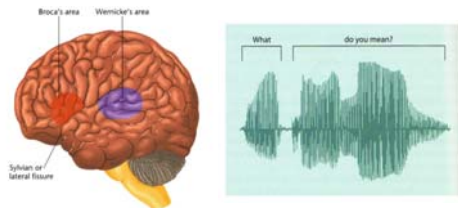
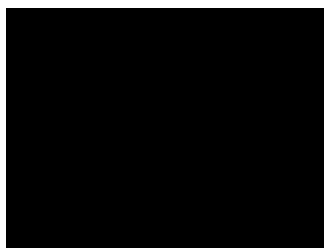


Language Functions



What's happening in this picture?



Aphasia

- Deficit in language comprehension and production, following neurological damage
- Extremely common
 - Most often observed after stroke
 - Approximately 40% of stroke patients

Etiology and course of development

- In almost all cases, associated with left hemisphere damage
- Course of development includes:
 - Acute period (few months after stroke occurred)
 - Subsequent period (a number of patients improve, but in many others the aphasic symptoms persist)

Classifications and subtypes

- In general, very difficult and controversial
- Aphasia impairments
 - Primary aphasia:** due to problems with language-processing mechanisms
 - Secondary aphasia:** results from memory impairments, attention disorders, or perceptual problems

Fluent Aphasia #2
9.1

Non-fluent Aphasia #2
7.1

Fluent Aphasia #1
8.1



Classifications and subtypes

- Broca's aphasia vs. Wernicke's aphasia
- ↓
- Non-fluent aphasia vs. Fluent aphasia
- ↓
- Production deficit vs. Comprehension deficit

Paul Broca's original patient

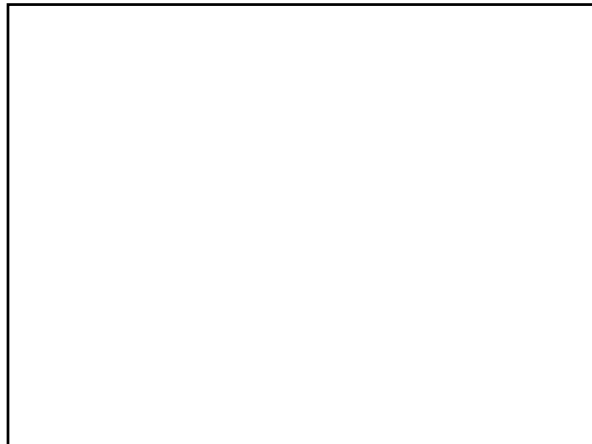
- Had to be treated for leg infection, but
 - had been hospitalized for many years already
 - lost speech ~ 20 years earlier
 - lost the use of his right arm ~ 10 years earlier
- Unable to utter anything but the nonsense word *tan* ("Tan tan tan, tan tan, tan tan tan....")
- His name was Leborgne, but other patients called him "Tan"
- Died only a few days after being transferred to Broca's clinic

Paul Broca's original patient

(a)

(b)

- Autopsy revealed lesion in the posterior portion of the left inferior frontal gyrus
- The region became known as "Broca's area"

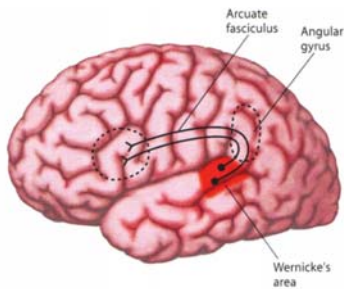


Carl Wernicke's patients

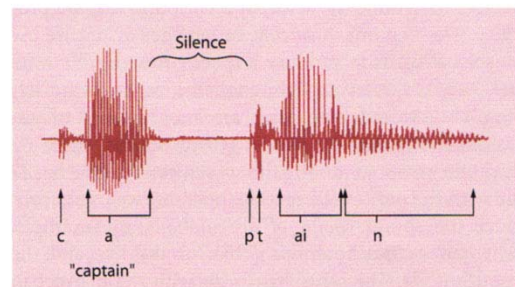
- Two patients, following stroke
- Problems understanding spoken language
- Fluent speech, but spoke nonsensical sounds, words, and sentences
- Severe deficit in comprehending what was spoken to them

Carl Wernicke's patients

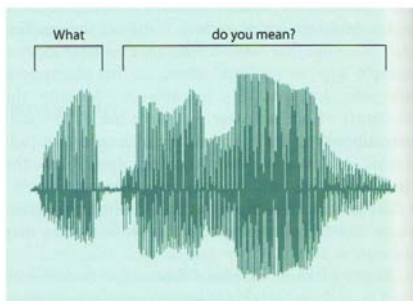
- Later autopsy on one of the patients revealed damage to the posterior regions of the superior temporal gyrus



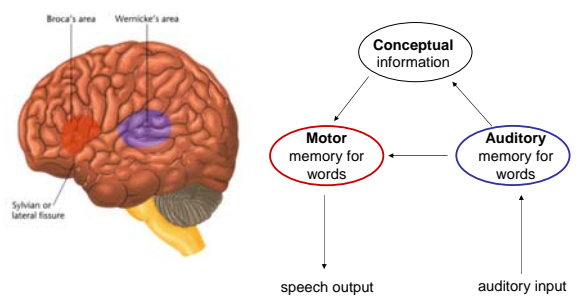
Comprehension requires complex auditory analysis



Comprehension requires complex auditory analysis

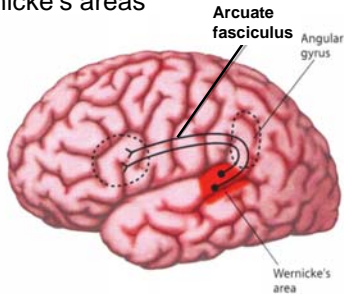


Early model of language processing in the brain



The arcuate fasciculus

- White matter tract connecting Broca's and Wernicke's areas



Problems with the early model

- Focuses on perception and production of individual words
- Takes a limited, localizationist approach
- Leaves out many brain structures that are also involved in language functions
- Does not attempt to explain difficulties in processing complex temporal linguistic sequences

Difficulties with complex temporal structures and sequences (syntax)

Fluent Aphasia #2
9.3

Fluent Aphasia #1
8.3

Outside Broca's and Wernicke's

- Broca's aphasia can occur with damage to
 - the insular cortex (situated between basal ganglia and inferior frontal gyrus)
 - the basal ganglia
- Wernicke's aphasia can occur with damage to
 - the junction between parietal and temporal lobes (including the supramarginal and angular gyri)
- Various white-matter lesions can also cause aphasia

Anosagnosia?

Fluent Aphasia #1
8.4

- Awareness of language deficits can vary:
- fully aware
- fully unaware
- only partially aware