FACULTY GUIDE

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Video Collection for
Developmental Psychology

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WORTH PUBLISHERS
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Each person has a unique way of handling the challenges of life. Some of us are bold and confident; some a bit more timid and uncertain.

For the past 10 years, researcher Steve Sumi has been studying a colony of 30 rhesus monkeys, who, like humans, display striking individual differences in personality. What Sumi and his team of researchers have discovered is that these different types of personalities are strongly associated with the type of relationship that exists between mothers and their offspring. The boldest monkeys have a secure attachment to their mothers—they play confidently, periodically returning to mom when they are frightened. Their mothers are relaxed and don’t hover when their offspring venture away to play.

The relationship between timid monkeys and their mothers is very different. Timid monkeys cling to their nervous mothers (reactive style), who seem overly protective of their babies.

Remarkably, the personality differences in monkeys are apparent in the first days of life, long before environmental experiences and learning could account for them. The researchers are convinced that the personalities of rhesus monkeys probably aren’t learned from parents; they are inherited through genes.

But the researchers wonder how rigidly temperament is fixed. To find out, research is conducted by placing a reactive newborn rhesus monkey with a relaxed foster mother.

The results? The foster mother taught the reactive baby to be more relaxed. He’s now showing all the signs of being a bold, young monkey, happy to play and explore on his own.

But 4 months later, the monkey is separated from his foster mother, and he becomes upset and obviously distressed. Despite being raised by a foster monkey who is calm and nurturing, the monkey has reverted back to being a very highly reactive individual. It seems that in extreme situations, the genes win out.

“High reactive infants that grow up in benign environments won’t have any trouble at all,” notes Sumi. “High reactive infants that grow up in environments that are full of stress and challenge will need help if they want to make it through in a successful fashion.”

The narrator speculates about the relevance of Sumi’s findings to our understanding of human development. It seems safe to conclude that, despite inherited personality traits, a parent’s behavior toward his or her child has a real effect, within limits, on that child’s attitude about life.

This segment is an appropriate supplement to your coverage of the nature-nurture issue, the relevance and ethics of animal testing, parental style, and other issues pertaining to the psychosocial development of children and the stability of personality throughout the life span.

Topics for Discussion
• psychology’s “big issues” (nature-nurture, stability-change)
• research issues (adoption studies, animal research, ethical issues in research)
Discussion Questions
1. What two personality styles have been identified in rhesus monkeys? How do these styles relate to a monkey’s relationship with his or her mother?

2. How did Steve Sumi and his team of researchers investigate the origins of these personality styles? What were their major findings?

3. What do you conclude from these studies regarding the stability of personality and the impact of parental style on the behavior of children?

4. Are animal studies useful in broadening the knowledge base of psychology and contributing to our understanding of human development?
Segment 2
Teaching the Computer to Think (10:05)

Ask 7-year-old Anthony a common-sense question like, “Why can’t a kid your age be a waiter in a restaurant?” and he’ll have no trouble giving you a thoughtful answer. But ask him how many times he breathes in a day and he may wildly underestimate the correct answer. In contrast, a computer can easily be programmed to do the necessary math to answer the latter type of question, but it would have a lot more trouble answering the former question.

Would it be possible to program computers to develop a common-sense approach to the world? A team of programmers in Austin, Texas, thinks so. Project “cyc”—which is short for “encyclopedia”—has two objectives: (1) to program a computer with knowledge that people share in common about the world, and (2) to develop a machine that is capable of advancing its own learning.

So far, cyc’s success has been limited. It can, however, engage in a simple form of logical reasoning. Cyc is not only learning common-sense knowledge but is also learning commonsense reasoning. If it is told, for example, that Karen is a musician and is married to John, it can infer that “John is probably a musician as well.” It can do this because it knows the commonsense rule that spouses tend to have similar interests. This is a simple ability, but it demonstrates that cyc can figure things out, and, in a limited way, learn on its own.

At night, when cyc’s programmers are sleeping, cyc is programmed to search for such connections among the bits of information stored in its knowledge base. Sometimes the connections can be quite creative, as when cyc came up with the analogy that the head of a family is like the dictator of a country.

This segment is appropriate as a supplement to your discussion of both cognitive development and artificial intelligence. It can also be used to illustrate several principles of adult thought processes.

Topics for Discussion
- cognitive development during childhood
- human problem solving
- heuristics and algorithms used in problem solving
- artificial intelligence

Discussion Questions
1. In what ways are human cognition and computer information-processing alike? In what ways are they different?

2. What is “cyc”? What are the objectives of this project? How are the project researchers carrying out their objectives?

Segment 3
Tackling a Killer Disease (8:35)

In the highly regulated world of medicine, it can take ten years or more for a new treatment or drug to be approved. The first step is testing with live animals. If all goes well, the next step is a clinical trial with a small sample of human subjects. One such subject is 10-year-old Justin, whose struggle to survive Duchenne’s Muscular Dystrophy is the subject of this heartwarming segment.

Duchenne’s is a degenerative, sex-linked disease caused by an abnormal gene. There is no cure, and Justin’s family watches sadly as Justin grows weaker. As his muscles weaken, Justin will no longer be able to walk. When his heart and lungs give out, he will die.

In response to normal activity, even healthy muscle cells in healthy humans develop small tears. Myoblasts come to the rescue, fusing with torn cells and producing the protein dystrophin, which helps the muscle repair itself. In Justin’s form of MD, the cells don’t produce dystrophin. When muscle tears occur, there is no healing, and the muscle eventually fails.

Although children like Justin rarely reach their 20s, there is hope that a new experimental treatment will slow, and possibly reverse, the degenerative process. The treatment involves transplanting healthy muscle cells to Justin’s muscles to begin producing dystrophin. One of Justin’s legs will receive the independent variable—treatment with healthy myoblasts. The other leg will serve as a control and receive injections of an inactive solution. This is a double-blind experiment: not even Justin’s doctor knows which leg is receiving the actual treatment.

It will be six months before researchers know if the treatment is working. Even then, the approval process will be far from complete: a full-scale clinical trial with several hundred subjects, and several more years of research to examine possible side effects of the treatment, will be necessary.

Because this segment touches on several topics related to the nature of experimentation, it is an excellent video to use at the beginning of your course.

Topics for Discussion
• the nature of experimentation
• cause-and-effect relationships
• independent and dependent variables
• experimental and control conditions
• placebo
• the double-blind procedure

Discussion Questions
1. What disease is Justin suffering from? How did he acquire this disease? What are the symptoms and mechanisms of the disease? What experimental treatment for this disease is described in the video segment? How is it supposed to work?

2. What type of research study is Justin participating in? What features of the study distinguish it from other research methods that are
described in the textbook? Why did the researchers choose this particular method?

3. What are the basic elements of the study that Justin is participating in? What is the independent variable? the dependent variable? What is the experimental condition? The control condition?

4. Assuming that Justin’s clinical trial is successful, what is the next step in the approval process for this new treatment? Explain how you would determine whether the results of Justin’s chemical trial could be generalized to others suffering from the same disorder.
Segment 4
Bypass Genes (8:09)

Lillian Cooper used to walk 5 miles every morning at a Natick, Massachusetts, shopping mall. But she has recently been sidelined by a badly narrowed artery in her left leg: “If I don’t find a way to get it fixed, I’m going to lose the leg. I’m not ready for that.”

Lillian has already tried all the standard therapies for her blocked artery. Restoring blood flow in a blocked artery is usually attempted with bypass surgery or balloon angioplasty. But for Lillian, these techniques have already failed.

Lillian’s doctor is recommending gene therapy—an experimental technique that many believe will revolutionize medicine in the twenty-first century. Although the field is still in its infancy, researchers are hopeful that the Human Genome Project and its efforts to map the 100,000 or so human genes, will pave the way for future successes. In Lillian’s case, the idea is to see whether putting a particular gene into blocked arteries will cause them to develop shoots that will bypass the blockage. Notes Lillian’s doctor, “There’s nothing like letting nature do the surgery.”

If the gene therapy grows a bypass for Lillian’s blocked leg artery, there are obvious medical implications, including the possibility of similar procedures on coronary arteries. In fact, the ultimate goal is to use gene therapy as an alternative to bypass surgery for people with heart disease.

Four weeks after the treatment Lillian is more hopeful than ever. Walking the one-half mile to the clinic without aid, she beams, “My leg is better, my foot is better. I feel that there have to be new blood vessels forming.” Another angiogram partially justifies her optimism. Before surgery, it took 15 seconds for blood to reach her calf; now it takes only 9 seconds.

Gene therapy is still in its infancy. Most of the 100 or so clinical trials have been disappointing or inconclusive. “A lot of the things we try turn out to be science fiction . . . make good movies but they don’t help too many patients. . . . Now we’re seeing a few indicators that this might actually be therapeutic for certain groups of patients.”

This segment can be used to supplement your discussion of the mechanisms of heredity. It can also be used in classroom discussions regarding the advancement of medical technology and the increasingly controversial issue of medical ethics.

Topics for Discussion
- mechanisms of heredity
- the Human Genome Project
- gene therapy

Discussion Questions
1. What is gene therapy? How was it used to treat the patient depicted in this video segment?

2. As new technologies develop, many controversial/ethical questions emerge. For example, should prospective parents be tested to determine if they carry any potentially serious genetic abnormalities? How do you
feel about this issue? Can you think of other issues that are raised by advances in medical technology?
Segment 5
Baby Body Sense (11:00)

Since Myrtle McGraw’s pioneering experiments in the 1930s, psychologists have been fascinated by the question of how much of a baby’s abilities are inborn and how much are the result of learning. This segment opens with archival footage of McGraw and several of her landmark experiments, including one in which a 2-week-old child is dunked into a pool to determine if the ability to swim is inborn.

In another longitudinal study, McGraw compared the motor development of identical twins, one of whom was introduced to roller skates at 13 months and given other special physical training. Although he outperformed his untrained twin on tests of physical strength and agility (on the basics of sitting, crawling, and walking), the special training did not accelerate the rate of development.

Indiana University psychologist Esther Thelan has spent years studying motor development in babies. We see footage of 3-month-old Madeleine, who doesn’t quite know how to control her arms to grab a toy. Katherine, however, has no problem with the same skill. By recording muscle contractions and videotaping the babies from different angles, Thelan has found that, although all babies eventually master purposeful reaching, each reaches his or her goal in a unique way. This suggests to Thelan that reaching ability isn’t simply programmed into genes.

The same is true for walking. “When a baby takes his or her first step,” notes Thelan, “it looks as though the behavior just suddenly appears. But actually the baby has been working on that problem for a year.”

As Thelan holds 7-month-old Eli above a treadmill, we see the stepping reflex, which many thought disappeared a few months after birth. Although stepping may be built in, babies’ legs have to figure out how to stand and balance on their own. Observing footage of children of various ages, we see the gradual emergence of this complicated ability.

This segment is an excellent supplement to your coverage of motor development in children. It also provides a vivid example of how developmental psychologists have tackled the “big issue” of the relative importance of environmental and biological factors in development.

Topics for Discussion
- early studies of infant development
- nature-nurture controversy
- newborn reflexes
- sequence and timing of motor development

Discussion Questions
1. How did early developmental psychologists, such as Myrtle McGraw, investigate the relative importance of learning and heredity in the acquisition of physical skills? What did they find?

2. How has Esther Thelan approached the nature-nurture issue in her studies of directed reaching and walking? What has she found?
Segment 6
The Magic Years (10:00)

Magic is a perfect way to study the developing mind. At the University of Illinois, psychologist Carl Rosengren is investigating where preschoolers’ ideas about magic originate. After analyzing videotapes of parents watching magic shows with their children, Rosengren has concluded that parents provide special explanations for extraordinary people and events.

“Parents build up all of these stories about people who can do all sorts of things—tooth fairies, Santa Claus, magicians—people who have special powers that differentiate themselves from other individuals in our culture. Without the parents providing some sort of support for that, it’s unlikely that the child will come up with these kinds of explanations entirely on their own.”

But there’s more to magic than just parental suggestion. Kids have to be ready to believe.

One segment shows an experiment in which a complicated deception makes it appear to children that a magical machine has shrunk a room and its contents. Far from being amazed, 3-year-old Andrew explores the shrunken room as though nothing has happened. Rosengren explains: “One of the important things that children must learn is what kinds of things are possible in the world; until the child differentiates those things that are possible from those things that are not, there’s no room for magic.”

As an observer records 3-month-old Holly’s gaze time, we see that she quickly loses interest in a nonmagical, real event. (A doll moves across her field of vision.) But when the doll magically seems to disappear and reappear, Holly stares much longer. She is surprised. Even at 3 months of age, she knows the world doesn’t work this way.

However, Felix, who is just 2 weeks older than Holly, is not surprised. “These babies spontaneously came to the conclusion that we were using two different objects to produce the event . . . . It’s absolutely remarkable that such little babies when shown surprising events are actively thinking about what we showed them and are actively searching for and finding explanations for what they see. It gives us a fascinating insight into what babies are doing when they look at the world around us.”

If babies can be so logical, why do kids believe in magic? The answer seems to be that at around 5 or 6 there are still gaps in children’s knowledge about the physical world. They are prepared to fill those gaps with a sort of catch-all explanation: “It must be magic.” By age 7, a firm sense of reality has set in, and children are able to explain how a disappearing act is done—that it is a trick rather than magic.

This segment makes an interesting supplement to your discussion of cognitive development during childhood. It also presents a thorough description of the fascinating methodology and findings of recent studies of infant memory.

Topics for Discussion
• cognitive development in children
• infant memory
Discussion Questions

1. What have Carl Rosengren’s studies of magic revealed about cognitive development in children? Why does the appreciation of magic depend on a person’s age?

2. How has Renee Baillargeon studied infant cognitive development? In your answer, be sure to explain her research paradigm and outline her findings.
Researchers at Montreal’s McGill University are studying the earliest hallmark of language development: babbling. Children the world over spontaneously repeat a single syllable over and over, producing utterances such as “mamamama.” All babies do this, but according to psychologist Laura Petitto, babbling is not language as we know it—as meaning and content—it’s language as a baby knows it—a form of play with forms and sound.

If babbling doesn’t mean anything, then why do babies do it? Most linguists think babies babble because they are establishing control over the muscles that produce speech. Petitto, however, thinks babbling has more to do with developing language ability.

This disagreement is fueling an intense debate about the nature of language itself. The central question is whether language and speech are as intimately connected as they seem. The human brain has evolved to work closely with the vocal tract to produce speech. But if the vocal tract hadn’t evolved the way it had, would humans still have developed language?

Petitto believes so. According to her viewpoint, language is an independent part of the brain that would find some way to come out even in the absence of sound.

Eighteen-month-old Remy, who along with his parents is profoundly deaf, provides a unique opportunity to test Petitto’s theory. If Petitto’s theory is correct, that babbling is tied to language and not to speech, then deaf children should babble with their hands.

Laborious videotape analyses of Remy signing indicate that deaf kids do babble. In a second example, 9-month-old Vance, also deaf, is at the dinner table with his sister and his mother. Vance is not yet able to join in the sign language conversation, but tries to get involved by placing his hands directly into their line of sight and making signs that have all the features of vocal babbling. The repeated syllable consists not of a consonant and a vowel, but of a hand shape and a hand movement.

“The babbling is the child’s active attempt to master the form of language, to listen to the environment, to look at the environment, to look for a particular structure, to extract out that structure and in little baby steps play with the forms of language in an attempt to build and master a target language.”

But is sign language just a substitute, something the brain turns to when speech is not available? To find out, the McGill researchers have been following the development of children such as 2-year-old Simone, who has one deaf parent and one hearing parent. Simone, who has normal hearing, is learning both to sign and to speak. Simone passed every milestone of language learning in both sign and speech at exactly the same time.

This segment provides an informative supplement to your discussion of language, including its structure, acquisition by children, and theoretical origins.

Topics for Discussion
• structure of language
• stages of language development
• linguistic universals in language development
• nature versus nurture in language acquisition

Discussion Questions

1. What is babbling? What does it reveal about language development?

2. Why is the issue of whether deaf babies babble with their hands significant to our understanding of the origins and nature of language?

3. What evidence is offered in the segment that the brain doesn’t “care” whether it receives spoken or signed language input as it develops?
This segment begins with a reenactment of Jean Berko's classic study of grammar acquisition in children. Psycholinguist Steven Pinker teaches 3-year-old Peter a new word.

"This is a wug. I've got another one, now I have 2 ___?"
Peter has no trouble responding ". . . wugs!"

Pinker and his colleagues at MIT have taught nonsense words to hundreds of kids to see if they will apply the same rules of grammar to made-up words as they do to real ones. The results have led them to conclude that children are born with an instinct for acquiring language.

"Human language is very special," says Pinker. "Kids don't have simple sentences prefabricated in their brains. They put them together on the fly." The reason they are able to do so, according to Pinker, is that they are born with an innate understanding of grammatical rules.

To convince host Alan Alda that this is true, Alda is asked to teach a child how to "chan" with a toy Cookie Monster. (Alda flips the toy from a teeter totter.) Afterward he asks the child "what did I just do?" Without hesitation she says, "You channed with Cookie Monster."

In the next scene we see another universal feature of language acquisition: the mistakes children make when they overapply grammatical rules. After Alda has acted out a story with stuffed animals, Erin is asked to retell the story. Doing so, however, requires her to form the past tense of several irregular verbs. How will Erin handle this problem? She does so by overregularizing verbs such as "draw" and "stick." As she comes to the appropriate points in the story, without hesitation she adds "-ed" and says "drawed" and "sticked."

"That's another way we know that they are not just memorizing words," notes Pinker. "Right from the beginning they are abstracting out rules and applying them to new forms. . . . 'cause if they say 'bringed' they haven't heard mom and dad say that, mom and dad say 'brought.'"

"Obviously no language is innate. Take any child of any race and bring him up in any culture and they will learn the language equally quickly. But what might be in the genes is the ability to acquire language—not any particular language, but the bits and pieces that they are born with."

This segment provides a clear replication of several classic studies of language development in children. It also touches on the nature-nurture controversy as it applies to cognitive development, vividly differentiating the position of behaviorists like B. F. Skinner from that of Noam Chomsky, who argued for the existence of an innate language acquisition device.

Topics for Discussion
· stages of language development
· linguistic universals
· over-regularization
· theories of language acquisition

Discussion Questions
1. What is Steven Pinker’s theory regarding language acquisition? How has he tested this theory? What has he found?

2. Why are the grammatical mistakes that all children make as they acquire language important to psycholinguists? What do they reveal about the origins of language?
Segment 9
A Change of Mind (12:00)

Both developmental psychologists and parents know that preschoolers are quite limited in their ability to take into consideration another person’s perspective. Preschoolers innocently believe that others see the world just as they do. These limitations are the subject of this video segment, which is hosted by Alan Alda.

At the University of Toronto, psychologists play a simple sorting game with several 3-year-old children. The object of the game is to see if the children can sort pictures based on certain criteria. In the first game, 3-year-old Jonathan has no trouble sorting boats and bunnies by their shape. Yet when he is asked to sort the same cards by their color, he persists in sorting by shape, as he did in the first game.

When 3-year-old Libby is asked to sort the cards first by color, she performs perfectly. But when she is asked to sort by shape, she gets stuck on the first rule she learned and continues to sort by color. The errors made by Jonathan and Libby demonstrate that it’s the sequence of tasks that gives preschoolers trouble.

Another game played with 4½- and 5-year-olds reveals that they begin to think about other people’s thoughts at this age. They learn that other people’s thoughts vary, are private, and are sometimes incorrect.

This segment is an appropriate supplement to your coverage of cognitive development during the play years. It vividly illustrates the formation of mental sets, egocentric thinking, centered thinking, and the transition of preschool thought from limited perspective-taking to a theory of mind. The child’s ability to deceive others and the appropriateness of various developmental tests at specific ages are also pertinent topics for discussion.

Topics for Discussion
• preschool egocentrism
• centered thinking
• the development of a theory of mind
• cognitive development and the ability to deceive others

Discussion Questions
1. In what ways is the mind of the typical 3-year-old unlike that of older children?

2. What characteristics of cognition during the play years were illustrated by the preschoolers as they played the card-sorting and doll games?

3. Why was 4½-year-old Patrick able to win when playing the “mean monkey game” whereas 3-year-old Jacob was not?

4. Were the various games appropriate tests of cognitive development in preschoolers? Did the nature of the games, or the instructors, limit or in any way influence the children’s performance?
Segment 10
Virtual Fear (7:57)

For people who have a fear of heights, taking an elevator ride can be a nightmare. Systematic desensitization is an effective way to treat phobias. But in the twenty-first century, the computer may revolutionize traditional psychotherapy for phobias.

At Georgia Tech, Larry Hodges has built a virtual version of a hotel elevator. The helmet that host Alan Alda puts on his head gives him a computer-generated, three-dimensional view that moves when he turns his head. It's remarkably realistic. But is it realistic enough to help someone like Christopher Clock, who has had a debilitating fear of heights since he was a child and panicked when he tried to climb the Statue of Liberty?

Working with Emory University psychologist Barbara Rothbaum, Clock attempts to conquer his fear of heights. Rothbaum is collaborating with the Georgia Tech virtual-reality researchers to determine if patients with phobias find the virtual height as scary as the real thing. As Chris demonstrates, the answer is a definite "yes." This means that the technique can be used therapeutically. After eight sessions working with the elevator simulator, Chris has nearly conquered his fear. "I can actually look over the edge of the bridge and not be terrified." The first time Chris used the simulator he rated his fear at 100 (on a 100-point scale). Now he gives it a 25.

The real proof of the success of virtual therapy, however, comes when Chris is able to travel to the 72nd floor of an actual building in an external elevator, which bombards him with cues to height.

The Georgia researchers are now constructing a virtual airplane to help people overcome their fear of flying without having to take real flights with a therapist on board.

With the costs of computing power coming down fast, it won't be long before virtual-reality systems are cheap enough for every therapist to have one in his or her office.

This segment provides a captivating supplement to your discussion of psychotherapy, especially as it pertains to the treatment of phobias.

Topics for Discussion
· phobias
· systematic desensitization
· counterconditioning
· virtual reality and psychotherapy

Discussion Questions
1. What are phobias? What type of psychotherapy is most effective in treating this type of disorder?

2. How is the computer revolutionizing psychotherapy for phobias? Does the new technique have the same theoretical underpinnings as traditional psychotherapy for phobias? Explain your reasoning.

3. What are some other possible applications of virtual-reality technology to the treatment of psychological disorders?
Segment 11
Mind Reading (9:00)

When an otherwise healthy child falls two or more years behind in reading level, the diagnosis is usually dyslexia. The nature of this disability has been fiercely debated for many years. This segment profiles the research of Paula Talal, who believes that dyslexics have a specific disability in processing sensory information.

Sound spectrographs of speech reveal that the sound changes involved in the difference between “puh” and “buh” last only a few hundred milliseconds. Talal believes that these rapid changes are too brief for dyslexic children to recognize.

To prove that the problem for a dyslexic person is not in the ability to hear, Talal devises a test that shows when information is presented to a dyslexic person too quickly, he or she just can’t keep up. Talal notes that “. . . the problem seems to be a specific problem that has to do with the rate at which the nervous system can transmit information that keeps coming at it one after the other.”

At the National Institutes of Health, other researchers are investigating the physiological bases of dyslexia. As dyslexic subjects are tested for their ability to detect rhyming words, PET scans capture pictures of cerebral blood flow, zeroing in on areas that are responsible for language processing. Some of these areas, such as one in the left parietal lobe, show abnormally low blood flow and neural activity.

Because results such as these imply that dyslexia may have an organic, genetic origin, researchers are developing an early detection test for infants. Early detection will help young dyslexic students receive sustained and supportive teaching to help them become successful readers.

This segment contains material that pertains to several topics, including the links between biology and behavior, the methods used in studying the brain, developmental disorders, and language processing.

Topics for Discussion
· the links between biology and behavior
· PET scan methodology
· reaction time and other methods of investigating infants’ perceptual capabilities
· the symptoms, mechanisms, and treatment of dyslexia

Discussion Questions
1. What is dyslexia? What are the criteria for its diagnosis?

2. What has Paula Talal’s research revealed about the underlying cause of dyslexia?

3. What is a PET scan? How does it work, and what does it reveal about the brain? What has this methodology revealed about the brains of dyslexic people?
Segment 12
Smart Glasses (8:13)

This segment explores how perception researchers are helping blind persons by developing the equivalent of “bionic senses.”

Leonard is a victim of macular degeneration. To get by he carries a variety of magnifying lenses: a small telescope that magnifies things until they are legible to his peripheral vision and a low vision lens for near objects.

But now Leonard is being fitted with a prototype system, called “Elvis,” that used advanced video and computer technology to provide a much clearer (and less cumbersome) view of the world. The system uses a video camera that processes the visual field electronically.

Elvis was designed by Bob Masov of the Wilmer Eye Institute. Masov is working on a refinement of the system that will help even those with the poorest visual acuity. Masov demonstrates how many visually impaired people, who are unable to see sharp detail, can decode images that provide high contrast—such as a caricature of a person’s face.

His new system consists of a computer program that converts an image into a high-contrast caricature. In addition to the perceptual advantages it offers, the software can operate in real time, as a visually impaired person is viewing the world.

This segment makes a nice supplement to your coverage of vision and visual perception. It also vividly illustrates how the fields of applied psychology and artificial intelligence have tackled a major human health issue.

Topics for Discussion
- visual system
- visual disorders
- bionic senses
- visual perception
- feature detection

Discussion Questions
1. What is macular degeneration? How is it “corrected” in the video segment?

2. How has Bob Masov used computer processing to improve the perceptual ability of visually impaired people? What does the success of this system demonstrate about visual perception?
Segment 13
Severed Corpus Callosum (10:00)

At Dartmouth University, Michael Gazzaniga has been working for many years with Joe, an epileptic who had his corpus callosum severed to stop daily seizures. Cutting the corpus callosum prevented the spread of the seizures from Joe’s right hemisphere to his left, but it also prevented the two hemispheres from communicating with each other.

Gazzaniga outlines his classic “split-brain” research paradigm for segment host Alan Alda, providing an especially clear explanation of its rationale. The left half of the brain controls the right side of the body, information on one side of the visual field projects to the opposite hemisphere, and so forth.

As Joe stares at the computer screen, words are flashed to one side of his brain or the other. When a word is flashed to his left brain, Joe can verbally report what he saw. But when only his right hemisphere sees the word, Joe is unable to verbalize what he saw. Using his left hand, however, Joe is able to draw a picture of the object. Not until Joe sees what his left hand (right brain) has drawn is he able to name what it is that was flashed.

“It’s almost as though someone has given him a secret communication,” notes Alda. “The communication is not occurring inside his head,” notes Gazzaniga. “It’s occurring out on the piece of paper.”

Gazzaniga believes that one of the greatest strengths of the left hemisphere is the drive to interpret why two events occurred. “You can imagine that a species that has that little chip in its brain that asks those questions is going to survive rather well because it’s going to figure out more about the nature of the world than a species that doesn’t have that.”

In a 1990s variation of Gazzaniga’s pioneering studies of hemispheric specialization, Joe is shown photographs of paintings by the sixteenth-century artist Archimbaldo, who made faces out of fruits, flowers, even books. Gazzaniga wondered whether the paintings would look different to each of Joe’s hemispheres. The first painting goes to the right hemisphere, followed by two words—face or fruits. He points to face. The next painting goes to the left hemisphere, and Joe reports fruits. When the image is projected to the left hemisphere the split-brain patient focuses on the elements that made up the face. But when the same image is projected to the right hemisphere, the patient focuses on the face and not the elements.

One side of the human brain is apparently specialized to detect an upright face. “That’s right,” notes Gazzaniga. “It’s an adaptation that we have to detect upright faces. You can imagine in an evolutionary time that all of a sudden you have to quickly detect a face, you want to read an expression on that face, to know if it’s friend or foe . . . .”

This segment is an effective supplement to your discussion of the structure and functions of the cerebral cortex.

Topics for Discussion
Discussion Questions

1. What is a “split brain?” When is it created, and why?

2. How did Michael Gazzaniga discover the specialized functions of the brain’s left and right hemispheres? Explain the rationale of the split-brain experiment.

3. For what specific abilities do the right and left hemispheres of the brain seem to be specialized? Does specialization make sense from an evolutionary standpoint? Explain your reasoning.
University of California-Irvine researcher Jim McGaugh has been studying how the mind is shaped by memory. In one experiment, a rat learns which arm of a radial maze contains food. Eighteen hours later, however, the rat has forgotten the task. When another rat is injected with adrenaline just after training, however, the memory remains after 18 hours.

Adrenaline is the hormone responsible for the "fight-or-flight" response. McGaugh's research suggests that the adrenaline rush does more than prepare animals to meet emergencies, however. "It also would be a good idea to remember where the predator was and what happened so that the next time the animal can avoid that situation . . . the same hormones that were involved in generating the fight-or-flight response, we now have discovered, work on the brain so as to make stronger memories."

In another experiment a rat swims to find a transparent underwater platform. Once he's shown where the platform is, the memory is stamped in. Three days later the rat is able to find the platform quickly. But when a rat is injected with a beta-blocking drug just after training, it can't remember where the platform is located. The drug works by blocking the effects of adrenaline. For rats, adrenaline appears to be central to making strong memories.

In the next scene, a human version of the experiment is depicted. A student listens to a boring story about a mother taking her son to visit his father's workplace. When the subject is asked to rate his emotional reaction on a 10-point scale, he responds with "2."

A second subject hears a very different version story. This time the boy is struck by a car as he crosses the street with his mother. When the subject is asked to rate her emotional reaction, she responds with "7."

Two weeks later the subjects' memories of story details are measured. Memories of the emotional story are much better recalled than memories of the boring story.

To determine whether adrenaline is responsible for the differences in memory, the researchers give another group of subjects a beta-blocking pill just before listening to the story. Although the story is still rated as highly emotional, two weeks later memories for details are just as poor as in those who heard the boring story.

PET scans reveal that the amygdala is the most active region of the brain as an emotional memory is formed. The more active the amygdala, the better the subjects' memory for story details weeks later. Activated by the hormones the emotions produced, the amygdala sends a message to the rest of the brain as if to say, "This is important! Don't forget it."

This is an effective supplement to your discussion of memory and emotion. It also provides a nice description of PET scan technology and brain mechanisms in information processing.

**Topics for Discussion**
• memory, emotion, motivated forgetting
• fight-or-flight response
• neural mechanism of agonists and antagonists
• PET scans
• limbic system

Discussion Questions
1. How has McGaugh’s team of researchers investigated the relationship between emotional arousal and memory in animals? in humans? What have they found?

2. What is the “fight-or-flight” response? What aspects of the nervous system and brain are involved in the processing of emotional memories?

3. What evolutionary advantage might have been conveyed to our species by the close connection between emotional arousal and memory?
Segment 15
True or False? (9:00)

Noted memory researcher Dan Schacter gives Alan Alda a simple memory test. Sitting on a park bench, the two watch an actor and actress enjoy a carefully choreographed picnic. When the play is over, and Alda has left, the scene is replayed and photographs are taken. Some photos depict actual scenes from the play. Others depict events that did not actually occur.

Schacter’s premise is that memory is malleable. “One of the things we know about memory is that it’s not fixed . . . the way we talk about the event later, the way we think about it... can sometimes change our memories later.”

Two days later a suspicious Alda is shown the photographs and asked to differentiate between events that occurred and those that did not. “Dan was obviously trying to confuse my memory of things I’d seen for real with things I’d only seen in the photographs.” Even though Alda knew some of the things in the photos had never happened, his memory was confused. Of eight false events, Alda incorrectly remembered two as having taken place.

Schacter is also studying how the brain represents real and false memories. “Instead of being in one place,” he explains, “many of us believe that memory is scattered in different parts of the brain. Memory consists of all the bits and pieces of an experience, the sights, sounds, and emotions, with each fragment stored in areas of the brain responsible for handling that particular sensation . . . sounds are stored in the auditory cortex, and so on.”

The final segment reviews Schacter’s recent PET scan studies differentiating real and false memories. Subjects heard lists of related words that they later were asked to recall. The words in each list are united by a theme word that is not on the list. For example, one list contains the words *bed, doze, nap,* and *yawn.* *Sleep,* however, is not one of the words on the list.

PET scans revealed that while recalling both true and false memories activated the hippocampus, only true memories activated the auditory cortex. Although the subjects reported hearing the words that weren’t there, their brains contained no trace of the sounds of the words.

Schacter emphasizes that there’s a long way to go before the trace of a false memory can be used in a practical test that can be used, for instance, in a courtroom.

This segment highlights several issues in the nature of memory. It also describes how neuroscientists investigate brain mechanisms in complex psychological phenomena.

**Topics for Discussion**
- constructive memory
- brain areas involved in memory
- false memory

**Discussion Questions**
1. What has researcher Dan Schacter discovered regarding the accuracy of long-term memory?

2. How does the brain store a memory? How is it recalled?

3. How does the brain differentiate between actual and false memories? How did Schacter discover this?
Segment 16
What’s in a Dream? (13:00)
Alan Alda joins a Harvard University’s sleep research project as a sleep subject. The study involves finding out what happens to the mind while we are dreaming. The experiment begins with a simple cognitive reaction time task. By measuring how long it takes to compare two words, the researchers have an index of how good the brain is at making associations.

As Alda falls asleep, the polygraph records his brain waves and eye movements. Several times during the night he is awakened and asked to perform the word association task. He’s also asked to report his dreams when the polygraph reveals that a REM episode has occurred.

Most dream researchers believe that during REM sleep the normal signals from the brain are cut off. Instead of receiving inputs from the eyes and ears, the visual and auditory centers are flooded with signals surging upward from more primitive regions of the brain. These signals are believed to be random and completely meaningless.

Harvard psychologist Bob Stickgold explains that during dreams our brains are scrambling to make sense of nonsense. And this is where the word association task is revealing. Subjects are faster at making associations following a REM episode than they are when they are awakened from NREM sleep, or even when they are wide awake. It’s as if during REM sleep the brain is primed to put together stories from random images and feelings.

Other research conducted at Toronto’s Trent University suggests that dreaming helps us learn. College student Lara is spending four nights of her summer vacation in the lab. Researchers record and count her eye movements during a time when she’s in a relaxed, relatively stress-free mode. The experiment is repeated four months later during final exam week, when Lara’s mind is in a strenuous learning mode.

Note that the pattern of eye movements is strikingly different during dreams. “For some people,” notes researcher Carlisle Smith, “there’s almost a doubling of eye movements after they’ve had intense learning activity.”

To investigate the purpose of the extra eye movements, Smith sets up an experiment to see if learning a complicated logic game is affected by how much dreaming a person does. After the students are tested, they receive a simple paired-associates memory test. Finally, all of the subjects are allowed to sleep. Some are awakened during REM episodes. Other control subjects are either awakened during NREM episodes or allowed to sleep uninterrupted.

One week later the subjects are retested on the paired-associates and logic tests. Although there were no differences in performance on simple memory task, dream-deprived subjects did significantly worse than control subjects on the more complex logic test.

In a final version of the experiment, students hear a loud clock ticking while they learn the logic game. Later, as they sleep, some wear headphones and hear the ticking during REM periods. The idea is to see if the ticks remind the dreamer of the learning task. Students who heard ticking during REM were far better than control subjects in learning the logic task. To Smith this suggests that being reminded of a problem during dreaming helps us tackle it.
This segment gives an effective overview of sleep stages and outlines the latest theories of the nature and function of dreaming.

**Topics for Discussion**
- sleep research methodology
- REM and NREM stages of sleep
- mechanisms and theories of dreaming

**Discussion Questions**
1. Outline the course of a night’s sleep, differentiating the body’s state during REM and non-REM stages.
2. Why, according to most psychologists, do we dream?
3. How has Bob Stickgold investigated the purpose of dreaming? What has he found?

**Segment 17**
**Old Brain, New Tricks** (11:00)

At the University of Oregon, neuroscientist Helen Neville records electrical activity in the cortex to find out where in the brain we process language. Averaged across hundreds of subjects, her research shows that vocabulary words seem to be in different places in both left and right hemispheres. The processing of grammar words, however, seems to be concentrated in the left.

When the study is repeated with young children, who are in the early stages of language development, the results are very different. Young children process language all over the brain. Not until age 4 or 5 does the typical adult-specialized pattern emerge.

This finding may have important implications for how children are educated. “We don’t know when the critical time windows are when learning math, learning music, would be optimized,” notes Neville, “but I don’t have any doubt that there are such critical windows of opportunity.

What we do know is that from the point of view of language learning, early is better.” For people who learn a second language, the early locking in of the brain’s language areas is especially important. Arthur, who speaks fluent Chinese and English, began learning English as a second language at age 3. When he’s tested, his brain’s response to English is identical to that of a native speaker—with the same specialized areas for grammar and vocabulary.

Although English is also Nick’s second language, he didn’t start learning it until age 10. When responding to English, his brain reveals no specialized grammar area. “The sound and the grammar of a language are the parts that suffer most from delayed learning,” notes Neville. “So,” she says to Alda—who began learning French as a teenager—“you probably speak with an accent, and your grammar probably isn’t perfect. On the other hand, you probably have a huge vocabulary.”

In the final story of the segment, Dean Gable, who has been deaf since he was 4 years old, has his brain responses to signs tested. His responses are just like those of any person who learns an early language, with typical grammar and vocabulary areas. But Dean’s brain
response also indicates that he’s using both the normal vision processing area and large parts of an area normally devoted to sound in hearing people. This makes sense, since sound processing is unimportant to a deaf person. This indicates that the developing brain is not only locking in specific functions, but can also invent new uses for sections if necessary.

This segment provides another effective supplement to the latest research questions within the burgeoning field of behavioral neuroscience. It also discusses brain plasticity, developmental issues in second language learning, and the concept of critical periods in development.

**Topics for Discussion**
- neuroscience
- electroencephalograph
- cerebral specialization in language
- second language fluency
- critical periods in development

**Discussion Questions**
1. How is neuroscientist Helen Neville investigating brain processes in language? What has she found?

2. Why is it easier for a child to master a second language than it is for an adult?

3. What is a “critical period” in development? What critical periods are described in the video segment? Can you think of other critical periods in human development?