

Introduction to Cognitive Psychology

Cognitive Process

Assoc. Prof. Atanas Kirjakovski

Grading System

Course Evaluation

Term	Percentage
Attendance	15%
Mid-term	35%
Final	40%
In-class Project Presentation	10%
Penalty Exam I	100%
Penalty Exam II	100%
MakeUp	40%

Exams

- ▶ Includes mid-term, final, makeup, excuse, upgrade, and penalty exams.

Mid-term Exam: Covers course content taught before the exam.

Final Exam: Covers all course content from the entire semester.

Make-up Exam: Equivalent to the final exam, replaces final exam results.

Excuse Exam: For students who missed mid-terms due to documented reasons.

Upgrade Exam: For students with final grades between 30.00 and 49.99, applicable to two courses per semester.

Penalty Exam: Extra exam for students who fail a course and need to retake it.

- ▶ Special provisions are available for graduating students, those with disabilities, and students needing to retake failed courses.

Grading

- ▶ Based on semester activities, midterm, and final exams.
- ▶ Minimum 40 points from final exam required to pass a course.
- ▶ Minimum 50 points from all required to pass a course.

Grade Announcements

- ▶ Grades are entered into the HELLO system and can be appealed within 48 hours.
- ▶ Students can object the grades via online tool in 48 hours after the grades are announced.

Grade Calculation

	Percent	Hypothetical Points	Subtotal Points
Attendance	15%	100	15
Midterm	35%	60	21
Final	40%	72	28.8
In-class	10%	40	4
		Total	68.8

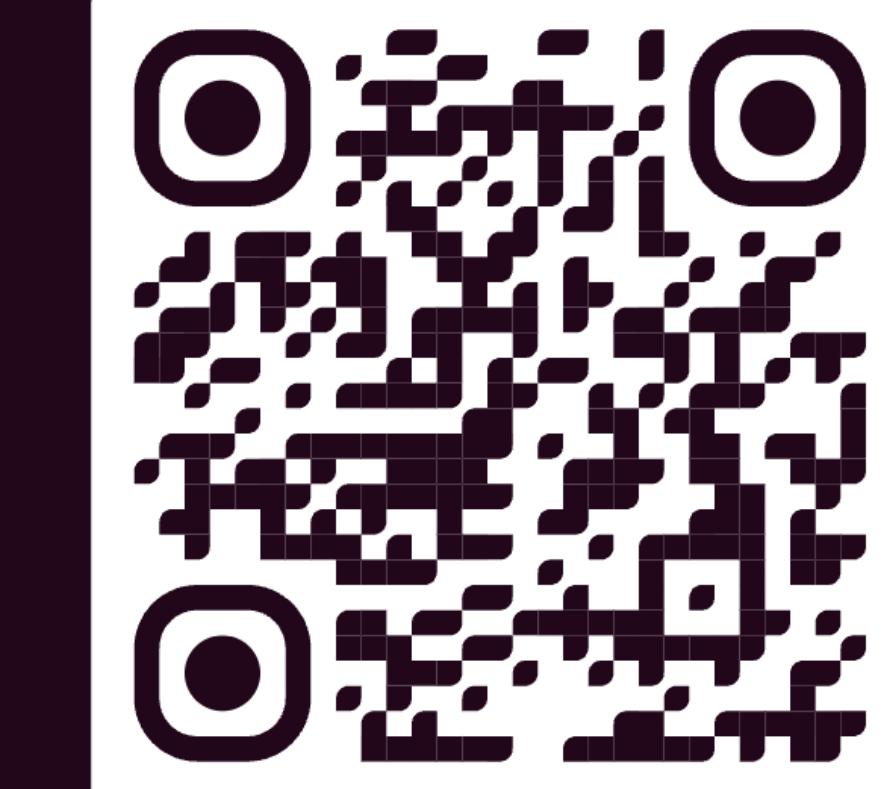
<https://ibu.kirjakovski.mk>

PROF. KIRJAKOVSKI IBU BLOG

2021

- | | | |
|--------|---|--|
| Jun 12 | MAKE-UP EXAM: Computer Aided Education | Computer
Aided
Education
(2020/2021) |
| Jun 04 | IMPORTANT: Repeated Final Exam for Some Students | Social
Psychology
(2020/2021) |
| May 24 | LECTURE 11: Organizational Theory, Dynamics, and Change | Organizational
Psychology
(2020/2021) |
| May 20 | COURSE EVALUATION: Organizational Psychology | Organizational
Psychology
(2020/2021) |
| May 20 | FINAL EXAM: Computer Aided Education | Computer
Aided
Education
(2020/2021) |

SCAN ME



DO NOT RE-UPLOAD
THE CONTENT!

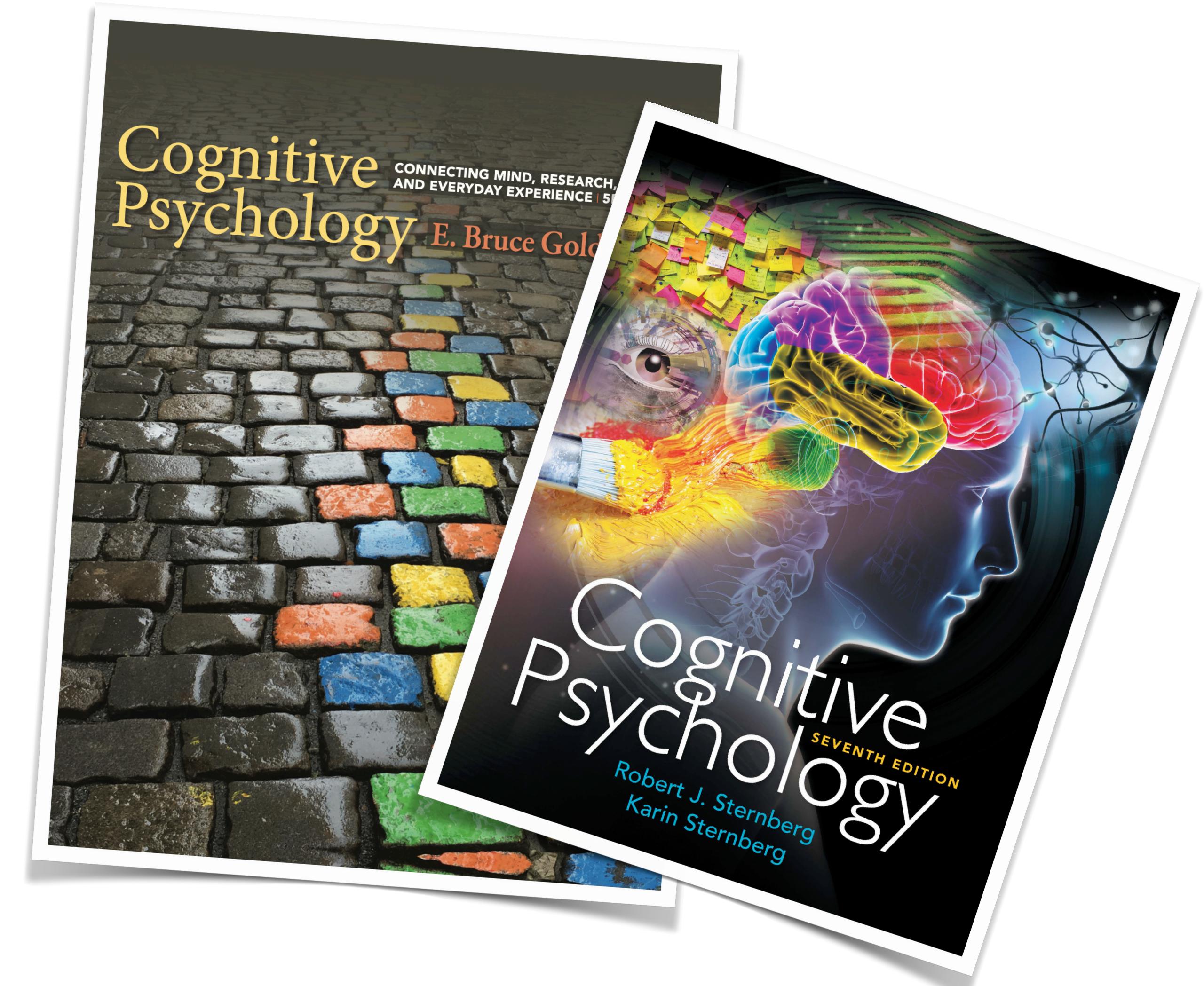
Academic Calendar

- 1 Oct 2025, Week 1
INTRODUCTION TO COGNITIVE PSYCHOLOGY
- 8 Oct 2025, Week 2
COGNITIVE NEUROSCIENCE
- 15 Oct 2025, Week 3
PERCEPTION
- 22 Oct 2025, Week 4
ATTENTION
- 29 Oct 2025, Week 5
MEMORY
- 5 Nov 2025, Week 6
CONCEPTUAL KNOWLEDGE
- **MIDTERM EXAMS (10–15 NOV 2025)**
- **EXCUSE EXAMS (24–28 NOV 2025)**
- 19 Nov 2025, Week 7
VISUAL IMAGERY
- 26 Nov 2025, Week 8
LANGUAGE
- 3 Dec 2025, Week 9
PROBLEM SOLVING & CREATIVITY
- 10 Dec 2025, Week 10
JUDGMENT, DECISIONS, AND REASONING
- 17 Dec 2025, Week 11
HUMAN INTELLIGENCE
- 24 Dec 2025, Week 12
COGNITIVE DISORDERS (+ REVIEW)
- **WINTER BREAK (31 DEC 2025 – 9 JAN 2026)**
- **FINAL EXAMS (12–17 JANUARY 2026)**
- **MAKEUP EXAMS (19–24 JAN 2026)**

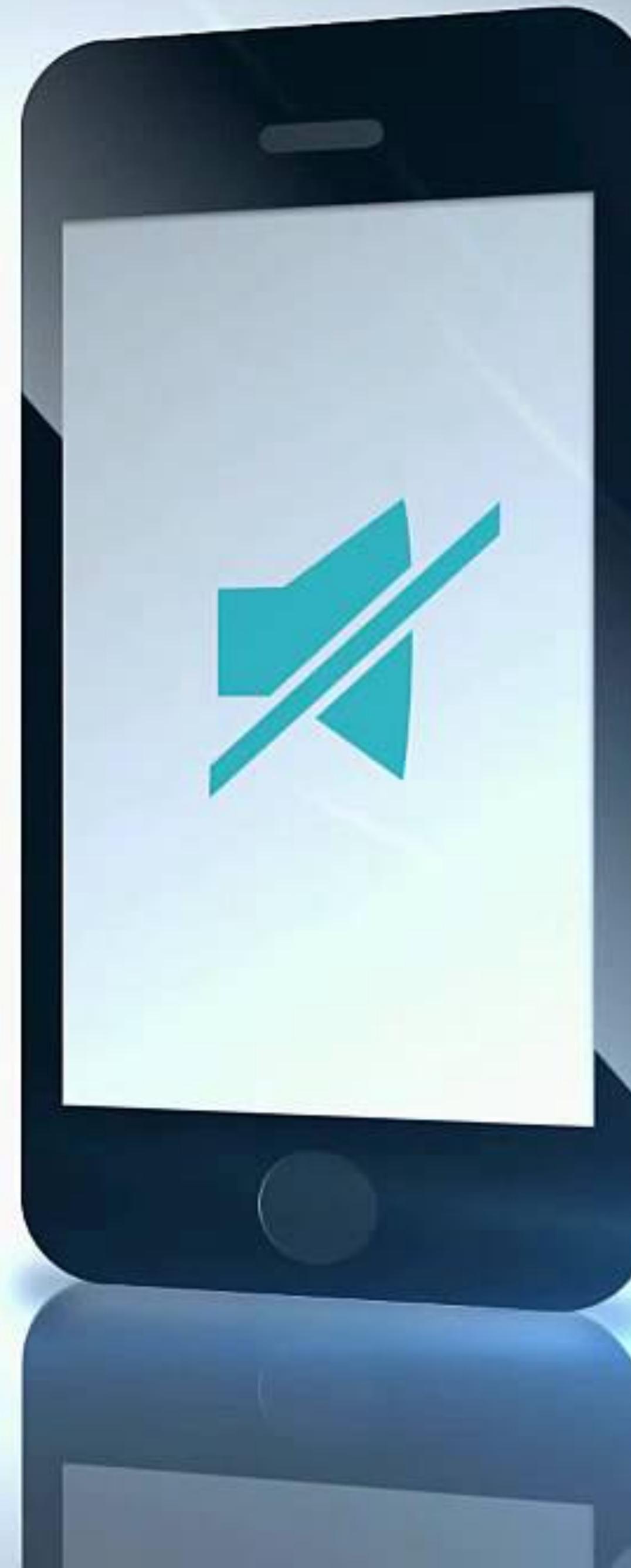
Study Materials

Main text: Goldstein, E. B. (2019). Cognitive psychology: Connecting mind, research, and everyday experience (5th ed.). Cengage Learning.

Supplementary text: Sternberg, R. J., & Sternberg, K. (2017). Cognitive psychology (7th ed.). Cengage Learning.



**PLEASE
SILENCE
YOUR PHONE**

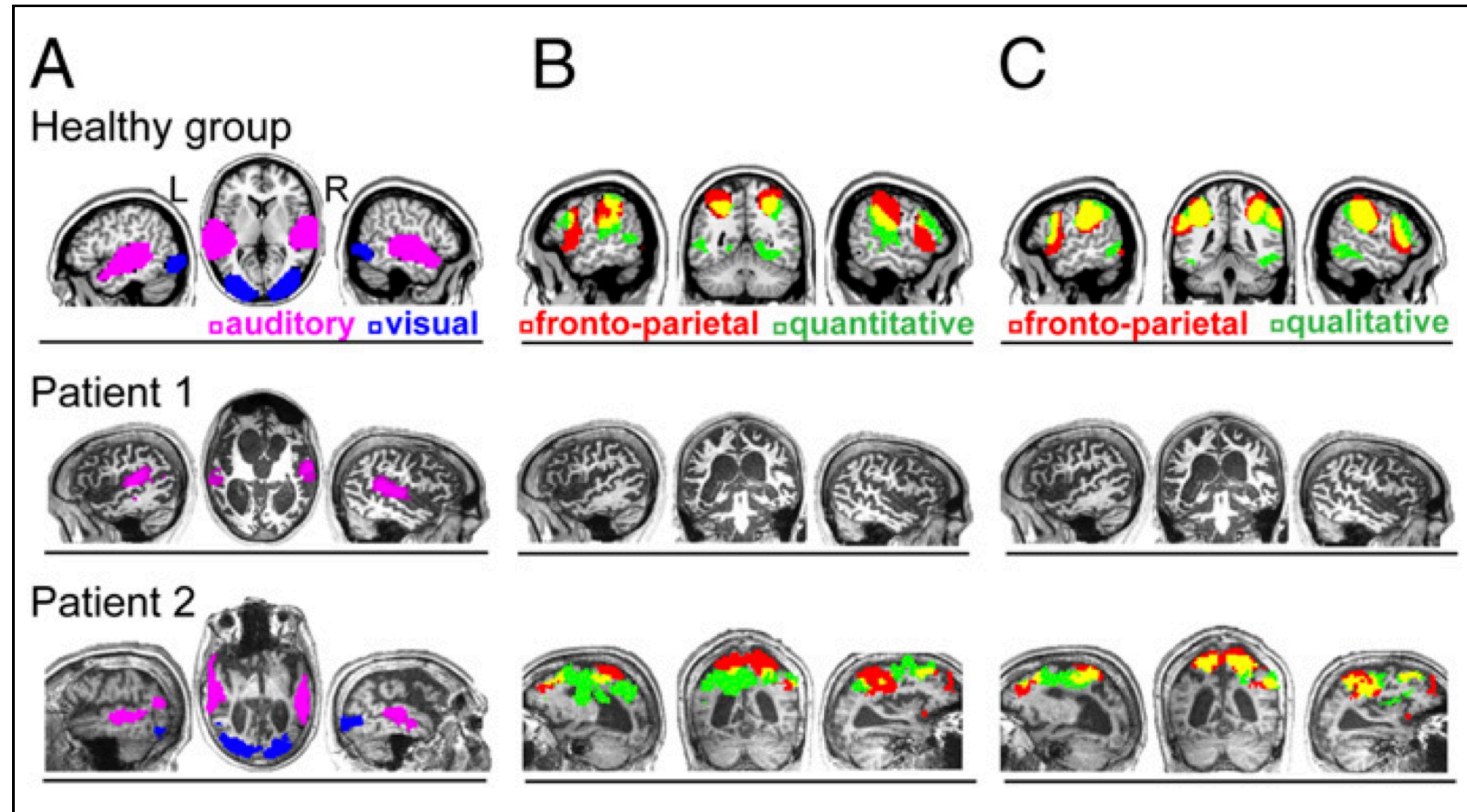


Consciousness in Coma?

- A coma is a deep state of prolonged unconsciousness in which a person cannot be awakened.
- Coma patients exhibit a complete absence of wakefulness and are unable to consciously feel, speak or move.
- The question arises: ***are coma patients actually consciously aware but incapable to communicate?***



“Bang. You’re Dead” Study



Naci, L., Cusack, R., Anello, M., & Owen, A. M. (2014). A common neural code for similar conscious experiences in different individuals.

Proceedings of the National Academy of Sciences, 111(39), 14277–14282.

<https://doi.org/10.1073/pnas.1407007111>

Brain scan showing synchronized activity between healthy and comatose patients.



Comatose patients watched this movie and their brain reacted to the plot similar to the healthy brains.

What is cognitive psychology
according to you?

Cognitive Psychology Defined

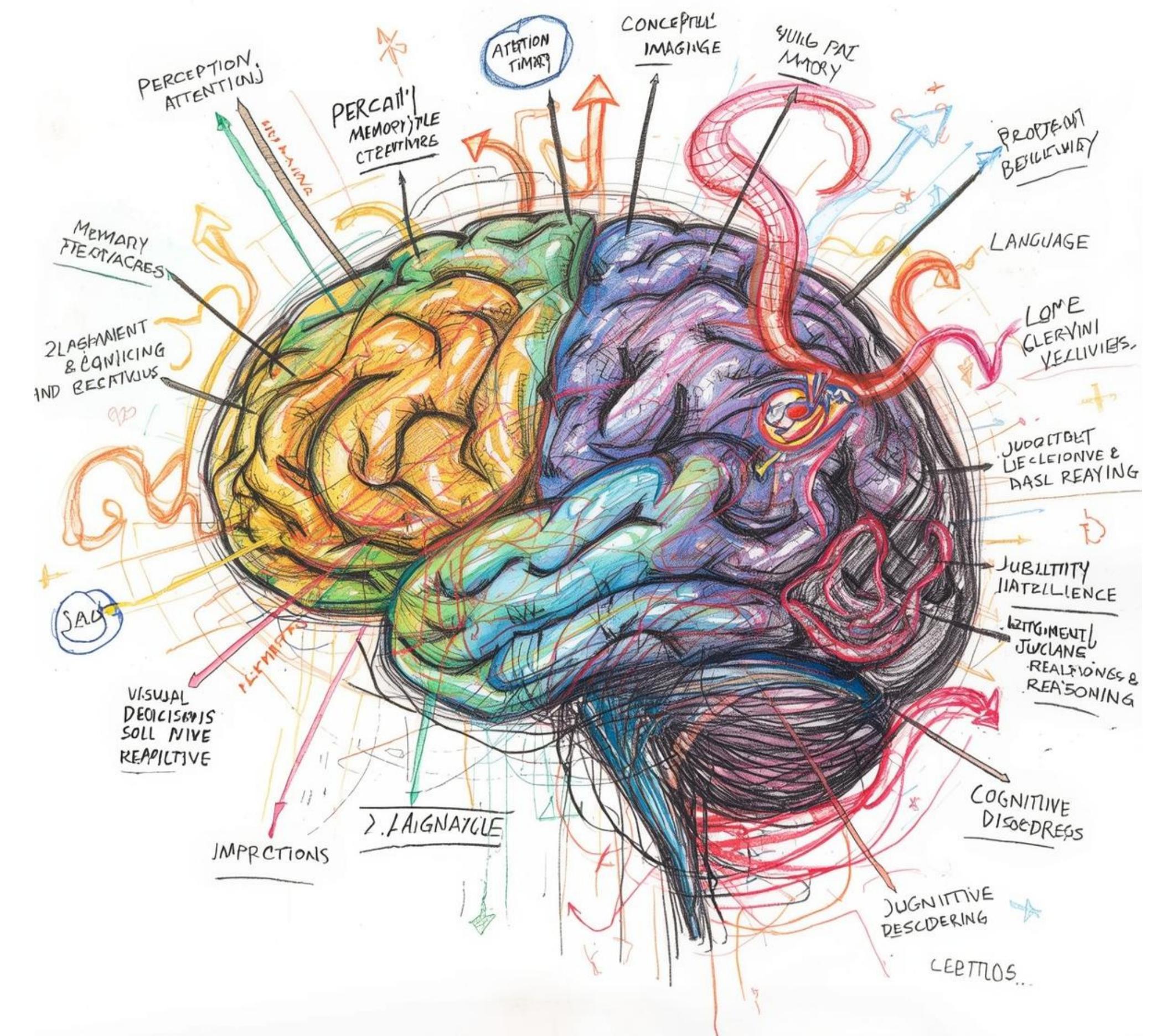
Cognitive psychology is the branch of psychology that scientifically studies mental processes and representations. In general sense, studies the characteristics and properties of the mind and how it operates.

Cognitive Psychology Defined

Cognitive psychology is the **branch of psychology** that **scientifically** studies **mental processes** and **representations**. In general, studies the characteristics and properties of the **mind** and how it **operates**.

The Mind

The mind creates and controls mental functions such as **perception, attention, memory, emotions, language, deciding, thinking, intelligence, and reasoning**. The mind is a system that creates representations of the world so that we can act within it to achieve our goals.



Some Keywords

- **Scientific study:** Systematic observation and experimentation of nature.
- **Brain:** Central nervous organ with 86B neurons and ~100T connections.
- **Neurons:** Fundamental nerve cells in brain and nervous system.
- **Mind:** Mental functions and processes of brain.
- **Cognition:** Mental activities for acquiring/processing info (attention, memory, reasoning, language).
- **Mental process:** Information transformation producing outputs.
- **Mental representation:** Information operated on or produced by mental processes.

Psychology Insights from Outside and Inside



Observe outside behavior to understand internal mental processes



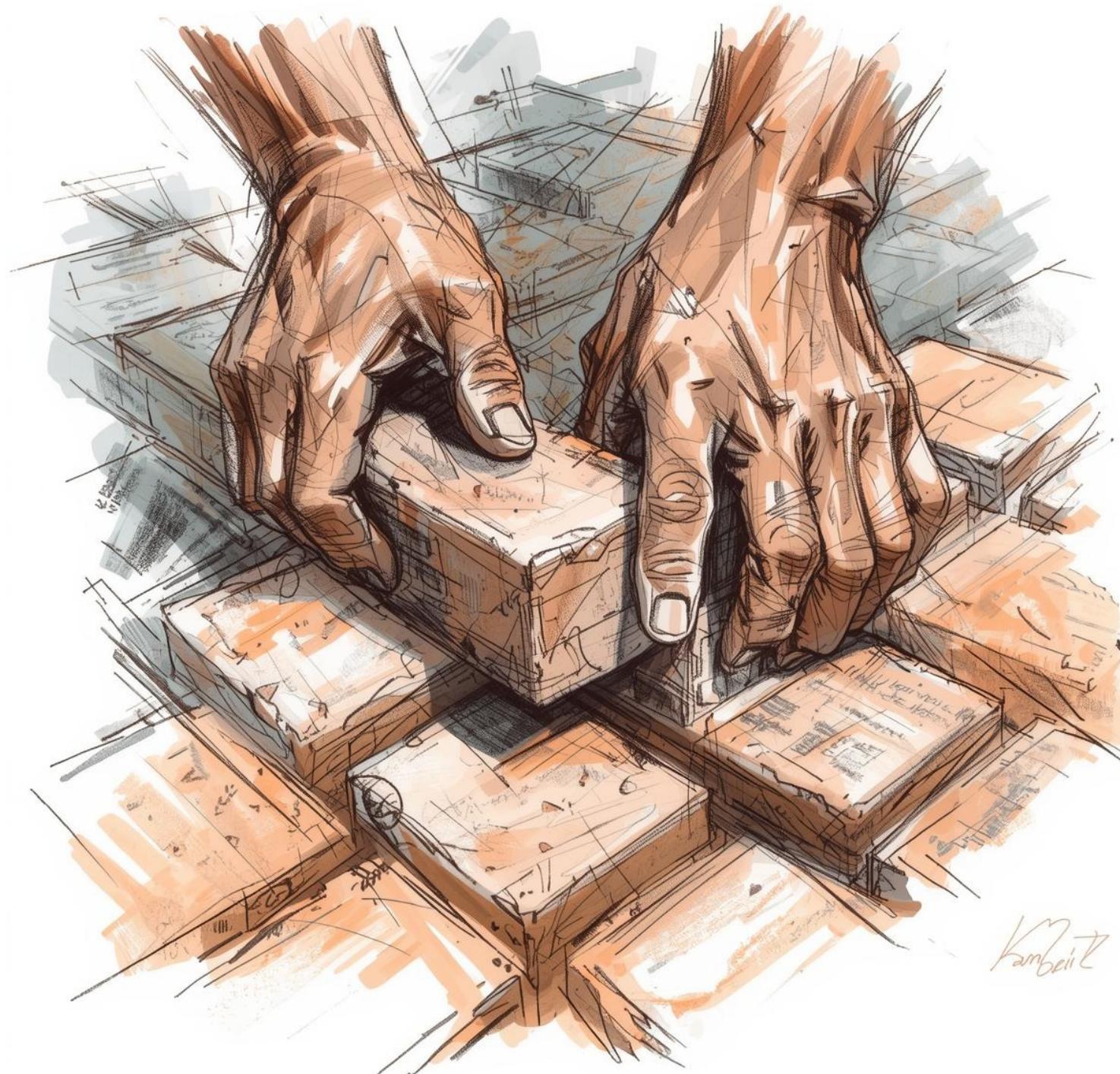
Observe internal brain activity to understand the external behavior

Three Levels of Analysis

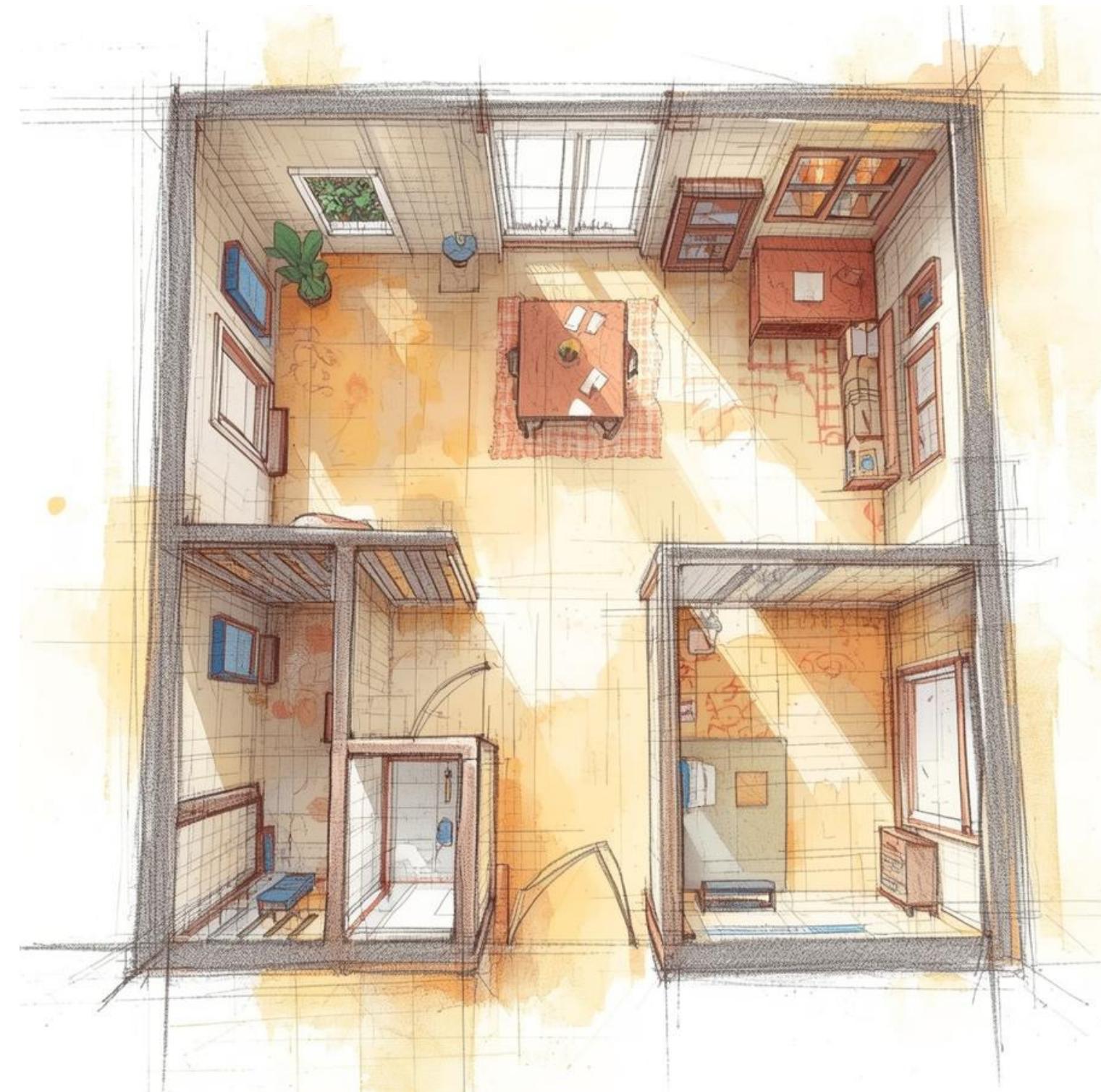
- **Brain level:** Activity, structure, cells, chemicals, genes.
- **Person level:** Mental processes and content.
- **Group level:** Social relations, group dynamics, culture.
- Physical world as a backdrop.



Three Levels of Analysis



Level of the brain



Level of the person



Level of the group

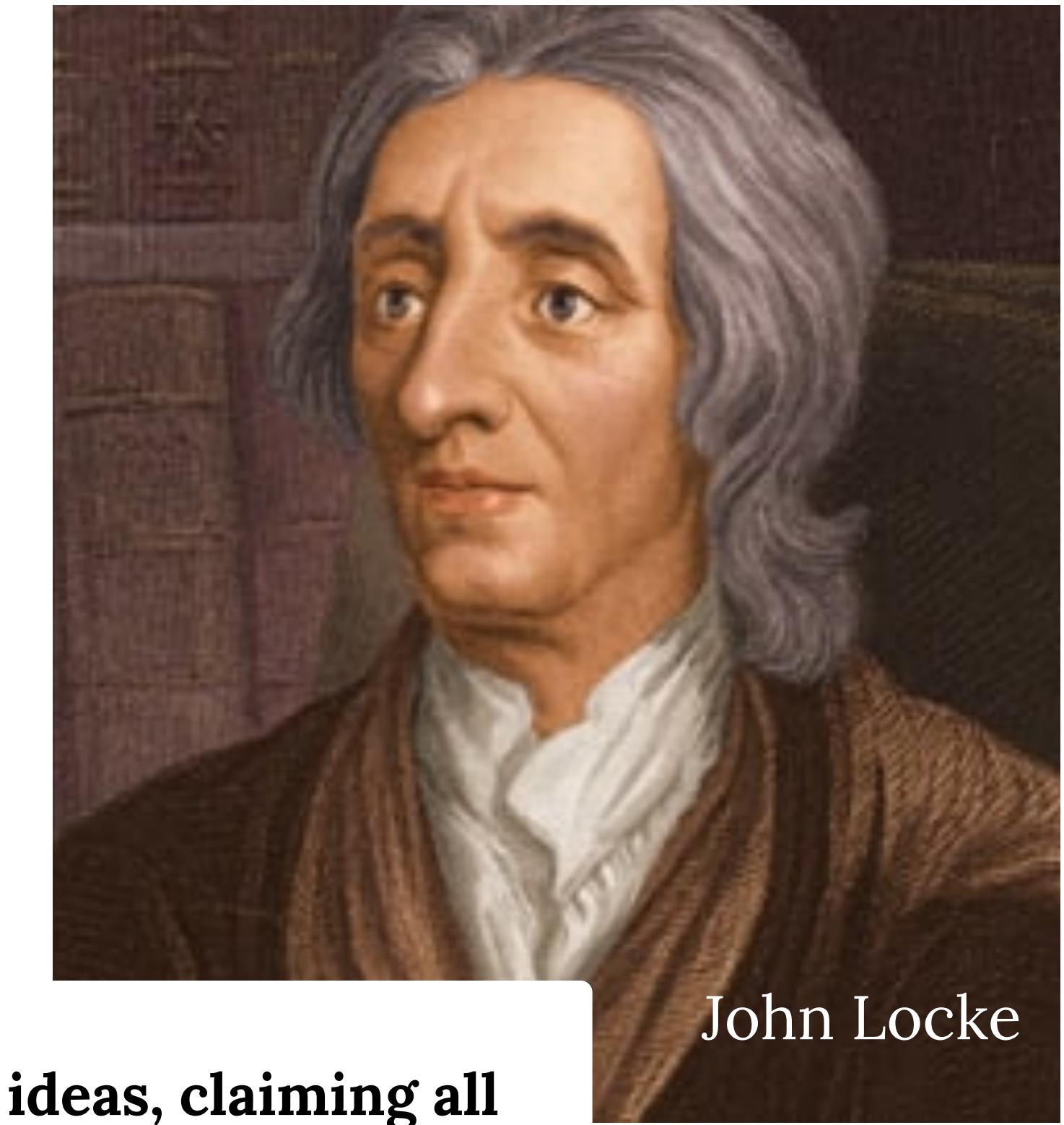
The Evolution of a Science



René Descartes

The mind and body are two different substances which interact with one another, known as **mind-body dualism**.

The roots of psychology lie in the intersection between philosophy and physiology.

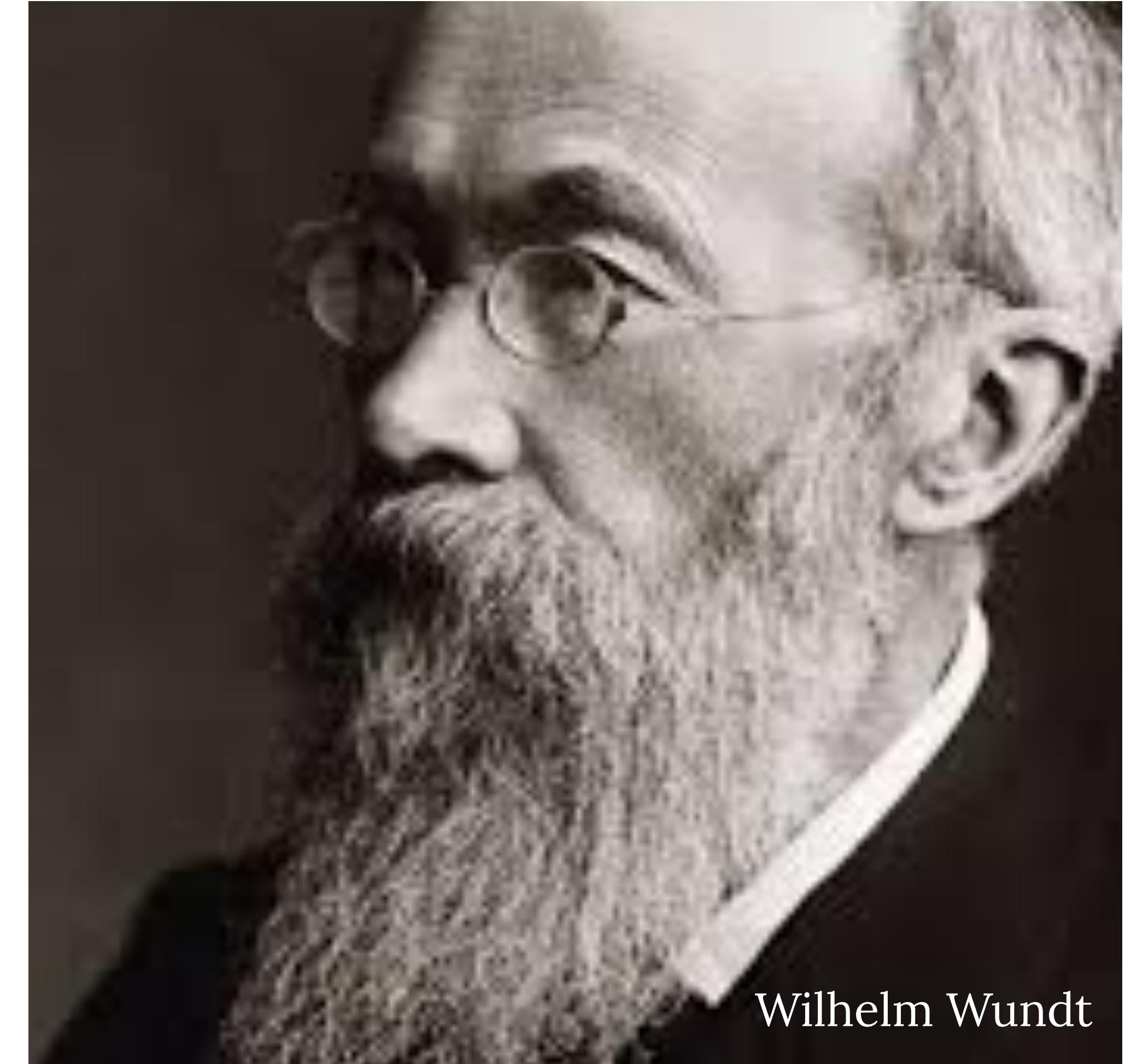


John Locke

Rejected innate ideas, claiming all knowledge comes from experience through sensation or reflection – **the mind as a tabula rasa (blank slate)**.

Early Days: Structuralism

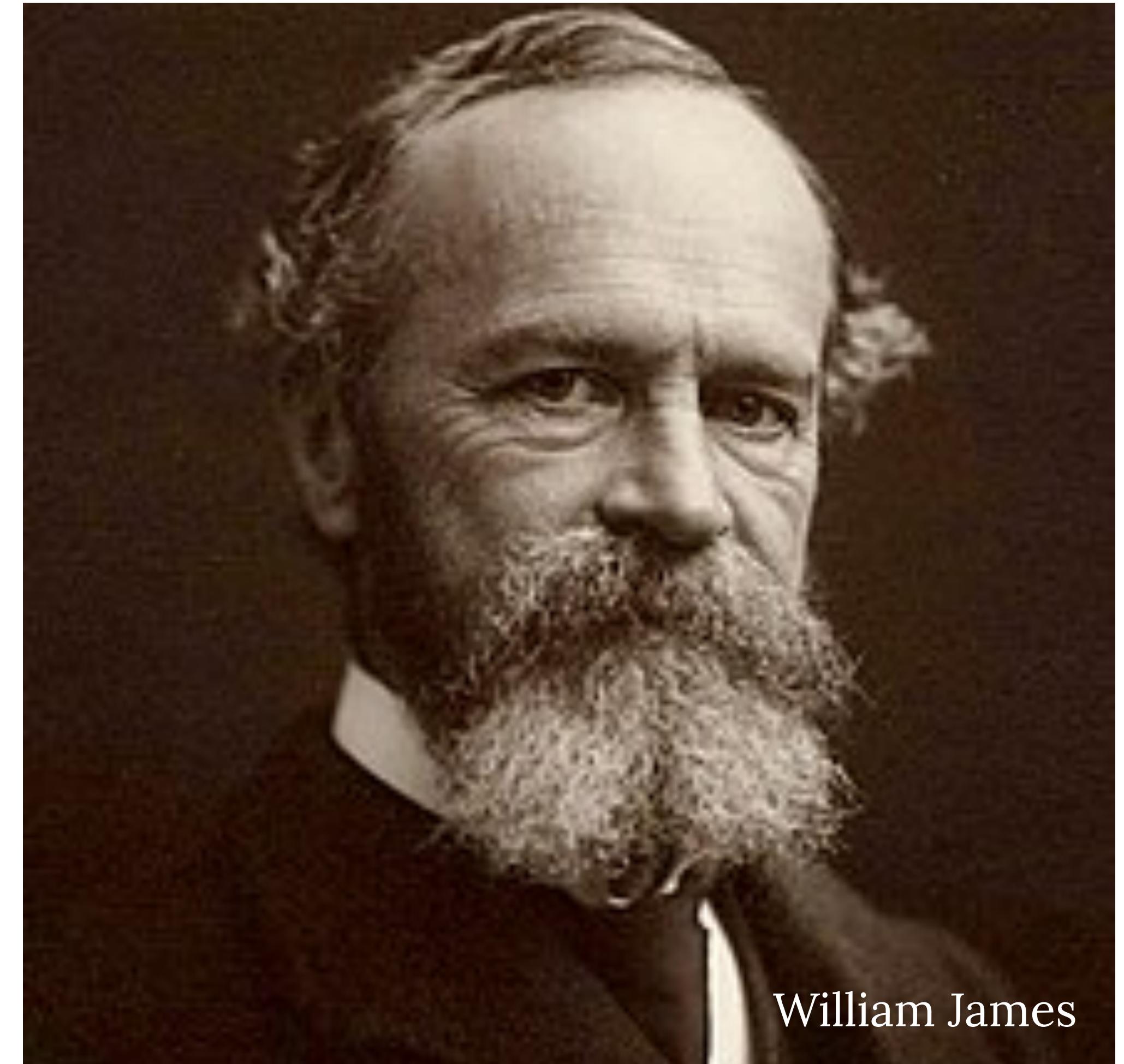
- **Wilhelm Wundt**, founder of scientific psychology, opened the first lab in Leipzig in 1879, defining consciousness as **sensations** and **feelings**. He is associated with the **structuralism** that sought to identify and describe the basic elements of consciousness that form **mental structures**.
- **Analytic introspection** involved observing mental events as they occur.
- **What constitutes the mind?**



Wilhelm Wundt

Early Days: Functionalism

- **William James**, a key figure in establishing Harvard's psychology department, published a highly influential two-volume synthesis and summary of psychology, *Principles of Psychology*, in 1890.
- **Functionalism**, a psychological school, aimed to understand how the mind helps individuals adapt and **function** effectively, influenced by Charles Darwin's theory of **evolution and** connecting the psychology of man and animals.
- **Why was the mind created?**



William James

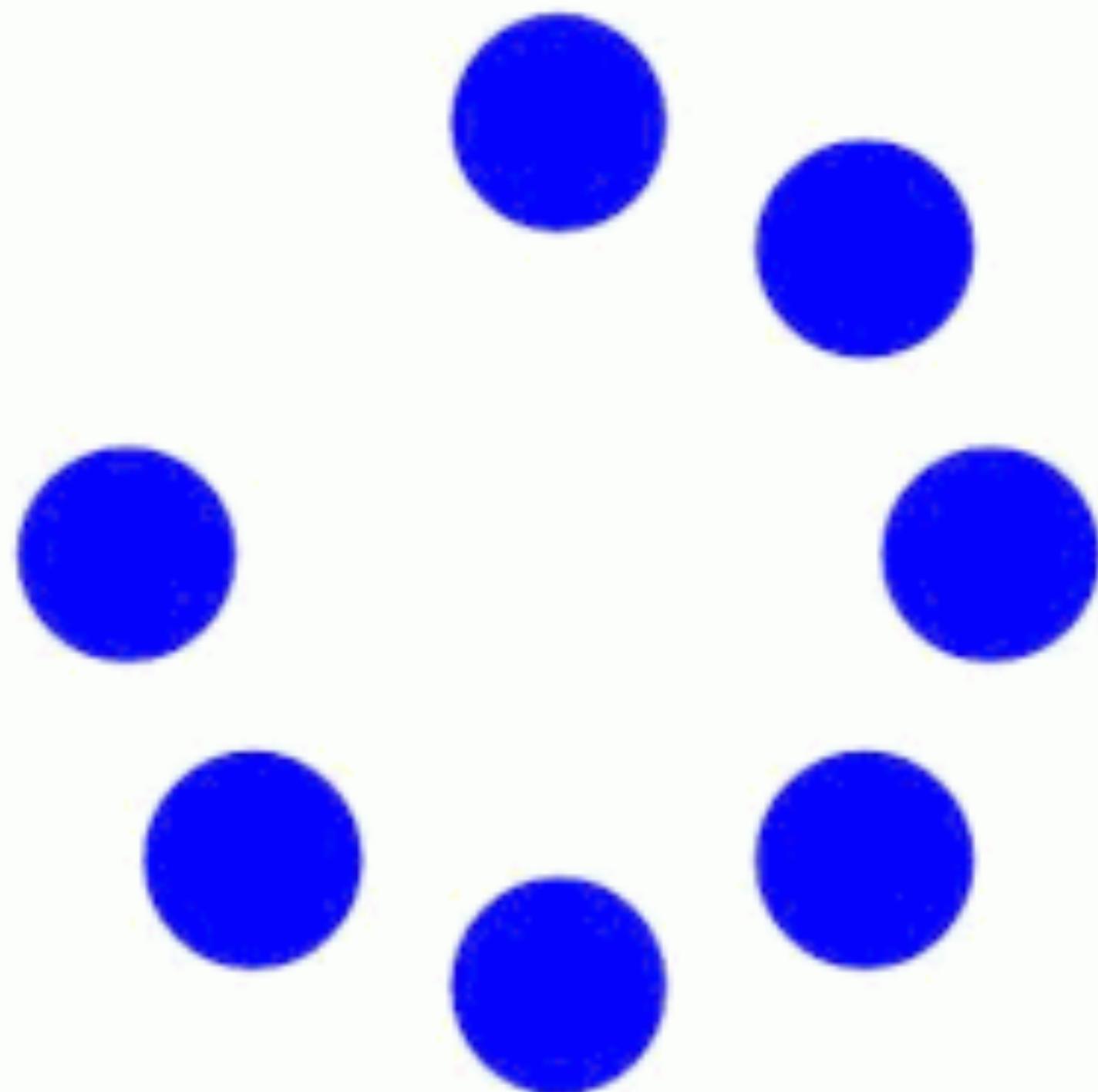
Early Days: Gestalt Psychology

- **Max Wertheimer**, an Austro-Hungarian psychologist, founded Gestalt psychology, known for the **phi phenomenon**.
- **Gestalt psychology** emphasized overall patterns of perceptions and thoughts, asserting that “**the whole is more than the sum of its parts.**” Gestalt psychologists developed over 100 perceptual laws describing how our minds organize the world.
- **How is the mind organized?**



Max Wertheimer

Early Days: Gestalt Psychology



Phi phenomenon



Chinese military human countdown

Behaviorism

- **John B. Watson**, an American psychologist, popularized behaviorism, a psychological school that emphasizes observable behavior.
- **B. F. Skinner**, considered the father of **operant conditioning**, based his work on **Thorndike's law of effect**.
- Behaviorism introduced scientific rigor to psychological research by focusing on how specific stimuli evoke specific responses.
- **Can behavior be explained through observable S-R relationships, without reference to mental states?**



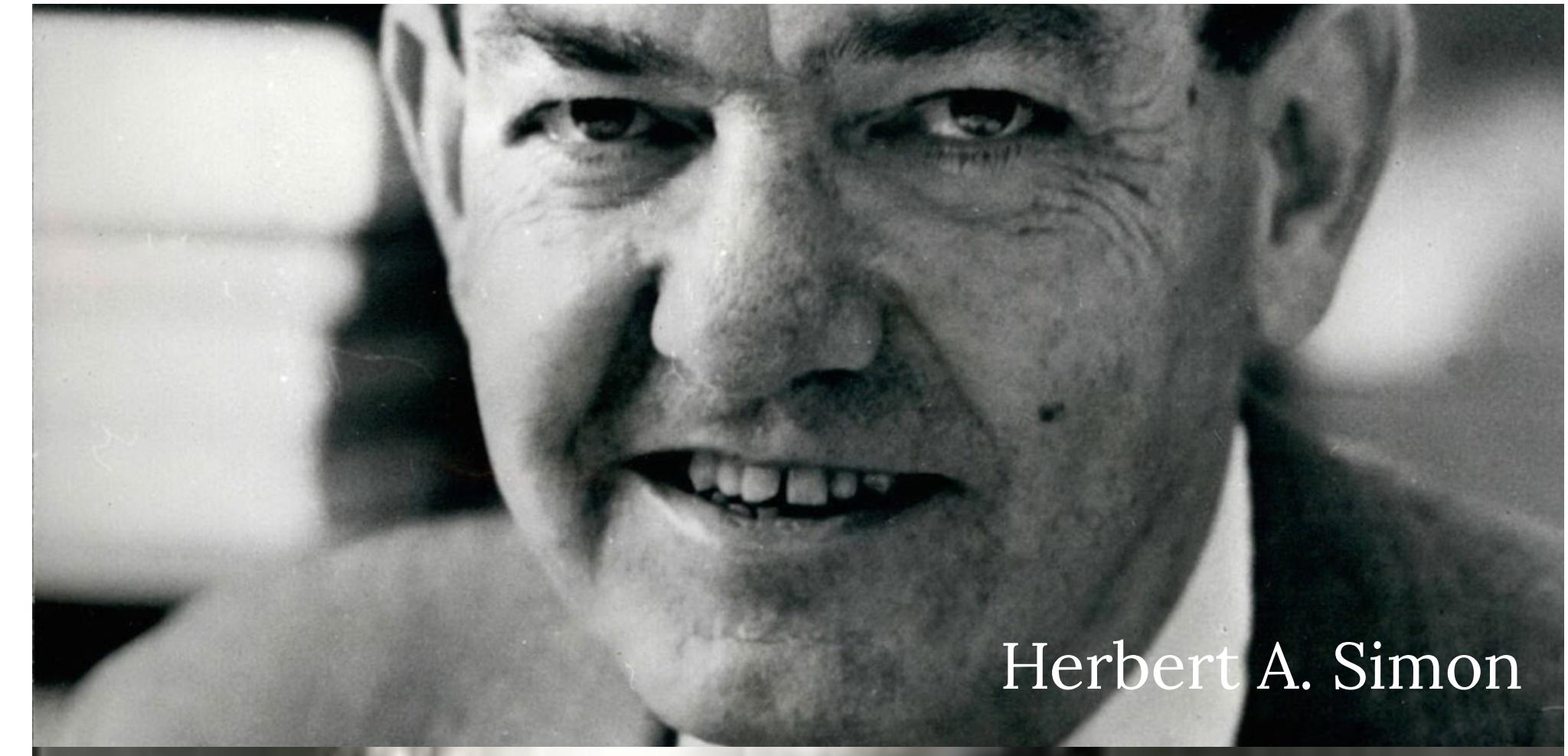
John B. Watson



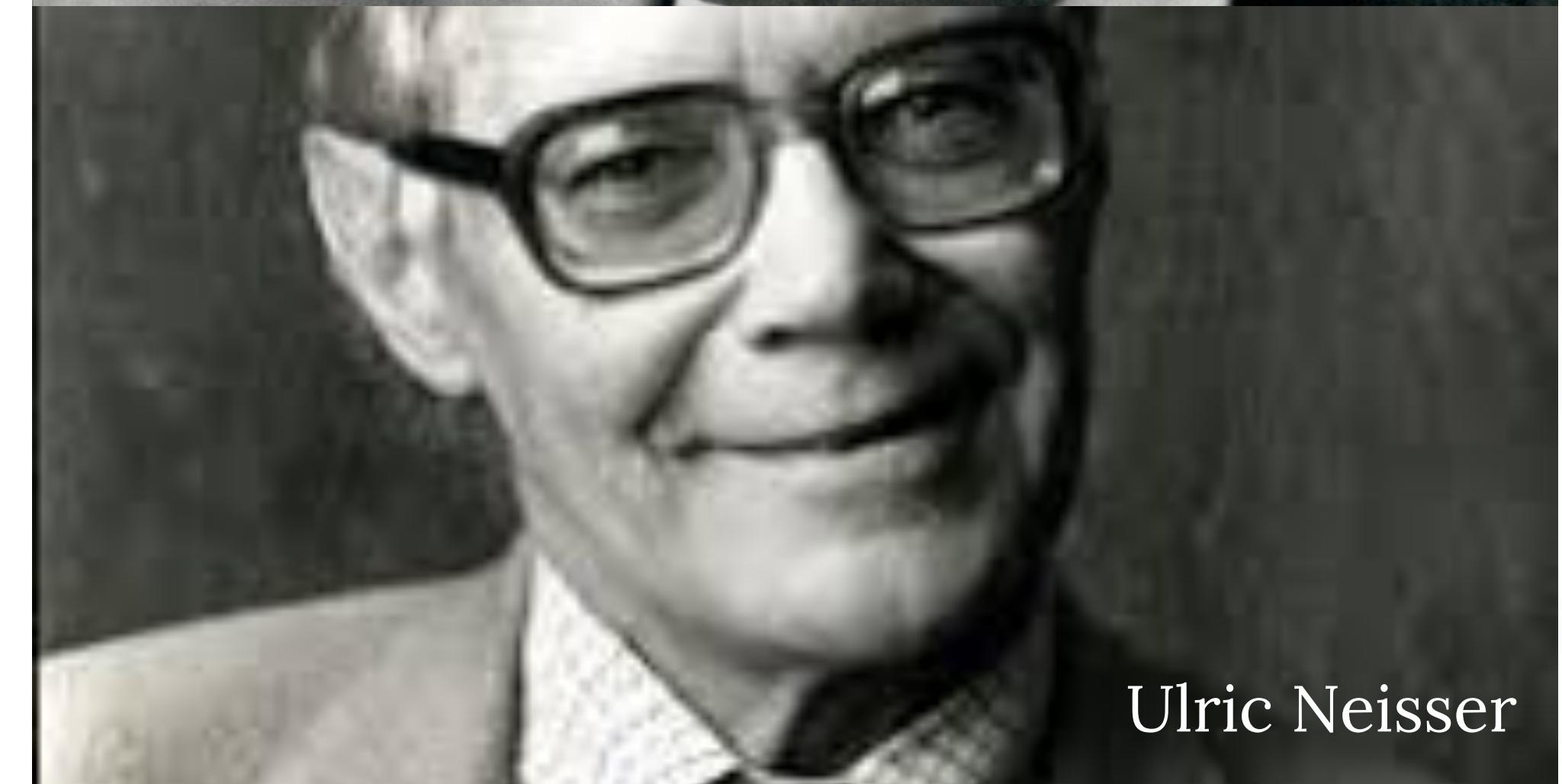
B. F. Skinner

Cognitive Psychology

- **Herbert A. Simon**, an American economist, political scientist, and cognitive psychologist, won the Nobel Prize in Economics for studying organizational decision-making.
- **Ulric Neisser**, a German-born American psychologist, is often called the “**father of cognitive psychology**”
- The **cognitive revolution** of the late 1950s and early 1960s used computers as models for human cognition.
- **Cognitive psychology** characterizes mental events that store and process information internally, viewing the mind as software and the brain as hardware.
- **Cognitive neuroscience** combines cognitive psychology and neuroscience to specify how the brain generates mental processes that store and process information.
- **How do humans acquire, process, store, and use knowledge?**



Herbert A. Simon



Ulric Neisser

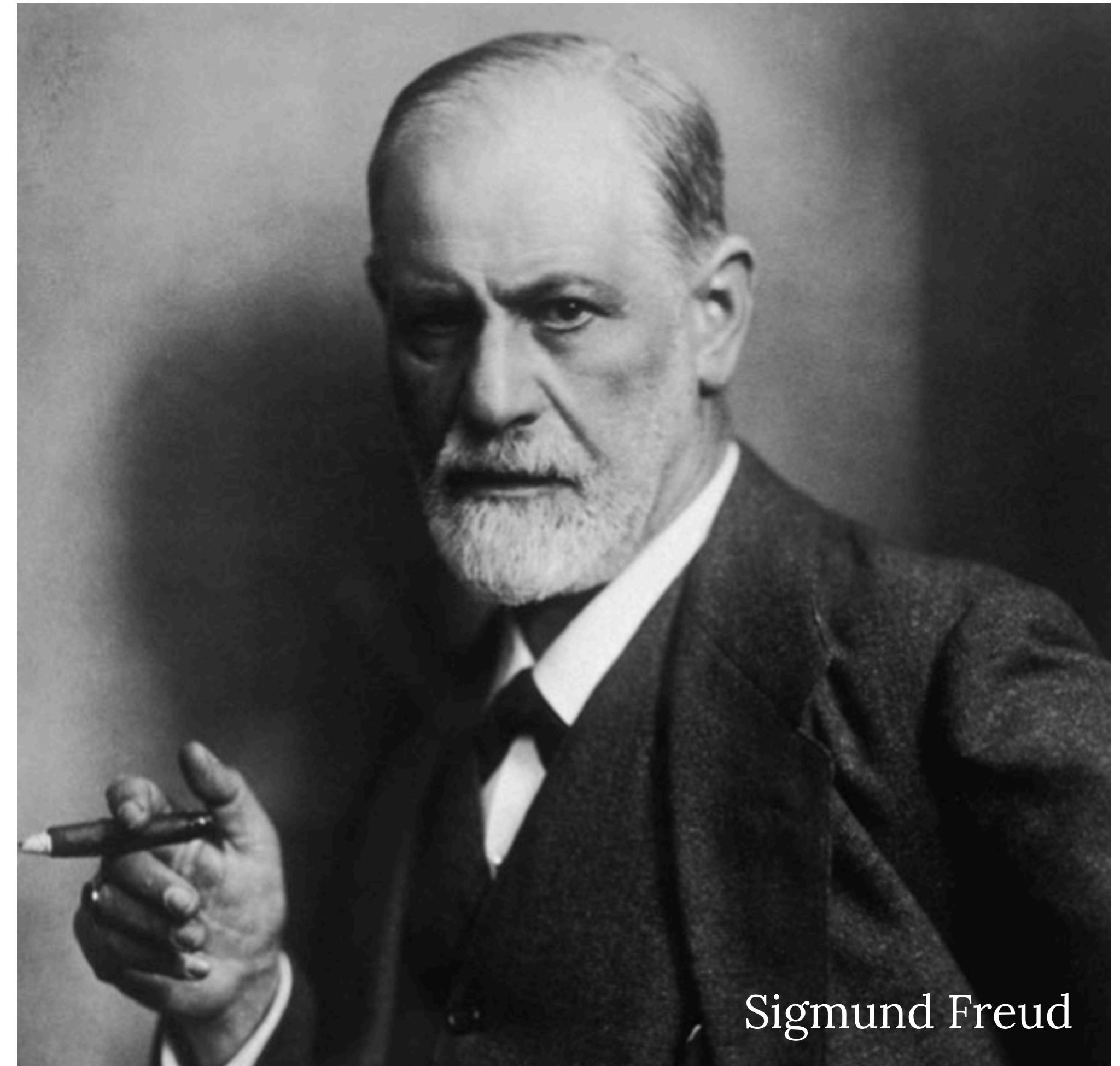
Evolutionary Psychology

- **David Buss**, a founder of evolutionary psychology, focuses on human mating strategies.
- **Steven Pinker**, a Canadian-American cognitive psychologist and author, advocates for evolutionary psychology.
- **Evolutionary psychology** assumes that certain cognitive strategies and goals are so important that natural selection built them into our brains. Human universals across cultures suggest that some modern characteristics are by-products of other selected characteristics (e.g., reading ability).
- **How have the human mind and behavior been shaped by evolutionary processes?**



Psychodynamic Theory

- **Sigmund Freud**, a Viennese neurologist, developed psychodynamic theory. Freud believed the **mind** has separate components, some of which are **unconscious**.
- **Psychodynamic theory** focuses on the continuous interaction between conscious and unconscious thoughts and feelings, and how these affect behavior. It also includes analyzing behaviors and phenomena previously ignored, like slips of the tongue and dreams, and promotes treating the causes of psychological problems, not just symptoms.
- **How do unconscious processes, conflicts, and desires shape thoughts, emotions, and behavior?**



Sigmund Freud

Early Cognitive Studies

Donders's Pioneering Experiment

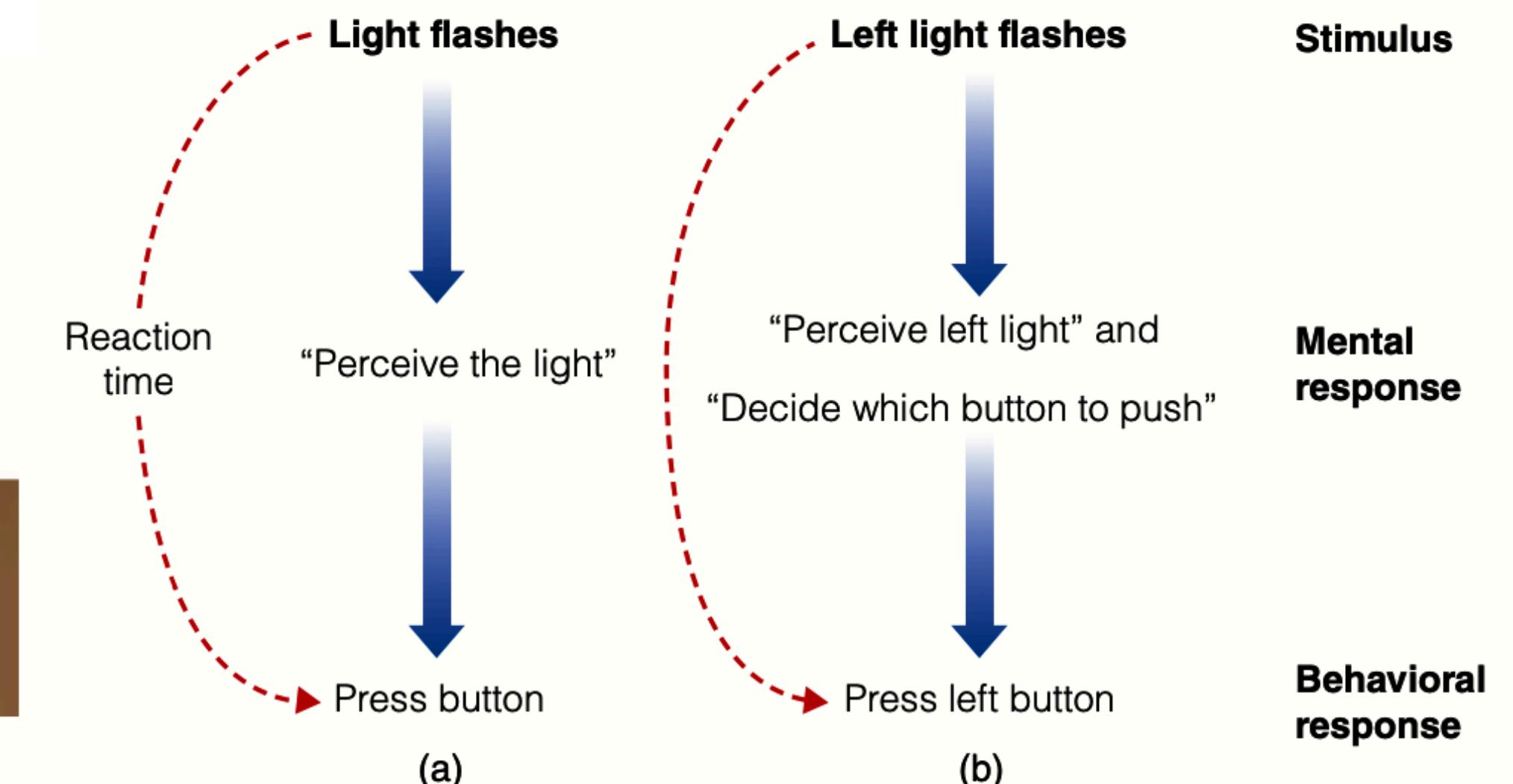
- Franciscus Donders's Pioneering Experiment in 1868: How long does it take to make a decision?
- He measured a **reaction time**, in this case **simple reaction time** and **choice reaction time**.
- Donders reasoned that the difference in reaction time between the simple and choice conditions would indicate how long it took to make the decision that led to pushing the correct button.



(a) Press J when light goes on.



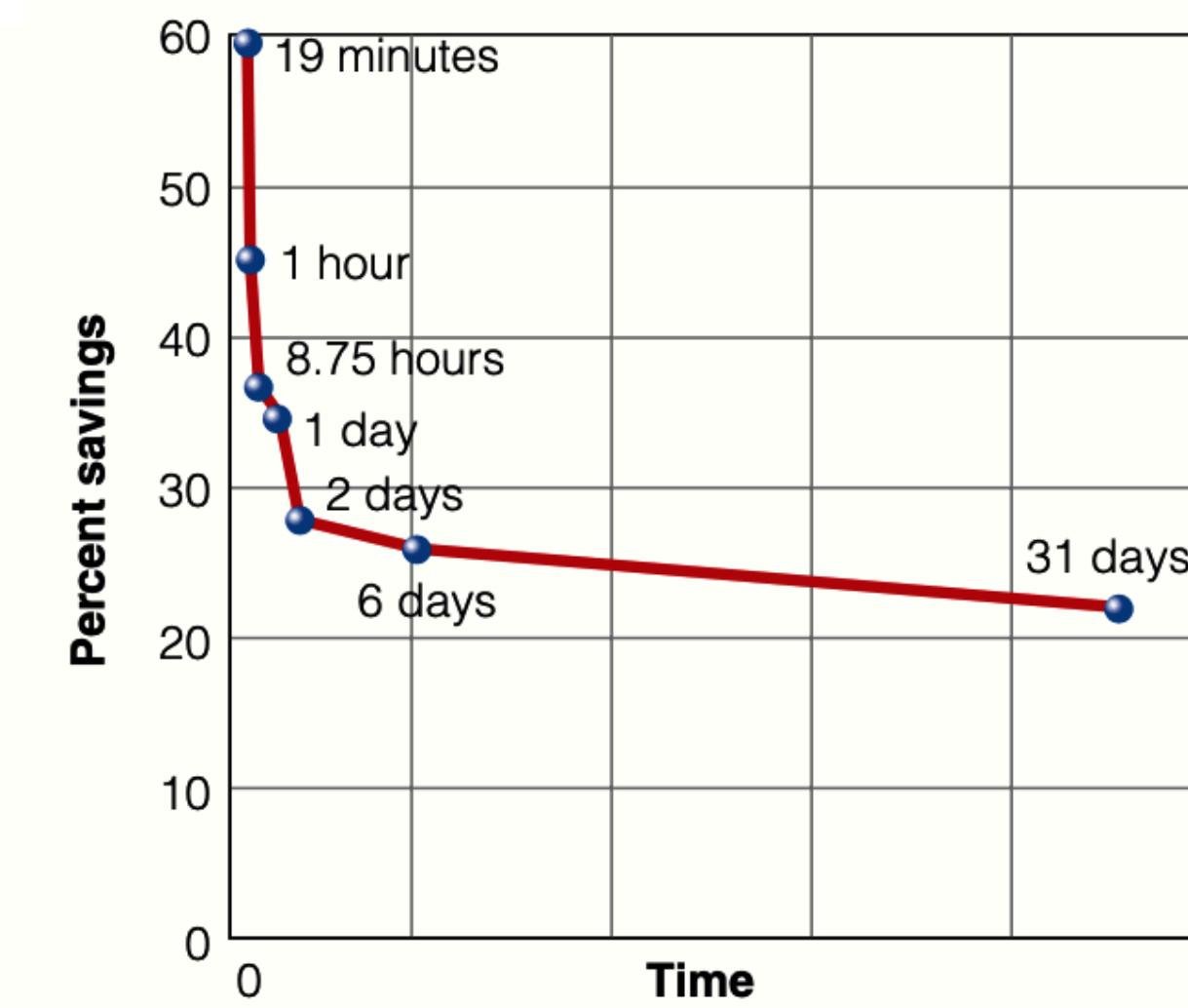
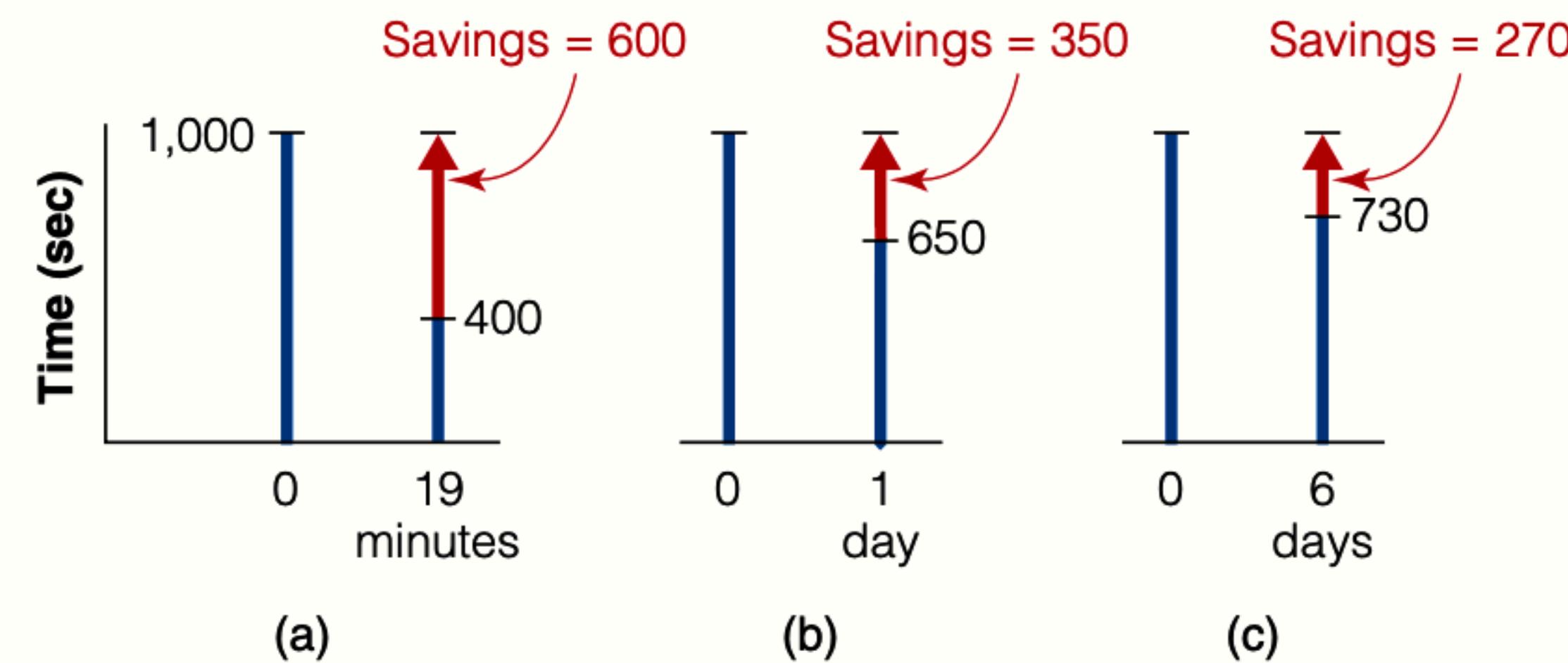
(b) Press J for left light, K for right.



Ebbinghaus' Memory Experiment

- Hermann Ebbinghaus studied memory and forgetting, specifically how quickly information is lost. He repeated lists of nonsense syllables to himself at a constant rate to determine how much was forgotten after a delay. He used **savings** as a measure of forgetting, with smaller savings indicating more forgetting.

Savings = Original time to learn the list - Time to relearn the list after the delay



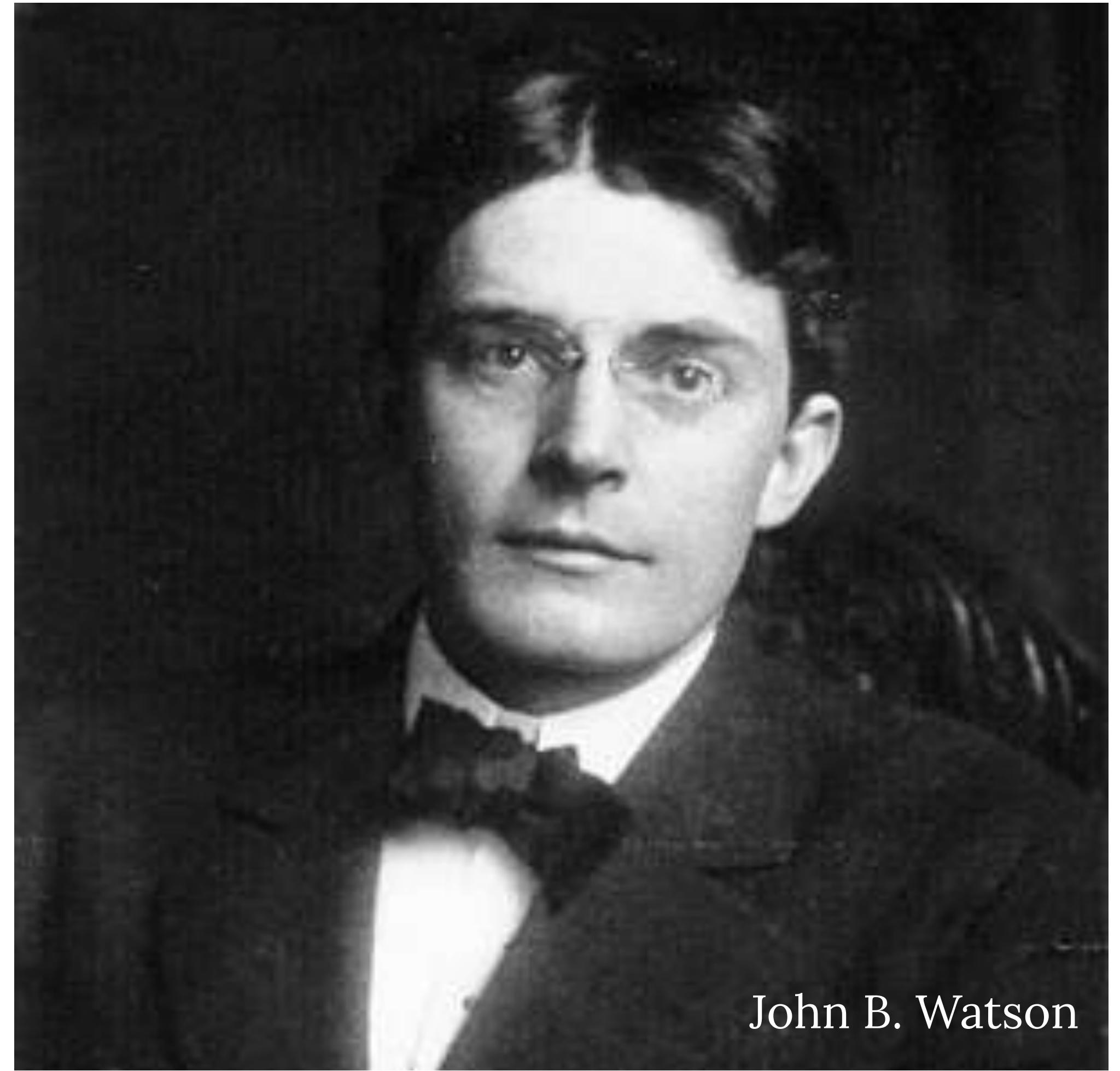
Early Pioneers in Cognitive Psychology

Person	Procedure	Results and Conclusions	Contribution
Donders (1868)	Simple reaction time versus choice reaction time	Choice reaction time takes 1/10 seconds longer; therefore, it takes 1/10 second to make a decision	First cognitive psychology experiment
Wundt (1879)	Analytic introspection	No reliable results	Established the first laboratory of scientific psychology
Ebbinghaus (1885)	Savings method to measure forgetting	Forgetting occurs rapidly in the first 1 to 2 days after original learning	Quantitative measurement of mental processes
James (1890)	No experiments; reported observations of his own experience	Descriptions of a wide range of experiences	First psychology textbook; some of his observations are still valid today

Abandoning the Study of the Mind

Watson Founds Behaviorism

- In 1913, Watson published “Psychology as the Behaviorist Views It” and founded **behaviorism**. He rejected introspection, believing **observable behavior** should be the main study topic.
- **Behaviorism** focuses on how specific stimuli evoke specific responses. Watson’s famous **“Little Albert” experiment illustrates this**. His ideas are linked to **Ivan Pavlov’s classical conditioning**.
- **Classical conditioning is a** learning type where a neutral stimulus becomes paired with a stimulus that causes a reflexive behavior. Over time, the neutral stimulus alone can elicit that behavior.

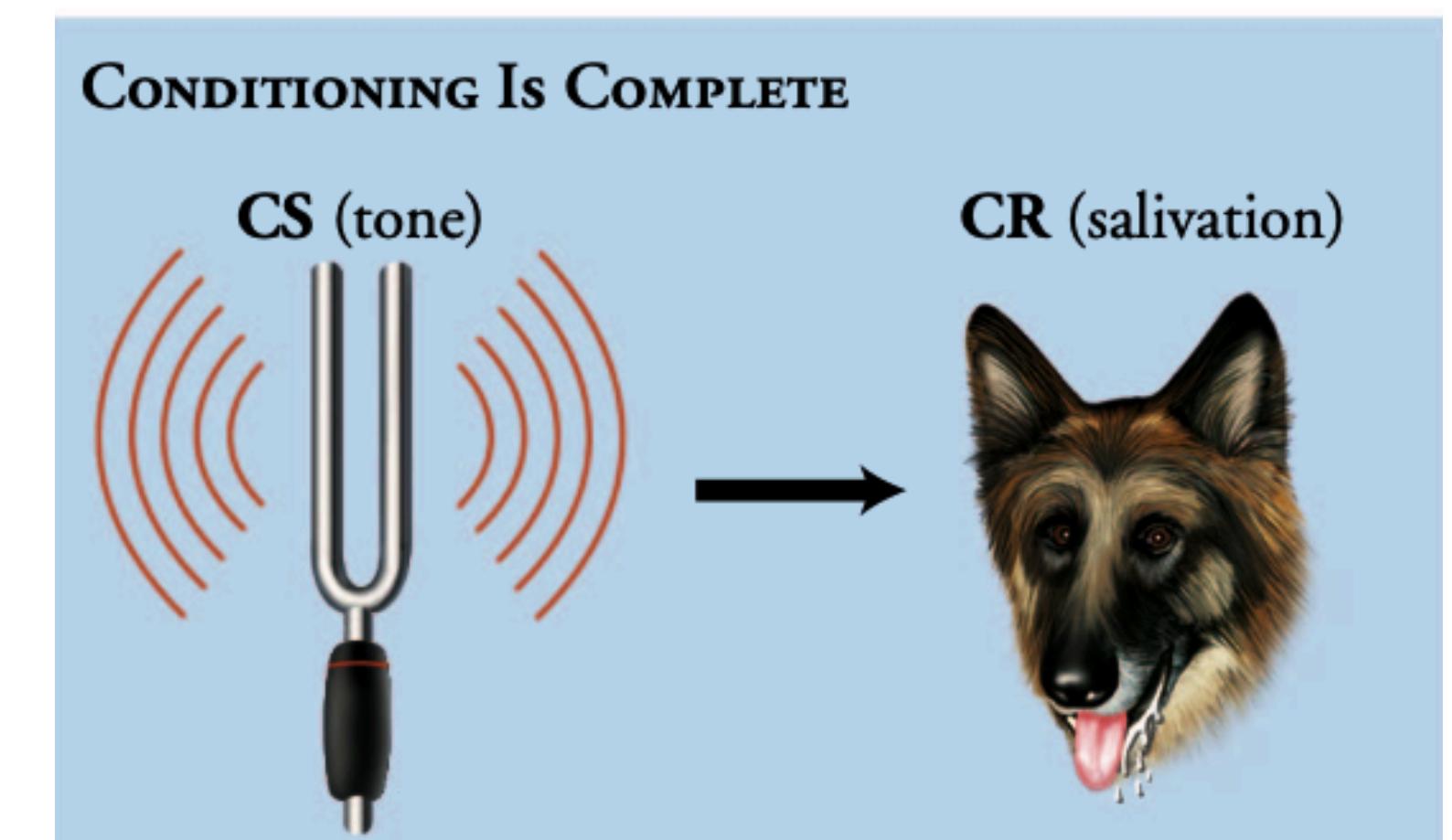
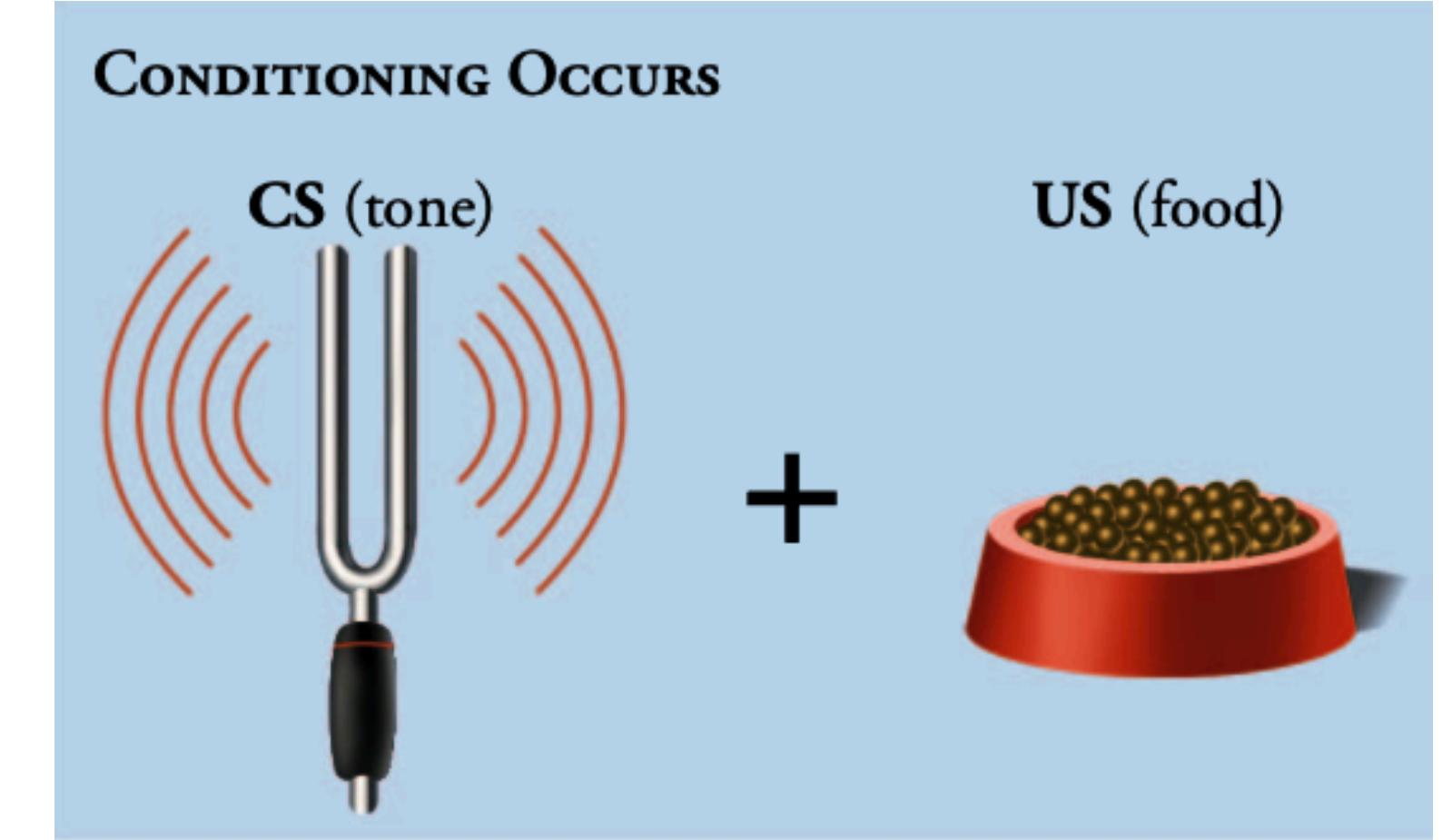
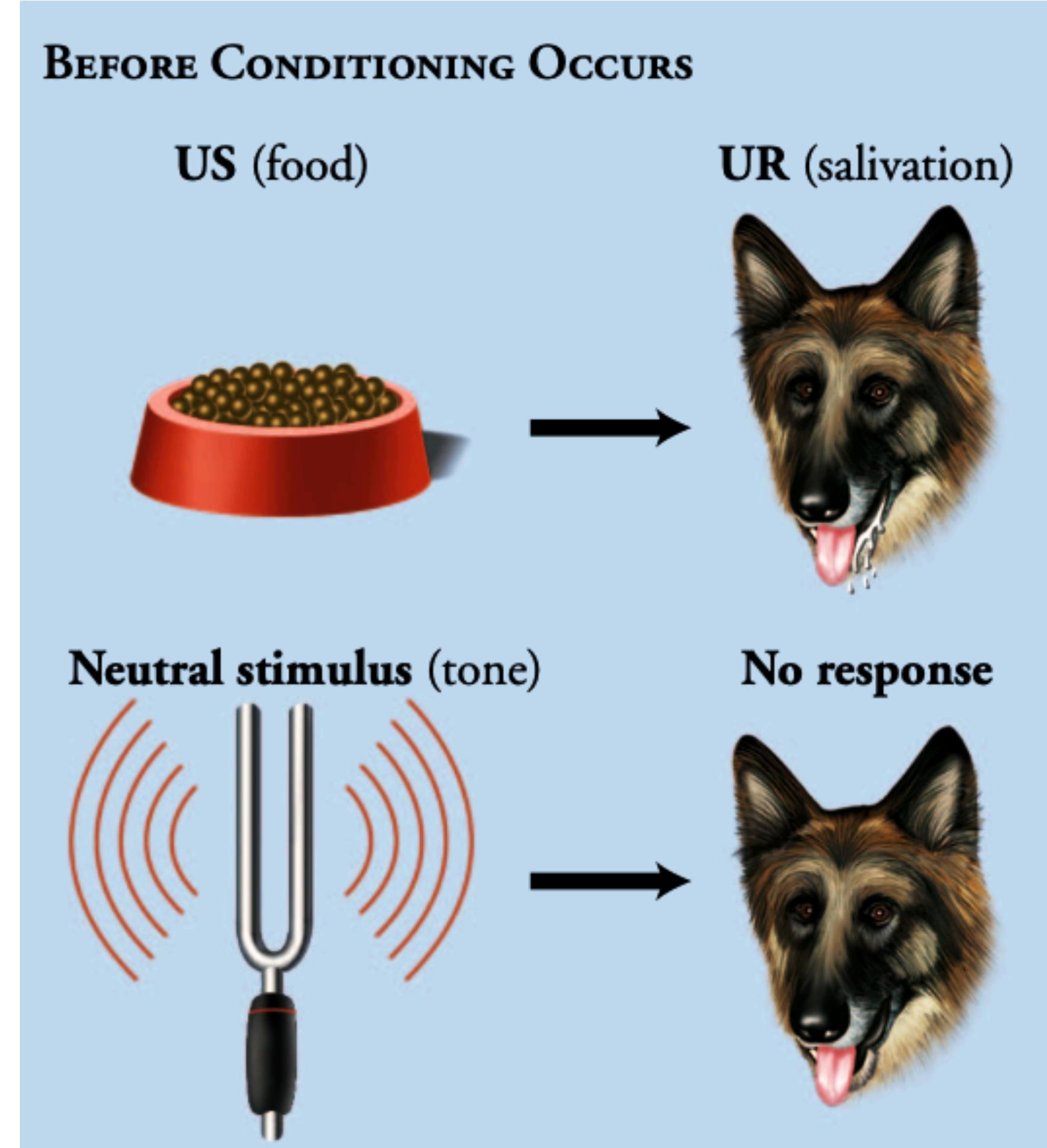
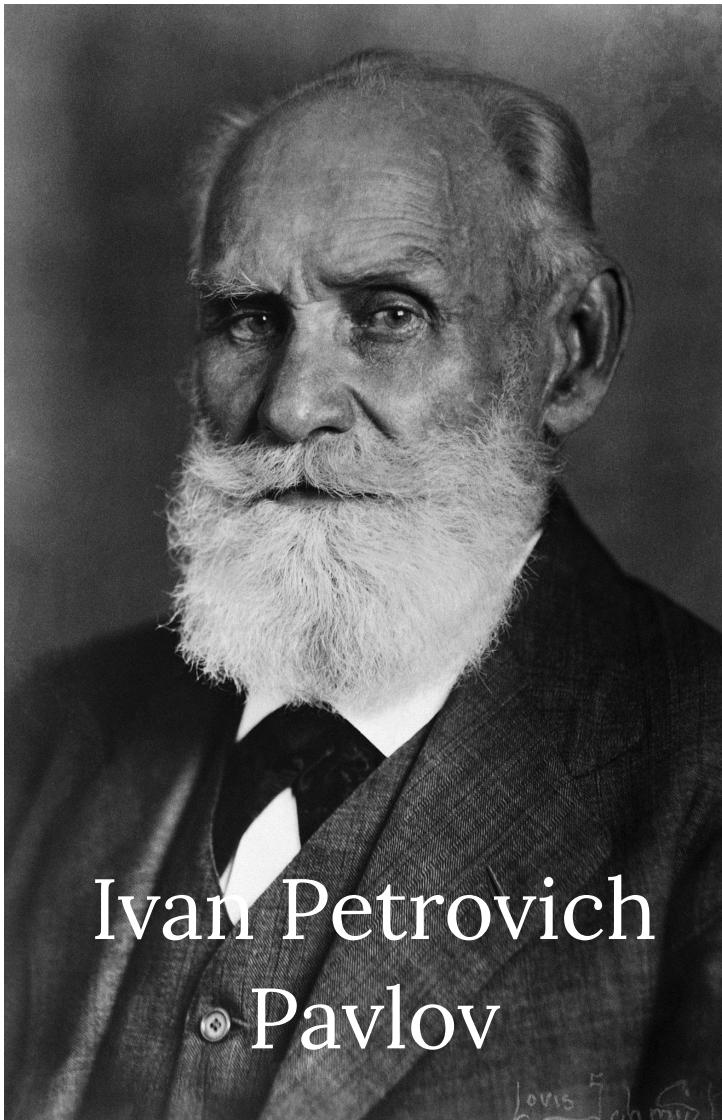
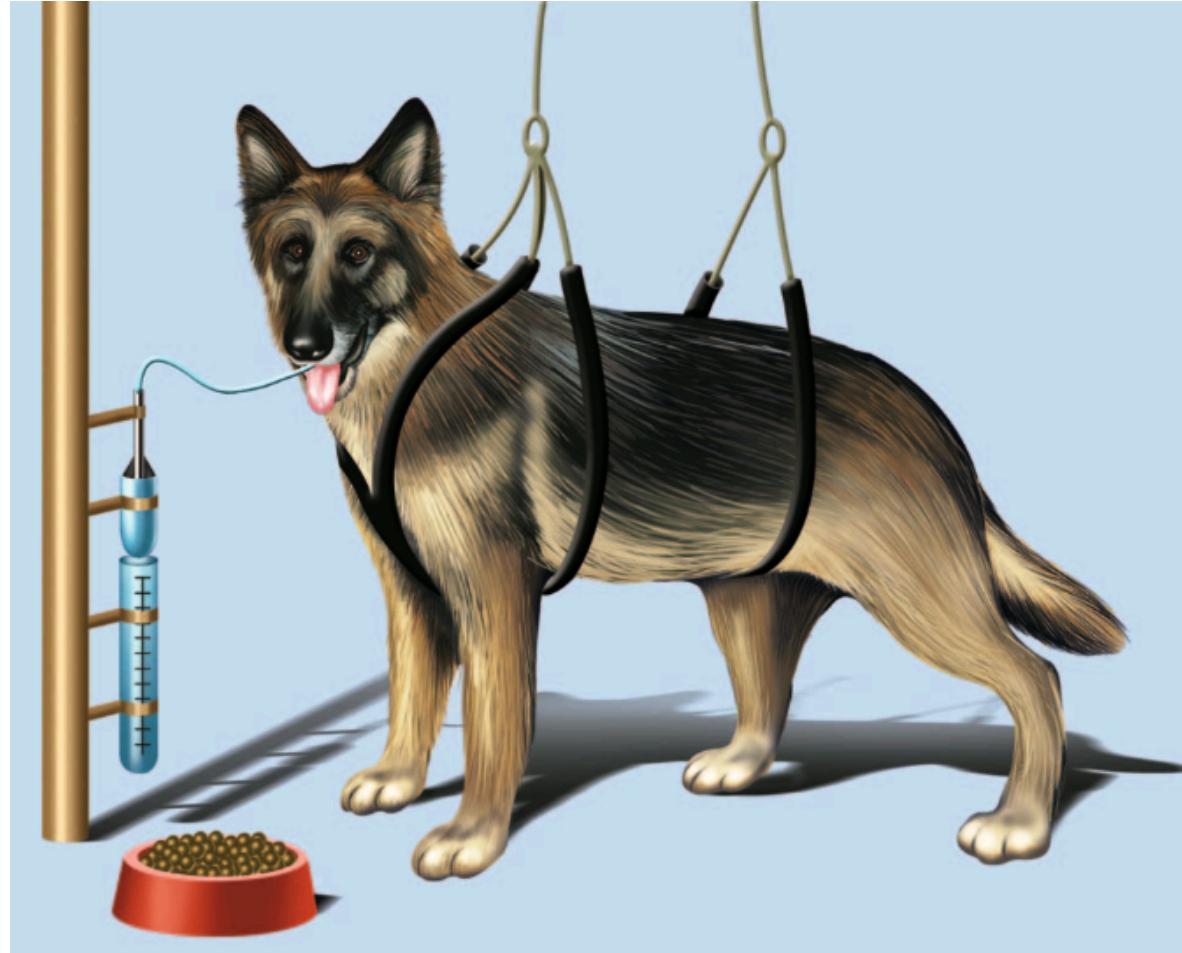


John B. Watson

Watson's “Little Albert” Experiment



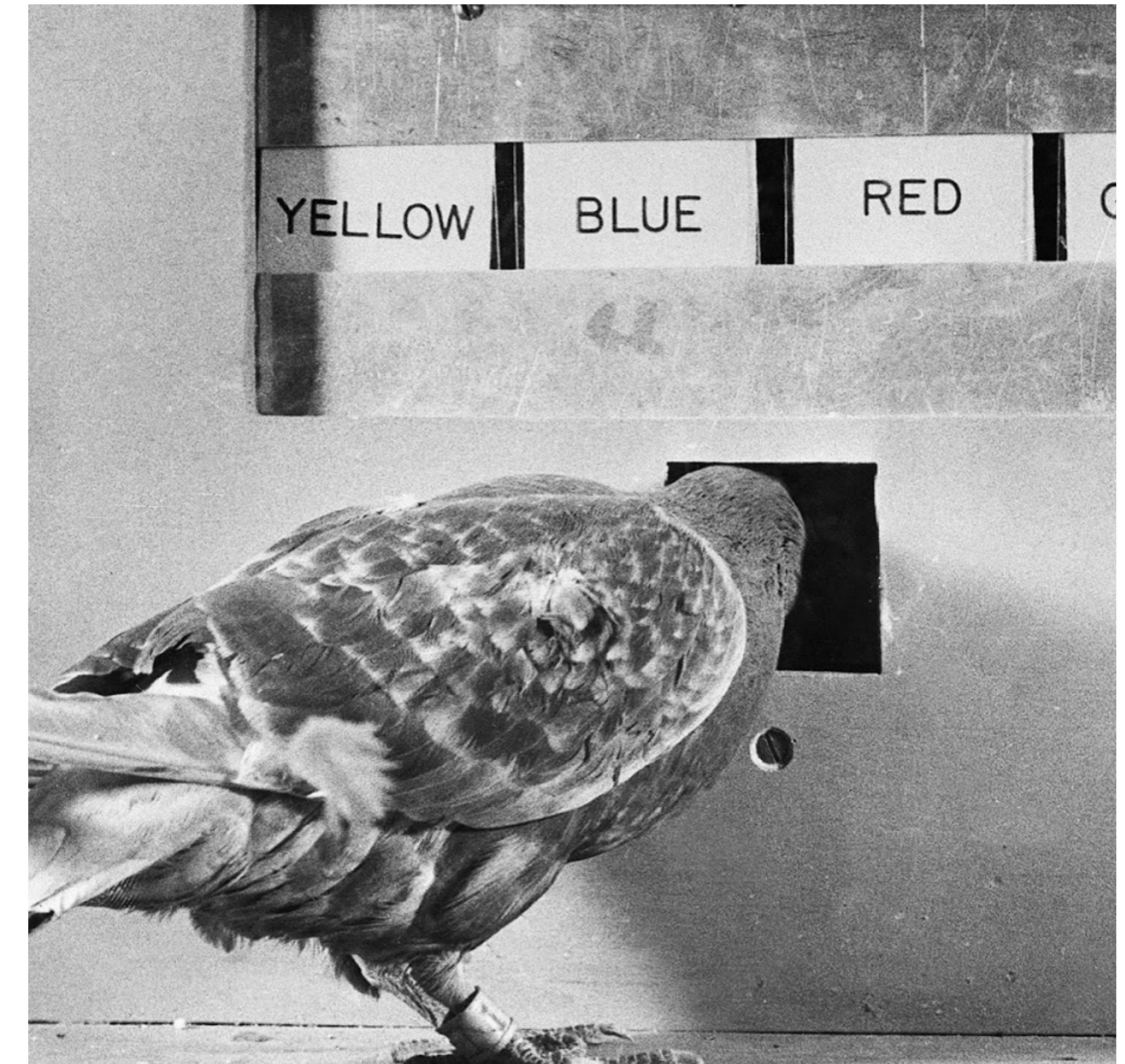
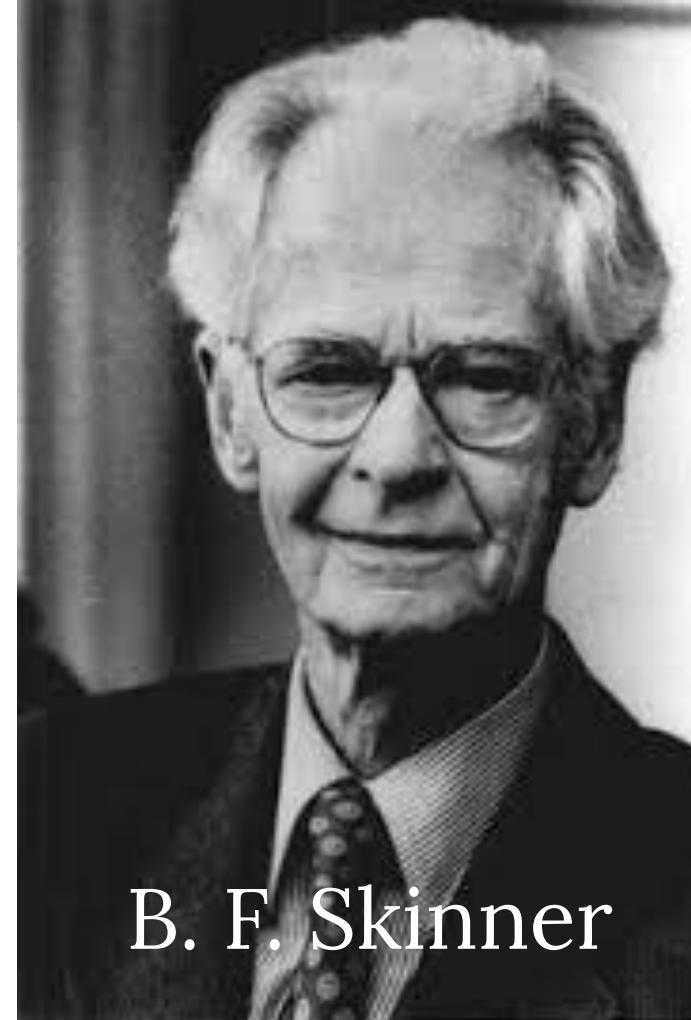
Pavlov's Experiment



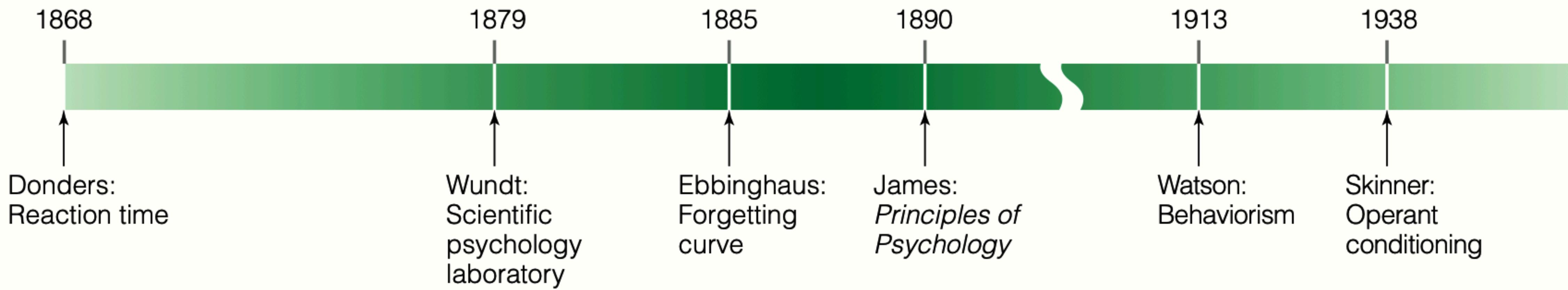
Skinner's Operant Conditioning

- **B. F. Skinner:** Regarded as the father of **operant conditioning**.
- **Operant conditioning:** Behavior increases through positive reinforcement (e.g., food, approval) or removal of negative stimuli (e.g., shock, rejection).

	REINFORCEMENT	PUNISHMENT
POSITIVE	 +	 +
NEGATIVE	 -	 -



Early Studies on Mind and Behaviorism



Great books on the history of the cognitive revolution:

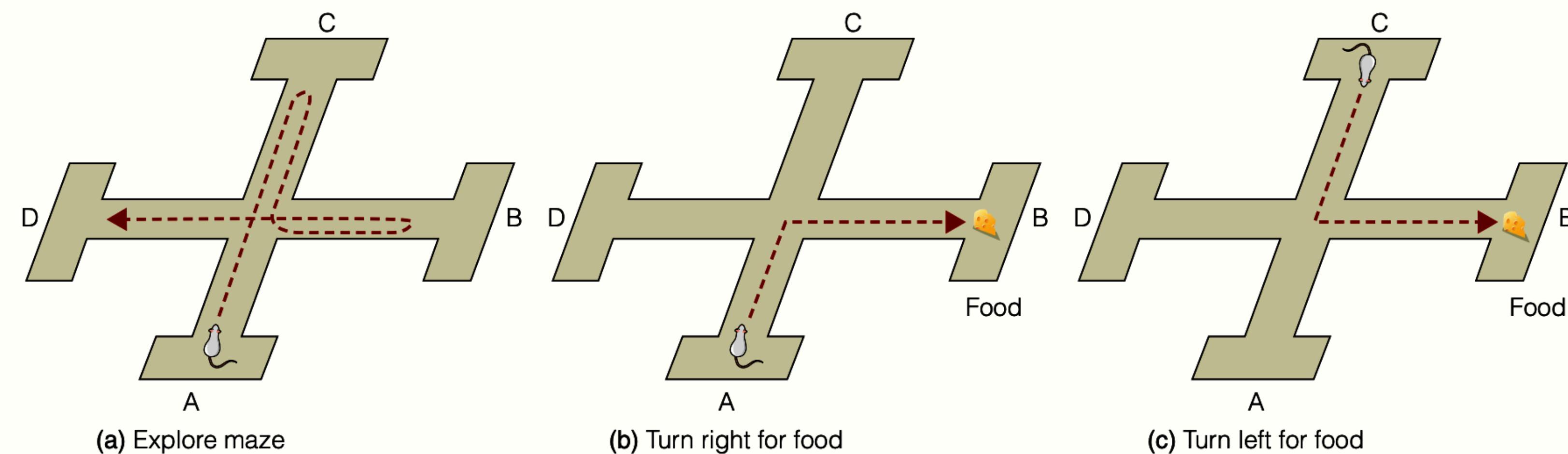
- “The Mind's New Science” by Howard Gardner (1985)
- “Mind as machine: A history of cognitive science” by Margaret Boden (2006)



The Rebirth of the Study of the Mind

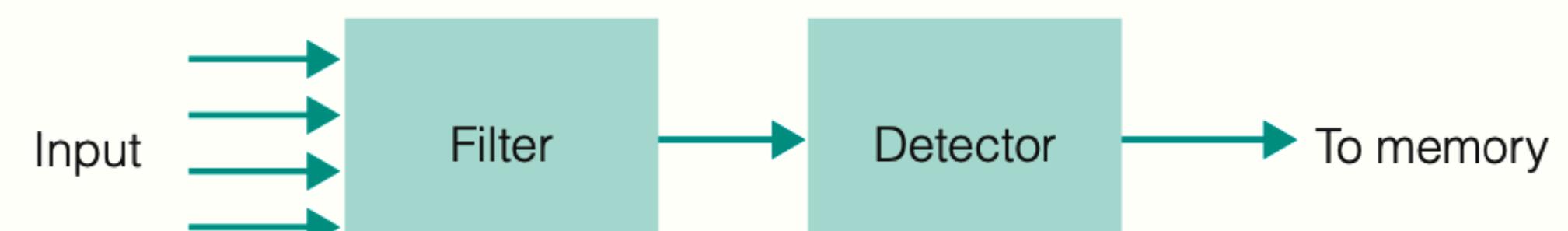
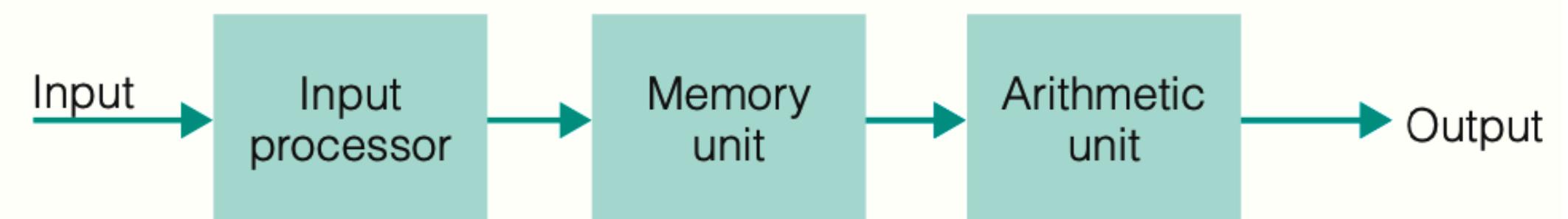
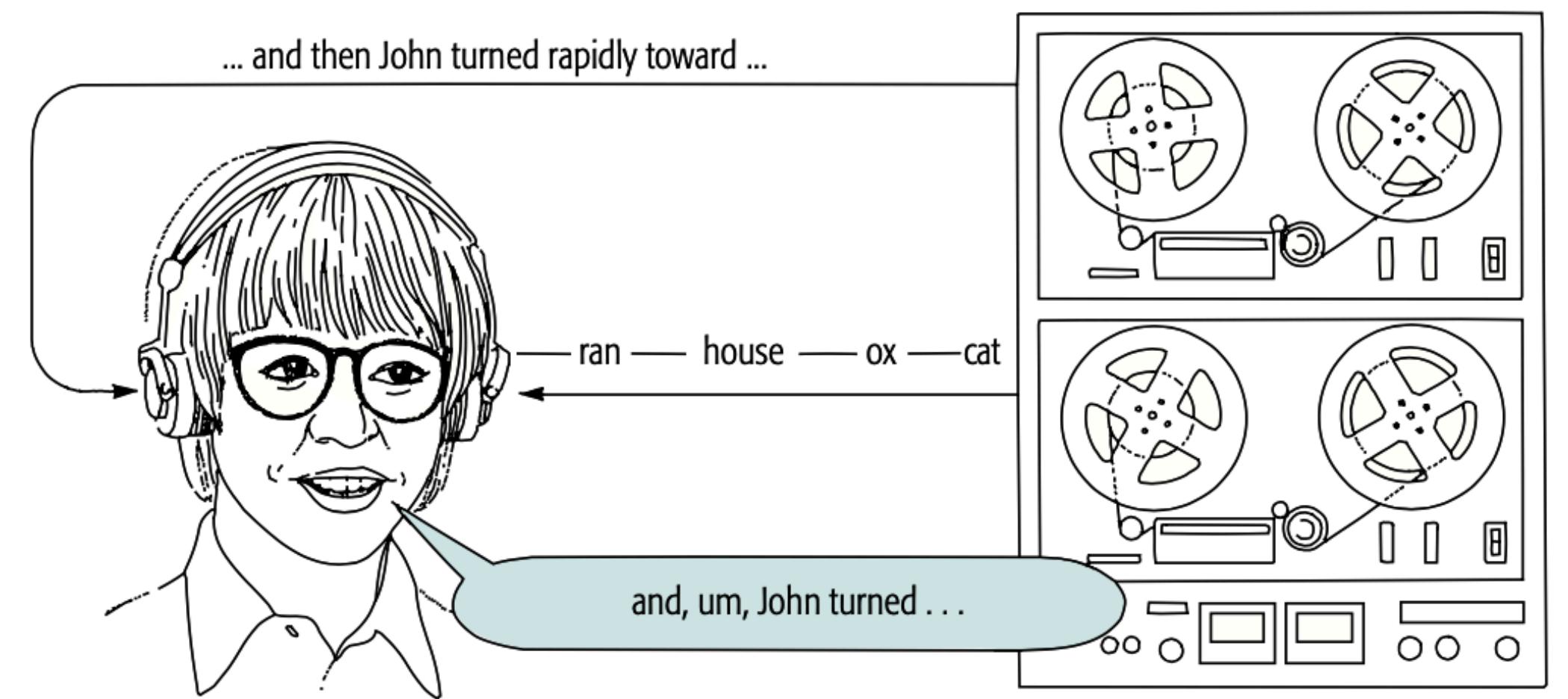
Reemergence of the Mind in Psychology

- Edward Chace Tolman (UC Berkeley, 1918–1954) conducted rat maze experiments that contradicted behaviorist explanations. Instead, Tolman proposed the concept of a **cognitive map**, suggesting that rats formed mental layouts of the maze and adjusted their behavior accordingly.



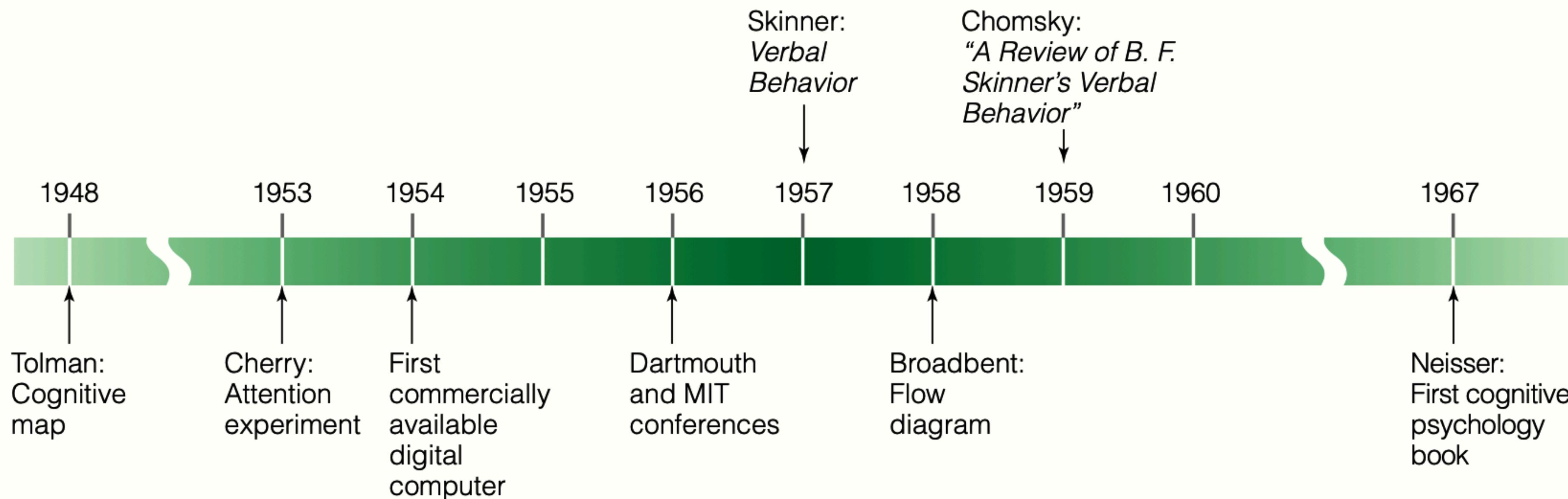
Introduction of the Digital Computer

- Computers inspired psychologists to propose the **information-processing approach** to studying the mind, tracing mental operations involved in cognition. Colin Cherry's **dichotic listening task** in 1953 and Donald Broadbent's early **flow (serial) model of attention** in 1958 emerged around the same period. The term "**artificial intelligence**" was introduced at the first Dartmouth Conference in 1956 by computer scientist John McCarthy.



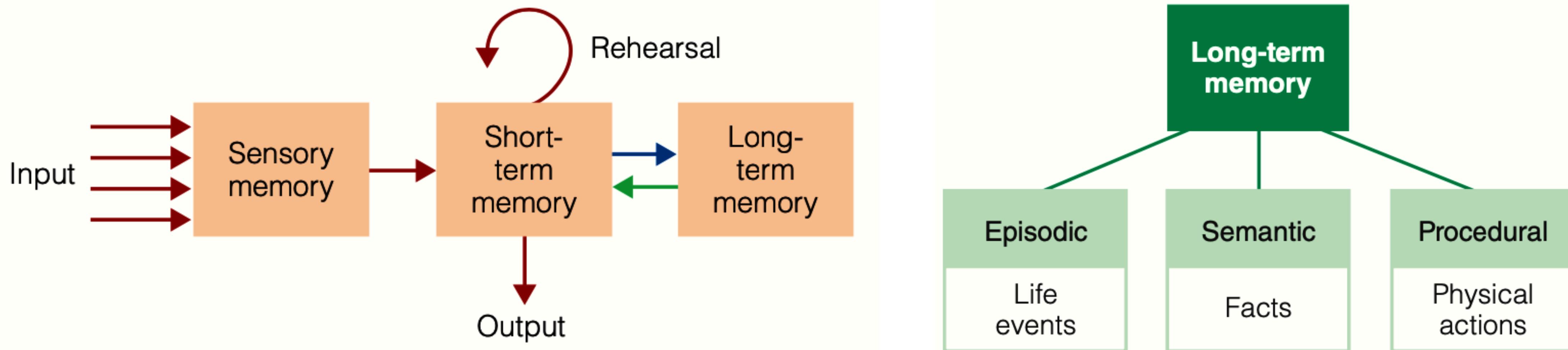
The Cognitive Revolution

- Ulrich Neisser's 1967 textbook "Cognitive Psychology" introduced the term "cognitive psychology" and became the name of this branch of psychology. He emphasized the information-processing approach to studying the mind. Behaviorism's influence began to decline.



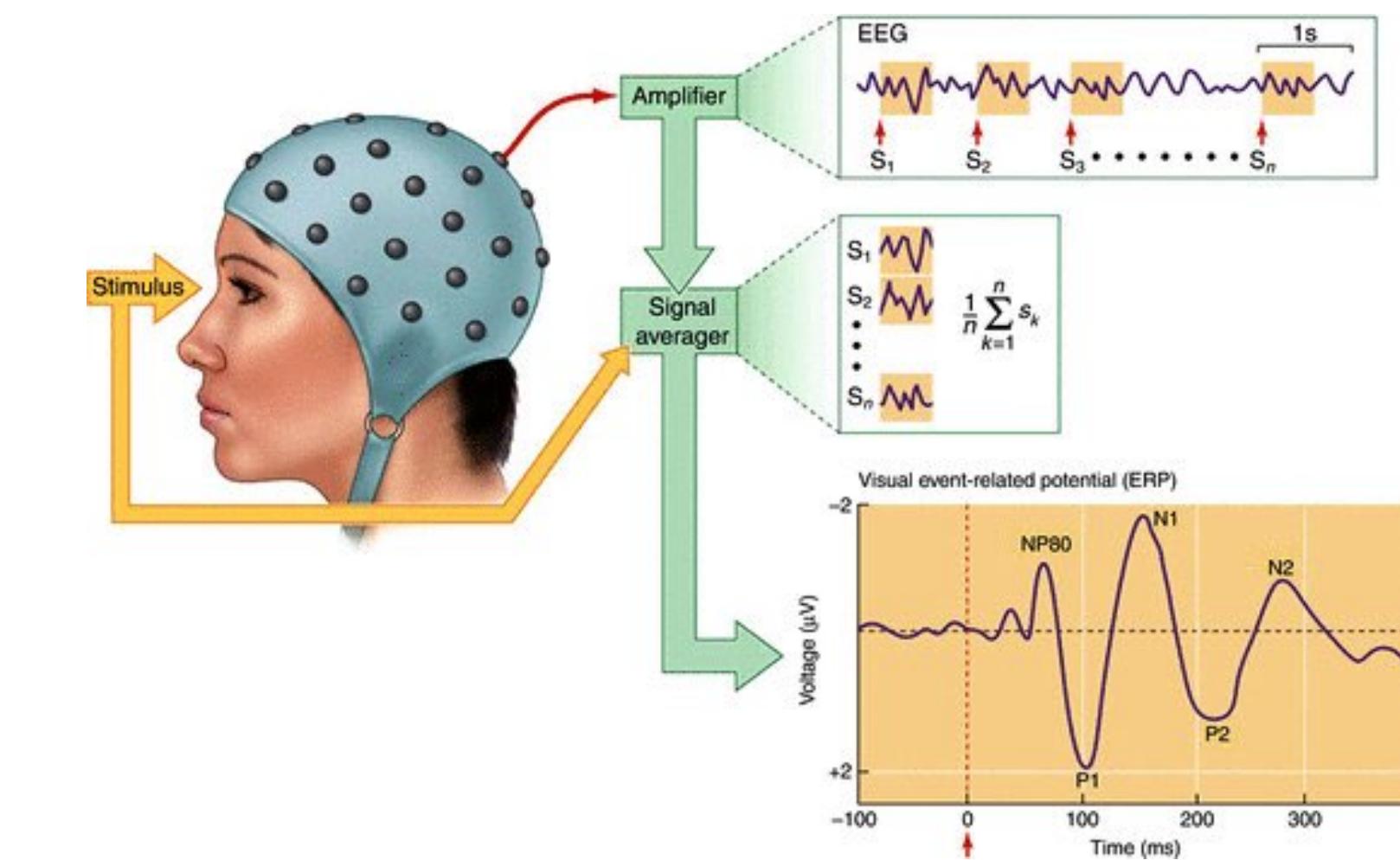
Higher Mental Processes

- Cognitive psychologists made progress in studying **higher mental processes**.
- In 1968, Richard Atkinson and Richard Shiffrin introduced a **memory model**, showing information flow through three stages, a year after Neisser's seminal book.
- Endel Tulvin, an early memory researcher, divided long-term memory into three components.



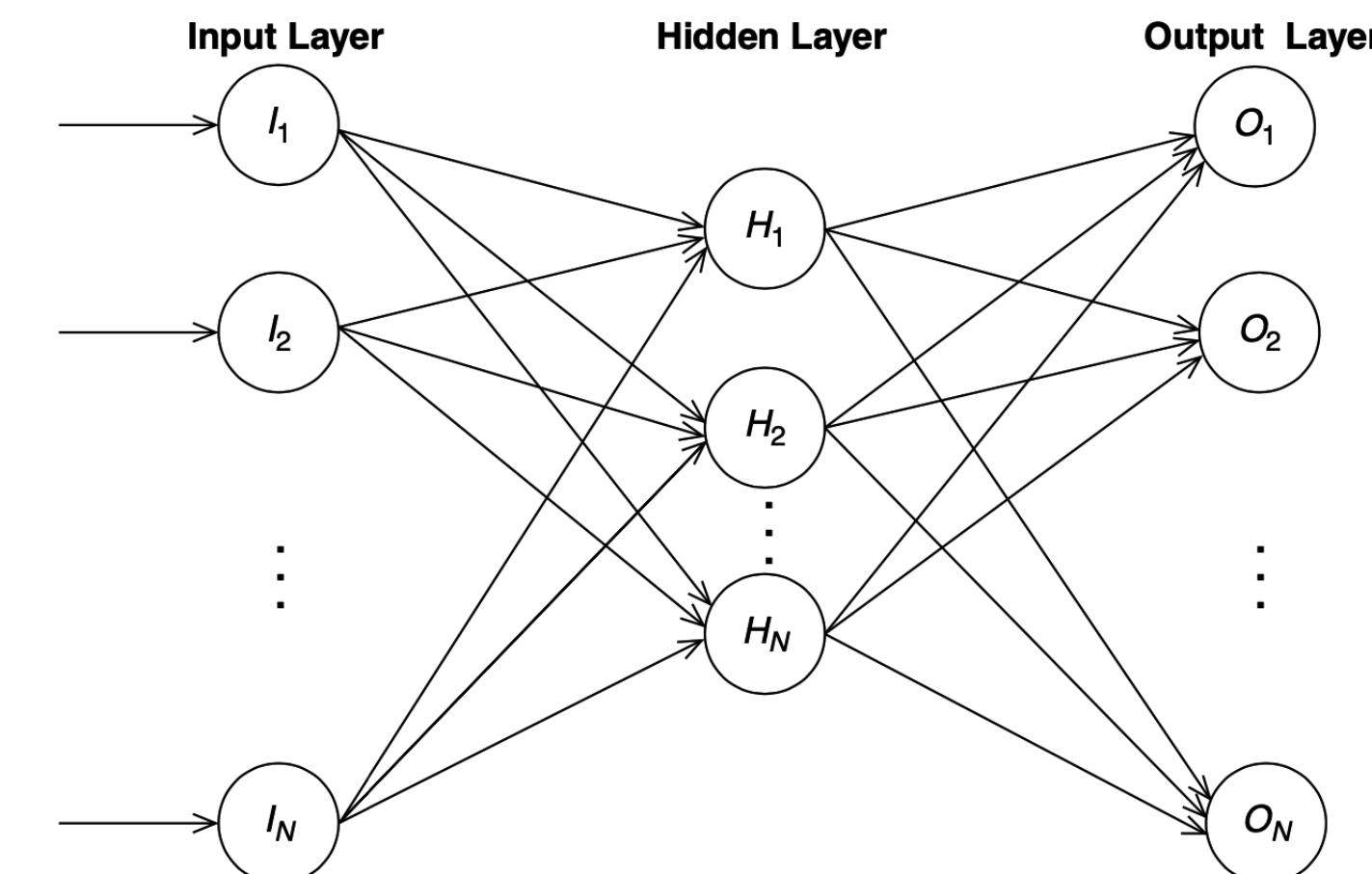
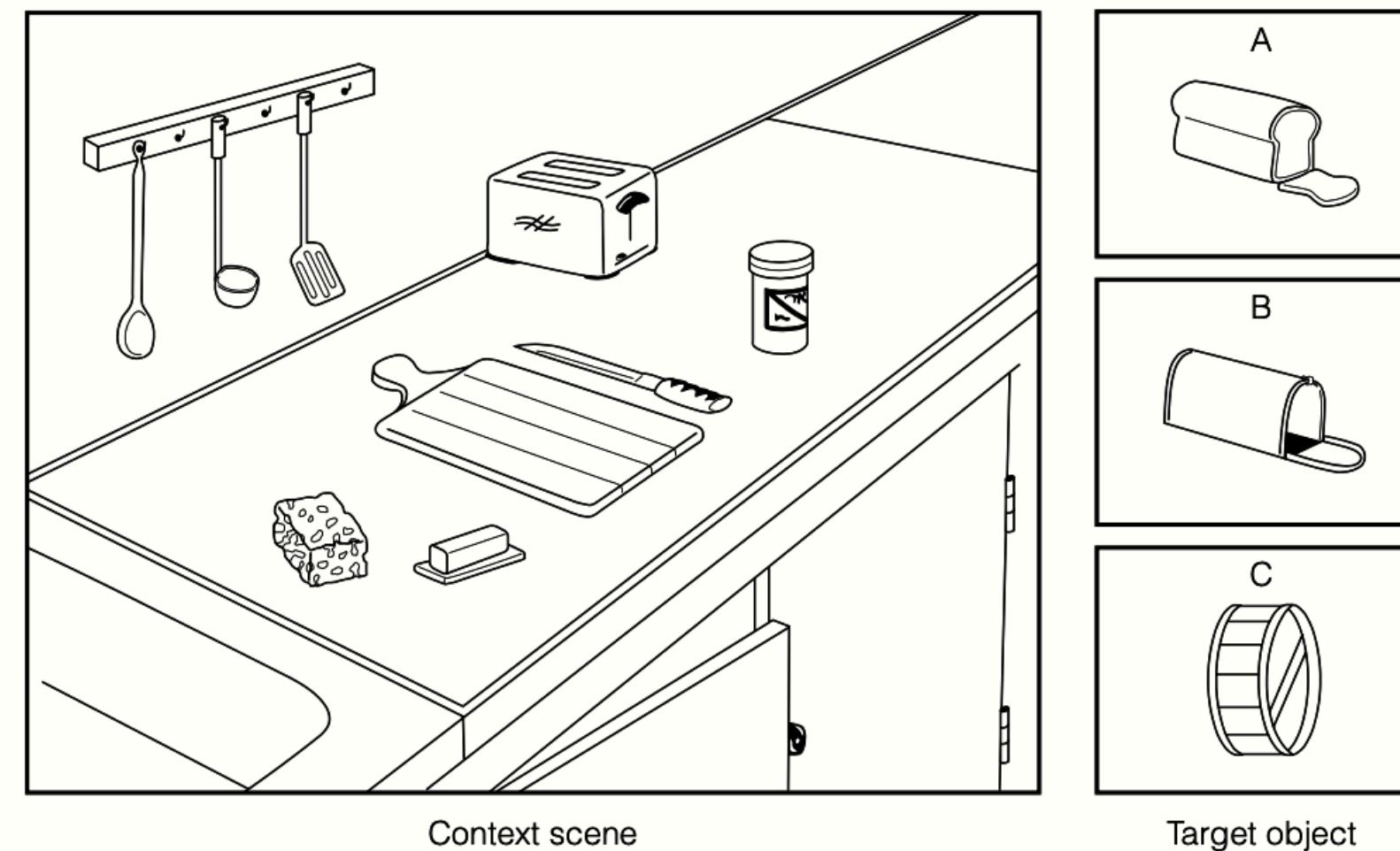
Physiology of Cognition

- **Neuropsychology**, studying brain damage, provided insights into brain function since the 1800s. **Electrophysiology**, measuring electrical nervous system responses, allowed listening to single neurons, mostly on animals. **PET**, introduced in 1976, visualized activated brain areas during cognitive activity but was expensive and involved radioactive tracers. **fMRI replaced PET due to these limitations.** **EEG records** scalp electrical activity over time, while **event-related potentials (ERPs)** observe scalp activity in response to specific stimuli.



New Perspectives

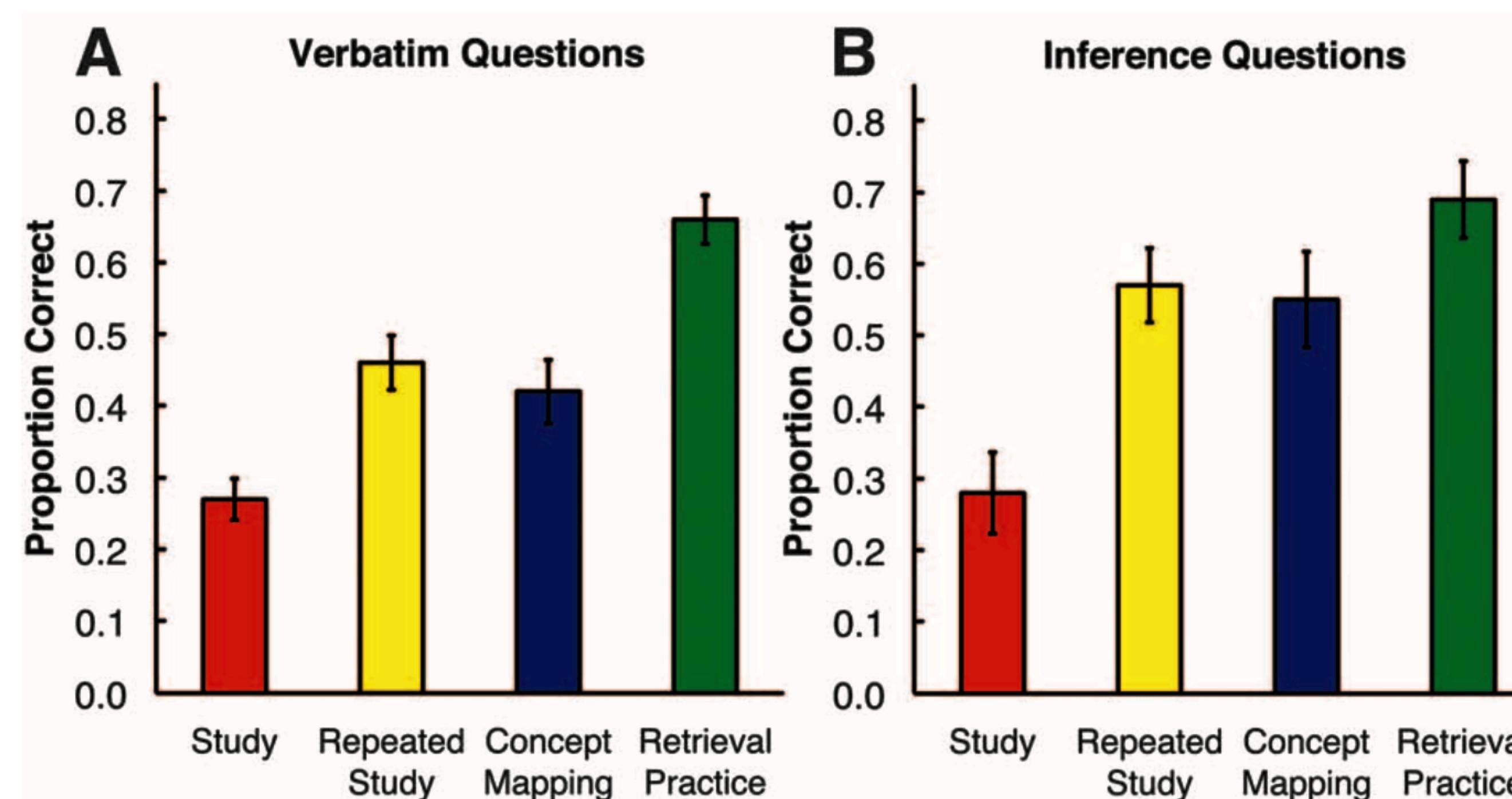
- Modern cognitive psychology increasingly focuses on cognition in **real-world** situations. Our **knowledge** of the environment can influence our perception (Stephen Palmer, 1975). **Neural-network modeling**, also known as **connectionist models**, emerged as a response to the limitations of process models. These models, as their name suggests, consider key brain properties and rely on interconnected units, each representing a neuron or a small group of neurons.



How to Study and Learn More Effectively?

The Importance of Retrieving Information

- The more you actively process and rehearse information, the better you retain it.
- The purpose of a test isn't only assessment. Repeated self-testing and rehearsal of what you've learned will help you retain that information in memory longer. This is known as the "**Testing effect**".



Karpicke, J. D., & Blunt, J. R. (2011).
Retrieval practice produces more learning than elaborative studying with concept mapping. *Science*, 331(6018), 772–775. <https://doi.org/10.1126/science.1199327>

The Importance of Retrieving Information

“Research on retrieval practice suggests a view of how the human mind works that differs from everyday intuition. Retrieval is not merely a read-out of the knowledge stored in one’s mind; the act of reconstructing knowledge itself enhances learning. This dynamic perspective on the human mind can pave the way for the design of new educational activities based on consideration of retrieval processes.”

Karpicke, J. D., & Blunt, J. R. (2011). *Retrieval practice produces more learning than elaborative studying with concept mapping*. *Science*, 331(6018), 772–775. <https://doi.org/10.1126/science.1199327>

Effective Strategies for Improving Studying and Self-Regulated Learning

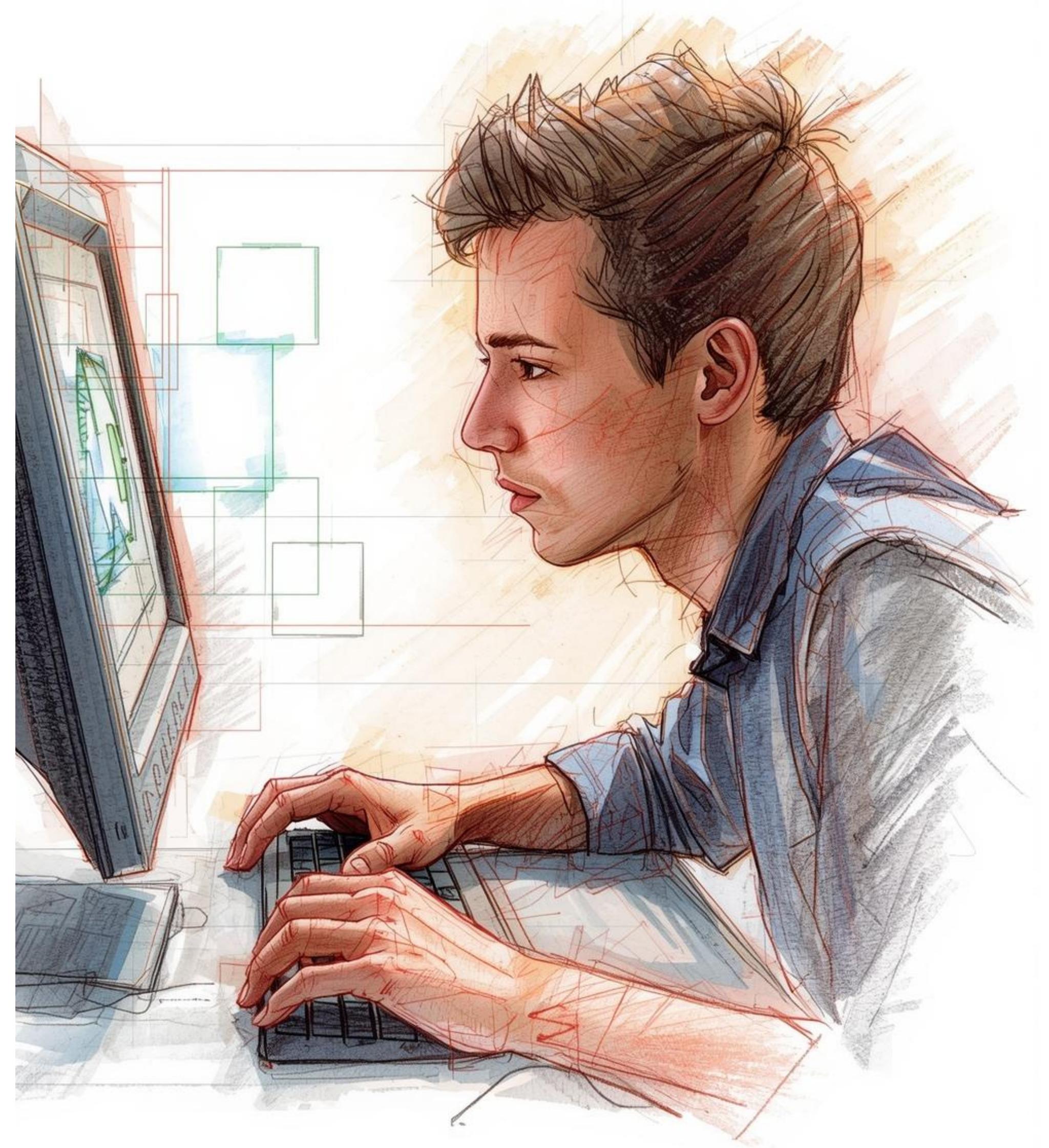
- **Set mastery-oriented goals & plan sessions** (specific short-term targets, organized environment)
- **Use high-yield techniques** (spaced retrieval, elaboration, concept mapping, note taking)
- **Monitor & calibrate** (regular feedback, self-testing, adjust learning tactics)
- **Prompt metacognition** (checklists, planning-monitoring-evaluation cycles)
- **Manage motivation & resources** (connect tasks to personal value, seek help strategically)
- **Reflect & adapt** (log what worked, make concrete tweaks for next time)

Exercises

Simple Reaction Time



Choice Reaction Time



Questions, comments?