

The Mind: Language

a segment of a PBS series on the mind, with George Page narrating

“Language is the clearest evidence we have of the mind that exists within us.”

Questions to be answered

- (1) “Do animals communicate as we do, or is there something unique about human language?”
- (2) “How much of language do we learn, and how much is built in at birth?”
- (3) “If language is so vital to communicate our thoughts, does it also color the thoughts we have?”

(1) Animal communication and language

There are examples of animal communication with highly specific messages, e.g. vervet monkeys, with a *snake call*, a *leopard call*, and an *eagle call*. “Do animals which produce such calls have language? At what point does animal communication leave off and language begin?”

Early experiments tried to teach animals to act like humans: examples are *Vicki* (tried to teach actual speech) and *Koko* (a gorilla who learned American Sign Language).

Purpose of these experiments: “Stringing words together logically implies that language exists, and if an animal were to actually use those words naturally, the implication would be even stronger.”

Jane Goodall

Recounts the poignant story of Lucy, a chimp raised as a human, then returned to Africa. She was able to sign, “Please help, out,” but Goodall does not consider this conclusive that the chimpanzee can use language in *spontaneous* communication, as all humans do. The ability to communicate, separated from events, is the major distinction between humans and apes.

“How far does this primitive potential [of apes to learn at least rudimentary sign language] extend [as a cognitive ability]?”

David Premack (University of Pennsylvania, formerly UCSB)

His experiments intend to explore nature of alleged difference between humans and other species and “in some measure, to understand the nature of language”. Whiskey, a chimpanzee, and Sarah 30 years earlier at UCSB, were trained in a “language” of plastic symbols. It doesn't have the machinery of human language, but simply requires that the animal learn rules. Sarah, in a 1969 BBC film, was said to have learned 130 symbols, and the narrator states that her achievements “challenge the belief that man alone among the animals can reason with words”.

Premack's conclusions after 30 years of research: *All* chimp “words” involve direct association with some object. One couldn't ask chimp “what these sentences have in

common”, “what is the subject of this sentence... there is no evidence that [the chimpanzee] has any grammatical competence, that it has notions like subject, noun phrase, verb phrase, without which you cannot formulate the rules of human language.” The complex grammar of human language is absent.

In addition, they probably cannot *think* using the language they have been taught. There is no evidence that their mental representations consist of the plastic symbols they have learned to associate with objects, in contrast to humans, where there are many kinds of evidence that mental representations are in terms of language.

(2) Language as a “built-in” human faculty

“Why did language evolve in humans alone of all animals?”

Philip Lieberman (Brown University)

We can reconstruct how physical differentiation came about between humans and apes. Evolution of speech organs (round tongue and lowering of the larynx) must have had concomitant evolution of brain, because the physical evolution would have been useless without the brain to drive and use it for what it was good for. Comparing *Homo sapiens* with Neanderthal, round tongue won't fit in Neanderthal mouth. The Neanderthal couldn't pronounce *i*, *u*, or *a*, and all vowels would have been highly nasalized.

Xrays show complexities of human speech, which is ten times faster than sounds chimpanzees can make. It has to be so, or we would forget the beginning of a sentence before we reached the end.

Homo erectus may have had beginnings of speech because he had the vocal anatomy. Speech must have had great selective advantage because the human vocal tract is deficient in other respects (we can choke to death, our breathing is inefficient, our teeth are crowded, making it necessary to extract wisdom teeth, etc.).

“Language is so central to the human mind that it emerges in everyone equipped with normal mental abilities, even when hearing is absent from birth.”

Ursula Bellugi (The Salk Institute)

Previously, the only way to investigate language was spoken language. Bellugi studies ASL to learn what it can tell us about all human language. ASL allows us to “sift out properties related to mode in which language develops and properties which are fundamental to human mind.”

Studies use computer imaging system. Such experiments show differences in movement related to grammatical differences, e.g. noun and verb (“sit” and “chair” use the same hand shape but are differentiated by types of movement), “compare” uses different movements to show “comparison” (noun), “compare” (verb), “compare across”, “compare by features”. It was originally thought that sign language had no grammar, but we now know that sign language is an autonomous, grammatically organized communication system, not derived from any spoken language.

Sign language uses vision and space rather than sound “so are the brains of deaf people organized differently from the brains of hearing people because of the differences in their language?”

Helen Neville (The Salk Institute)

Explores which hemisphere is stimulated by sign language. The right hemisphere processes motion for most people, so shouldn't sign be processed in right hemisphere? Results of experiments indicate no, left hemisphere handles sign language as well as spoken language. This suggests that “the brain is built to reserve an area for language, no matter what.”

Bellugi: Does learning sign influence development, as in a school with children deaf from birth? Does the form of language alter way people learn to communicate? The answer is no: deaf people “think” in sign, dream in sign, plan in sign, “talk” to themselves, children “babble”, children make the same types of errors as speaking children, e.g. at age of 2, they mix up “me” and “you” even though signs appear to be iconic.

All this shows that language is so fundamental to humans that it emerges even in the absence of hearing

“Expressing ideas is so important that we embellish language whenever we can.”

William Condon

How people express themselves with body language. Example of how body movement is influenced by words (film of man saying “You know, what can I do about it?”).

“So language is only one aspect of how we as humans communicate with each other.”

Colwyn Trevarthen (University of Edinburgh)

“Studies communication between mother and infant, believing it offers a glimpse of mind beyond language.” “Language on the drawing board.” It shows forms of communication that will be incorporated into language. Babies learn to respond to mother's movements and facial expressions. Mothers can move into a form of behavior perfectly matched to what the baby requires without knowing how they do it.

Conclusion: “Babies communicate from birth.”

“So babies communicate from birth, but when do they begin to pick apart the actual sounds of language?”

Patricia Kuhl (University of Washington)

We can hear babies *produce* sound which they will use in speech, but what can they *perceive* discriminate and categorize. In an experiment, a baby hearing differences between vowels turns to see toy.

Babies can discriminate different vowels even when pronounced with different voices (children, male, female). The naturalness with which babies do this can be compared to

the difficulty in trying to get a machine to recognize a pattern which stays constant (e.g. a particular vowel) but which is produced by different talkers.

We must come into the world especially prepared to perceive language.

“If we do come into the world with the basics of language built in, what explains the great differences between languages?” (Film shows people saying ‘I am thirsty. I need water,’ in many languages)

“If we were present at the birth of a language, we might see how it naturally emerges from the mind.”

Derek Bickerton (University of Hawaii)

Studying creoles as a way to attempt to understand how language emerges from scratch. Example of creole from Surinam. Bickerton calls this the most interesting of all Creole languages because of the severe linguistic deprivation under which it developed. *Berry Vrede*: “You can't stop communicating.” Slaves without common languages bought by slave owners who spoke different languages. Some slaves ran away to form their own communities, but they had no common languages. Adults spoke *pidgin*, with limited vocabulary and no real grammar. Children brought grammar to their parents' pidgin speech in one generation. The Surinam *creole* was thus “invented by children”.

The only explanation for how this could happen is that language has to be built into the “hard wiring” of the brain.

“If language is somehow built into the brain, it should be possible to explore how it's processed.”

Marcus Raichle (Washington University School of Medicine)

Experiments to watch the brain at work as it processes words (the basic building blocks of language. This leads a long way to understanding how brain works in a general sense . Uses a PET scan of brain: brain areas that are active will absorb a radioactive substance injected into blood stream. The experiment is conducted in steps:

- (1) control scan, with subject looking a blank screen
- (2) subject reads words silently from screen (process visual image); subtract brain image found in viewing a blank screen from the image with read word to see what areas of the brain are affected by reading written language
- (3) repeat words out loud (parts of brain causing movements of vocal apparatus show up in brain scan)
- (4) subject sees word and must produce a related word (cake-eat, gun-shoot, radio-listen, bike-ride, etc.); shows frontal areas of *left hemisphere* as well as motor areas and areas typically activated during stress

By subtracting motor areas, we can see areas of brain stimulated by language. Many different brain areas must collaborate to produce a single word.

“But language involves more than just words.”

Antonio Damasio (University of Iowa)

Experiments to explore how the brain processes *grammar*. This is done by studying how brain damaged patients process language. Film shows a stroke victim with left hemisphere damage (right foot numb, etc.).

“The bird that the cat watched was hungry”: Patient can't sort out who was hungry (remembered bird first, “the cat was hungry about the bird” - cat is most likely eater of bird). Wernicke's area affected. Patient's problems are with grammar, not words. But does this mean that the Wernicke's area is where grammar is localized?

Damasio does not believe that one brain area has grammar, another words, etc.; there are large networks working together; we cannot localize language. It involves the whole brain.

“Language offers clues to the structure of the mind.”

(3) Language and the structure of thought

William Wang (UC Berkeley)

Believes language plays role in shaping mind itself, how we relate to others and within ourselves.

“Having more languages does make available to you more ways of looking at things, more ways of relating to things, relating to others, planning within yourself.”

Wang comes very close to expressing the Whorfian view that language influences thought, a view that we have argued does not stand up to close scrutiny.--RGS

Can language influence the way we think?

Eskimo has over 100 words for snow: does an Eskimo think differently because of his language has different priorities? [This is a myth—see *The Language Instinct*, pp. 54-55)—RGS]

Whorf hypothesis (*Benjamin Whorf*): Believed Hopi seemed to define world in an utterly different way from Europeans

Ekkehart Malotki (Northern Arizona University)

Wants to test Whorf's belief that Hopis' language gives them a different view of the world from, say, Europeans.

Brian Honyouti (Hopi Teacher): language comes from earth; it is part of being Hopi.

Malotki has spent 15 years trying to see if Whorf is right: Whorf made many claims, the most spectacular being that Hopi is timeless, i.e. Hopis do not experience time because they don't have words for time. Malotki finds that the Hopi are living with time in every aspect of their life; but time is more “organic”, it springs from environment, movement of sun, rhythm of seasons, harvest, etc.

Language is a “coping mechanism” and will be used to categorize what we find in the world, but “people are not different because of their language, but because of their different experience with this world ... Deep down we are all the same.”

Whorf was wrong about Hopi in particular, though this doesn't mean he was wrong in general. But most people working today believe Whorf's question is the wrong one to ask. Maybe language merely reflects the workings of brain and mind. Brain and mind, like biology and psychology, form a continuum which is almost impossible to tease apart.

Some study questions: This film touches on many issues which we cover in Linguistics

1. The order of the questions below relates to the order they come up in the film. I have included the week of class which the issue raised by the question most closely relates to.

1. (Week 8) What was the purpose of experiments such as those with Vicki, Washoe, and Koko?

2. (Week 8) How did Premack's experiments differ in focus from the ones mentioned in question #1? In what two ways does Premack believe his experiments have shown a chimpanzee to be cognitively different from humans?

3. (Week 9) Why does Lieberman believe that the reconstructed vocal organs have implications for how the brain has to be reconstructed? Why does he believe that Neanderthal could not have had speech as we know it? What evidence does he give for the selective advantage of speech?

4. (Week 7) What is "lateralization"? What is the significance of the left hemisphere of the brain for experiments such as those of Neville, Raichle, and Damasio?

5. (Week 7) Why does the study of the sign language of the deaf have special significance for understanding language in the brain? What have experiments shown about how sign language is processed in the brain? What kinds of evidence show that the linguistic development of a deaf child is like that of hearing children? (What implications does sign language research have for Lieberman's theories, which focus on the vocal apparatus?)

6. (Week 6) What kinds of experimental evidence with babies show that we are endowed with linguistic abilities from birth, even though children typically do not begin to speak until they are a year old or more?

7. (Weeks 1, 7) What is the difference between a "pidgin" and a "creole"? Why does the formation of Surinam creole suggest that we are "hardwired" for language from birth? Why are there so many different languages, i.e. why don't we all speak creoles?

8. (Week 7) Describe how it is experimentally possible to show where specific linguistic abilities are stored in the brain.

9. (Week 7) How would the language deficits of aphasics show how the brain stores grammar? What in the film tells us that Damasio's stroke patient had left hemisphere damage (other than him saying so)?

10. (Week 1) What is the "Whorf Hypothesis"? What evidence did Whorf think Hopi gave for this hypothesis? What is Malotki's view (and the view of virtually all linguists today) on this hypothesis? If Whorf was wrong, what would explain the Eskimos having many words for snow [if, in fact, they did] or nomadic Arabs having many words for camels?

