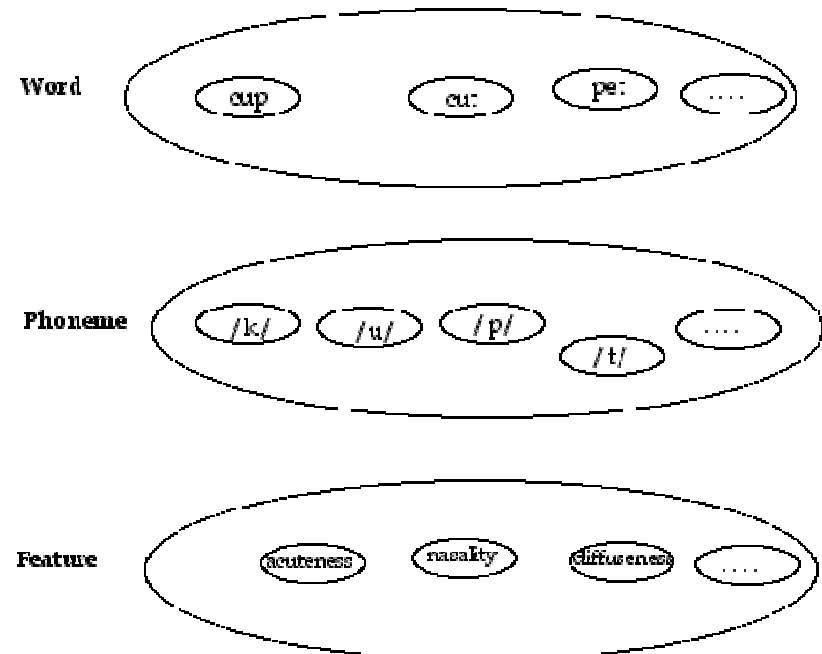


Announcements

- Review Session
 - Today, 4-6pm, Center Hall 105
 - Podcast available shortly afterwards
- Coulson's Office Hours
 - Thursday 10am-Noon
- Midterm
 - Friday 10am
- Friday 11am Section Cancelled
 - But Ben will hold an office hour at that time
- Experiment Participation/Article Summaries
 - Experimentrix deadline today, Message directly to TA must arrive by Monday
 - Article Summaries can be dropped off with final papers on Monday (do not staple your summaries to your paper, though!)
- Final Paper
 - Due Monday, turn in a **hard copy** to box outside Coulson's office (CSB 161)

TRACE


- Like the interactive-activation model of printed word recognition, TRACE has three sets of interconnected detectors
 - Feature detectors
 - Phoneme detectors
 - Word detectors
- These detectors span different stretches of the input (feature detector span small parts, word detectors span larger parts)
- The input is divided into “time slices” which are processed sequentially.



TRACE - continued

- Within a set (or level) connections are inhibitory
 - E.g. evidence that a certain stretch of the input is the word “tip” is evidence that it is NOT any other word
- Between a set (or level) connections are excitatory
 - E.g. evidence that a certain stretch of the input is the sound /t/ is evidence that it might be the beginning of the word “tip”
 - Also, evidence that the word is “tip” is evidence that its parts are /t/ /i/ /p/, so there are “top-down” (feedback) effects in TRACE as in the interactive activation model
- Or inhibitory..
 - If it’s a /t/ it isn’t the beginning of “cat”

TRACE - continued

- Accounts for context effects
- Can handle (some) acoustic variability (and noise)
- Can account for phoneme restoration (Warren - “Open the  oor” heard as “Open the door”)
- Can account for co-articulation effects
- Can find word boundaries (using the possible word constraint)

Spoken Word Recognition: Conclusions

- The two leading models, TRACE and the Revised Cohort Model, have much in common
- Both depend on competition between partially activated candidates for the word's identity

McGurk Effect

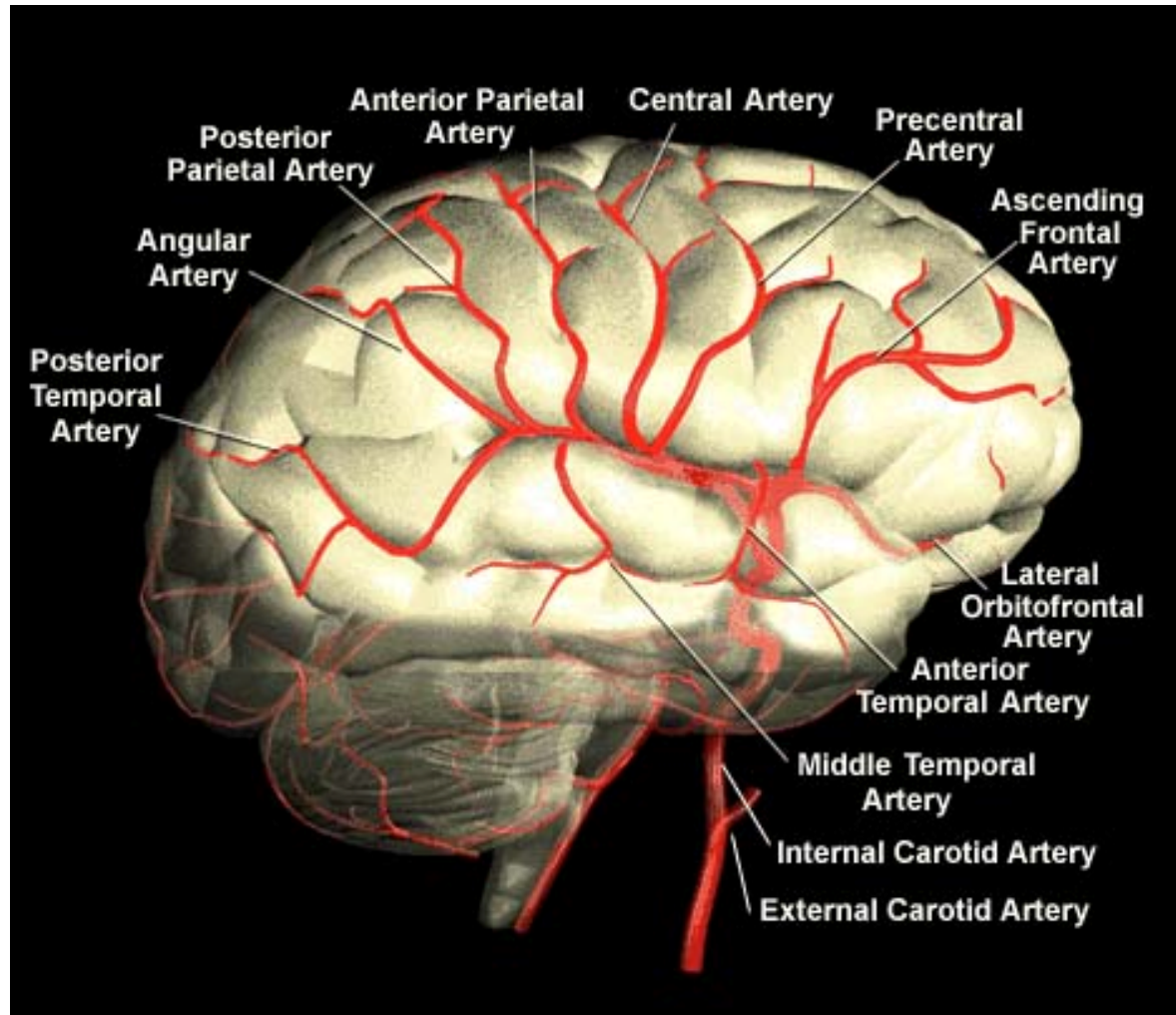


Aphasia

- Stimulus for field of neuropsychology
- Same incidence as M.S. or Parkinson's
- Loss of (aspects of) language
- Can be accompanied by other symptoms
 - Paralysis or weakness of right arm & leg
 - Other orofacial disorders

Some causes of aphasia

- Trauma
- Tumor
- Cerebrovascular accident (CVA)
 - Hemorrhagia (bursting of artery)
 - Ischemia (blockage of artery)
 - Sudden (embolism)
 - Gradual (thrombosis)
- **80% of strokes are ischemic**



Middle cerebral artery

Localization of brain function

Franz Josef Gall (early 19th century)

- “bulging eyes” hypothesis
- One of first “materialists”
- Theory of “phrenology”



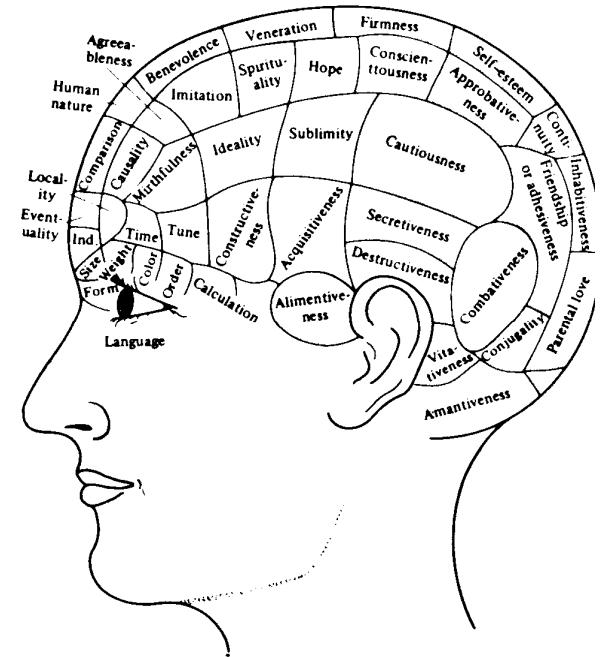


1. The instinct of reproduction (located in the cerebellum).
2. The love of one's offspring.
3. Affection; friendship.
4. The instinct of self-defense; courage; the tendency to get into fights.
5. The carnivorous instinct; the tendency to murder.
6. Guile; acuteness; cleverness.
7. The feeling of property; the instinct of stocking up on food (in animals); covetousness; the tendency to steal.
8. Pride; arrogance; haughtiness; love of authority; loftiness.
9. Vanity; ambition; love of glory (a quality "beneficent for the individual and for society").
10. Circumspection; forethought.
11. The memory of things; the memory of facts; educability; perfectibility.
12. The sense of places; of space proportions.
13. The memory of people; the sense of people.
14. The memory of words.
15. The sense of language; of speech.
16. The sense of colors.
17. The sense of sounds; the gift of music.
18. The sense of connectness between numbers.
19. The sense of mechanics, of construction; the talent for architecture.
20. Comparative sagacity.
21. The sense of metaphysics.
22. The sense of satire; the sense of witticism.
23. The poetical talent.
24. Kindness; benevolence; gentleness; compassion; sensitivity; moral sense.
25. The faculty to imitate; the mimic.
26. The organ of religion.
27. The firmness of purpose; constancy; perseverance; obstinacy

Humans only

Background

- Localization
 - Certain regions devoted to specific tasks.
 - Broca, Gall
 - Based on (almost) no evidence
- Equipotentiality
 - Whole brain involved with tasks
 - Flourens (1840s), Head, Lashley
- Both correct/wrong.



Language

- Distinctly human?
- Superior to other animals
- Is there a single anatomical basis?

Classical types of aphasia

- 1. Broca's
 - 2. Transcortical Motor
- 3. Wernicke's
 - 4. Transcortical Sensory
 - 5. Conduction
- 6. Anomia
 - 7. Global



Paul Broca
(1824-1880)



Leborgne's Brain
displayed in the Dupuytren Museum (Paris)

The case of Leborgne (“Tan”)

- Long history of epilepsy
- Age 30: Sudden right hemiparesis & loss of speech
 - Comprehension and ‘reason’ remain intact
 - Able to produce no meaningful speech, only the stereotypic syllable “tan”
- Progressive deterioration
- Bedridden at age 40
- Develops gangrene (basis for Broca’s exam)

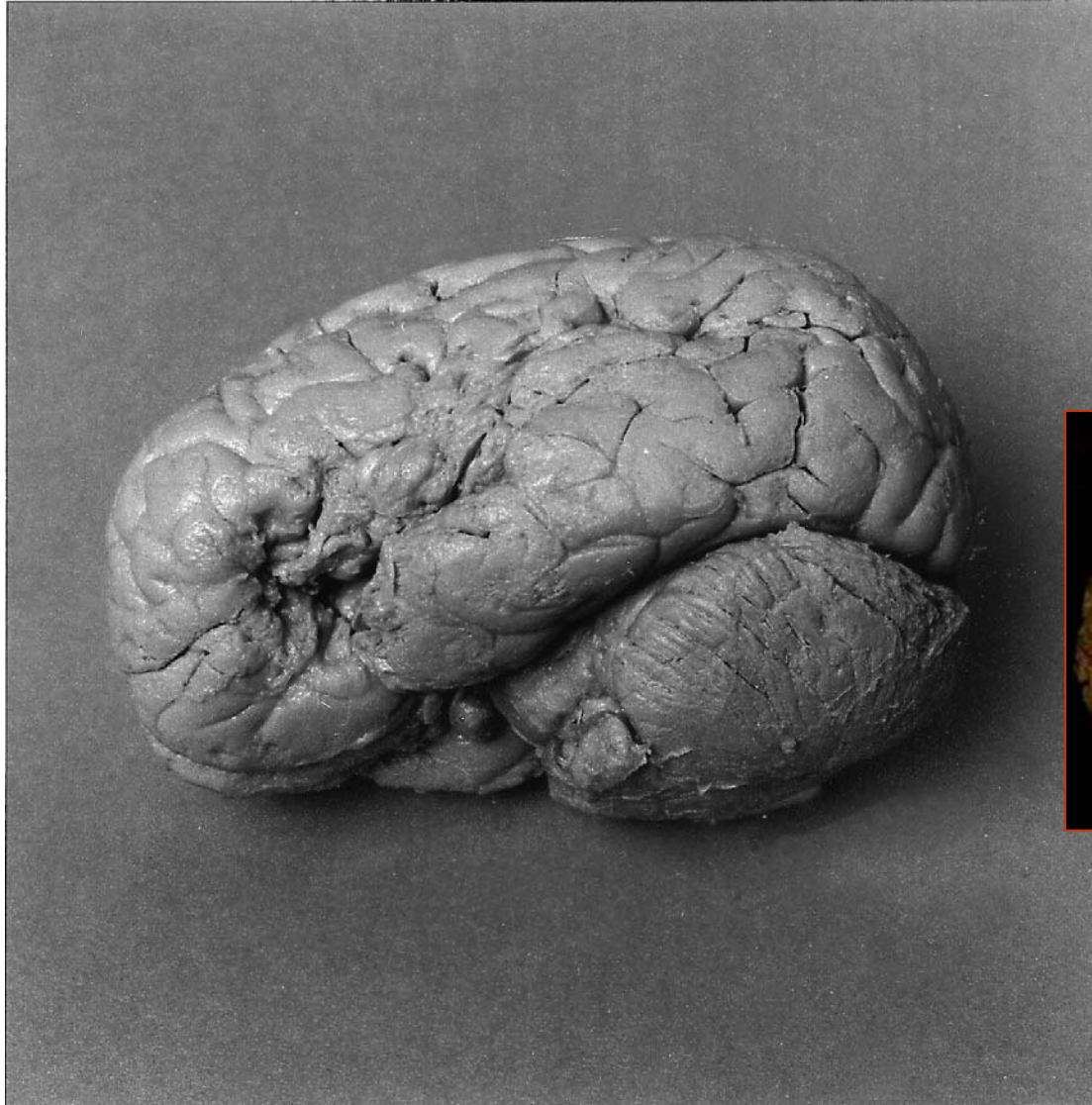
Leborgne (cont'd).

- Language tested at bedside during gangrene exam
- Dies & comes to autopsy days later
- Broca presents neuroanatomical results to the Society (whole brain, no slices)
- Large cavity in left anterior lobe
- Site of injury pronounced “special faculty of articulated language”
- Broca proposes term “aphemia” for this syndrome

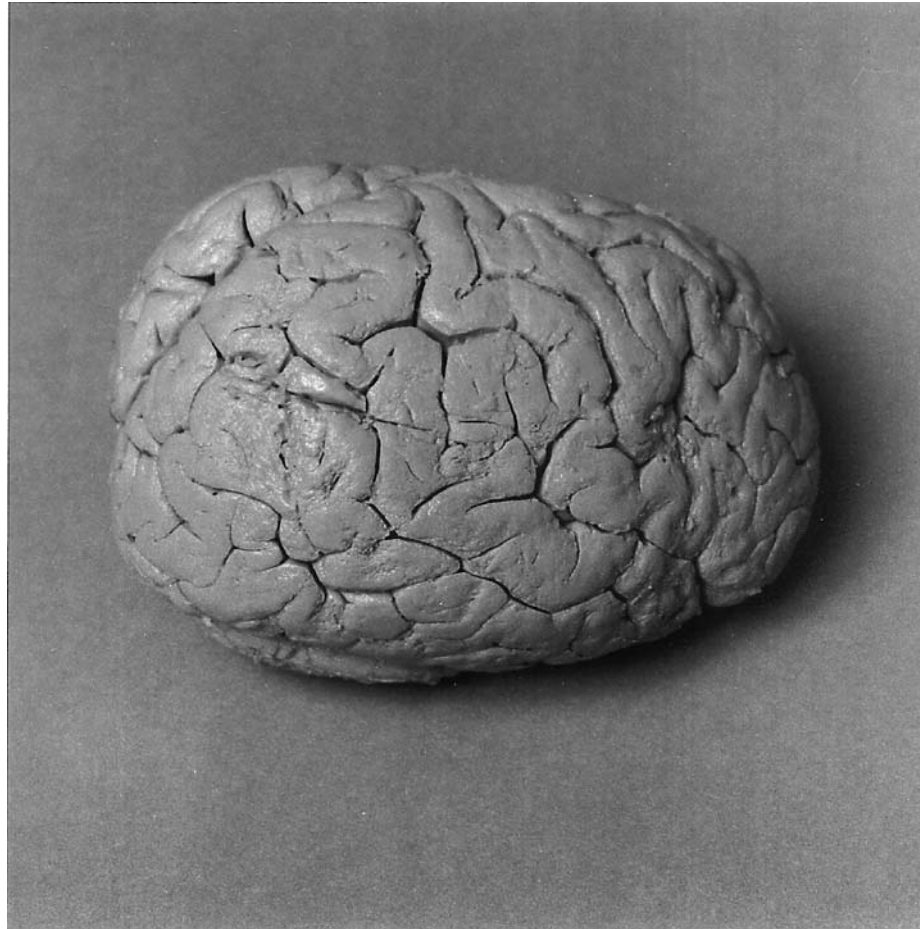


Leborgne's Brain
displayed in the Dupuytren Museum (Paris)

Brain of Leborgne - Left Hemisphere



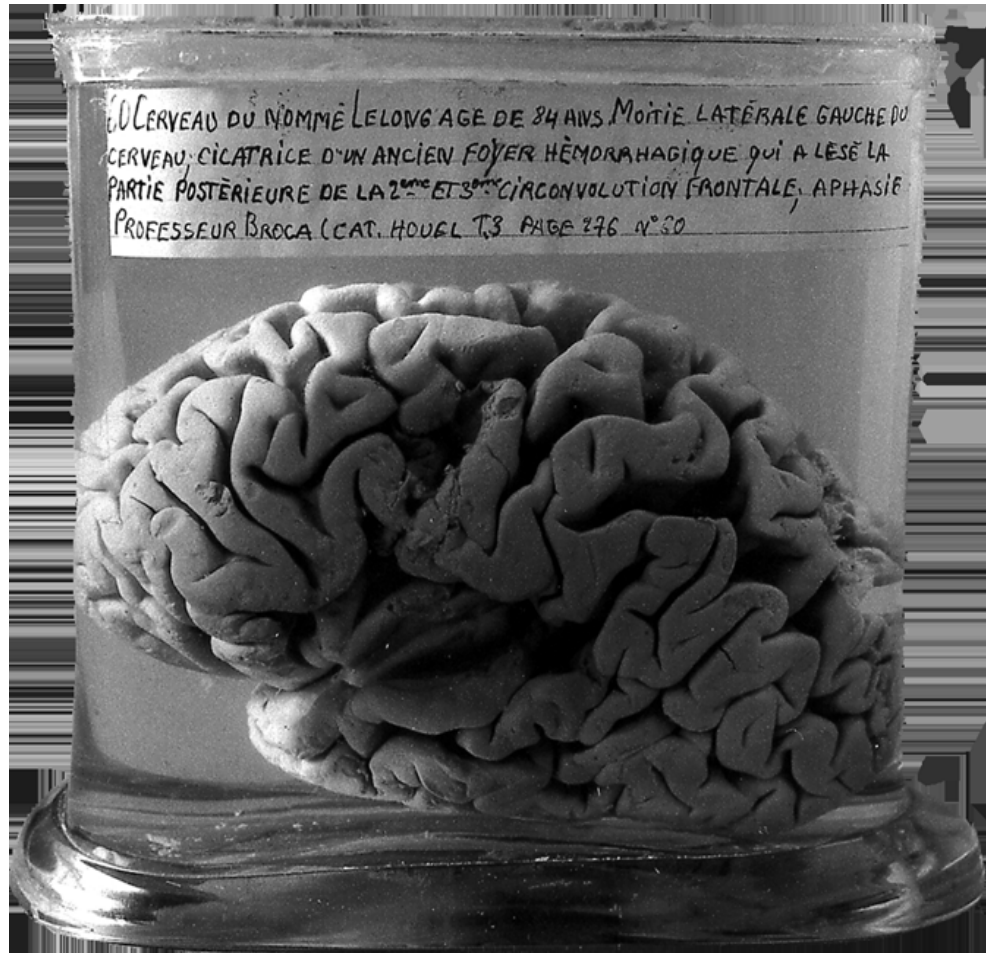
Brain of Leborgne - Right Hemisphere



The case of Lelong

- 84-year-old man, 8-year hospitalization for senility
- Sudden loss of speech accompanying fall & broken hip (probably stroke as cause of both)
- Good comprehension at bedside testing, only a few words and numbers in production
- Dies and comes to autopsy
- Broca describes lesion (whole brain, no slices) involving third and part of second frontal convolution of the left anterior lobe

Brain of Lelong



Broca's aphasia

- Halting, non-fluent, effortful speech
- “telegraphic” or “agrammatic” language
- Often accompanied by anomia
- Use of “paraphasias”
- In severe cases: repetitive speech
- Sometimes called
 - Anterior aphasia
 - Expressive aphasia

Interview with Broca's aphasic

Yes... ah... Monday... er... Dad and Peter...
and Dad... er... hospital... and ah...
Wednesday... Wednesday, nine o'clock...
and oh... Thursday... ten o'clock, ah
doctors... two... and doctors... and er ...
teeth... yah.

Broca's aphasia

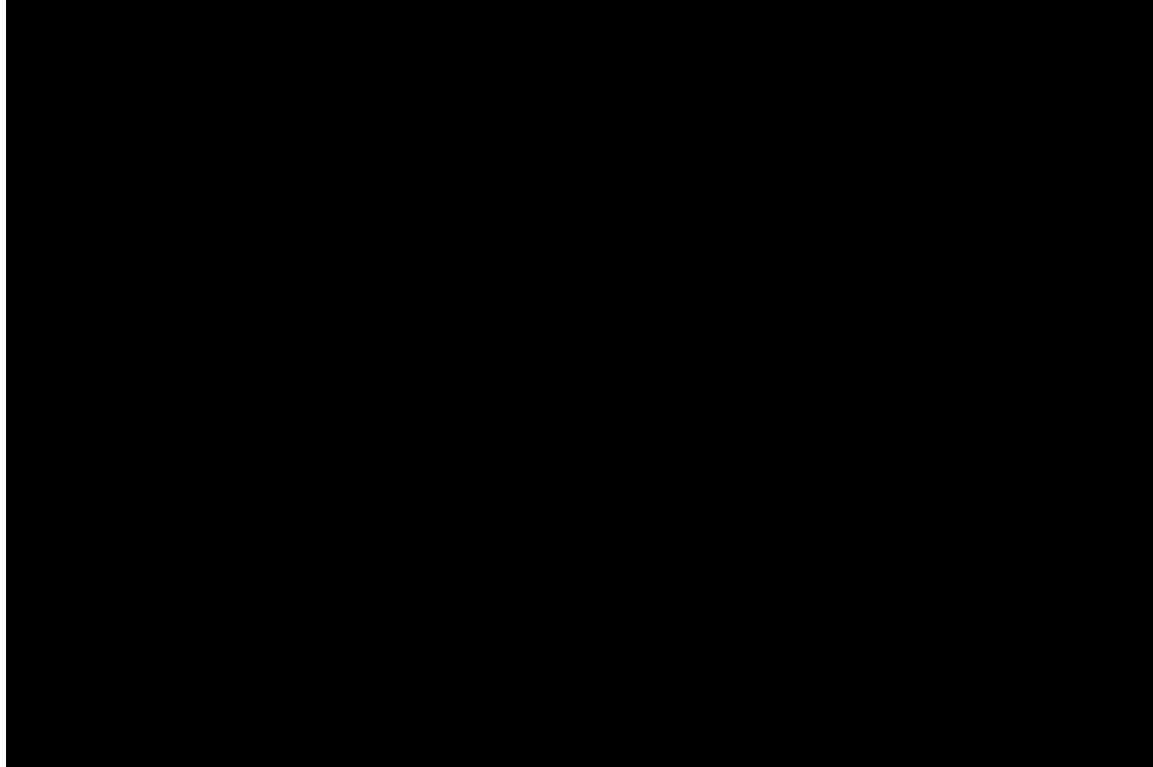
VS.

apraxia and dysarthria

Apraxia: motor planning disorder; difficulty in carrying out complex motor commands (“comb your hair”)

Dysarthria: speech is slurred, misarticulated, “sloppy”, unclear, poor control of pitch, etc. Will affect speech and language, but is not specifically a speech or linguistic disorder.

Two Broca's & an Apraxic





Carl Wernicke
(1848-1904)

Wernicke's Aphasia

- Language may be fluent
- Articulation usually fine
- Impaired comprehension
- Impaired ability to read
- Frequent paraphasias
- In extreme cases, resembles “word salad”

CLINICIAN: “Can you tell me what happened to you?”

“It just suddenly had a feffort and all the feffort had gone with it. It even stepped my horn. They took them from earth you know. They make my favorite nine to severed and now I’m a been habed by the Uh.... stam of fortment of my annulment which is now forever.”

Classical Types of Aphasia

(- = *relatively deficient*; + = *relatively spared*)

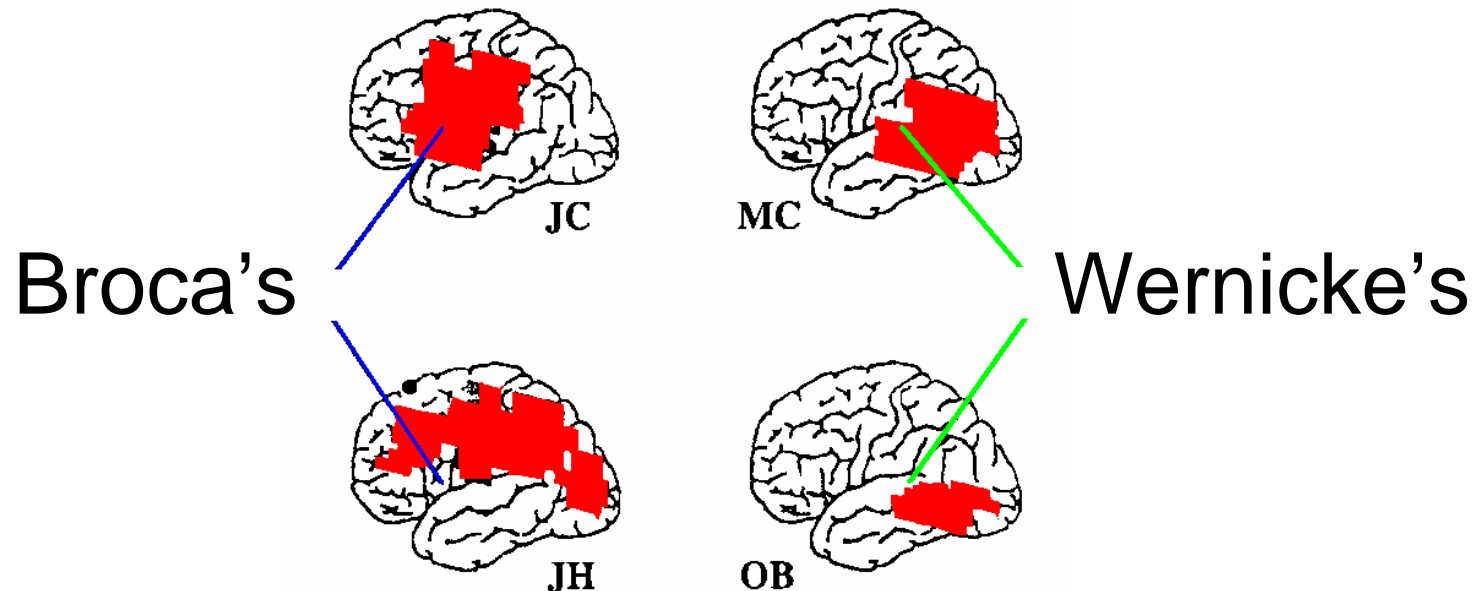
APHASIA TYPE	NAMING	FLUENCY	COMPRE- HENSION	REPETITION
→ Broca's	-	-	+	-
Transcortical Motor	-	-	+	+
→ Wernicke's	-	+	-	-
Transcortical Sensory	-	+	-	+
Conduction	-	+	+	-
→ Anomia	-	+	+	+
→ Global	-	-	-	-

Specifically language

- Aphasics unable to use speech to convey information.
- However, aphasics can often cite memorized texts
 - Songs
 - Prayers, verses
 - Cliché

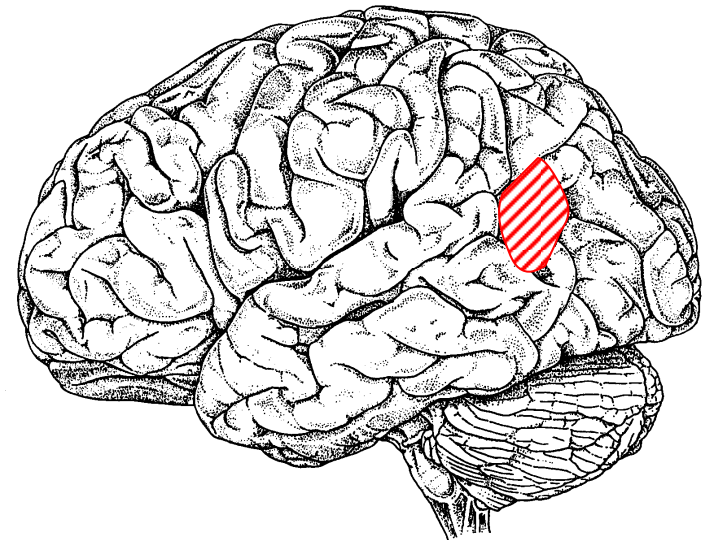
Exceptions to the rule

- Dronkers et al [2000] note exceptions to anatomy
- Traditional Theory:
 - JC will have Broca's and MC will have Wernicke's Aphasia
 - JH and OB will not have aphasia
- Reality:
 - Neither JC or MC has Aphasia
 - JH has Broca's and OB has Wernicke's Aphasia.



Alexia with agraphia

- Déjerine, 1891: Damage to the angular gyrus (**BA 39**) leads to
 - ‘Alexia with agraphia’ reading & writing deficits
 - Intact speech comprehension



Alexia without agraphia

- Disconnection of angular gyrus from visual inputs
 - Language outputs intact
 - Patients cannot read
 - Writing preserved

Rare: left and right pathways to angular gyrus

Requires damage to

1. posterior callosum
2. left occipital lobe

Without damage to left angular gyrus

