

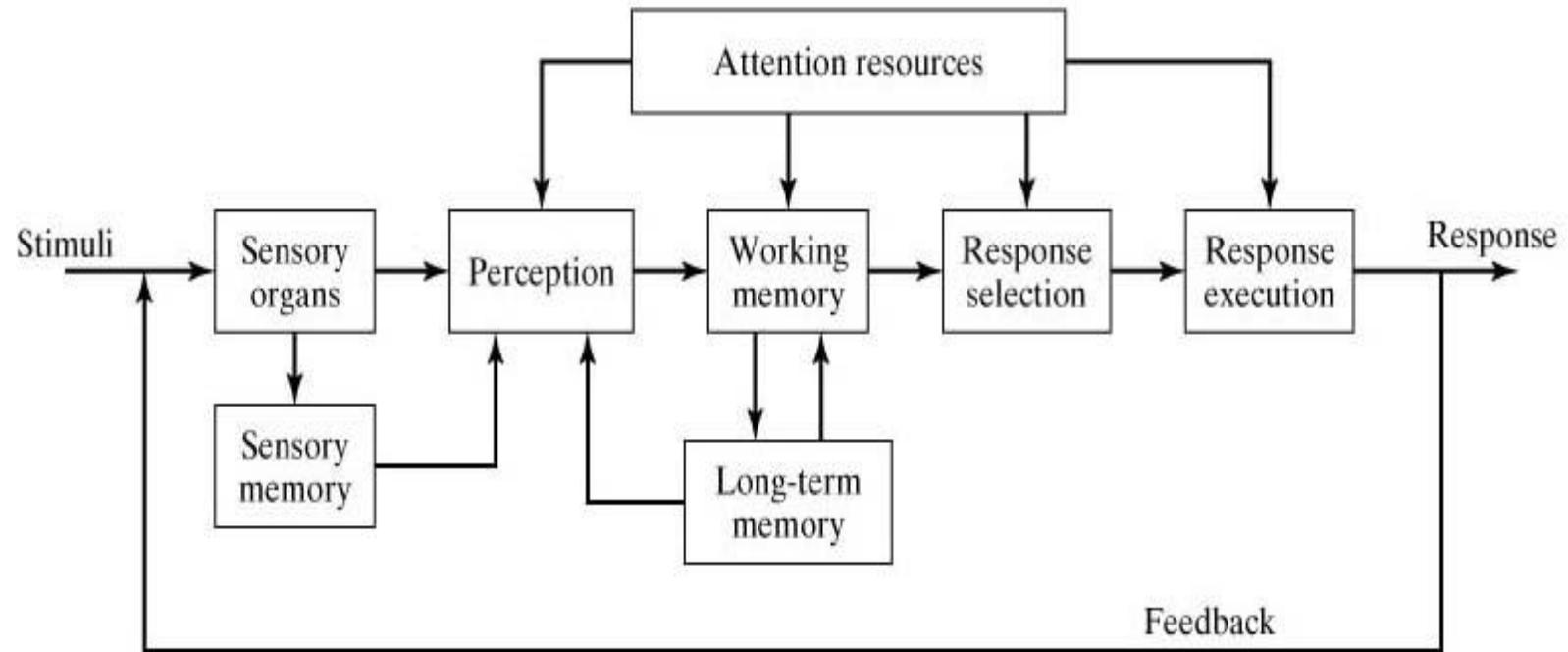
COGNITIVE ERGONOMICS

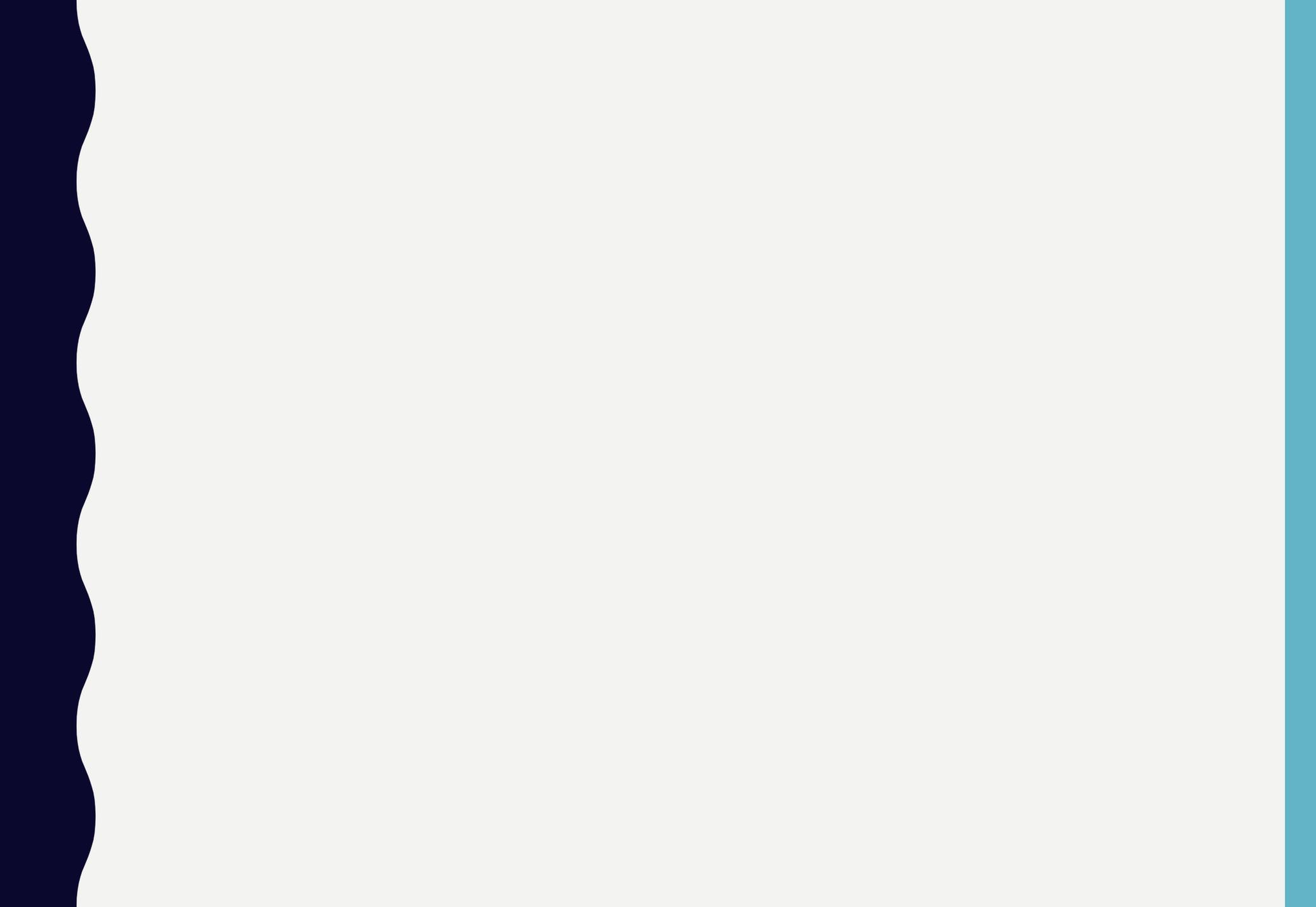
**DR. ANKUR GUPTA
IIT BHUBANESWAR**



**DESIGN GUIDELINES
FOR COGNITIVE WORK**

HUMAN INFORMATION PROCESSING MODEL





DESIGN GUIDELINES FOR COGNITIVE WORK

- Guidelines for sensory reception and perception
- Guidelines for working memory
- Guidelines for long-term memory



GUIDELINES FOR SENSORY RECEPTION AND PERCEPTION

RECEPTION AND PERCEPTION GUIDELINES

- Selection of sensory modality - visual presentation vs. auditory presentation

When to use visual

Long message

Complex message

Referred to later

Noisy environment

Person remains in
one location

When to use auditory

Short message

Simple message

Requires action now

Very light or very dark

Person expected to
move around

RECEPTION AND PERCEPTION GUIDELINES

- Standardization - having similar devices operate in the same way
 - Example: all machines in the plant have the same controls
- Redundancy - presenting information using more than one sensory mode
 - Example: combine visual and auditory modes for warning messages

RECEPTION AND PERCEPTION GUIDELINES

- Graphical displays - information presented graphically usually more effective than same information presented as text
 - Example: Toyota production system's use of graphical instructions
- Stimulus variation - use of variable stimuli rather than stimuli that are constant and continuous
 - Example: flashing red light on control panel more likely to alert operator than continuous red light



GUIDELINES FOR WORKING MEMORY

WORKING MEMORY GUIDELINES

- Minimize demands on working memory - minimize the number of alphanumeric items that must be kept in working memory and length of time they must be retained
- Exploit chunking
 - Formulate meaningful sequences out of a string of alphanumeric characters so string can be retained as one chunk
 - Use letters rather than numbers (letters are more likely to have meaning)
 - Limit chunk size to 3 or 4 characters



GUIDELINES FOR LONG- TERM MEMORY

GUIDELINES FOR LONG-TERM MEMORY

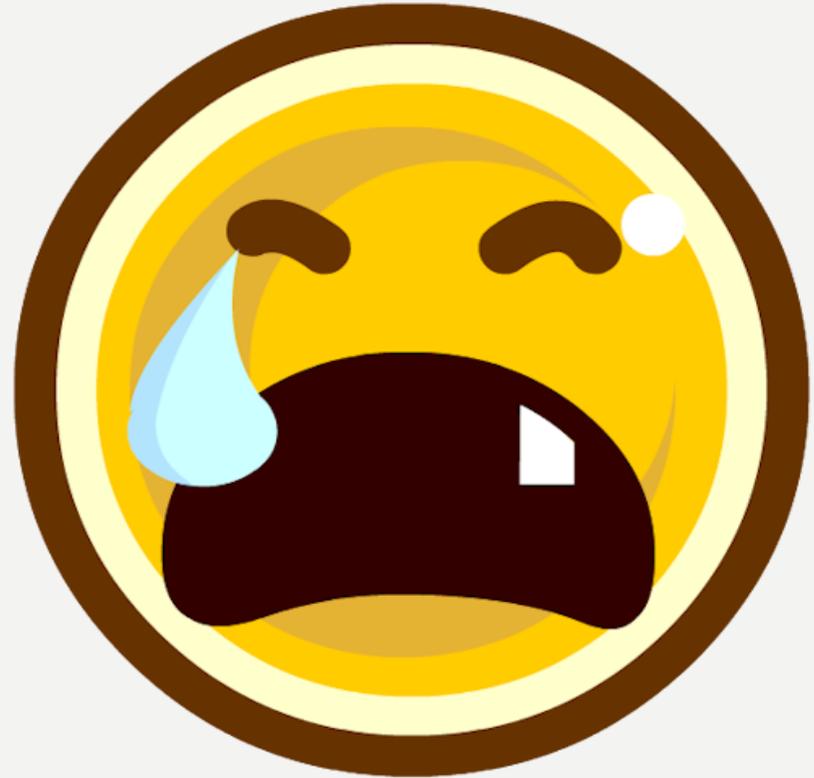
- Increase frequency and recency of using information stored in long-term memory
 - Drills to recall emergency procedures
 - Regular and frequent training sessions
 - Standardized procedures in batch operations
- Use memory aids
 - Example: written instructions for procedures that must be carried out in the correct sequence



**LECTURE
CLOSING**

DID YOU KNOW.....?????

- Crying is good for health. It flushes unhealthy bacteria out of your body, strengthening the immune system and relieving stress



A BRIEF HISTORY OF COGNITIVE PSYCHOLOGY & ERGONOMICS

REEMERGENCE OF COGNITIVE PSYCHOLOGY

George Miller

- George Miller is a professor at Princeton University. He studies information processing and focuses his studies on the capacity of Short-term Memory (STM). His name is associated with the "Magic Number 7." This theory suggests that most people can remember 7 plus/minus 2 bits of information using their STM. Miller also found that recall of information is better when it is chunked together.

Allen Newell

- Newell is a mathematician who applied cognitive psychology to the design of computer systems. He spent forty years at CMU educating cognitive psychologists on the implications of artificial intelligence. Newell saw cognitive activities as problem solving activities. Some of his other work focused on expert vs. novice differences in memory. Newell and Simon worked on artificial intelligence at Carnegie Mellon University.
- Cognitive psychology has grown rapidly since the 1950's. A very important event was the publication of Ulric Neisser's book, *Cognitive Psychology*, in 1967. It gave a new legitimacy to the field and consisted of six chapters on perception and attention and four chapters on language, memory, and thought. Following Neisser's work, another important event was the beginning of the *Journal Cognitive Psychology* in 1970. This journal has done much to give definition to the field. More recently a new field, called cognitive science, has emerged which attempts to integrate research efforts from psychology, philosophy, linguistics, neuroscience, and artificial intelligence. This field can be dated from the appearance of the journal, *Cognitive Science* in 1976 (Anderson, 1995).

GRAFFITI



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THANK YOU

