Early Studies of the Central Nervous System

Physiological Psychology

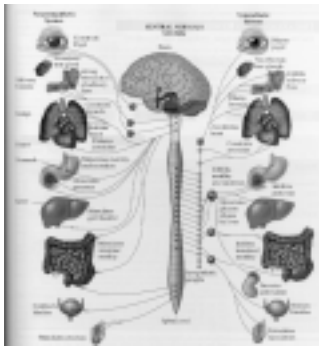
Early Studies of the Central Nervous System

The Central Nervous System

Gross Anatomy

The Central Nervous System

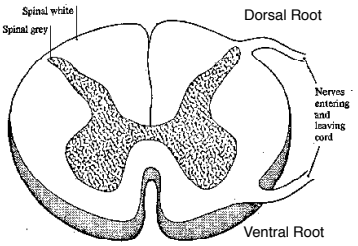
The Central and Peripheral Nervous Systems



The Central and Peripheral Nervous Systems

The Spinal Cord

in cross section; dorsal at top, ventral at bottom.



The Spinal Cord

Studies of the Spinal Cord

Charles Bell (1774–1842)
François Magendie (1785–1855)

- **Dorsal root conveys sensory (afferent) information from the body to the brain.**
- **Ventral root conveys motor (efferent) information from the brain to the body.**

Studies of the Spinal Cord

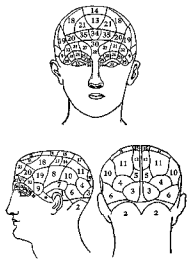
Sensory Physiology

- **Johannes Müller (1801–1858)**
  - **Handbuch der Physiologie der Menschen (1840).**
  - **Doctrine of specific nerve energies.**
- **Hermann Ludwig von Helmholtz (1821–1894)**
  - **Opthalmoscope.**
  - **Speed of neural impulse (43 meters/sec).**
  - **Law of conservation of energy.**

Sensory Physiology

Phrenology

Franz Gall (1758–1828)
Johann Spurzheim (1776–1832)



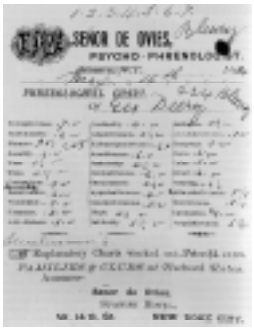
Phrenology

Phrenological "Qualities"

AFFECTIVE FACULTIES		INTELLECTUAL FACULTIES	
PROPENSITIES	SENTIMENTS	PERCEPTIVE	REFLECTIVE
2 Desire to live	10 Cautiousness	22 Individuality	34 Comparison
* Alimentiveness	11 Approbativeness	23 Configuration	35 Causality
1 Destructiveness	12 Self-Esteem	24 Size	
2 Amativeness	13 Benevolence	25 Weight and Resistance	
3 Philoprogenitiveness	14 Reverence	26 Coloring	
4 Adhesiveness	15 Firmness	27 Locality	
5 Inhabitiveness	16 Conscientiousness	28 Order	
6 Combativeness	17 Hope	29 Calculation	
7 Secretiveness	18 Marvelousness	30 Eventuality	
8 Acquisitiveness	19 Ideality	31 Time	
9 Constructiveness	20 Mirthfulness	32 Tune	
	21 Imitation	33 Language	

Phrenological "Qualities"

Phrenological Chart



Phrenological Chart

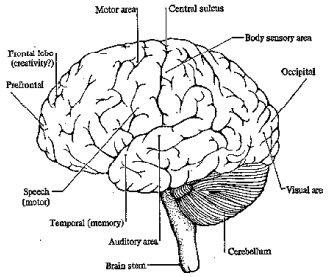
Localization of Function in the Brain

- Pierre Flourens (1794–1867)
  - Pioneered the use of ablation (in animals).
  - Identified major structures and their specific actions.
  - Described the concept of "common action" [cf. Lashley's (1929) studies of mass action and equipotentiality.]
- Paul Broca (1824–1880)
  - Pioneered the clinical method.
  - Discovered the speech center in the left frontal lobe of the brain. (See Stanley Finger's Cortical localization and cerebral dominance.)

Localization of Function in the Brain

The Human Brain

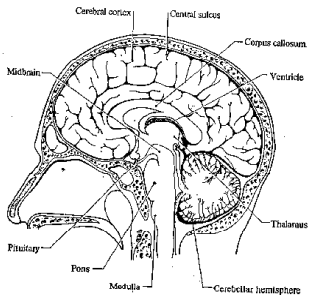
lateral view



The Human Brain

The Human Brain

medial view



The Human Brain

Direct Brain Stimulation

- Early studies by Gustav Fritsch (1839–1927) and Eduard Hitzig (1838–1907).
- Mapping of the animal brain by David Ferrier (1843–1928) in order to create a "scientific phrenology."

Direct Brain Stimulation

Direct Brain Stimulation (cont'd)

- Roberts Bartholow at the Medical College of Ohio (1874).
- Wilder Penfield's (1950) Cerebral cortex of man.
- Olds and Milner's studies of brain stimulation reinforcement (1954).

Direct Brain Stimulation (cont'd)

Epilogue

Despite considerable progress, the mysteries of brain function have not yet been solved.

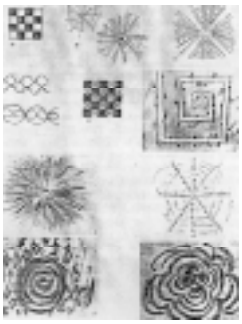
Epilogue

The Specific Energies of Nerves
Johannes Müller

- The same cause gives rise to different sensations in each sense according to the special endowment of its nerve, e.g., electrical stimulation.
- "The peculiar sensations of each nerve of sense can be excited by several distinct causes internal and external."
  - The sensation of sound, for example
    - can be excited by vibrations within the organ of hearing.
    - can be excited by electricity.
    - can be excited by chemical influences.

The Specific Energies of Nerves

Phosphenes



Phosphenes

Helmholtz

Helmholtz

Gall, Flourens, and Phrenology

Raymond E. Fancher

- Gall made important contributions to comparative brain anatomy.
- He mistakenly assumed that the shape of one's skull accurately reflects the shape of the underlying brain.
- He mistakenly located highly specific psychological qualities within the brain.
- Phrenology was based on serious errors in scientific method and interpretation.
- Flourens used science to discredit phrenology .

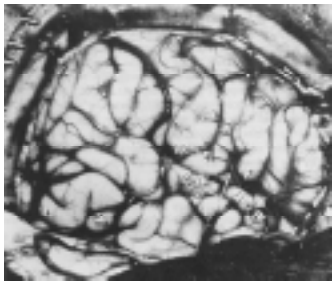
Gall, Flourens, and Phrenology

Broca

PAUL BROCA (1824-1880)
From Sichtbar 1976, courtesy National Library of Medicine, Bethesda Md.

Broca

Exposed Human Cortex



Exposed Human Cortex