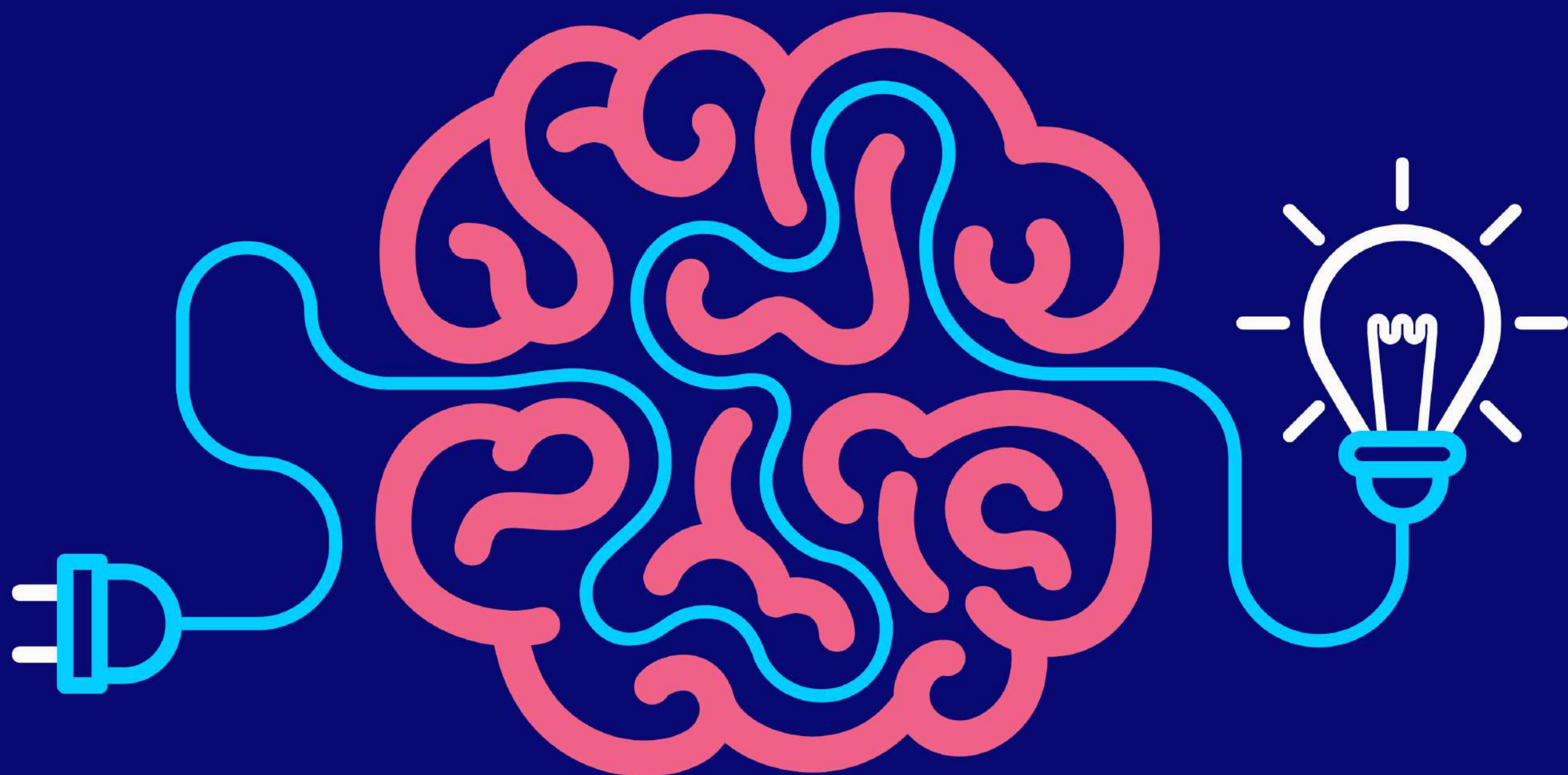


# **5. Cognitive Development Throughout the Lifespan**



## **5.1 Thinking**

## **5.2 Piaget's Cognitive Development Theory**

## **5.3 Vygotsky's Sociocultural Theory**

**5.4 Play**

**5.5 Information  
Processing**

**5.6 Executive Function**

**5.7 Attention**

**5.8 Memory**

**5.9 Problem Solving  
and Planning**

**5.10 Environmental  
Influences**

**5.11 Expertise**

**5.12 Wisdom**

# **5.1 Thinking**





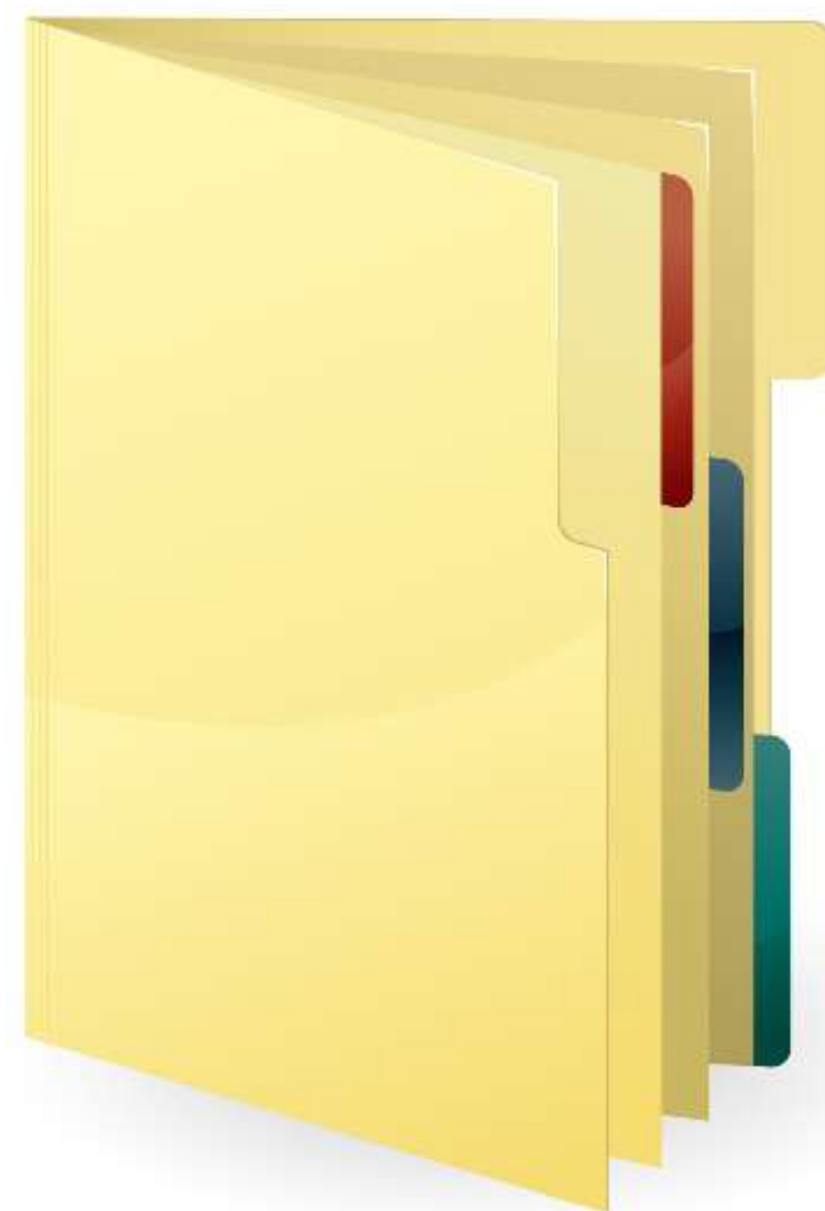


# Thinking and its development

- Thinking differences infant to child to teen to adult
- How/when do changes occur?
- What can/can't be thought at different ages?

## **5.2 Piaget's Cognitive Development Theory**





# **Piaget: observing child thinking/acting**

- **Before cognitive science, but mostly accurate**
- **Stages/ages with distinct thinking traits**
- **Should show up across cultures**



# Piaget: First model

- **Schema = concept or category of information**
  - **Disequilibrium = new facts don't match schema**
  - **Adaptation (reorganize)**
    - Accommodate (modify)**
    - Assimilate (incorporate)**
- **New equilibrium**

# Piaget: Example

- Schema: DOG = small, furry
- Disequilibrium: Say “DOG” parent says, “No, CAT”



# Piaget: Example

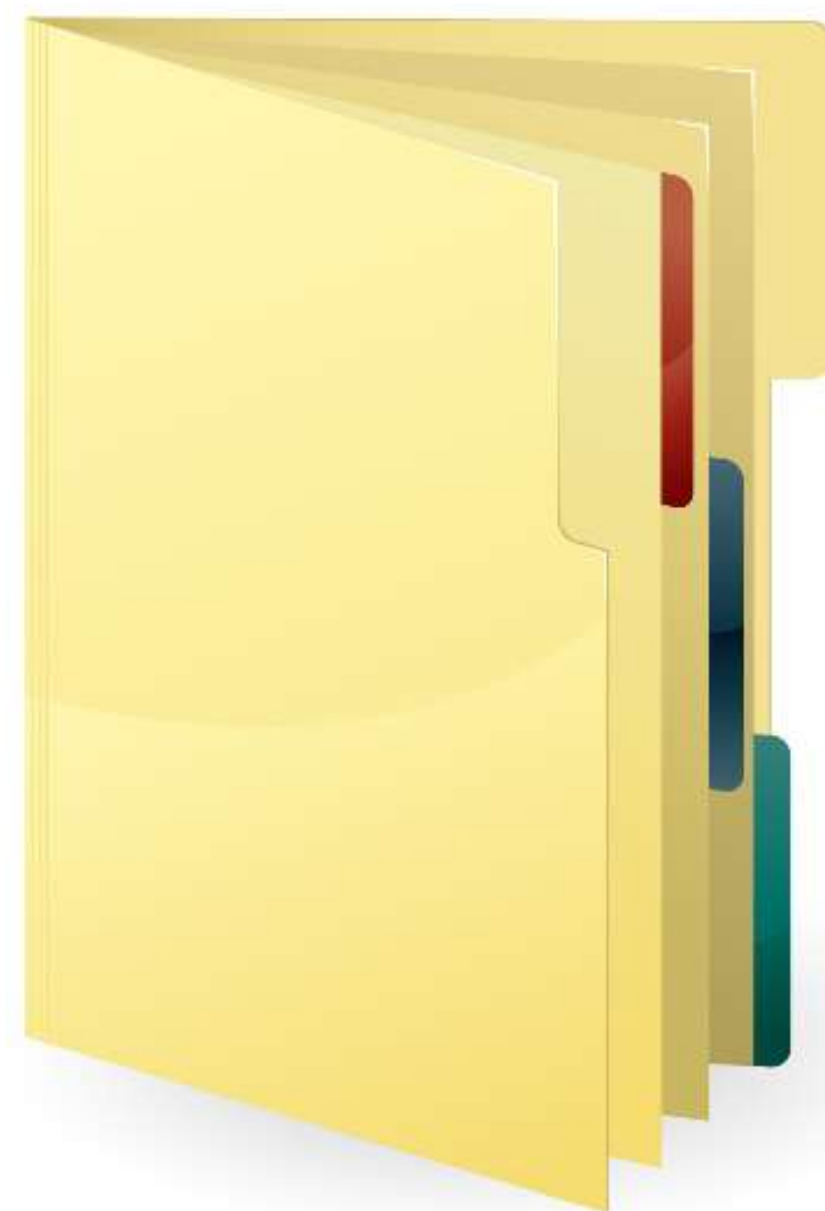
- Adaptation

Accommodation:

Some small, furry are  
not dogs

Assimilation: Create  
new CAT schema

→ New equilibrium  
achieved





# **Sensorimotor stage (0-2)**

## **Characteristics & challenges**

- **Senses and manipulation**
- **Focus and intention**
- **Object permanence**
- **Imitation**
- **“Random” explorations and experimentation**

# **Preoperational (2-7)**

- **Centration (can filter only 1 attribute out of many), so not able to understand**
- **Conservation of quantity**
- **Reversibility of operations**
- **Egocentric viewpoint**
  - **From “my” perspective**
  - **Animism (“Ball is sad”)**

# **Preoperational (2-7)**

- **“Play” as primary learning mode**
- **Language acquisition**
- **Also time of mastering gender identity/stability**

# **Concrete operations (7-11)**

- **Mastery of previous challenges**
- **Less egocentric**
- **Logical reasoning**
  - **Classification (by attribute)**
  - **Seriation (sequencing)**



# **Formal operations (11-)**

- **Abstract reasoning**
  - **Literary symbols**
  - **Ideological implications**
- **Quantitative concepts**  
**(higher math, geometry)**
- **Hypothetical reasoning**
  - **Generate hypotheses**
  - **Idealization**

## **5.3 Vygotsky's Sociocultural Theory**







# **Vygotsky: Social learning**

- **Internalization = soaking up environment (learning) through interaction with others**
- **Observation and imitation central to learning**



# Scaffolded learning

- Parent/sibling/teacher assesses zone of proximal development (gap in skills or knowledge)
- “Teacher” sets up mediated learning experiences
- Sets environment to fill in gap sequentially

## 5.4 Play









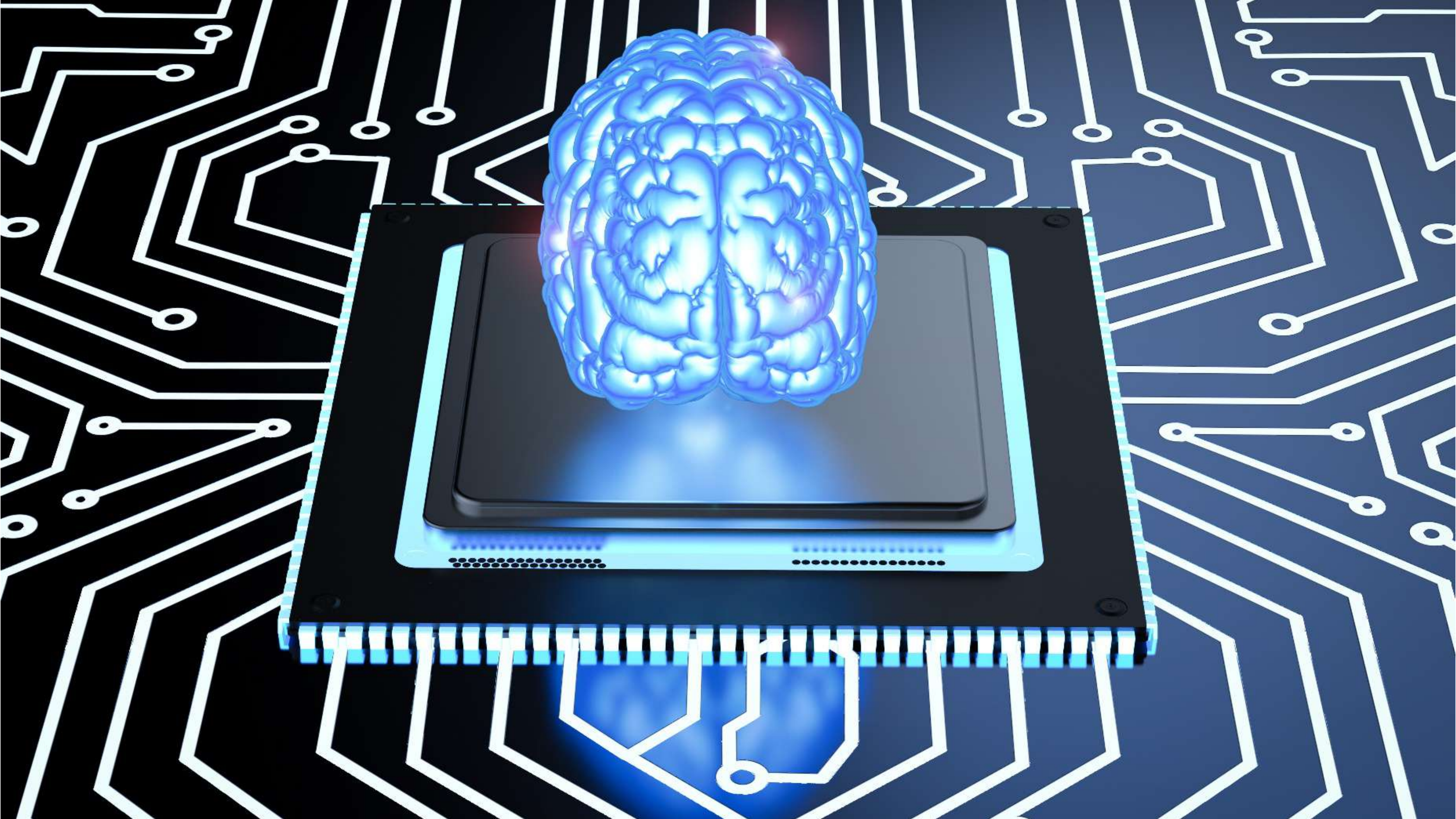


# **Play: child's work**

- **Fits Piaget and Vygotsky**
- **Stages of play:**
  - **Solitary**
  - **Parallel**
  - **Cooperative**
- **Types of play:**
  - **Constructive**
  - **Symbolic/pretend**

## **5.5 Executive Function**







# **Executive function**

- **All brain processes that affect learning/behavior**
- **Examples: control of attention, memory**
- **Early childhood (2-5):**
  - **Inhibitory control (block impulses)**
  - **Working (temporary) memory**



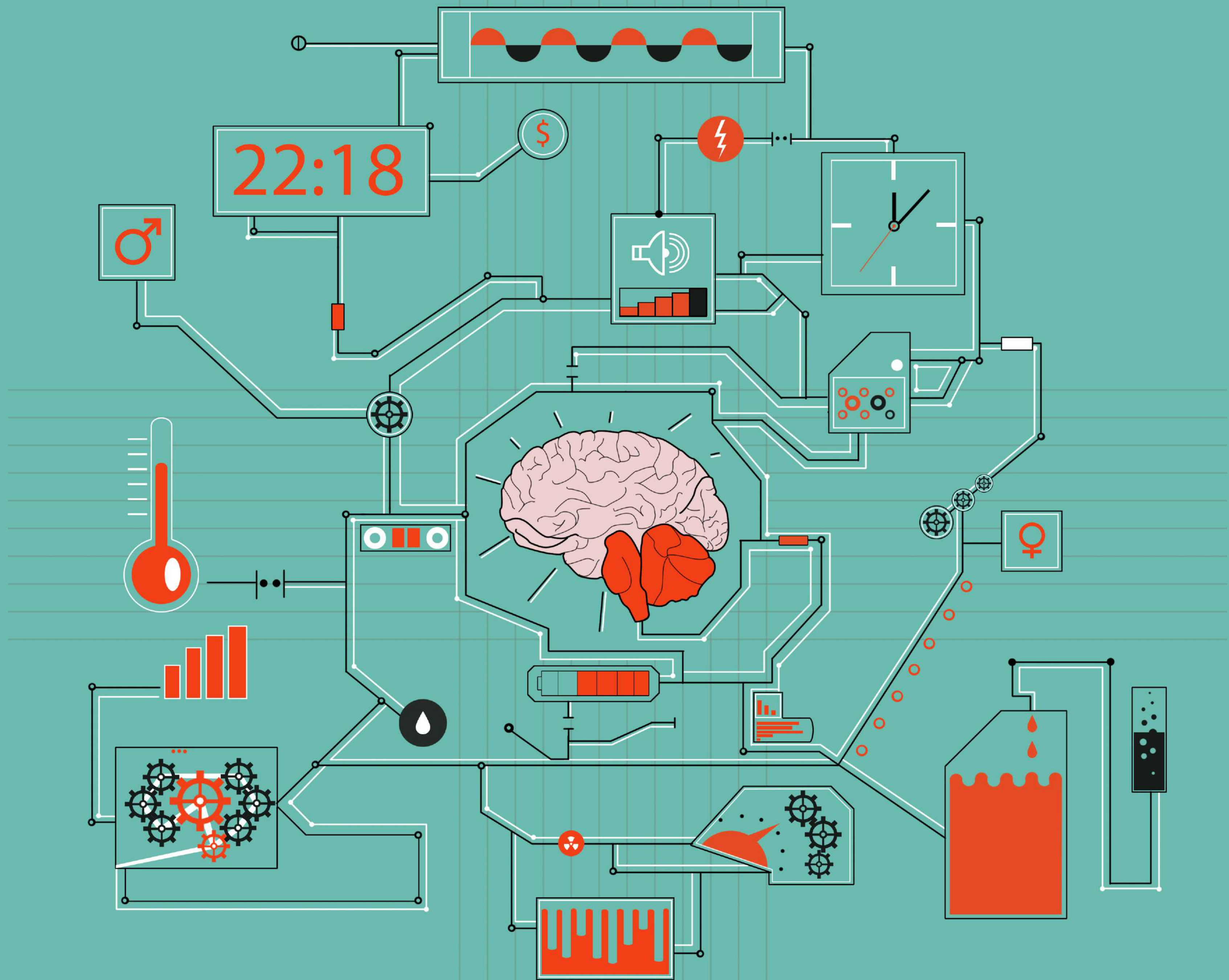
# **Executive function**

- **Middle childhood (6-12):**
  - **Verbal working memory**
  - **Plan/organize**
  - **Cognitive flexibility**
- **Adolescence:**
  - **Strong improvement of all previous**

# Executive function

- **Adulthood:**
  - **Myelination in prefrontal cortex for maximum cognitive ability (peak 20-29)**
  - **Decline in memory in later adulthood**
  - **Cognitive flexibility starts declining age 70**

## **5.6 Information Processing**





# Cognitive science brain models

- Explain how executive function works
- How stimuli “out there” → useable knowledge
- Memory processes:
  - Attend (focus)
  - Encode (retain)
  - Retrieve (recall)

## **5.7 Attention**

**NEXT EXIT**

**ATTENTION  
PLEASE!**

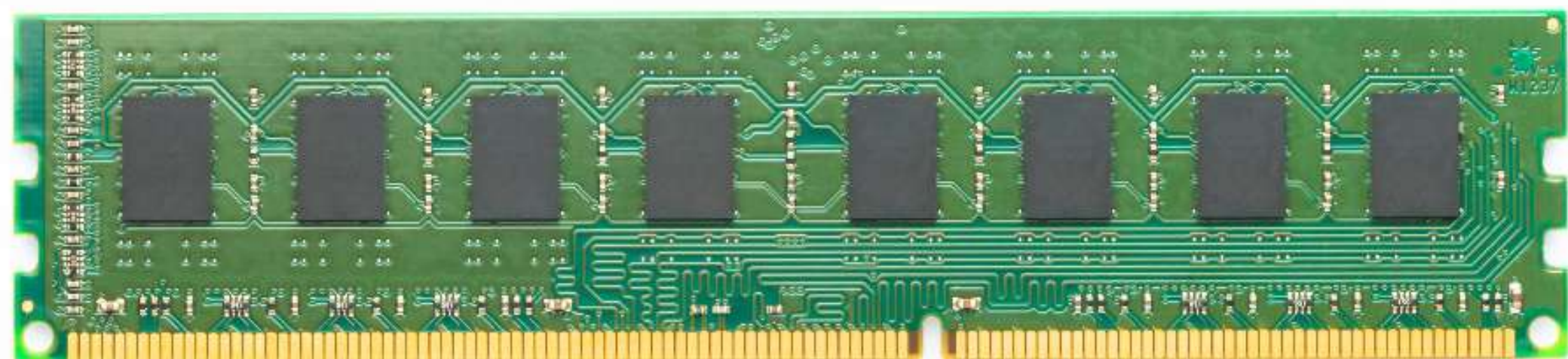
# **Attention**

**Act of focusing/filtering  
sensory input**

- **Sensory input is constant,  
changing, and vast**
- **From earliest age, brain  
learns to filter and attend  
to small portion of input**



## 5.8 Memory



# **Working memory (aka “short-term memory”)**

- **Like computer RAM  
(temporary storage  
before processing)**
- **Capable of storing few  
bits of information**
- **Size of bits can be  
enlarged by chunking**



# Rehearsal

**Prevent loss of working  
memory contents**

- **Maintenance rehearsal =  
rote/repetition**
- **Elaborative rehearsal =  
encoding by activity or  
by relating to previous  
knowledge**

# **Long-term memory**

**Like computer storage**

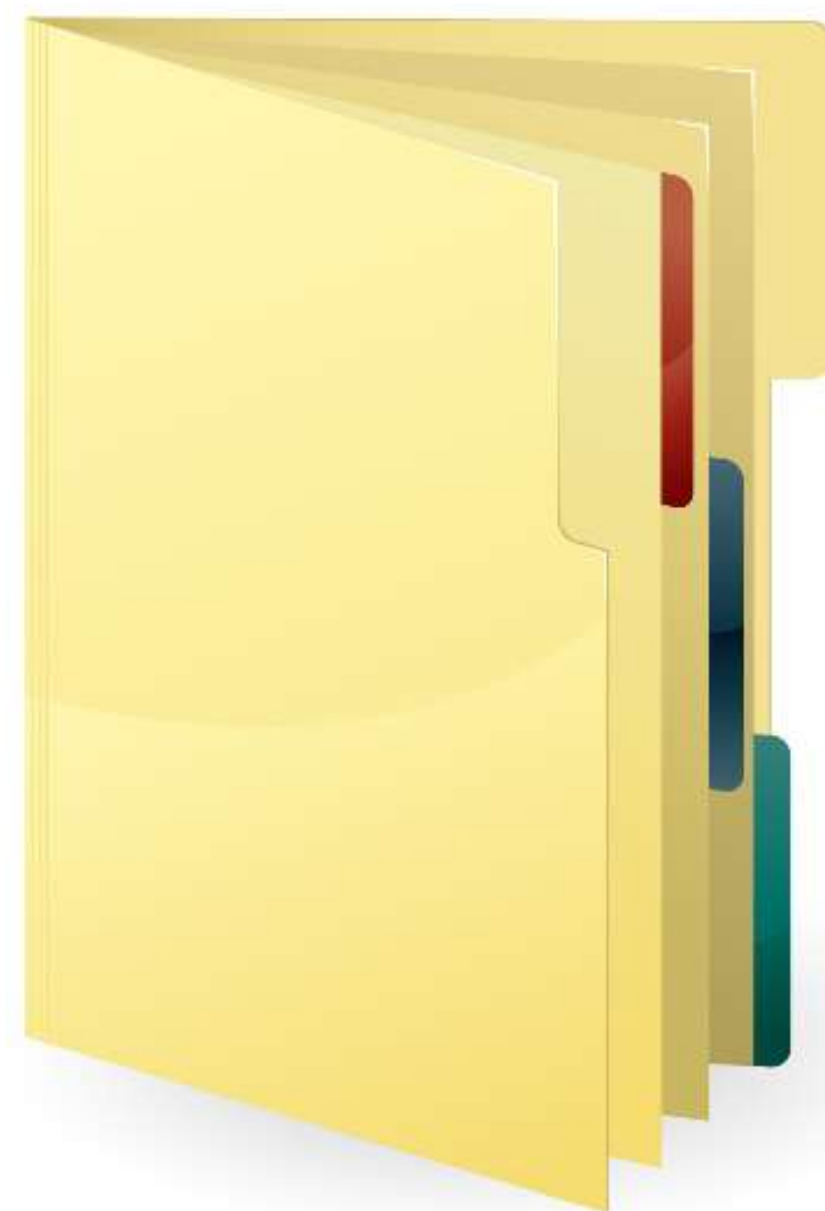
- **Semantic = facts and information**
- **Episodic = experiences and events**
- **Procedural = “how-to”**



# **Schemata (plural)**

## **Organizational metaphor**

- **Like folders on computer screen to show contents**
- **Schema = concept or category (e.g. “dog”) [like document folder]**
- **Subschema = sub-category [folder in folder]**





## **5.9 Problem Solving and Planning**







# **Problem-solving ability**

- **Related to developing prefrontal cortex and myelin sheathing**
- **Ability in childhood, big increase in adolescence, more in early adulthood**



# **Synthesizing memory for new situations**

- **Brainstorming (idealizing and rearranging memory)**
- **Creating/using heuristics (general rule, mental map)**
- **Ability to work backward from goal**

## **5.10 Environmental Influences**







# Cognitive influencers

- Long-term stress (family, SES, events)
- Affects brain structure development
- Affects hormone balance brain/body
- Culture & gender
- Expectations mold cognitive functions

## **5.11 Expertise**







**10,000 Hours = 10  
years**

- **Expertise: know, apply, analyze, and synthesize**
- **Associated with middle adulthood → peak of knowledge/ability**
- **Good for promotion, mentoring, or entrepreneurship**



## **5.12 Wisdom**







# Wisdom of age?

- **Associated with late adulthood (but not all)**
- **Self-awareness, emotional stability, appropriate word/action**
- **Understanding and empathy**
- **From helping and leading others**