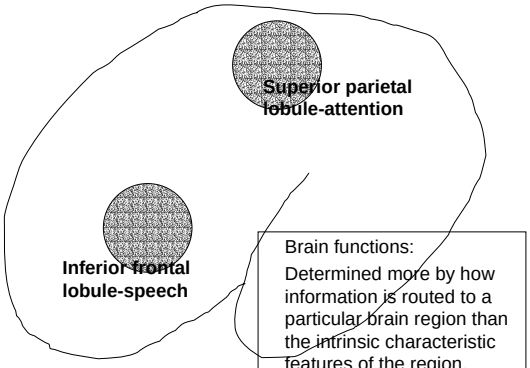
Introduction to Neuroanatomy II:
Functional Anatomy

- **Regional neuroanatomy**: spatial relations between brain structures within a portion of the nervous system
- **Functional neuroanatomy**: those parts of the nervous system that work together to accomplish a particular task, for example, visual perception

Functional Localization

How does structure relate to function?

- Heart structure predicts pumping function
- Muscle structure--with particular bone attachments--predicts function
- Brain??



Overall Aims of Lecture

- Functional localization of neural systems
- Functional organization of the thalamo-cortical systems
- Cortical circuitry

Topics cut across all lectures
- •add to preparation for lab
- •basis for better understanding of lectures on neural systems

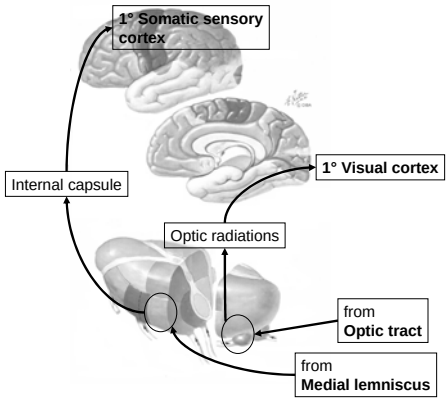
Specifics…

- Functional localization of touch pathway in brain stem
  - To understand hierarchical organization of a neural system
  - To begin to become familiar with internal brain structure
- Organization of visual pathway
  - Segue into…
- Functional organization of the thalamo-cortical systems
- Cortical circuitry

Dorsal column-medial lemniscal system for touch

- Sensory receptor neurons
- Dorsal column of spinal cord
- Medial lemniscus in brain stem
- Thalamus
- Cortex

Visual system



Functional localization in the Thalamo-cortical systems

Thalamic nucleus

Touch pathway	Ventral posterior nucleus	Postcentral gyrus
Visual pathway	Lateral geniculate nucleus	Occipital cortex
…system…	…nucleus…	…cortex…

Anatomical slice through cortex:
- neurons are packed into ~6 discrete layers
- cortical circuit
- distinct cytoarchitecture
- Brodmann's areas

Summary

- Principle of functional localization
- Neural pathways carry specific information
  - Ascending sensory; descending motor
- Different thalamic nuclei serve different sensory and motor functions
  - More differences in inputs than intrinsic organization
- Different sensory and motor functions served by different cortical areas
- Structural specialization in cortex augment functional differences produced by different inputs

Brain Organization

- Dual vulnerability:
  - Regional damage produces set of neurological (or psychiatric) impairments
    - Depends on location
    - Spinal cord injury; stroke
  - System damage
    - Must have common link for system to be a system (genetic, biochemical, early development)
    - Huntington's disease; psychiatric diseases (schizophrenia); autism