

- 1  **Nineteenth Century Scientists Influencing Psychology**
- 2  **19<sup>th</sup> Century Philosophy Integrated with Natural Science: Johann F. Herbart (1776-1841)**
- 3  **Johann Friedrich Herbart**
  - Early advocate of combining philosophy and science
  - Lived 1776-1841; German
  - Chair of Philosophy at Konigsberg
  - Textbook in Psychology (1816)
  - Psychology as Science (1824)
  - Educational psychology
  - Predict order, clarity of ideas (presentations)
  - Math model of “mental mechanics”.
- 4  **Charles Darwin (1809-1882)**
- 5  **Darwin around the time of the voyage of the Beagle**
- 6  **Charles Darwin**
  - Lived 1809-1882; British
  - Noted family
  - Cousin of Francis Galton
  - Voyage of the Beagle (Pub. 1839)
  - Theory of Evolution
  - Darwin a recluse
  - Origin of Species (Pub. 1859)
  - Contributions to Comparative, Developmental Psychology.
- 7  **HMS Beagle in S. America (Conrad Martens)**
- 8  **Adaptation of beaks in Darwin’s Finches**
- 9  **Early Edition of “Origin of Species” (orig. 1859)**
- 10  **19<sup>th</sup> Century Scientists Influencing Psychology: Developments in Neurology**
  - J. Müller
  - M. Hall
  - P. Flourens
  - B. Rush
  - F. Gall
  - P. Broca
  - P. Gage case-study
  - D. Ferrier.
- 11  **Johannes Müller (1801-1858)**
- 12  **Johannes Muller**
  - Lived 1801-1858; German
  - Experimental approach to physiology
  - Specific energies of nerves
    - Receptor neurons have an “adequate stimulus” (the kind of stimulation to which they are most sensitive)
    - Other kinds of stimulation may produce activity, but the sensation will be the same
    - E.g., pressure on eyes produces visual flashes.
- 13  **Sensory neurons respond producing specific sensations**
- 14  **Marshall Hall (1790-1857)**

- 15  **Marshall Hall**
- Lived 1790-1857; Scottish
  - Studied reflexive responses in decorticate animals
  - Developed extirpation technique (employed more extensively by Flourens).
- 16  **Earthworm anatomy**  
(extirpation, ablation)
- 17  **Pierre Flourens (1794-1841)**
- 18  **Pierre Flourens**
- Lived 1794-1867; French
  - Identified functioning of CNS
    - Medulla: vegetative functioning
    - Cerebellum: muscular coordination
    - Midbrain: vision, audition
    - Cerebrum: higher processes.
- 19  **Major structures in human brain**
- 20  **Benjamin Rush (1745-1813)**
- 21  **American Psychiatric Association Seal (Benjamin Rush)**
- 22  **Benjamin Rush**
- Lived 1745-1813; American
  - Signed Declaration of Independence
  - Surgeon General under Washington
  - Social reformer
  - Invented phrenology
  - Physical basis of mental disorders
  - Gyrator cure.
- 23  **Declaration of Independence (detail; Rush signed just above Franklin)**
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- 25  **Rush's "Tranquilizing Chair"**
- 26  **Rush's "Gyrator"**
- 27  **Franz-Josef Gall (1758-1828)**
- 28  **Franz-Josef Gall**
- Lived 1758-1828; German/Austrian
  - Research on brain anatomy
  - Developed "Cranioscopy"
  - Refined phrenology (27 faculties).
- 29  **Phrenological Chart**
- 30  **Paul Broca (1824-1880)**
- 31  **Paul Broca**
- Lived 1824-1880; French
  - Used clinical method to study CNS
  - Studied role of brain in speech
  - Discovered Broca's Area.

32  **Broca's Area**

33  **Phineas Gage**

- In 1848 a Vermont railroad foreman (Gage) is injured by an explosion sending a 3-foot iron rod through his head
- Treated by local physician John Harlow
- Gage recovered (no pain, no intellectual deficits) but showed marked personality changes (profanity, obstinacy, moodiness, impulsive).
- Gage died (in 1860) after some epileptic seizures.

34  **Phineas Gage: Images of Damage**

35  **Phineas Gage: Assessment**

- Computer analysis at Univ. IA (Hanna & Antonio Damasio)
- Frontal lobe damage
- Symptoms resemble other cases.

36  **David Ferrier (1843-1924)**

37  **David Ferrier**

- British neurophysiologist
- Studied localized motor functions in brain
- Used electrical stimulation on live (anesthetized) monkeys
- *The Functions of the Brain* (1876)
- Became focus of British anti-vivisectionist protests.

38  **David Ferrier: Cortical Map of Monkey's Brain**

39  **Psychophysics Emerges**

- H. Helmholtz
- E. Weber
- G. Fechner
- F. C. Donders.

40  **Hermann von Helmholtz (1821-1894)**

41  **Hermann von Helmholtz**

- **Life**
  - 1821-1894;
  - born Potsdam, Germany
  - attended medical school
  - faculty at Berlin
- **Contributions**
  - Young/Helmholtz Theory of color vision
  - Measured speed of neural conduction
  - Work on color blindness, afterimages, eye movements, audition
  - Psychophysiological processes can be measured objectively.

42  **The Young/Helmholtz Theory of Color Perception**

- "Trichromatic" theory
- Specific neurons detect primary colors red, green, blue
- vs. Hering's opponent process theory (red-green, yellow-blue, black-white)
- Color perception actually involves both aspects.

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47  **Ernst Weber (1795-1878)**

48  **Ernst Weber**

- **Life**
  - 1795-1878
  - born Wittenberg, Germany
  - U. Leipzig, 1815
  - Taught anatomy, physiology til 1871
- **Contributions**
  - Pioneered determination of 2-point threshold
  - Concept of jnd
  - Computed ratios for jnd
  - Perception is not directly related to physical stimulation.

49  **The Weber Ratio (in theory)**

50  **Gustav Fechner (1801-1887)**

51  **Gustav Theodor Fechner**

- Lived 1801-1887; German
- Student of Weber
- Eccentric, neurotic
- Named psychophysics (Elements of Psychophysics, 1860)
- Change in sensation proportional to changed intensity (1850)
- Weber/Fechner Law:  $S = K \log R$
- Method of average error, constant stimuli, limits.

52  **F. C. Donders (1818-1889)**

53  **F. C. Donders**

- Lived 1818-1889; Dutch
- Physiologist at U. Utrecht
- Donders' Law (1846)
- Studied reaction time using subtractive procedures (total processing time = detection + processing (decision) + response).

54  **Donders' law (orientation of eyeball same regardless of previous movements)**

55  **End of this topic**