construction

- We often construct our memories as we encode them, and may alter memories as we withdraw them from our memory bank. By filtering information and filling in missing pieces, your schema for something directed your memory construction.

A. Misinformation and Imagination Effects

- Elizabeth Loftus has shown how eyewitnesses similarly reconstruct their memories when questioned. In many follow-up experiments around the world, people have witnessed an event, received or not received misleading information about it, and then taken a memory test. The repeated result is a misinformation effect – incorporating misleading information into ones memory of an event. So unwitting is the misinformation effect that people later find it nearly impossible to discriminate between their memories of real and suggested events. Even imagining nonexistent actions and events can create false memories. Imagined events later seem more familiar and real. Thus the more vividly people can imagine things, the more likely they are to inflate their imaginations into memories. People who believe they've been abducted by aliens for medical exams on spaceships tend to have powerful imaginations and, in memory tests, to be more susceptible to false memories. Same with people who have reconstructed memories of childhood abduction.

-Richard Wiseman did an experiment in which 25 curious people were told to concentrate on a moving table (that wasn't actually moving. A magician acted like it was levitating). When questioned two weeks alter, 34 percent of the participants recalled having actually seen the table levitate. Nobody is immune to memory construction. Piaget constructed many false memories.

B. Source Amnesia

- Piaget remembered but attributed his memory to the wrong sources. When we encode memories, we distribute different aspects of them to different parts of the brain. Among the frailest parts of a memory is its source, so we may recognize someone but have no idea where we saw them before. Source amnesia – attributing to the wrong source an event we have experienced, heard about, read about, or imagined. (Also called *source misattribution*.) Source amnesia, along with the misinformation effect is at heart of many false memories.

C. Discerning True and False Memories

- Because memory is reconstruction as well as reproduction, we can't be sure whether a memory is real by how real it feels, so we must discern what is true and what is false. We cannot judge a memory's reality by its persistence. Memories we derive from experience have more detail than memories we derive from imagination. Memories of imagined experiences are more restricted to the gist of the supposed event. False memories created by suggested misinformation and misattributed sources may feel as real as true memories and may be very persistent. We more easily remember the gist than the words themselves. The more confident

get cold water in the bathroom. You place yourself there mentally and visualize turning the knob, but you don't think, "I am turning the knob right." Artists think in images, as well as composers, poets, mathematicians, athletes, and scientists. Pianist Liu Chi Kung showed the value of thinking in images. One year after placing second in a piano competition, Liu was imprisoned during China's cultural revolution. Soon after he was released 7 years later, he was back on tour. He said he practiced in his head because he had no piano to play on. Mental practice has become a standard part of training for Olympic athletes. Mentally simulating an action activates neural networks that are also active when performing the action.

- Tennessee won the national championship game in overtime, thanks to part of their trash-talk mental practices. Mental rehearsal can also help in academics. Imagine you will look at gradespeed and see an A in the test category, and imagine your happiness. Repeating this for 5 minutes a day can add up to 2 points on the exam scores. It is better to spend your fantasy time planning how to get somewhere than to dwell on the imagined destination.
- Information processing outside of consciousness is more evidence of thinking without language. Thinking light with no language is "one-fourth the effort of regular thinking." Relationship between thinking and language is that language influences thinking, but if thinking did not also affect language, there would never be any new words. *Thinking affects our language, which then affects our thought.* The human mind is simultaneously capable of striking intellectual failures and of striking intellectual power. Misjudgments are common and yet have disastrous consequences. Heuristics often serve us well.

desire because they can imagine. People have erotic dreams. Some people are sexually aroused by fantasies. However, fantasies are far different from reality. 95% of men and women say they've had fantasies. Men think about it more often, more physically, and less romantically.

C. Adolescent Sexuality
- Adolescents' physical maturation fosters a sexual dimension to their emerging identity. Yet sexual expression varies dramatically with time and culture. 3% of women before 1900 experienced sex by age 18 (premarital). Half of highschoolers report having sex as do 42% of Canadian 16 year olds. Increase in sexual activity in western countries led to an increased rate of teen pregnancy. Many of them are impoverished.

1. Teen Pregnancy
- American teens have lower rates of intercourse compared with European teens, but they also have lower rates of contraceptive use and thus higher rates of teen pregnancy and abortion.

1. Ignorance
- half of sexually active Canadian teen girls have mistaken ideas about birth control methods.

2. Guilt related to sexual activity
- 72% of 12-17 year old girls who have had sex, regretted it. Many don't carry a condom for fear of looking too promiscuous.

3. Minimal communication about birth control
- Many teens aren't comfortable talking about contraception with their parents, partners, and peers. Teens who talk freely with friend or parents are more likely to use contraceptives.

4. Alcohol use
- Sexually active teens are typically alcohol using teens. Those who drink before sex are less likely to use a condom.

5. Mass media norms of unprotected promiscuity
- An average hour of prime time television on the three major U.S. networks contains 15 sexual acts, words, and innuendos. Nearly all involve unmarried partners, and half have had no prior relationships or have just met, and few communicate about birth control, or STIs.

C1. Sexually Transmitted Infections
- Unprotected sex led to an increase in rates of STIs (aka std). 2/3 infections are from people under the age of 25. Condoms offer no protection against certain skin-

XIII. Emotion (Pages 513-523)

- More often than any other creature, we express fear, anger, sadness, joy, and love. In this chapter, we consider psychology's understanding of our emotion-related feelings, thoughts and actions. And we'll take a close look at fear, anger and happiness.

I. Theories of Emotion

- Emotion – A response of the whole organism, involving (1) physiological arousal, (2) expressive behaviors, and (3) conscious experience. How do they fit together?
- There are two controversies over the interplay of our physiology, expressions, and experience in emotions. The first is old: does your physiological arousal precede or follow your emotional experience? And the second controversy concerns the interaction between thinking and feeling: Does cognition always precede emotion?
- According to William James, "We feel sorry because we cry, angry because we strike, afraid because we tremble." Your feeling of fear followed your body's response. James-Lange theory – the theory that our experience of emotion is our awareness of our physiological response to emotion-arousing stimuli. Walter Cannon said that this was implausible. He thought the body's responses weren't distinct enough to evoke the different emotions. Cannon and Philip Bard concluded the following. Cannon-Bard theory – the theory that an emotion-arousing stimulus simultaneously triggers (1) physiological responses and (2) the subjective experience of emotion.
- Stanley Schachter and Jerome Singer proposed a third theory; that our physiology and our cognitions – perceptions, memories, and interpretations – together create emotion. Two-factor theory – Schachter-Singer's theory that to experience emotion one must (1) be physically aroused and (2) cognitively label the arousal. Like James and Lang, Schachter and Singer presumed that our experience of emotion grows from our awareness of our body's arousal. Yet like Cannon and Bard, Schachter and Singer also believed that emotions are physiologically similar. Thus, in their view, an emotional experience requires a conscious interpretation of the arousal.
- Does physiological arousal always preceded emotional experience?
Are different emotions marked by distinct physiological responses?
What is the connection between what we think and how we feel?

II. Embodied Emotion

- You need little convincing that emotions involve the body. Physical responses coincide with emotions.

A. Emotions and the Autonomic Nervous System

- As your autonomic nervous system mobilizes for action, your body also responds for action in less noticeable ways. To provide energy, liver pours sugar in bloodstream, burn sugar with increased respiration to supply oxygen, digestion slows, diverting blood from internal organs to muscles. With blood sugar driven into large muscles, running becomes easier. Pupils dilate to let in more light and you sweat to cool body down. Body's response to danger prepares for fight or flight.

didn't kill 500 people, the fear of the fire that caused a stampede and trampled and smothered others was the cause of the death of those 500. Fear is usually adaptive, an alarm system preparing our bodies to flee from danger. It helps us focus on a problem and rehearse coping strategies.

A1. Learning Fear

- The variety of human fears are learned to experience through observational learning and conditioning. Example; babies learn from falling over how to be more careful than walking. Mother monkeys won't reach for food in the presence of a snake, and the younger monkey learns from that.

A2. The Biology of Fear

-We may be biologically prepared to learn some fears more quickly than others. Why? Because fear taught our ancestors to fear spiders and snakes and falling off cliffs and through evolution, we have become afraid of those things. The amygdala is the center where fear learning takes place, receiving input from regions such as the anterior cingulate cortex and sends output to all parts of brain that produce the bodily symptoms of extreme fear like diarrhea and shortness of breath. Humans also learn fears, which later trigger amygdala fear pathways. Some fears fall out of average range. Some, with phobias, have intense fears of specific objects. Others are less frightful than most of us. Fear is also genetic, proven by twin studies that show twins' level of fearfulness or fearlessness are similar to the other twin.

B. Anger

- When we see an insulting or frustrating event, and we believe that event/action to be done on purpose with no good intention, we can be easily angered. But how do we deal with it? In Individualized cultures, there is encouragement to vent rage. In collectivist, this isn't seen. Venting anger presumes that through aggressive actions or fantasy we can achieve emotional release or catharsis – emotional release. In psychology, the catharsis hypothesis maintains that "releasing" aggressive energy (through action or fantasy) relieves aggressive urges. This only happens sometimes, and only If counterattack is directed against the provoker, if the retaliation seems justifiable, and if their target isn't intimidating. Expressing anger can be temporarily calming if it doesn't leave us feeling guilty or anxious. However, more often than not, anger breeds anger. When anger outbursts calm us temporarily, they can become habit forming. Anger is better handled by waiting to calm down and by dealing with anger in a way that involves neither being chronically angry over every little annoyance nor passively sulking, merely rehearsing reasons for anger. Anger communicates strength and competence. It can benefit a relationship when expressed as a grievance in ways that promote reconciliation rather than retaliation. Forgiveness helps release anger and can calm the body.

C. Happiness

- Feel-good, do-good phenomenon – people's tendency to be helpful when already in a good mood. Psychology has more often focused on negative emotions. But

engage in their skills, having a meaningful religious faith, and sleeping well and exercising. Things that don't predict happiness: Age, gender, education levels, parenthood, and physical attractiveness.
-Ten ways to be happy: realize that enduring happiness doesn't come from financial success. Take control of your time. Act happy. Seek work and leisure that engage your skills. Join the "movement" movement. Give your body the sleep it wants. Give priority to close relationships. Focus beyond self. Be grateful. Nurture your spiritual self.

their difficulties, with symptom relief in the here and now, and not an overall personality change.

B. Humanistic Therapies

- The humanistic perspective has emphasized people's inherent potential for self-fulfillment. These therapists aim to boost self-fulfillment by helping people grow in self-awareness and self-acceptance. They attempt to reduce conflicts that are impeding natural developmental growth, but they focus on the present and future, consciousness, responsibility for one's feelings and actions, and promoting growth instead of curing an illness. Client-centered therapy – a humanistic therapy, developed by Carl Rogers, in which the therapist uses techniques such as active listening within a genuine, accepting, empathetic environment to facilitate clients' growth. (Also called person-centered therapy). The therapist listens, without judging or interpreting, and refrains from directing the client toward certain insights, a strategy labeled *nondirective therapy*. Believing that most people already possess the resources for growth, Rogers encouraged therapists to exhibit *genuineness, acceptance, and empathy*. Active listening – empathetic listening in which the listener echoes, restates, and clarifies; a feature of Rogers' client-centered therapy. Rogers conceded that one cannot be totally nondirective, but it is still important to accept and understand the client. Given a nonjudgmental, grace-filled environment that provides *unconditional positive regard*, people may accept even their worst traits and feel valued and whole. Active listening involves paraphrasing, inviting clarification, and reflecting feelings.

C. Behavior Therapies

- Behavior therapists doubt the healing power of self-awareness, and assume that behaviors are the problem. Behavior therapy – therapy that applies learning principles to the elimination of unwanted behaviors. They view maladaptive symptoms as learned behaviors that can be replaced with constructive behaviors.

C1. Classical Conditioning Techniques

-Examples of classical conditioning: Pavlov's dog, and children who wet the bed. Counterconditioning – a behavior therapy procedure that conditions new responses to stimuli that trigger unwanted behaviors based on classical conditioning. Includes exposure therapy and aversive conditioning. Behavior therapists have used counterconditioning techniques to combat claustrophobic fear.

1. Exposure therapies

- The most widely used method of behavior therapy consist of exposure therapies – behavioral techniques, such as systematic desensitization, that treat anxieties by exposing people (in imagination or actuality) to the things they fear and avoid. One exposure therapy is systematic desensitization – a type of counterconditioning that associates a pleasant relaxed state with gradually increasing anxiety-triggering stimuli. Commonly used to treat phobias. Using progressive relaxation, a therapist trains you to relax one muscle group after another, until you achieve a drowsy state of complete relaxation and comfort. Then the therapist asks you to imaging a mildly

E. Group and Family Therapies

- Group therapy does not provide the same degree of therapist involvement with each client; however, it saves therapists' time and clients' money – and is no less effective than individual therapy. The social context allows people both to discover that others have problems similar to their own and to receive feedback as they try out new ways of behaving. Family therapy – therapy that treats the family as a system. Views an individual's unwanted behaviors as influenced by or directed at other family members; attempts to guide family members toward positive relationships and improved communication. We struggle to differentiate ourselves from our families, but we also need to connect with them emotionally. Some of our problem behaviors arise from the tension between these two tendencies, which creates family stress. Therapy heals relationships and mobilizes family resources by helping members discover the role they play in the family.