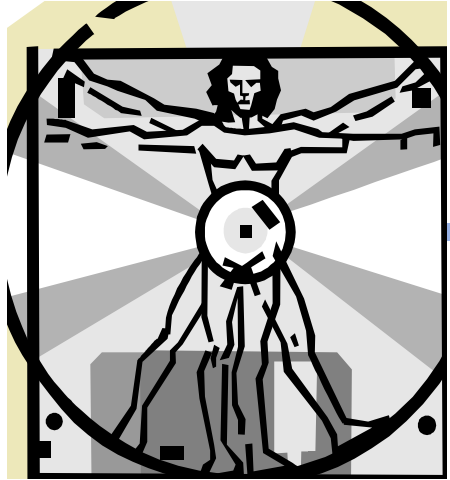
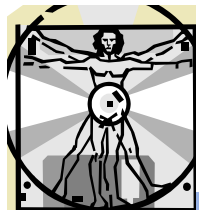


# Methods & Techniques (An Overview)

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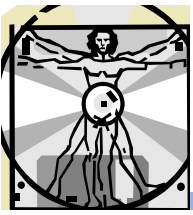
Modern approaches



# Overview

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- Intro
- Levels of Analysis:
  - ❖ Psychophysical
  - ❖ Physiological
- Upcoming



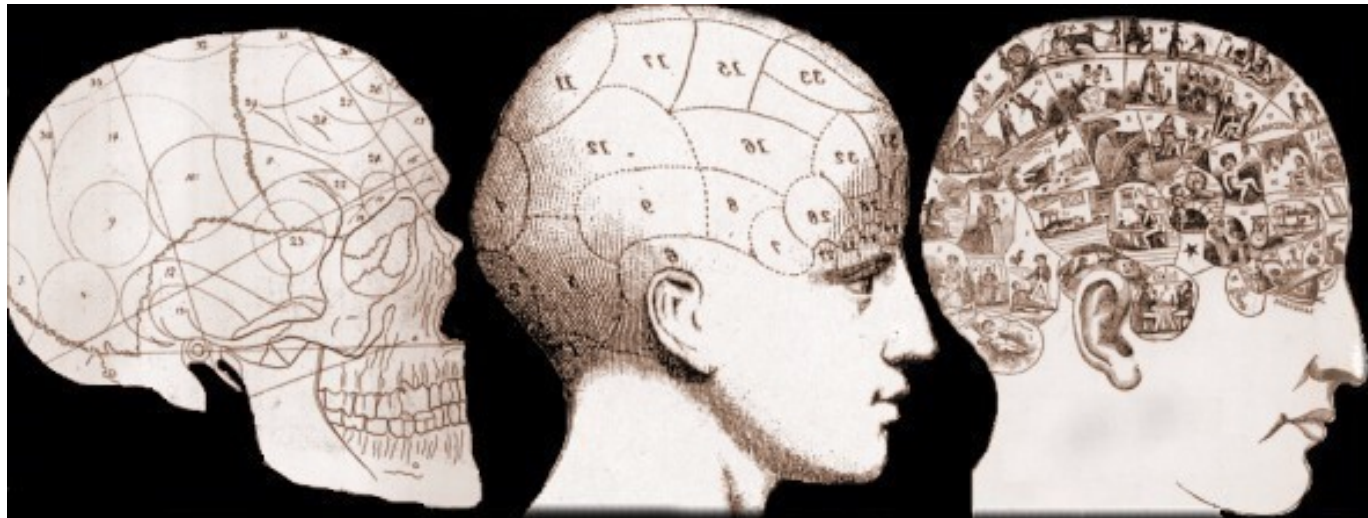
# “Different” (?) Techniques

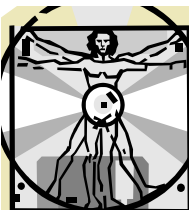
## ➤ For example, phrenology

"[Before phrenology] all we knew about the brain was, how to slice it..." R. Chenevix (phrenologist), 1828.

Phrenology was a science of character divination, faculty psychology, theory of [brain](#) and what the 19th-century phrenologists called "the only true science of mind." Phrenology came from Viennese physician [Franz Joseph Gall](#) (1758-1828). The basic tenets:

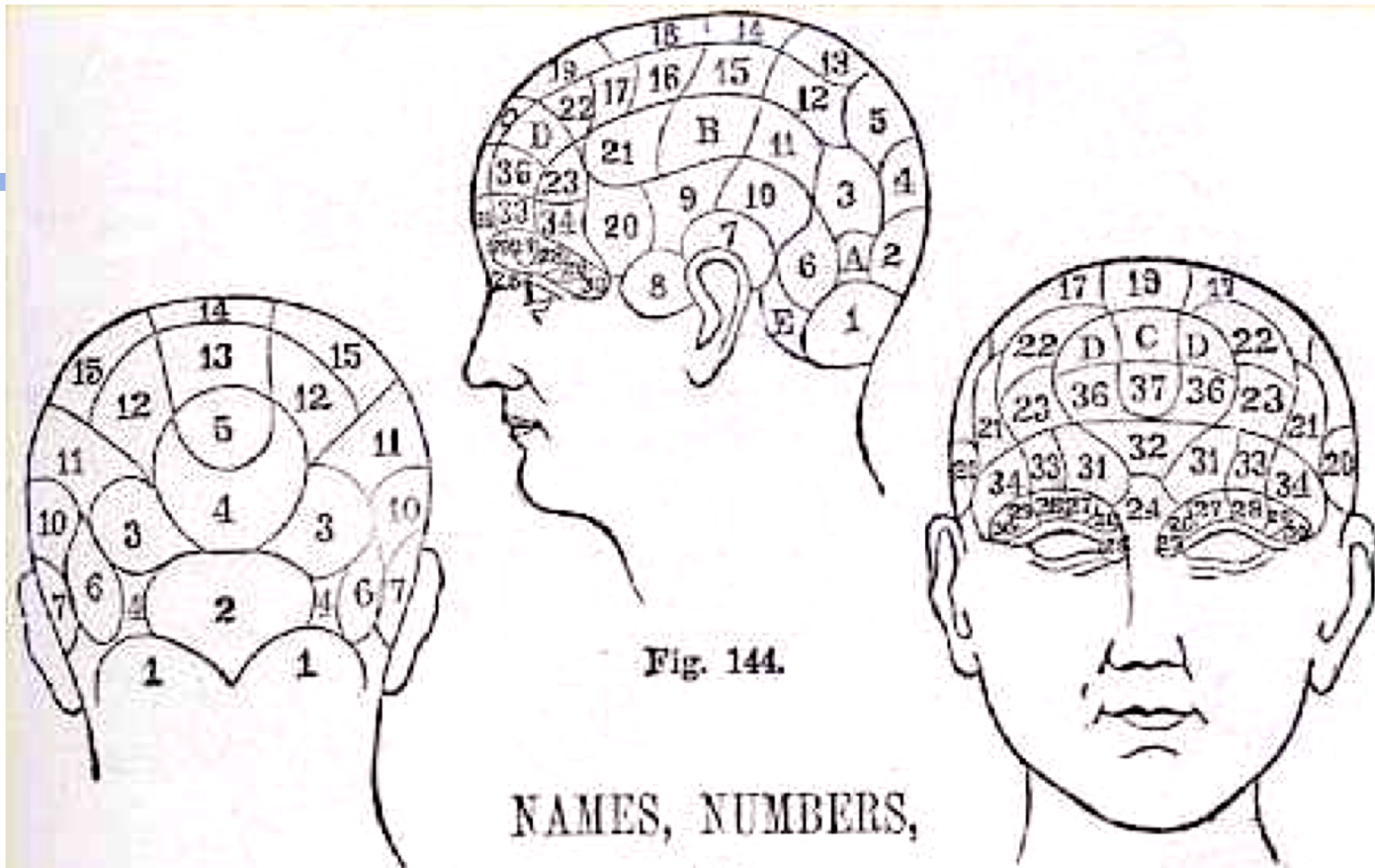
1. The brain is the organ of the mind. 2. The mind is composed of multiple distinct, innate faculties. 3. Because they are distinct, each faculty must have a separate seat or "organ" in the brain. 4. The size of an organ, other things being equal, is a measure of its power. 5. The shape of the brain is determined by the development of the various organs. 6. As the skull takes its shape from the brain, the surface of the skull can be read as an accurate index of psychological aptitudes and tendencies.



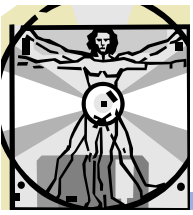


# ➤ Phrenology:

- I. Amativeness (*physical love*).
- II. -- philoprogenitiveness
- III. -- inhabitiveness
- IV. -- adhesiveness.
- V. -- combativeness.
- VI. -- destructiveness.
- VII. -- constructiveness.
- VIII. -- covetiveness.
- IX. -- secretiveness.
- X. -- self-love.
- XI. -- approbation
- XII. -- cautiousness.
- XIII. -- benevolence.
- XIV. -- veneration.
- XV. -- hope.
- XVI. -- ideality.
- XVII. -- conscientiousness.
- XVIII. -- firmness or determinateness
- XIX. -- individuality
- XX. -- form.
- XXI. -- size      XXII. -- weight
- XXIII. -- colour    XXIV. -- space
- XXV. -- *order?*    XXVI. -- *time?*
- XXVII. -- number    XXVIII. -- tune.
- XXIX. -- language.
- XXX. -- comparison.
- XXXI. -- causality.
- XXXII. -- wit. XXXIII. -- imitation.



- |                      |                        |                  |
|----------------------|------------------------|------------------|
| 1. AMATIVENESS.      | 13. SELF-ESTEEM.       | 26. SIZE.        |
| A. CONJUGAL LOVE.    | 14. FIRMFNESS.         | 27. WEIGHT.      |
| 2. PARENTAL LOVE.    | 15. CONSCIENTIOUSNESS. | 28. COLOR.       |
| 3. FRIENDSHIP.       | 16. HOPE.              | 29. ORDER.       |
| 4. INHABITIVENESS.   | 17. SPIRITUALITY.      | 30. CALCULATION. |
| 5. CONTINUITY.       | 18. VENERATION.        | 31. LOCALITY.    |
| E. VITATIVENESS.     | 19. BENEVOLENCE.       | 32. EVENTUALITY. |
| 6. COMBATIVENESS.    | 20. CONSTRUCTIVENESS.  | 33. TIME.        |
| 7. DESTRUCTIVENESS.  | 21. IDEALITY.          | 34. TUNE.        |
| 8. ALIMENTIVENESS.   | B. SUBLIMITY.          | 35. LANGUAGE.    |
| 9. ACQUISITIVENESS.  | 22. IMITATION.         | 36. CAUSALITY.   |
| 10. SECRETIVENESS.   | 23. MIRTH.             | 37. COMPARISON.  |
| 11. CAUTIOUSNESS.    | 24. INDIVIDUALITY      | C. HUMAN NATURE. |
| 12. APPROBATIVENESS. | 25. FORM.              | D. SUAVITY.      |

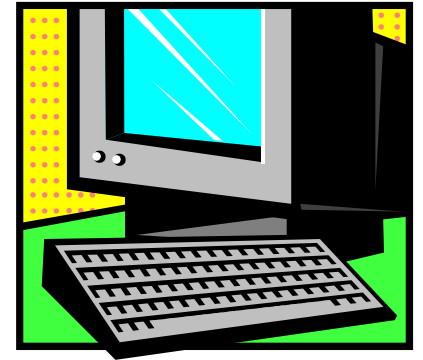


# Intro to Modern Methods

➤ What is the same?

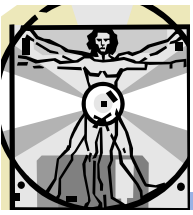


➤ What is different?



➤ What are the questions *we* want to answer?

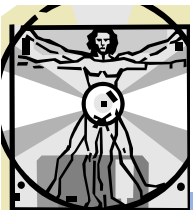




# Levels of Analysis

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- The tools and techniques you use depend on the level of analysis you want to consider, and the questions you want to answer
- Study of perception needs:
  - ❖ Psychophysical
  - ❖ Physiological
  
  - ❖ We need to consider perception from both perspectives to answer the questions we value in modern perceptual science



# Psychophysical Approach

Sensation -> Perception

- Phenomenological method
- Recognition
- Detection

e.g. Fechner, *Elements of Psychophysics* (1860)

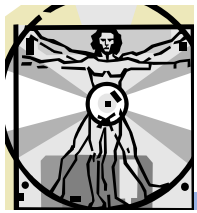
## ❖ Thresholds

- Method of limits
- Method of adjustment
- Method of constant stimuli

## ❖ Difference Threshold (JND)

- Weber's Law:

$$\frac{\Delta S}{S} = K$$

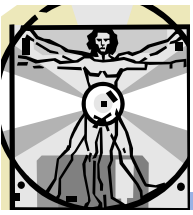


# Psychophysical Approach, cont' d

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- Perceiving magnitude
  - ❖ Magnitude estimation
    - S.S. Stevens (1975)
- Multidimensional scaling
- Searching
- Others
  - ❖ Variations of describe, recognize, detect, compare, etc.





# Physiological Approach

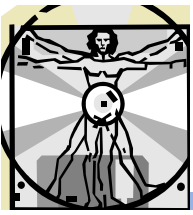
Stimulation -> Neural Firing

## ➤ Early Approach: Physiology as Anatomy

- ❖ Aristotle

- ❖ Others

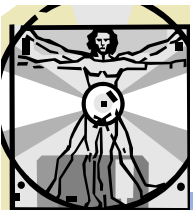
- Hippocrates, Galen
- Ibn Sina (Avicenna)
- Descartes
- Galvani
- Kepler



# Physiological Approach

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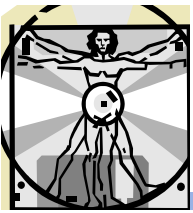
- Neurons & electrical signals
  - ❖ Mueller: “doctrine of specific nerve energies”
  
  - ❖ Development of study of:
    - Nerves, neurons, dendrites, axons...
    - Pathways
    - Receptors
  
  - ❖ Recording electrical signals
  
  
  - ❖ Brain chemistry



# Physiological Approach

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- Functional structure of brain
  - ❖ *pathways* (but not just anatomical)
  - ❖ from electrical and chemical studies of functions
  - ❖ *networks* (e.g., default network)
  
- Brain activity (related to structure)
  - ❖ Evoked potentials -- electrical (EEG)
  - ❖ Neuroimaging (PET, fMRI, MEG)
    - Subtractive logic



# Upcoming

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- Signal Processing & Signal Detection
- Physiology of Sensation
- Neuroimaging
  - ❖ Read Carlson chapter 3 for Neuroimaging class
  
- Bottom-up vs. Top-down Processing
  
- Extra Readings
  - ❖ Download from Web site