

What makes language
language?

2 PRONGED PROCESS

(sensory and motor)

Receiving / Comprehension - specialization of sensory processing

- Language *input* - hearing / seeing / feeling
 - Attend > Identify (Understand)

Sending / Production - specialization of motor processing

- language *output* - speech, writing, signing
 - Attend > Identify > Appropriate response
- develops after understanding
- *generative* – can be completely new, not repetitions

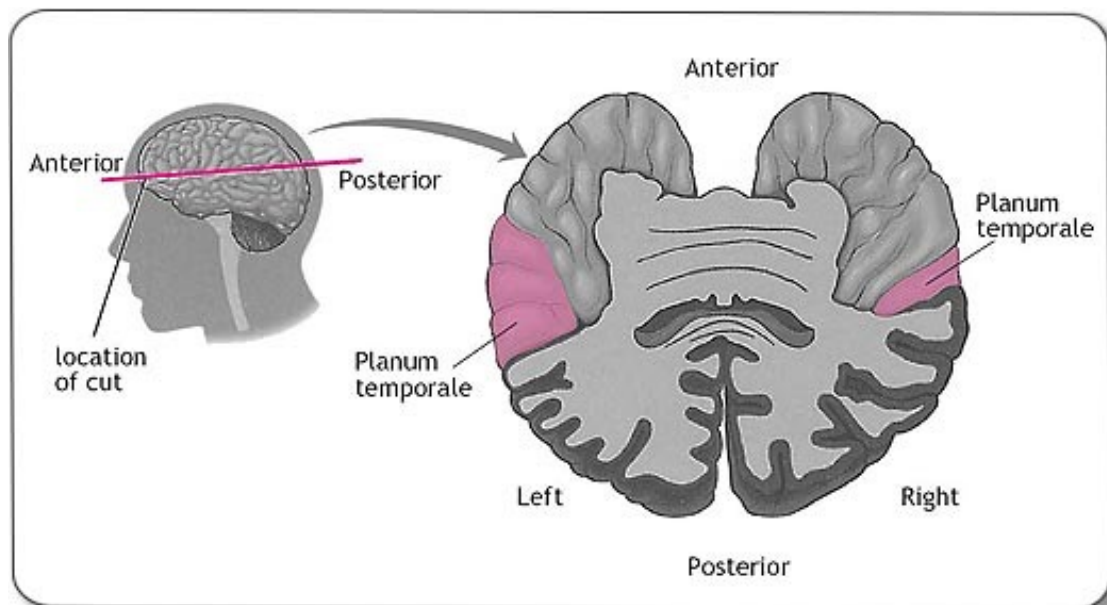
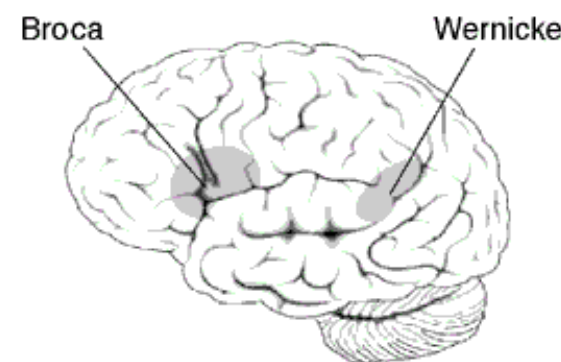
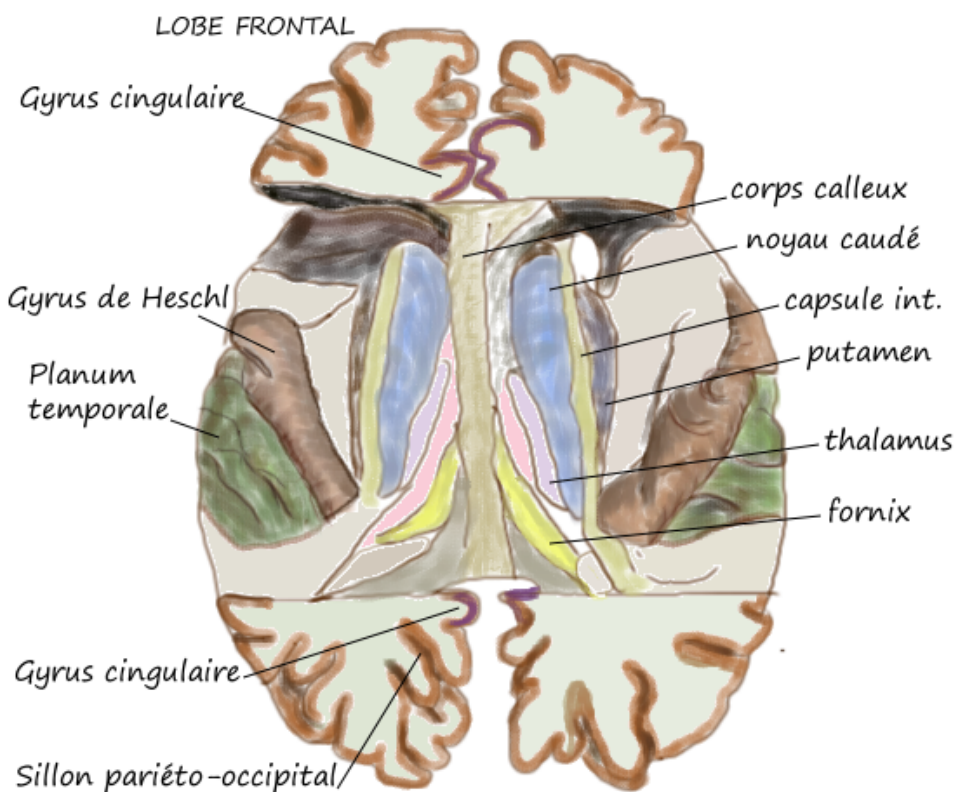
THINKING:

- *to some extent*, thoughts are shaped by language
 - the language you speak limits your thought
- words and images are used to EXPRESS thought
 -but we usually don't really think in WORDS
- we generally think in “mental images”
 - Internal representations like those from perception, but from stored info rather than immediate sensory input (sensory memory)
- Thoughts are like language – generative, not simply repetitions of patterns (memory)

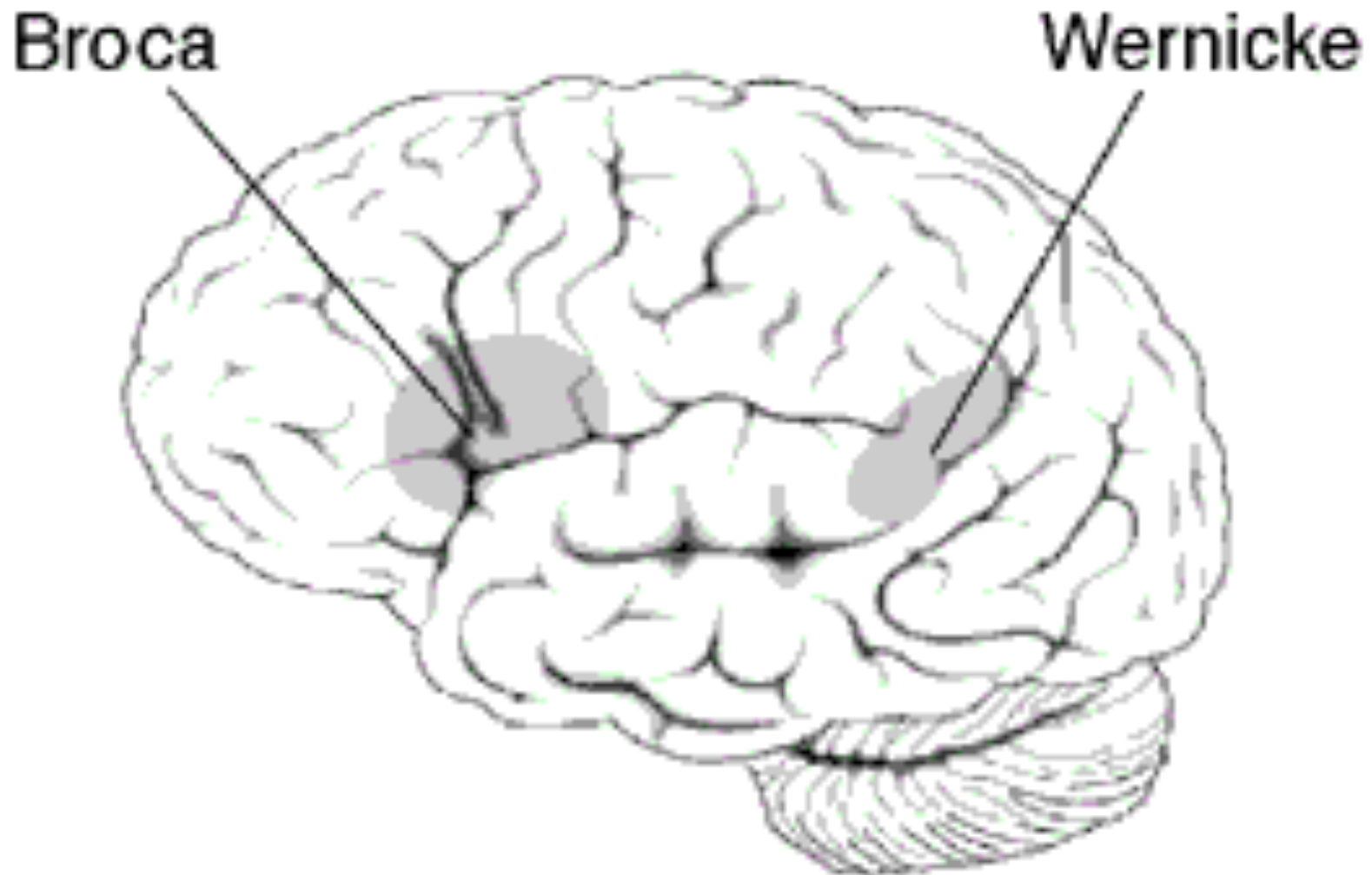
Thoughts arise from manipulations of *concepts* – neither images nor words, but a type of “mental grouping”

Biological substrate for language:

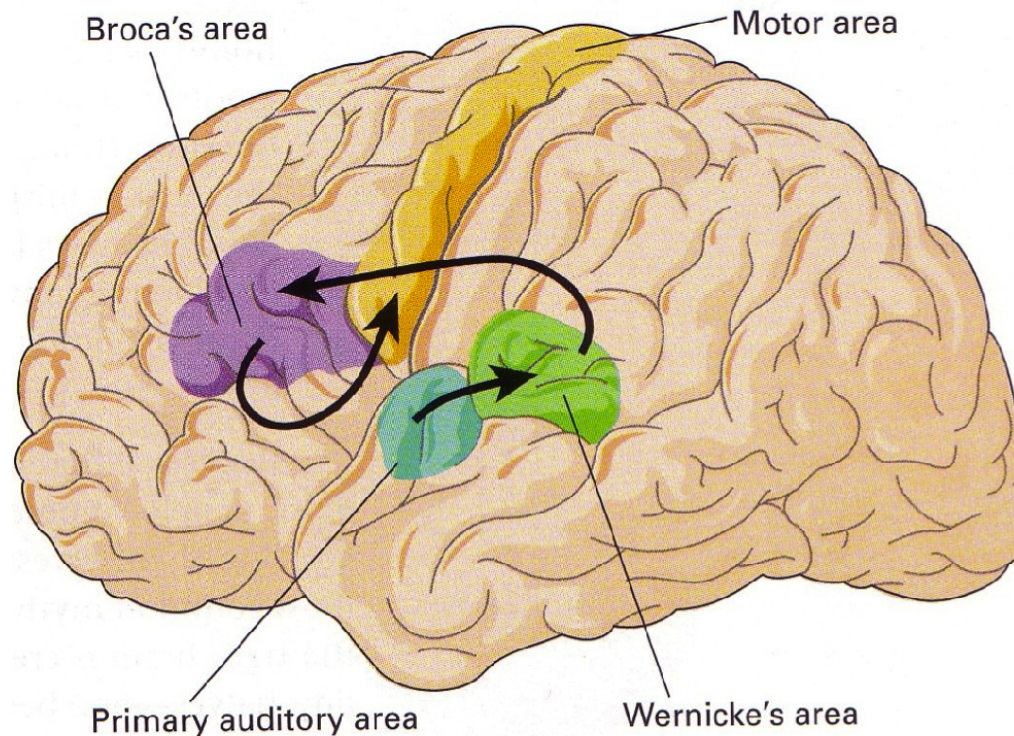
- brain contains innate “circuitry” for language
 - larger *planum temporale* in L hemisphere
 - near auditory cortex & language areas
 - before any exposure to language
- “language acquisition device” (Noam Chomsky)



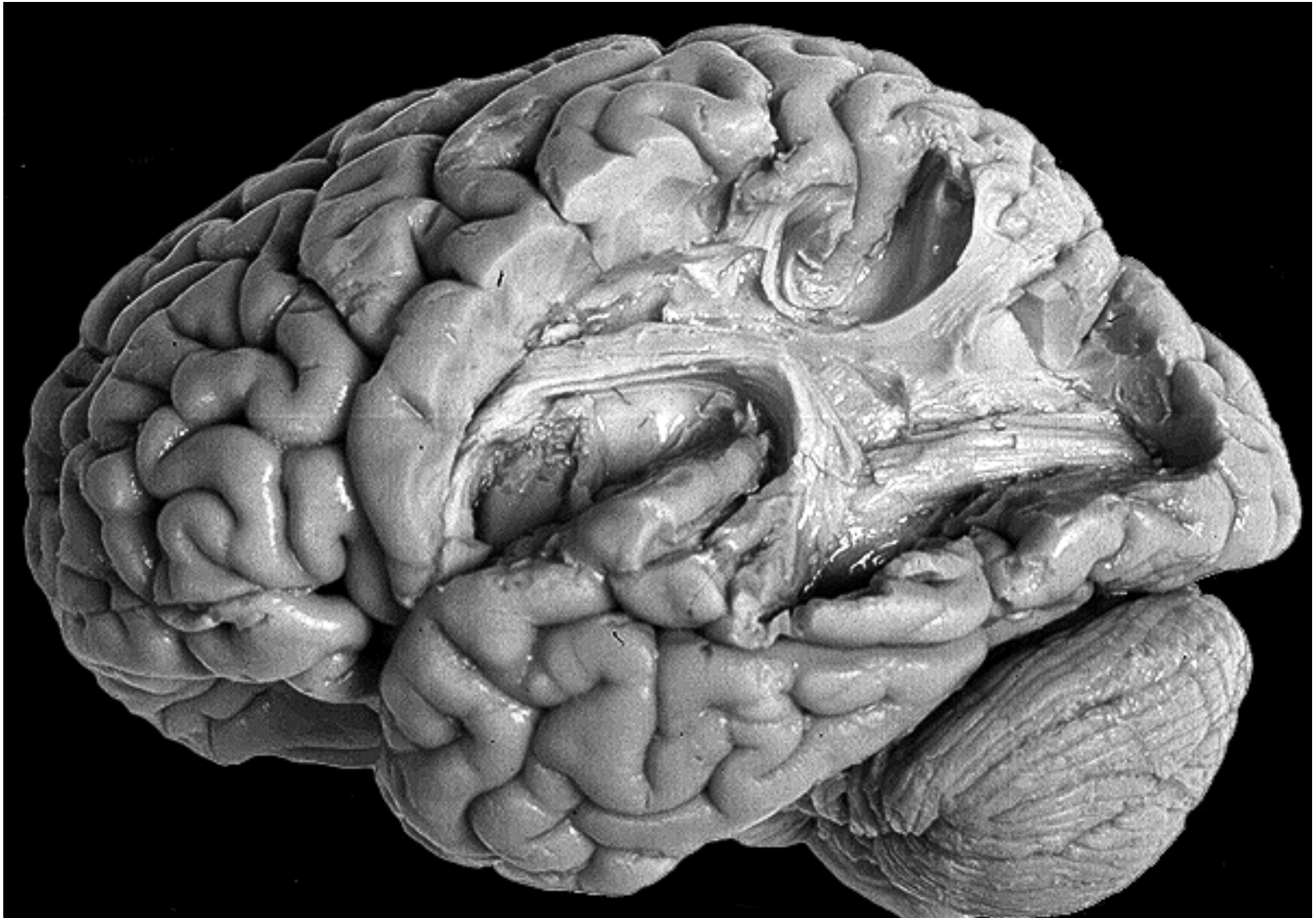
- 2 regions main “language” regions in the brain:
 - 1 in frontal association cortex
 - 1 in temporal association cortex



- mostly in L hemisphere
 - extension of:
 - higher order perceptual areas for hearing, seeing, feeling
 - premotor areas for face / tongue / etc
 - concerned with symbolic representation

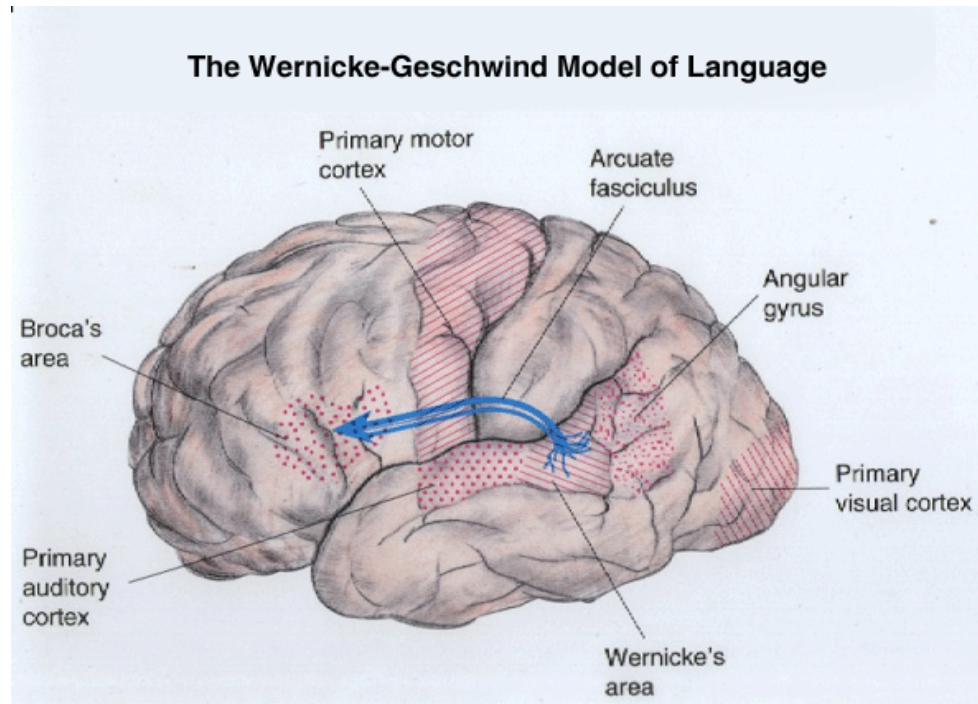


Connected by the “arcuate fasciculus”



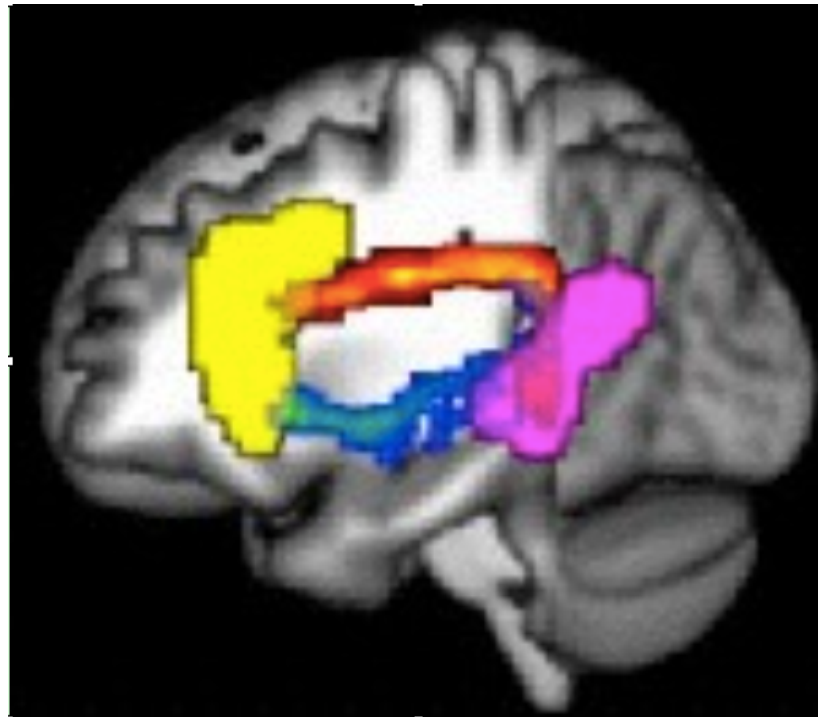
Wernicke-Geschwind Model of Language

- repeating a written word
 - visual cortex >
 - association cortex - angular gyrus (*integration*) >
 - Wernicke's area (*comprehension*) >
 - arcuate fasciculus (axon pathway) >
 - Broca's area (*production*)
 - primary motor cortex
- **mostly L hemisphere – R deals mostly with “prosody”**



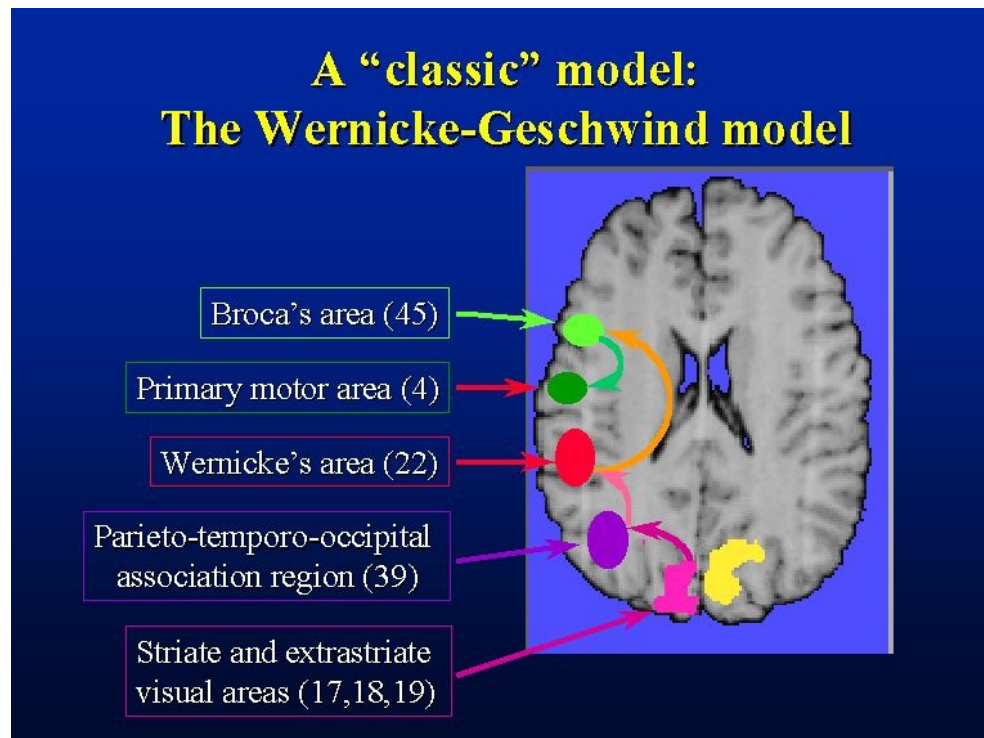
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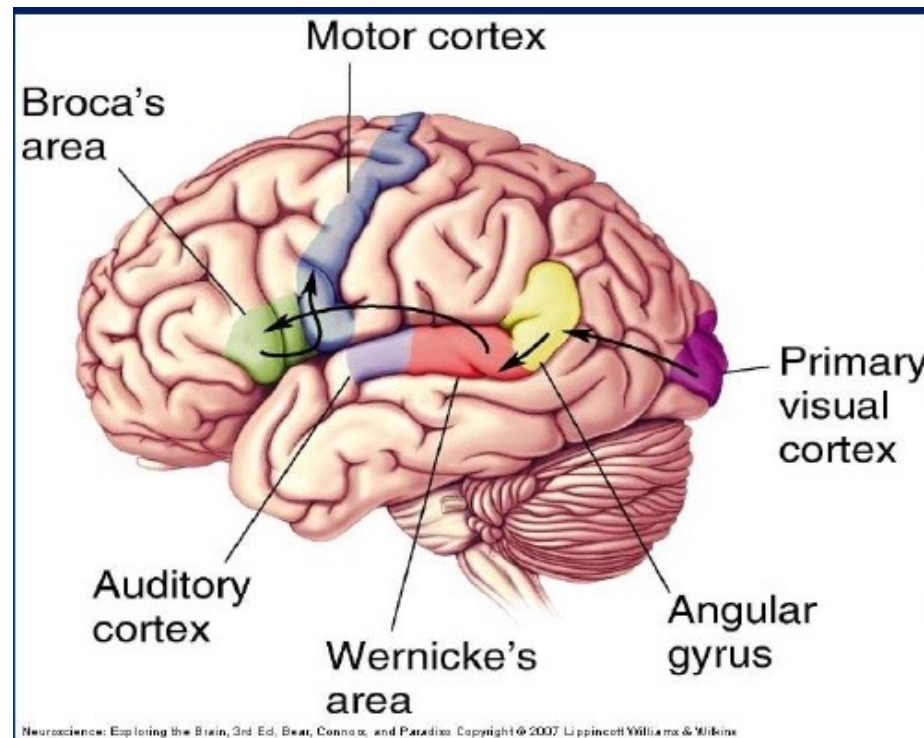
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...however, model places too much emphasis on Wernicke's and Broca's areas

- original studies had lesions larger than just 1 region

- actual pathways are somewhat more complicated

 - serial and parallel paths

e.g., some PET studies suggest that the angular gyrus / Wernicke's path can be "skipped", going straight through the arcuate fasciculus to Broca's area (Petersen model)

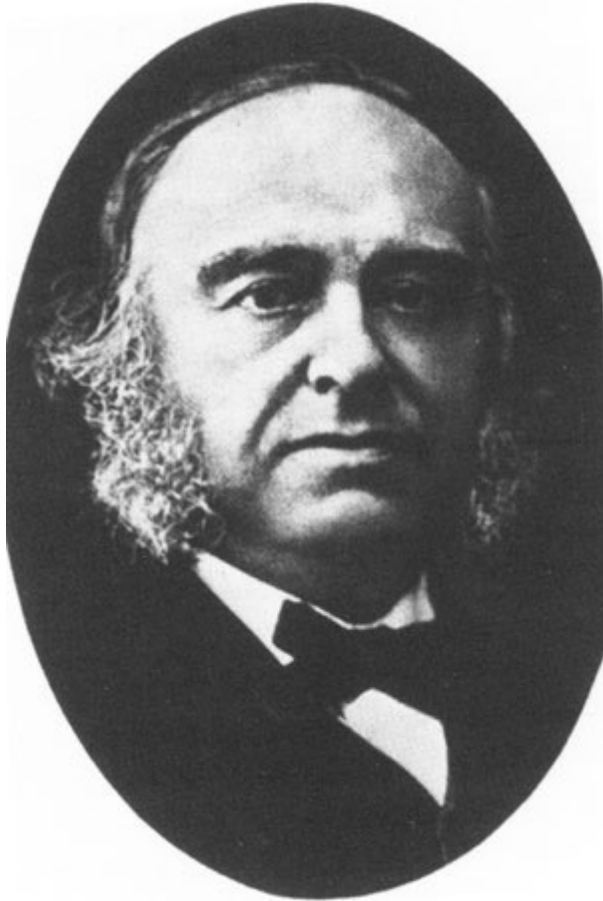
- "meaning" can be processed in visual cortex

Also, Broca's area active during generation of words, not during output of overlearned words (e.g., songs)

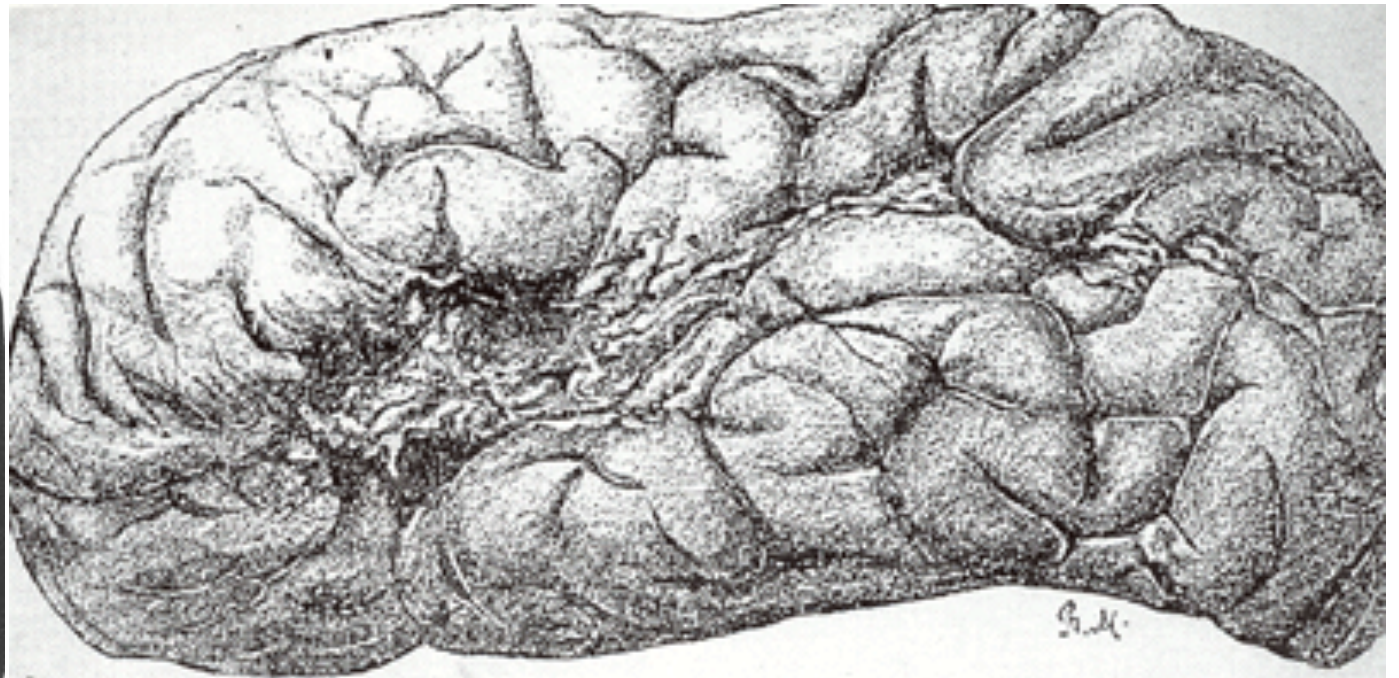
...so, Broca's area is not just an automatic motor sequencer, but more of an information processor

Language Problems

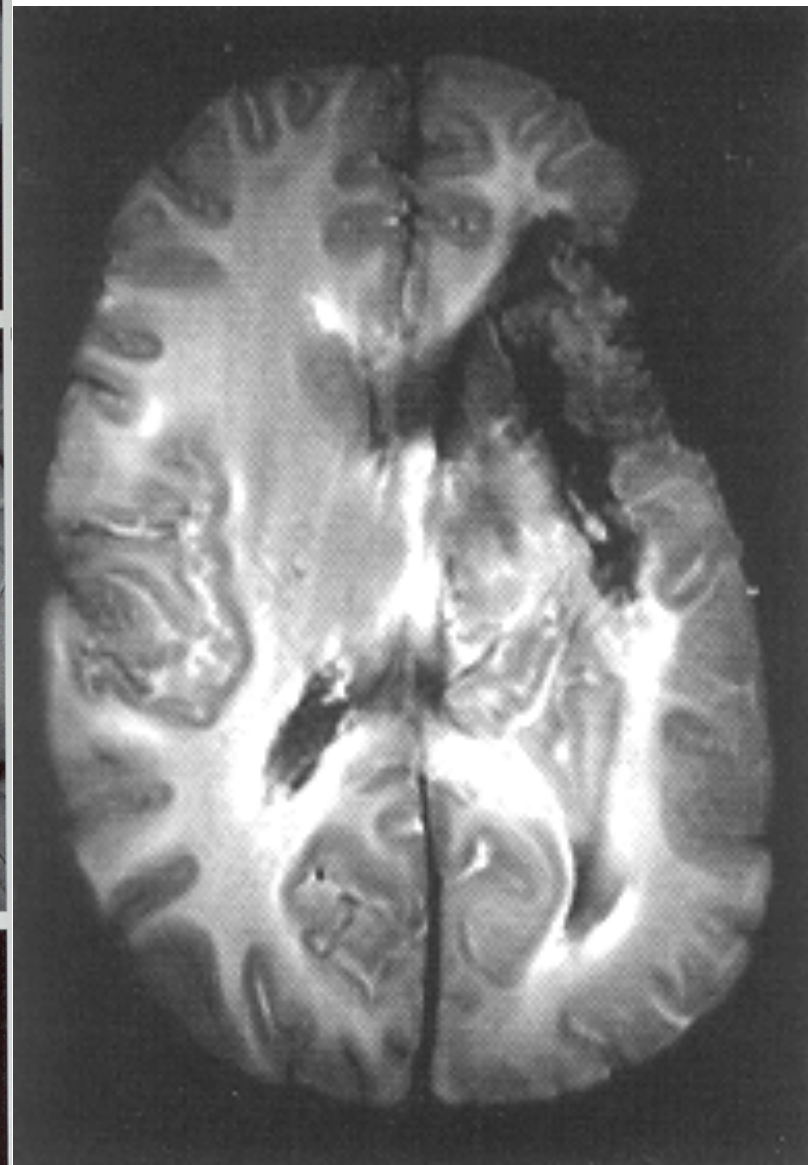
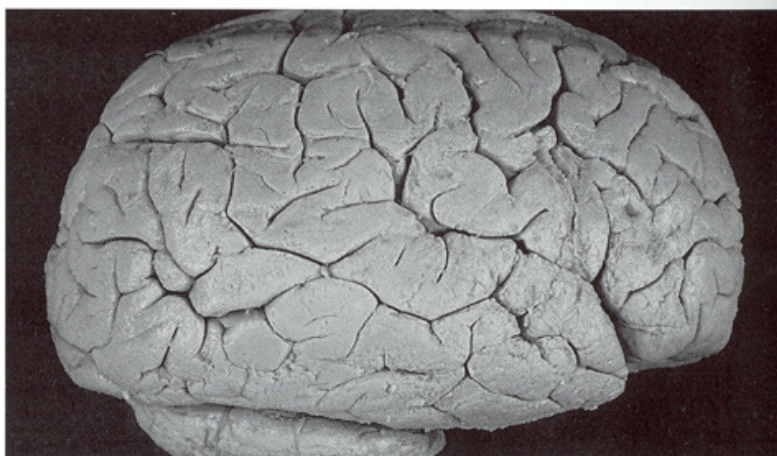
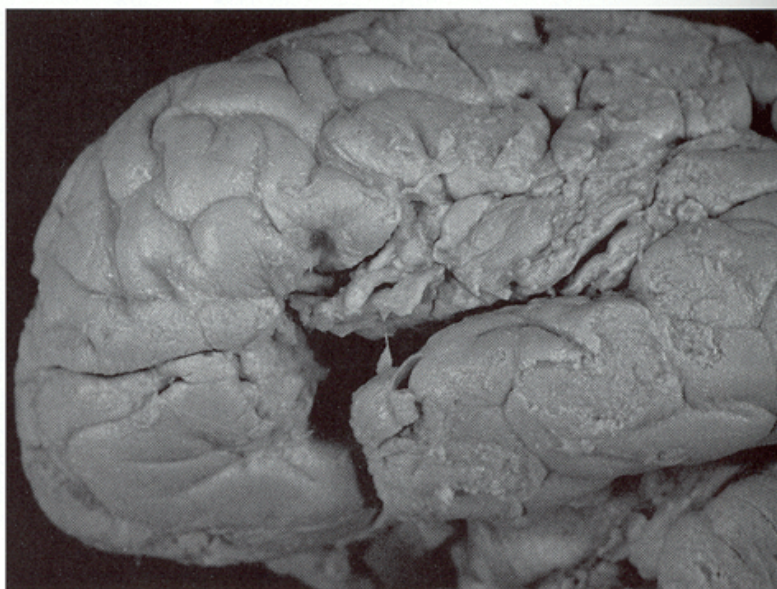
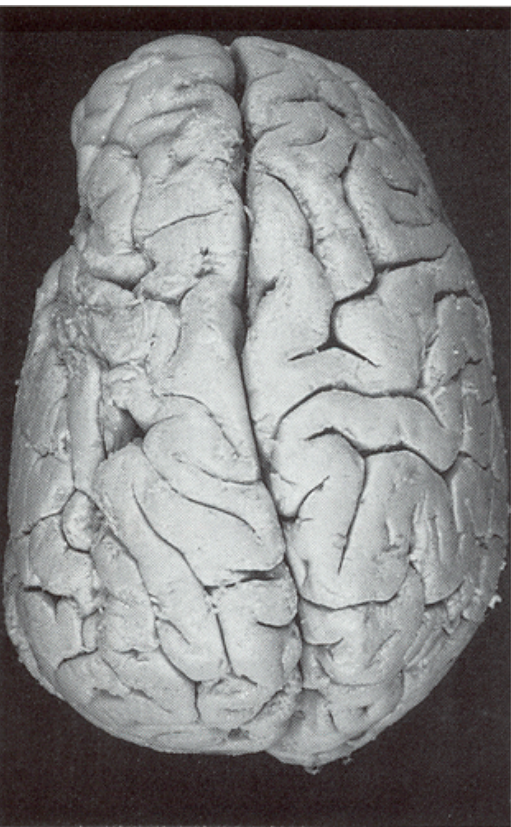
Paul Broca



“Tan’s” brain



1 — Hémisphère gauche du cerveau de Leborgne, première autopsie de Broca. Le dessin fait sur la photographie de la pièce actuellement conservée au musée de la Pitié-Salpêtrière. On voit que, en outre de la lésion de la troisième frontale, le ramollissement existait tout le long de la scissure de Sylvius et siégeait par conséquent aussi dans la zone de Wernicke.



- *aphasia* - loss of expression or comprehension of language
- affects speech, writing, and signing
- usually due to injury of “language” regions
- not by deafness or motor deficits
 - Wernicke’s area – problems w/ comprehension / understanding
 - Broca’s area – problems with production
 - arcuate fasciculus - “connection” (can’t repeat words)

TABLE 27.1 Characteristics of Broca's and Wernicke's Aphasias

Broca's aphasia ^a	Wernicke's aphasia ^b
Halting speech	Fluent speech
Tendency to repeat phrases or words (perseveration)	Little spontaneous repetition
Disordered syntax	Syntax adequate
Disordered grammar	Grammar adequate
Disordered structure of individual words	Contrived or inappropriate words
Comprehension intact	Comprehension not intact

^a Also called motor, expressive, or production aphasia.

^b Also called sensory or receptive aphasia.