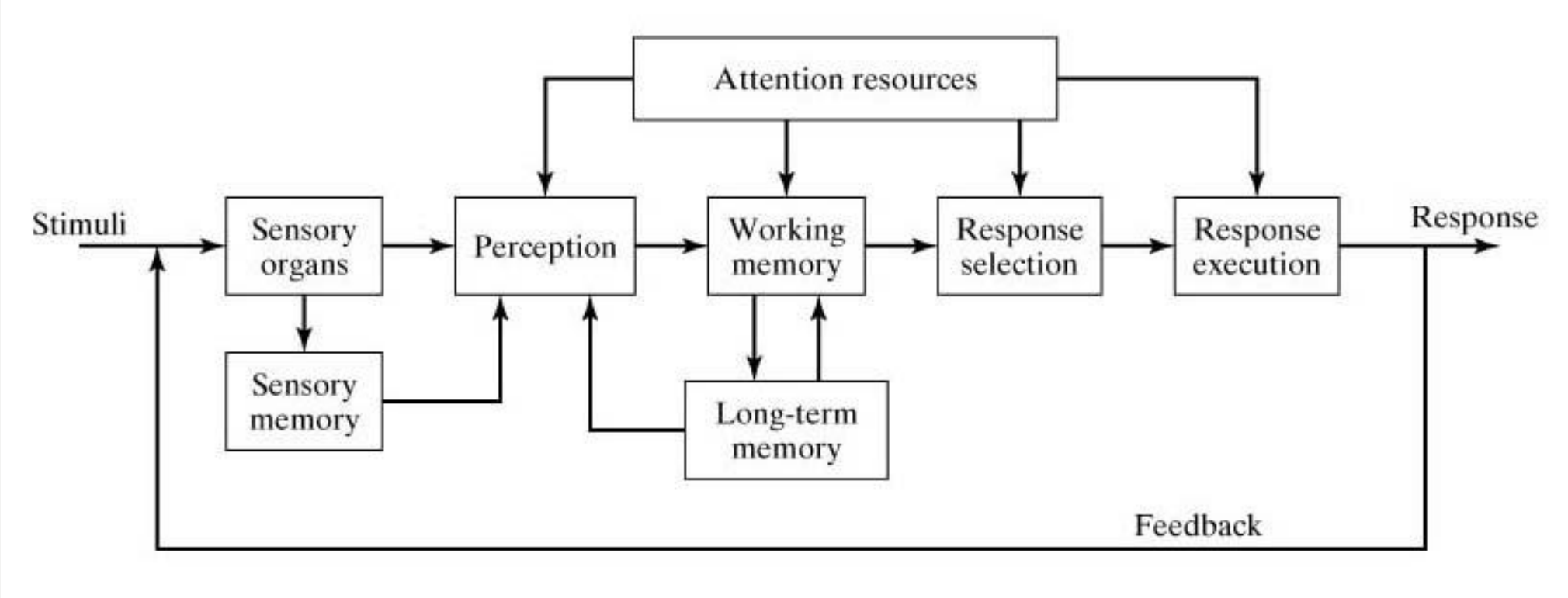
COGNITIVE ERGONOMICS

DR. ANKUR GUPTA
IIT BHUBANESWAR

SUMMARY OF PREVIOUS LECTURES

1. The Human Sensory System
2. Perception
3. Attention Resources

HUMAN INFORMATION PROCESSING MODEL



MEMORY

LECTURE OUTLINE

- Memory
- Types of memory
  - Sensory memory
  - Working memory
    - Capacity of working memory
  - Long term memory
    - Types of long term memory

MEMORY

- Three categories of memory in the model of human information processing:
  1. Sensory memory
  2. Working memory
     - Also called short-term memory
  3. Long-term memory

TYPES OF MEMORY

SENSORY MEMORY

SENSORY MEMORY

- Associated with the human sensory channels, mainly sight and hearing
- Operates autonomously
  - Does not require attention resources
- Vision sensory memory called *iconic* storage
  - Only lasts ~ 1 second
- Hearing sensory memory called *echoic* storage
  - Lasts a few seconds
- Sensory memory data disappears unless encoded and processed in working memory

WORKING MEMORY

WORKING MEMORY

Consists of three primary components, according to one plausible model:

1. Central executive component - coordinates activities of other two components
   - Also interacts with long-term memory
2. Visuospatial sketchpad - operates with visual and spatial information while it is being processed in working memory
3. Phonological loop - operates with verbal and acoustical information while it is being processed in working memory

MORE ON WORKING MEMORY

- Number of images, sounds, and ideas that can be processed in working memory at one time is limited
- Key performance factors in operation of working memory:
  1. Capacity
  2. Time factor
  3. Attention resources
  4. Similarity of information items

CAPACITY OF WORKING MEMORY

CAPACITY OF WORKING MEMORY

- Upper limit on the number of information items that can be processed at one time in working memory is 7 ± 2
- An information item is called a *chunk* - an information entity the mind works with as a unit
  - A chunk can be a single digit or a group of digits or other data forms that are stored as a single item
  - When a chunk is retrieved, it is retrieved in its entirety

TIME FACTOR

- Information contained in working memory gradually declines in strength as time proceeds
- To avoid this decay, the information must be periodically refreshed
  - When the chunks are phonologic, the information is rehearsed
    - A person repeats the chunks subvocally to keep them in working memory
  - For visual or spatial chunks, there is an analogous refresh process, but conversion to vocal data is sometimes used

ATTENTION RESOURCES

- Attention resources are required during operation of working memory
  - More resources for more chunks of information being processed
- Attention resources are needed
  - To refresh chunks of information (e.g., rehearsal)
  - To transfer information to long-term memory

SIMILARITY

- Chunks of information that are similar are more difficult to process and decay at a faster rate
- Most applicable in the phonetic loop
- Examples:
  - More difficult to remember:
    - T G 3 E D B
  - Easier to remember:
    - T K 5 L N O

LECTURE CLOSING

A BRIEF HISTORY OF COGNITIVE PSYCHOLOGY & ERGONOMICS

EARLY 20TH CENTURY

Edward Tolman

- Edward Tolman was known for "his work that centered around demonstrating that animals had both expectations and internal representations that guided their behavior." (Galotti, 1994)
- He believed that rats used a cognitive map in order to complete the maze instead of memorization. He showed this by putting rats in different places on the maze than ones where they had been trained. The rats reached the goal point without going to the learned place. This supported the notion that they had created a cognitive map.

THANK YOU

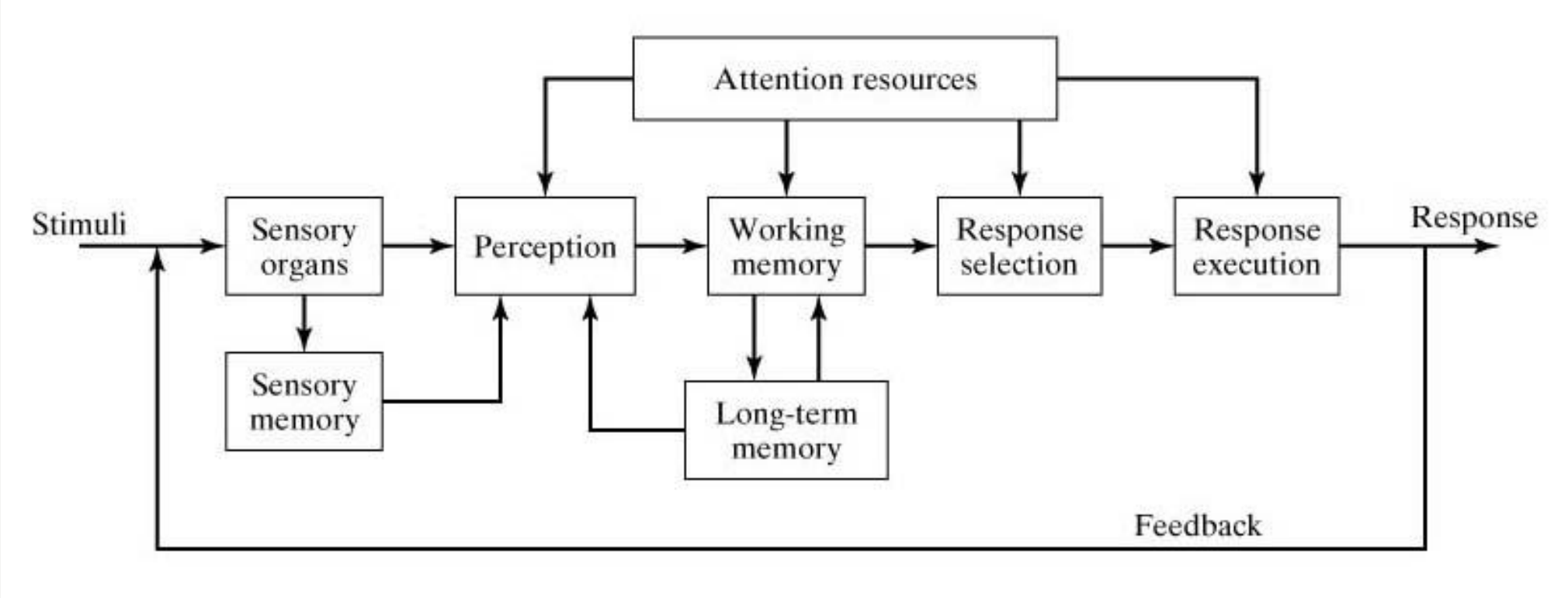
COGNITIVE ERGONOMICS

DR. ANKUR GUPTA
IIT BHUBANESWAR

SUMMARY OF PREVIOUS LECTURES

1. **Memory**
   - **Working memory**
   - **Capacity of working memory**

HUMAN INFORMATION PROCESSING MODEL

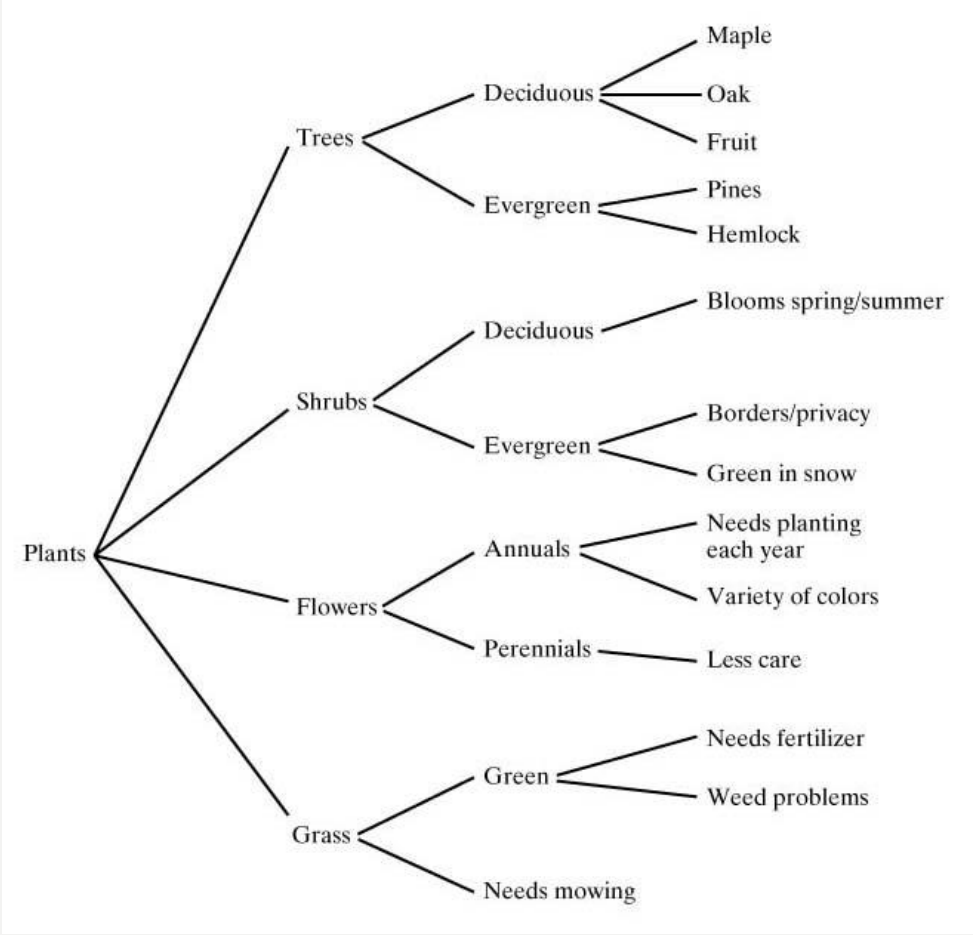


LONG TERM MEMORY

LONG-TERM MEMORY

- Much of the information processed in working memory is transferred to and retrieved from long-term memory
- Information in long-term memory consists of semantic codes
  - Individual items are given meaning and are organized into symbolic structures and associations
    - The structures allow for new information to be added

MODEL OF LONG-TERM MEMORY



TYPES OF LONG-TERM MEMORY

- Semantic memory - used predominantly to store facts, figures, and other information related to
  - General knowledge about the world
  - Specific knowledge about one's work
- Episodic memory - refers to memory of important events and episodes in one's life
  - Example: memory of the death of a parent

LECTURE CLOSING

DID YOU KNOW……????

- Dreams carry more weight and meaning than our conscious thoughts while awake. 70% of your dreams contain secret messages.

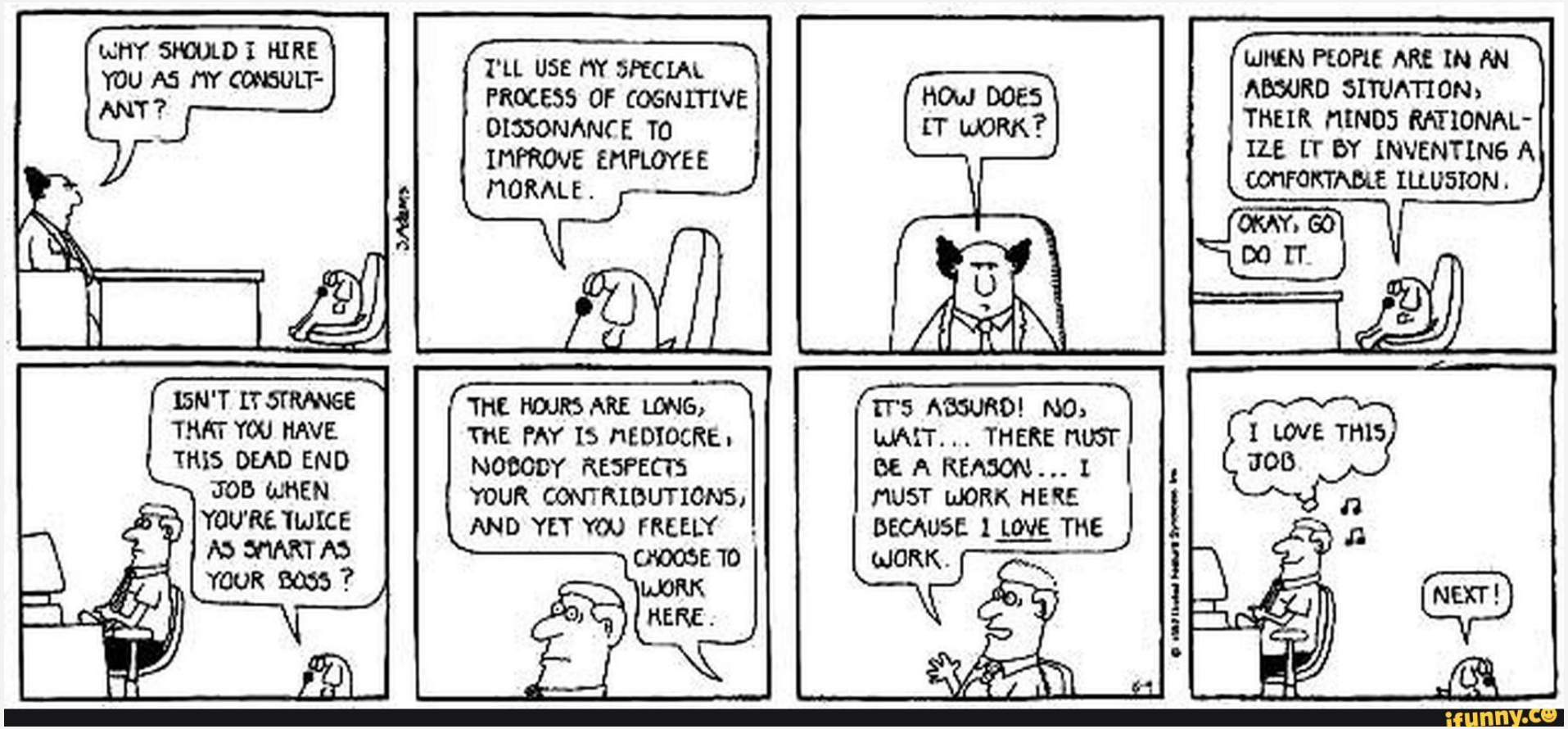
A BRIEF HISTORY OF COGNITIVE PSYCHOLOGY & ERGONOMICS

EARLY 20TH CENTURY

Wolfgang Kohler

- Wolfgang Kohler was known for his early criticism of the characterization of problem solving. His famous study involved “an ape in a cage”, Sultan, that was given two hollow bamboo sticks. A banana was placed outside the cage out of range for the sticks to reach it. For a certain amount of time the ape tried to reach the banana with the sticks, failing each time. At a certain point Sultan was observed to sit quietly for a time, after which he put the two sticks together. Kohler called the sudden solution that followed the quiet time "insight" and concluded that it was a typical property of problem solving.

GRAFFITI


WHY SHOULD I HIRE YOU AS MY CONSULTANT?
I'LL USE MY SPECIAL PROCESS OF COGNITIVE DISSONANCE TO IMPROVE EMPLOYEE MORALE.
HOW DOES IT WORK?
WHEN PEOPLE ARE IN AN ABSURD SITUATION, THEIR MINDS RATIONALIZE IT BY INVENTING A COMFORTABLE ILLUSION.
OKAY, GO DO IT.
ISN'T IT STRANGE THAT YOU HAVE THIS DEAD END JOB WHEN YOU'RE TWICE AS SMART AS YOUR BOSS?
THE HOURS ARE LONG, THE PAY IS MEDIOCRE, NOBODY RESPECTS YOUR CONTRIBUTIONS, AND YET YOU FREELY CHOOSE TO WORK HERE.
IT'S ABSURD! NO, WAIT... THERE MUST BE A REASON... I MUST WORK HERE BECAUSE I LOVE THE WORK.
I LOVE THIS JOB.
NEXT!
ifunny.co

THANK YOU ……