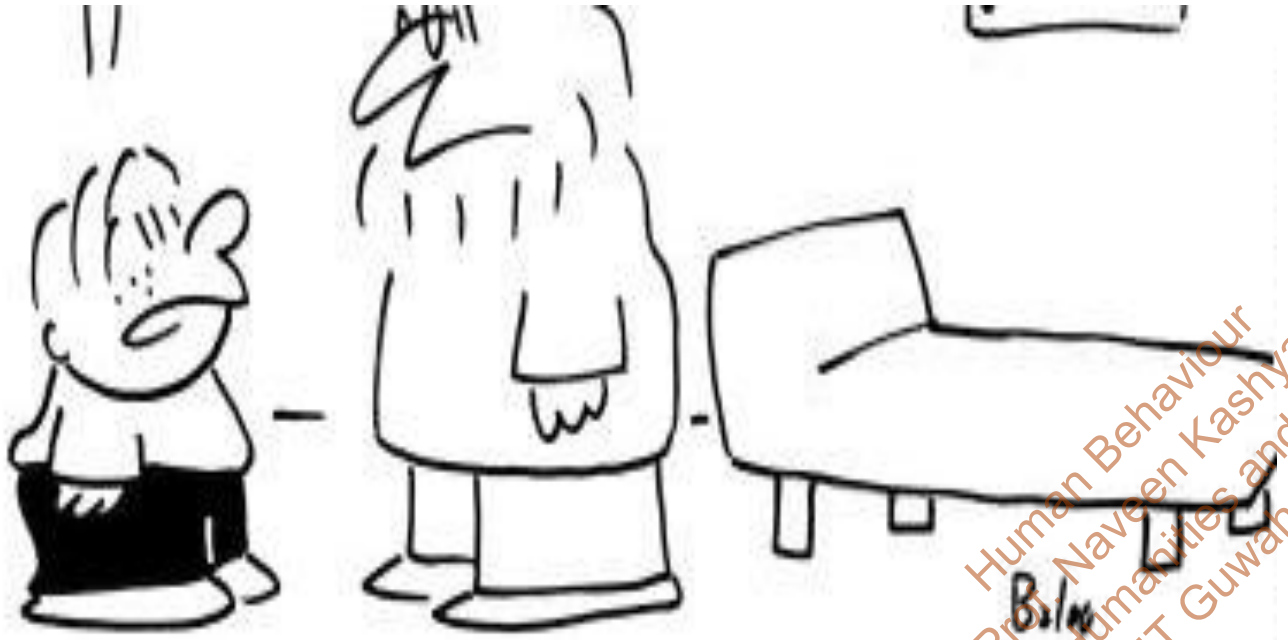
Memory

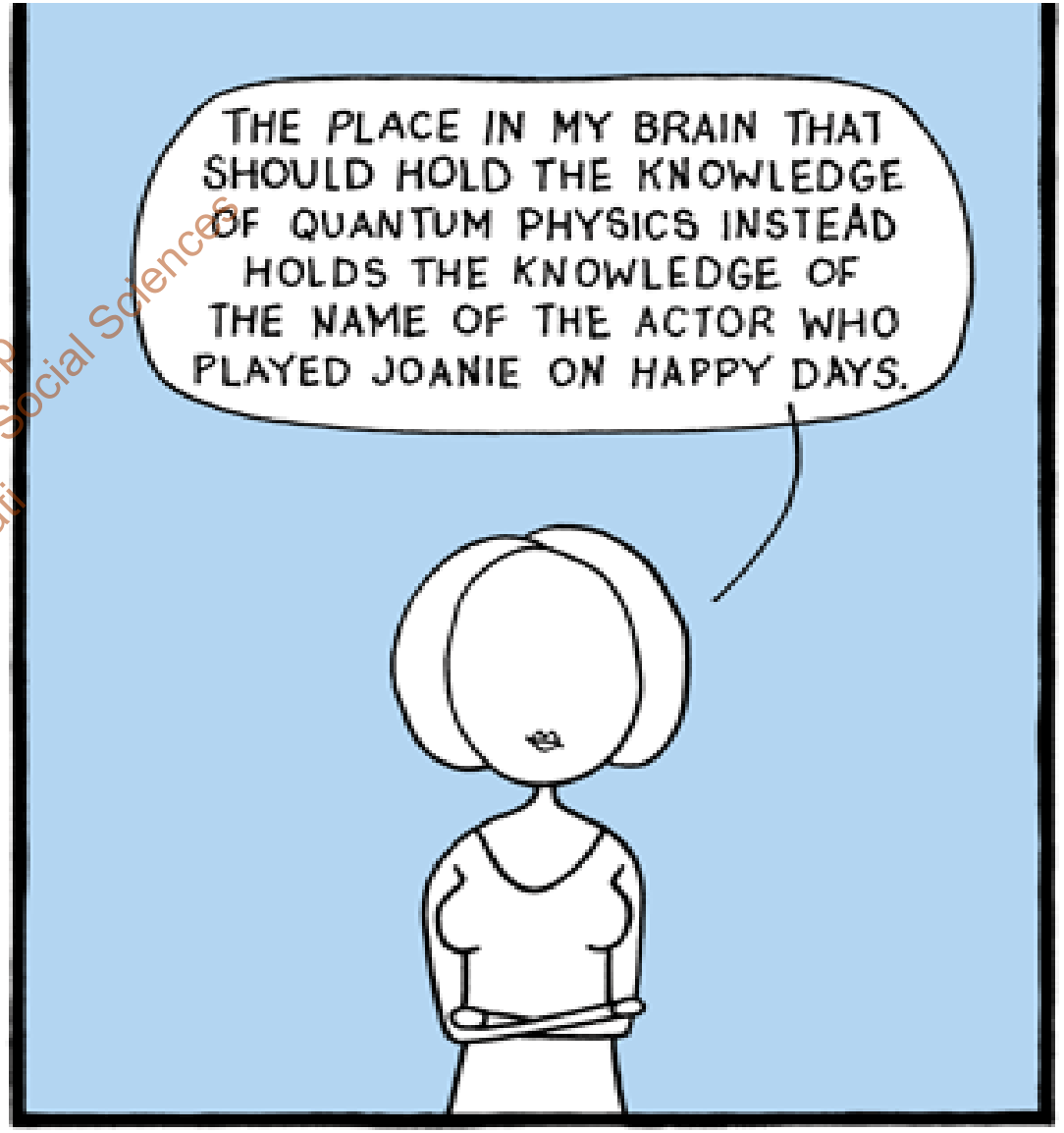
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Memory



"I want you to help me recover my repressed memories— I keep forgetting the multiplication table."



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Memory

Memory **-** is the cognitive system (s) for storing and retrieving information.

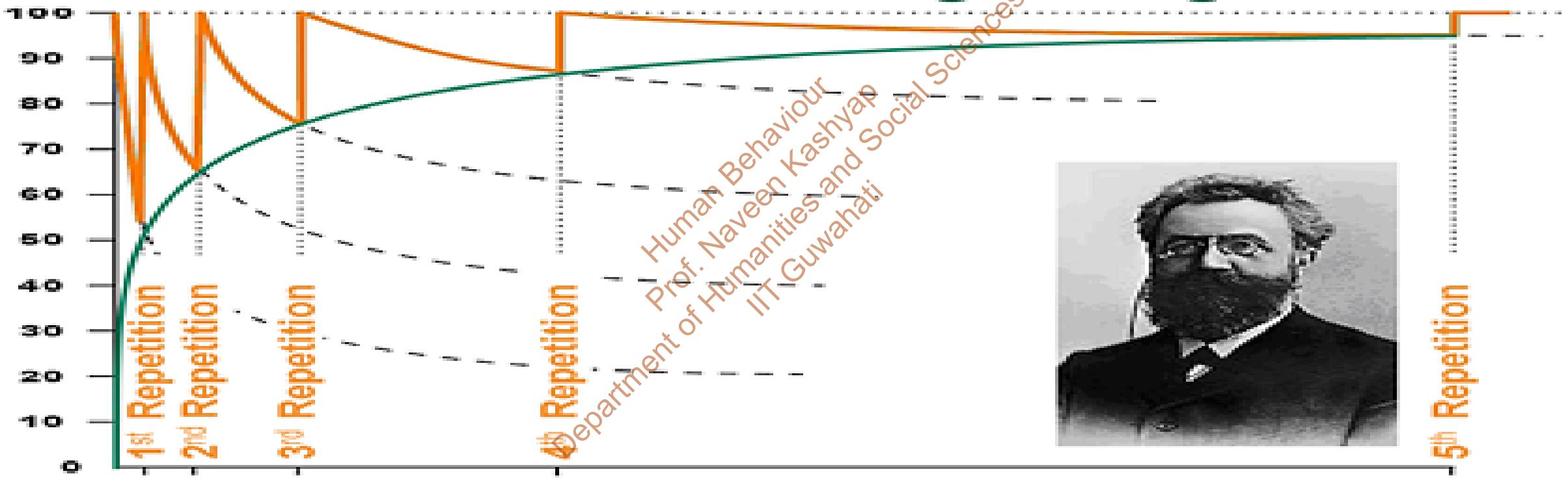
Herman Ebbinghaus **–** German Psychologist (1885) who conducted the earliest work on human memory. Some of this work hold significance till today.

- memorizing and recalling ***nonsense syllables***

- compared ***massed vs distributed*** practice

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Ebbinghaus Forgetting Curve



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Human Memory: Two Influential View

Psychologists often construct *models* for studying mental processes. Models meet two major goals – *accurate description & explanation* of how the processes work. Psychologists have proposed two influential models of human memory. They are discusses below

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The Atkinson and Shriffrin Model

This model of memory is akin to memory system in computers. The model is also called as *modal model / information processing model*

The researchers proposed three basic tasks of memory

- Encoding – the process through which information is converted into a form that can be entered into memory

- Storage – the process through which information is retained in memory for varying periods of time

- Retrieval – locating and accessing specific information when it is needed at later times

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Human Memory: Two Influential View

Atkinson and Shiffrin proposed three distinct systems for storing information.

- *Sensory Memory* – a memory system that retains representations of sensory input for brief periods of time

- *Short Term Memory* – holds relatively small amounts of information for brief periods of time usually thirty seconds or less

- *Long Term Memory* – allow us to retain vast amounts of information for very long periods of time

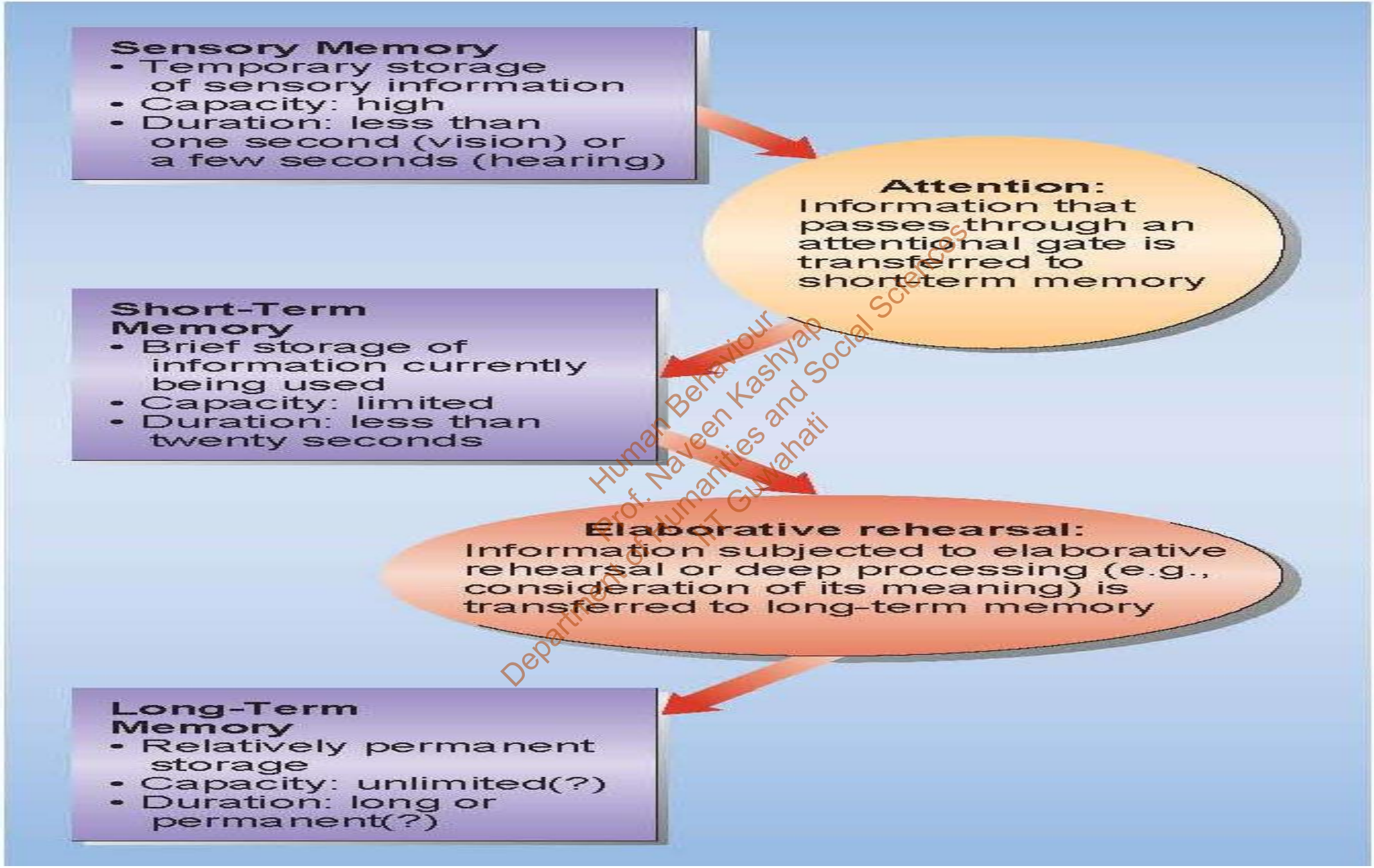
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How does information move from one memory system to another? – Atkinson and Shiffrin proposed - *this involves the operation of* ***active control processes*** *that act as filters, determining which information will be retained.*

Two basic ideas of the model supported by research findings are

- the suggestion the memory involves encoding, storage & retrieval
- that we posses different kinds of memory systems.

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Human Memory: Two Influential View

Neural Networks Model: Parallel Processing of Information

Neural Network Model – Models of memory that describe parallel (simultaneous) processing of information by numerous neural modules in the brain; each of these processing units is dedicated to a specific task, and all are interconnected.

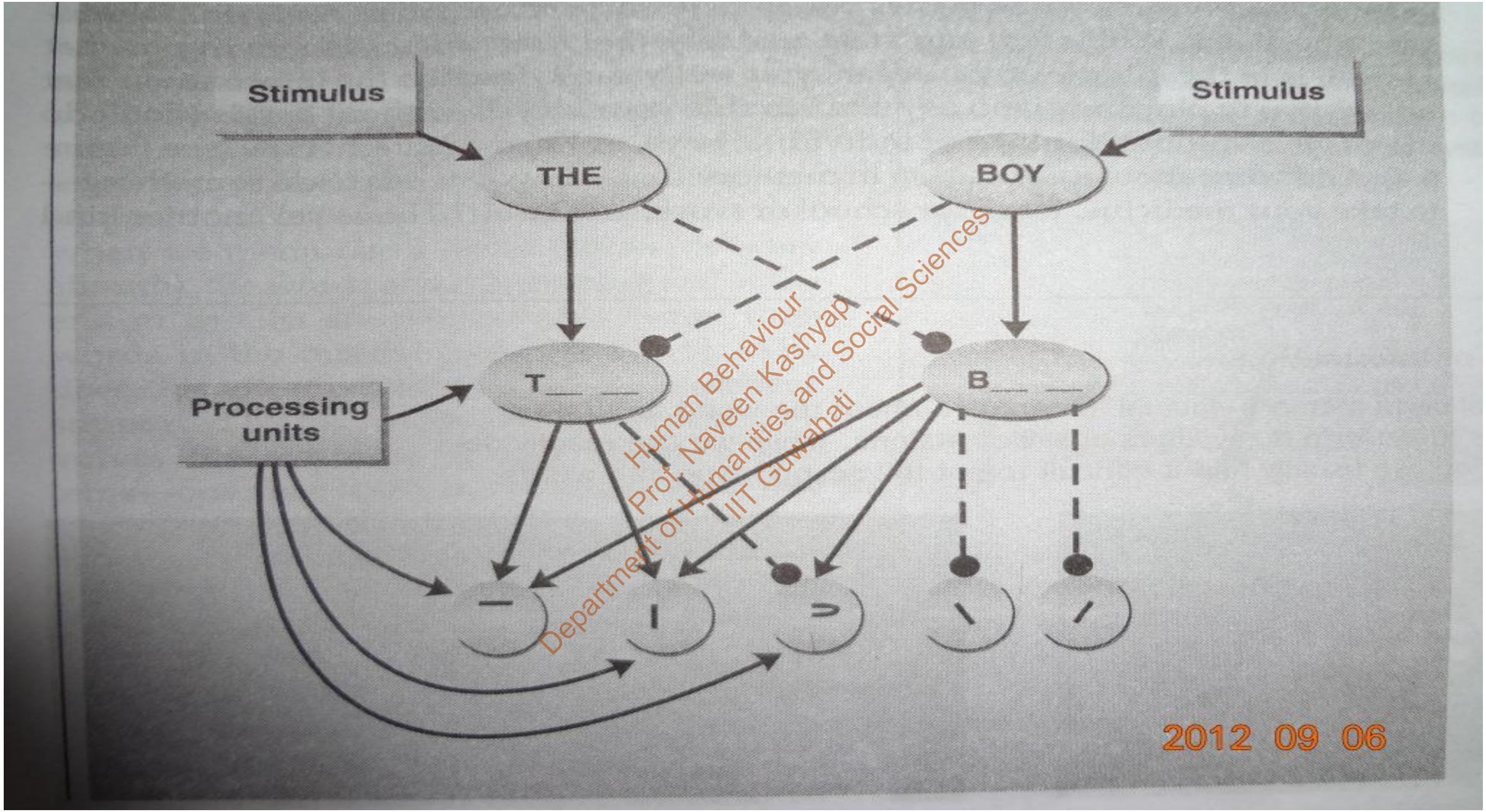
McClelland & Rumelhart, 1981 – suggests that humans possesses processors for 26 different letters, 16 letter features and more than 1000 words.

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So when we encounter a string of letters such as *pen*, these neurons are activated in parallel – at the same time.

Neural network models suggest that it is the rich interconnectedness of our neural units that accounts for our ability to process information so quickly. These models also propose that information in memory is not located in a specific place within the brain; rather it is represented by patterns of activation that spread over many processing units and by the strengths of the activation across these various units.

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Kinds of Information Stored in memory

Human memory is capable of holding variety of information. Starting with ***factual to general knowledge, action and also future intent*** the list of information type is huge. Does this mean we have separate memory systems or a single system involved in processing?

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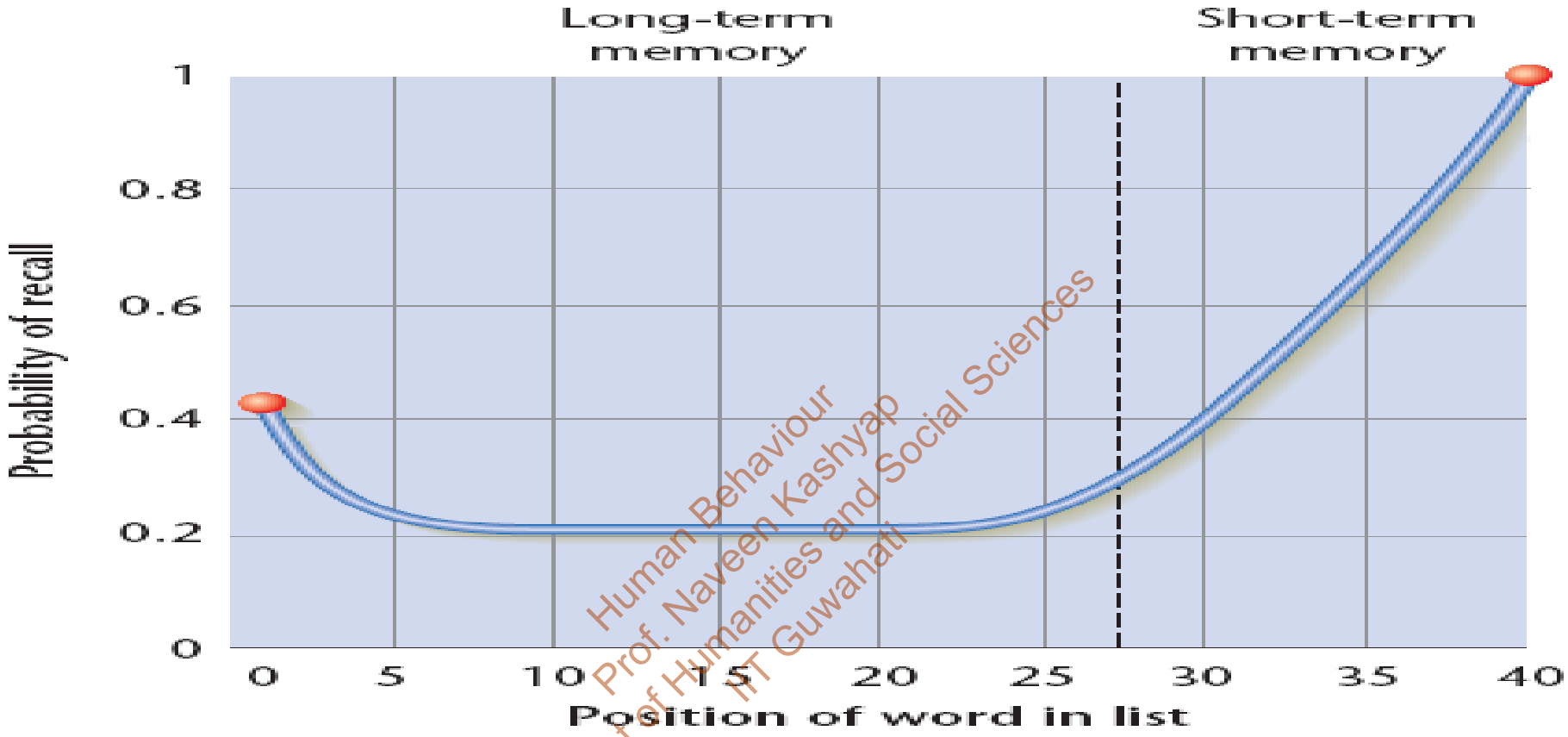
Working Memory – the workbench of consciousness

Initially working memory was confused with *short term memory* – refers to the temporary storage of limited information for very short duration.

Working memory – involves both storage capacity and the capacity to transform (process) information held in the memory system. In a sense, working memory is the workbench of consciousness – the "place" where information we are using right now is held and processed.

Early Research on Working Memory – to answer questions on the existence and storage capacity of working memory the *serial position curve* – the greater accuracy of recall of words / other information early and later, in a list of information than in the middle of the list – has been effectively used.

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Figure 8.9 Results of a Free Recall Experiment. *The probability of recall varies with an item's position in a list, with the probability being highest for the last five or so positions, next highest for the first few positions, and lowest for the intermediate positions. Recall of the last few items is based on short-term memory, whereas recall of the remaining items is based on long-term memory.* (B. B. Murdock (1962) 'The Serial Position Effect in Free Recall', from *Journal of Experimental Psychology*, 64:482–488. Copyright © 1962 by the American Psychological Association. Adapted by permission.)

Kinds of Information Stored in memory

The Multiple Component Model of Working Memory

- Current conceptions of working memory
  - –Working memory conceptualized as being divided into:
    - *Phonological loop* – for storing & operating on information in an acoustic code
    - *Visual-spatial sketchpad* – holds & operates visual/spatial information

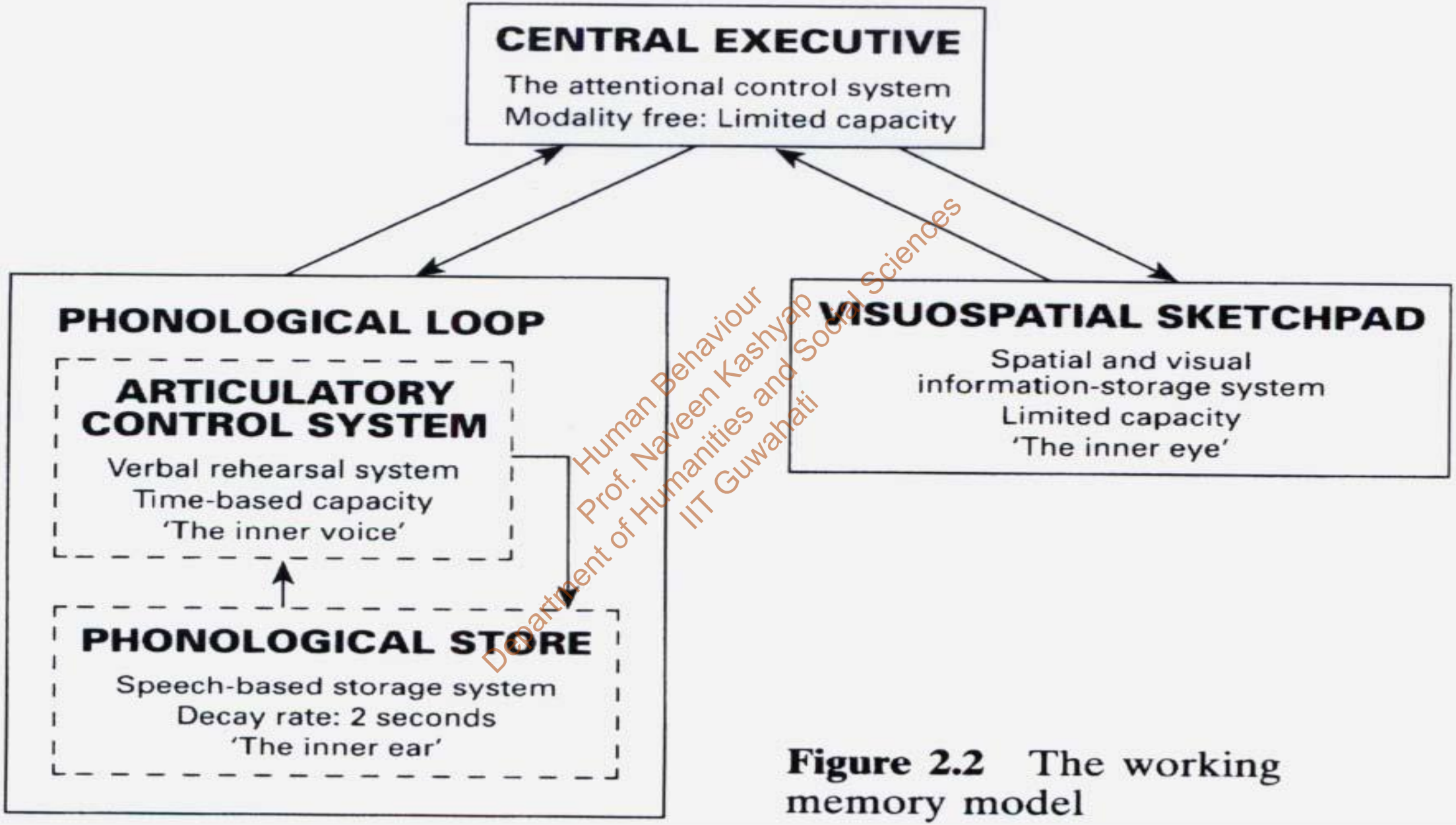
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Mediated by different brain structures – phonological loop by the left hemisphere & visual-spatial sketchpad by the right

Two systems controlled by the *executive* – directs attention & decides what operations performed on the information

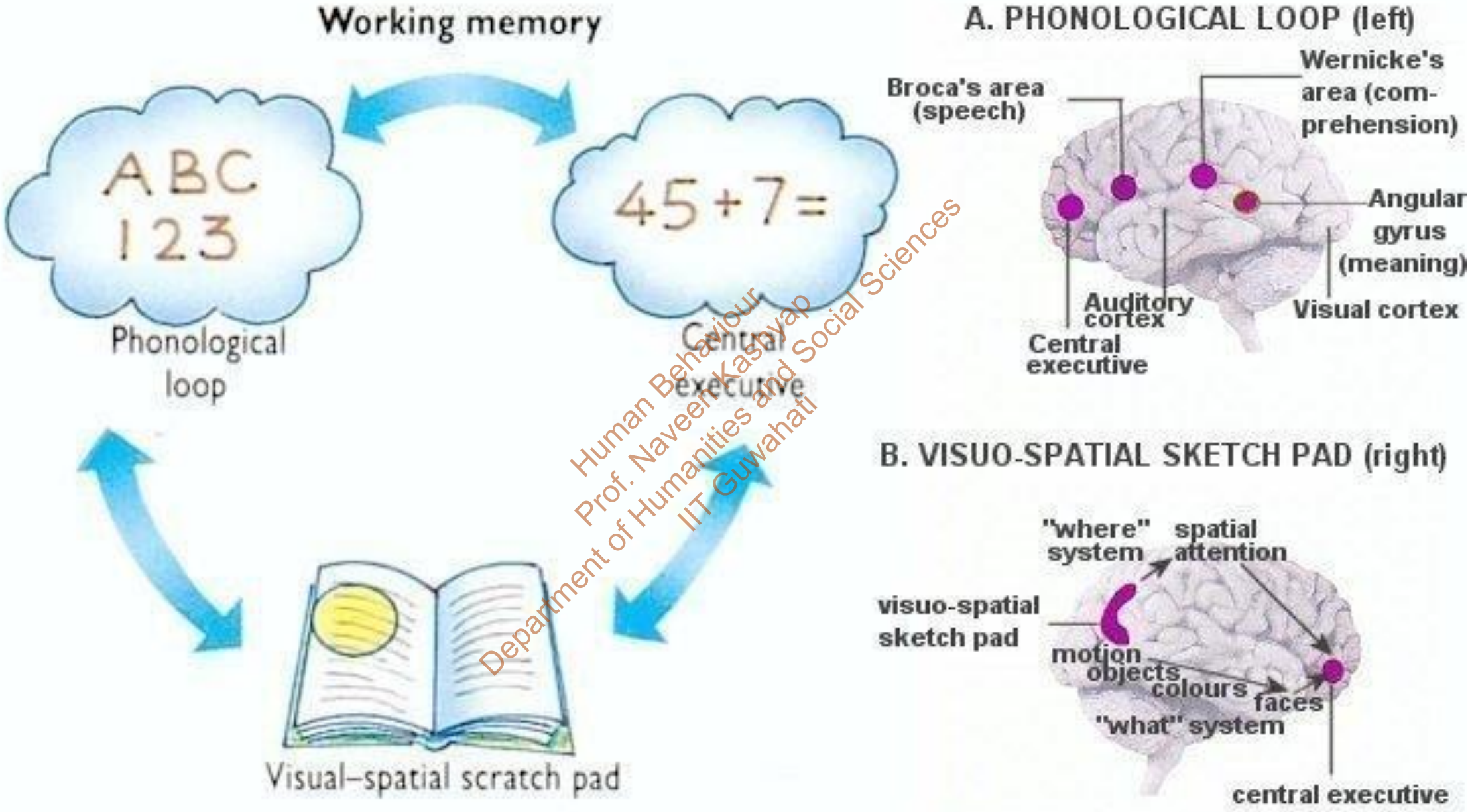
Additional component – *episodic buffer* which binds or associates different aspects of a memory

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Figure 2.2 The working memory model



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Working Memory

- Storage
  - Capacity of working memory limited – for the phonological loop, memory span is seven items, give or take two (7 ± 2)
  - Chunking – can use long-term memory to perform chunking – recoding new material into larger, more meaningful units & storing those in working memory
  - Forgetting – occurs either because the items "decay" over time or are displaced by new items

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Working Memory

- Working memory and thought
  - When consciously problem-solving, we often use working memory to store parts of the problem as well as relevant information accessed from long-term memory
- Transfer from working memory to long-term memory
  - Rehearsal – process of conscious repetition of information which maintains an item in working memory (maintenance rehearsal) but can also cause it to be transferred to long-term memory (elaborative rehearsal)

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Memory for Factual Information – Episodic & Semantic Memory

Memory for factual information is sometimes termed as *explicit or declarative memory*, because we can bring it into consciousness and report it verbally. They are of two major types

- ***Episodic memory*** – holds information we acquire at a specific time and place. It is the kind of memory that allows you to go back in time and to remember specific thoughts and experiences you had in the past

- ***Semantic memory*** – holds information of a more general nature, information we do not remember acquiring at a specific time or place

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Episodic Memory – some factors that affect it

a) The amount and spacing of practice

b) The kind of processing we perform

- **Maintenance Rehearsal**

- **Elaborate Rehearsal**

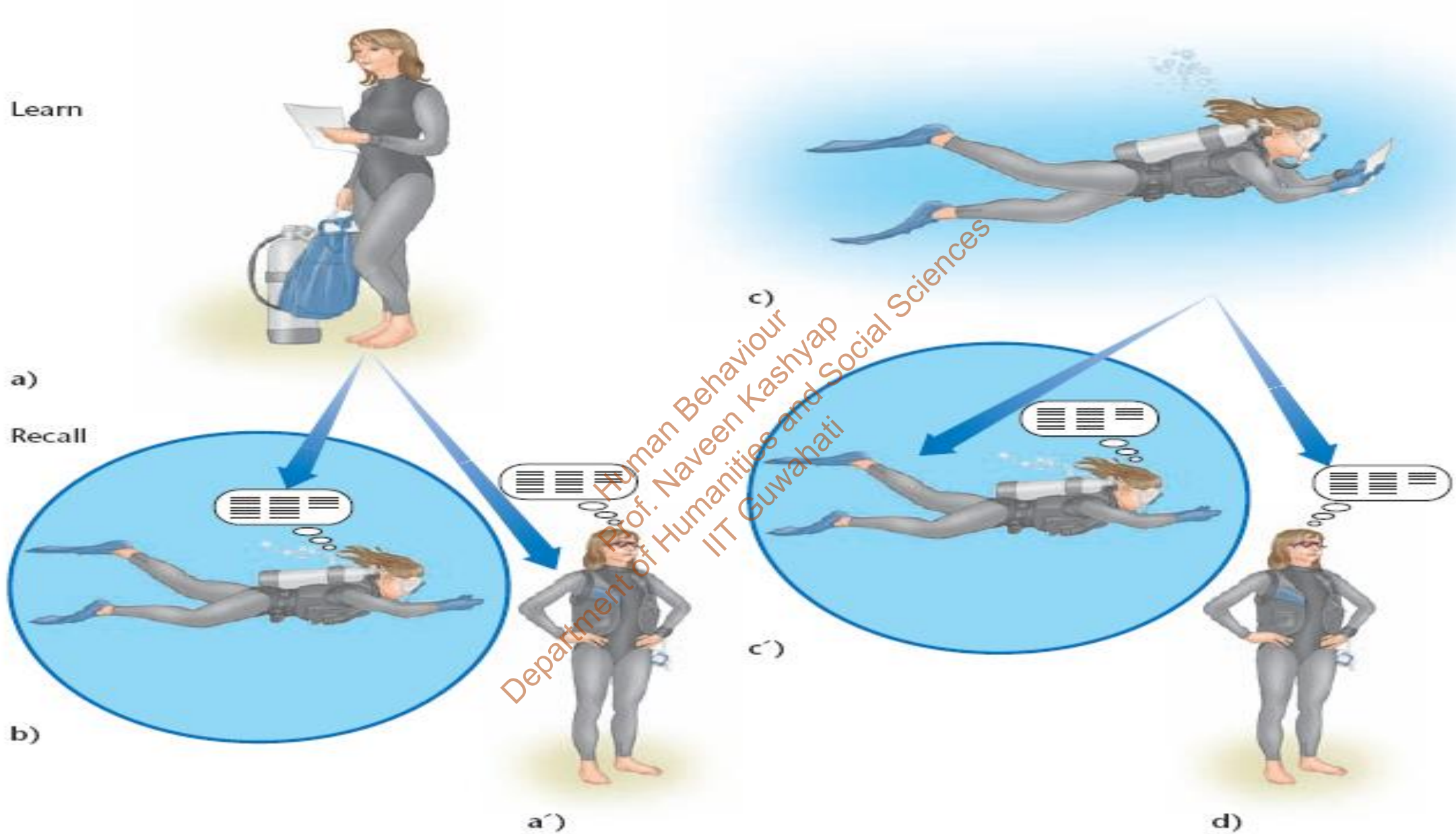
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c) **Retrieval Cues** – stimuli that are associated with information stored in memory and so can help bring the information to mind at times when it cannot be recalled spontaneously

- **Context – dependent retrieval**

- **State dependent retrieval**

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State dependent effects

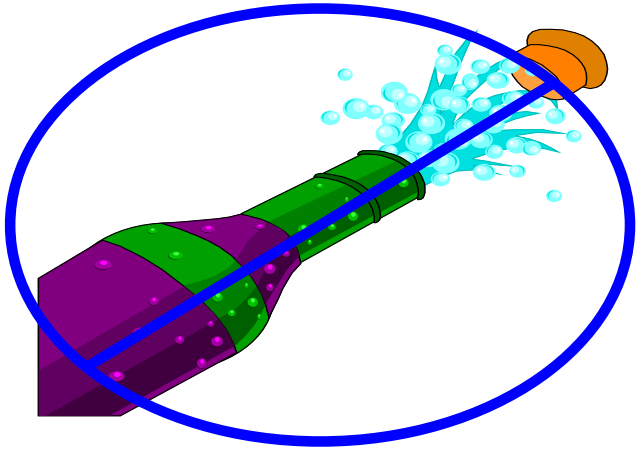
Drunk during learning



Recall better if drunk



Than if sober



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Semantic Memory – Information Organization

Semantic Memory – memory of general knowledge – stores a large amount of information in highly organized structure. Organization in semantic memory uses elements like

Concept – mental categories for objects or events that are similar to one another in certain way. Concepts in semantic memory seem to exist in networks reflecting the relationship between them – ***semantic networks*.**

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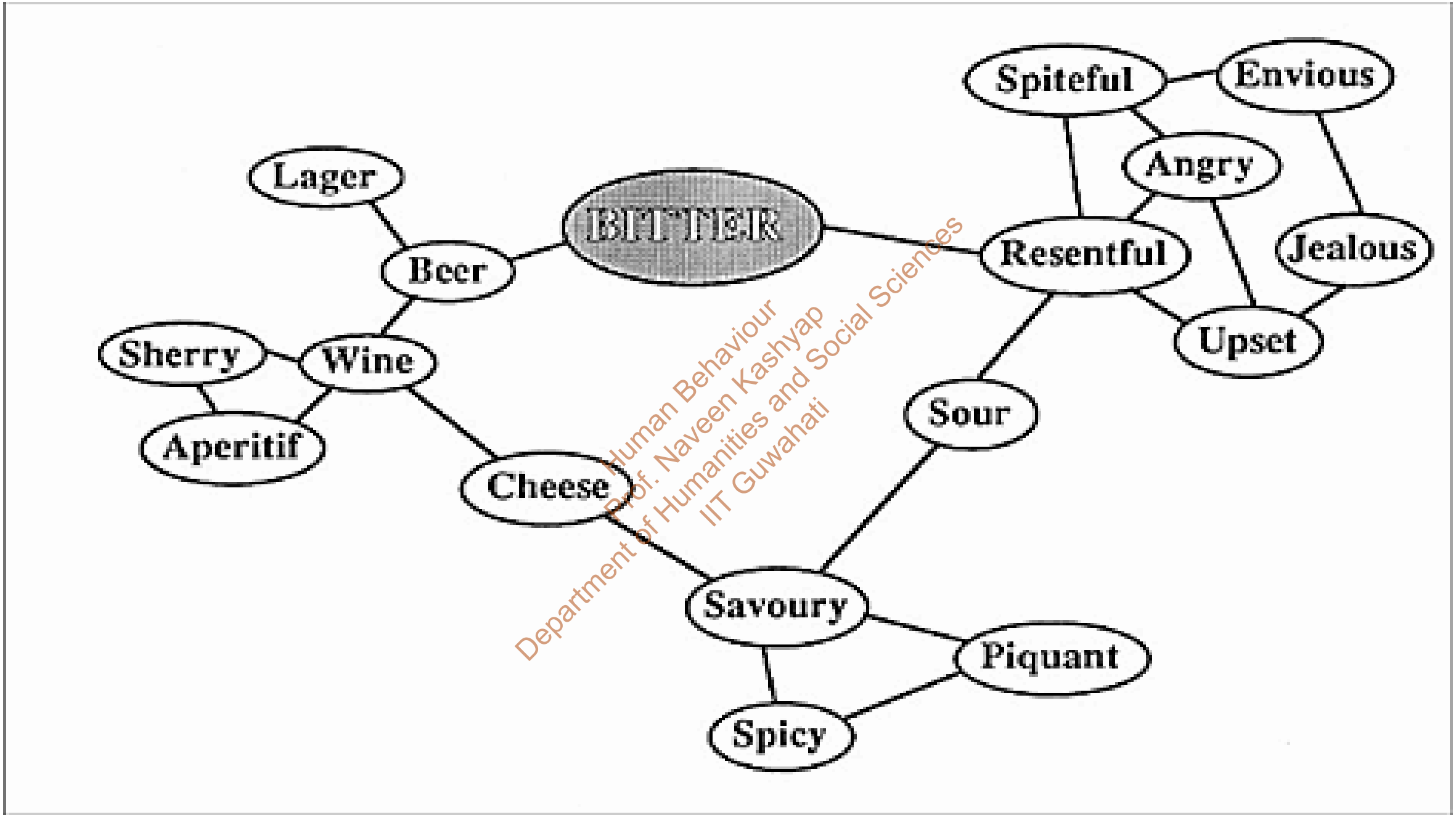
The meaning of concepts reflects its links or associations with other adjoining concepts.

Concepts are derived from

Prototypes – abstract, idealized representations that capture an average or typical notation of members of the category

Exemplar – an example of the category that the individual can readily bring to mind

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Memory for Skills – Procedural Memory

Memory systems that retains information we cannot readily express verbally – for example, information necessary to perform skilled motor activities such as riding a bicycle. It is also called *Implicit memory.*

Support for the existence of procedural memory comes from the phenomenon of ***priming*** – the fact that having seen or heard a stimulus once may facilitate our recognizing it on a later occasion, even if we are unaware that this is happening.

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Forgetting

Memory is mostly appreciated when it fails i.e. when forgetting occurs. Earliest views on forgetting suggest – information in long term memory *fades or decays* with the passage of time causing forgetting. However research on forgetting suggests that forgetting is not only *a function of time but also depends of the intervening events between learning and re-testing*

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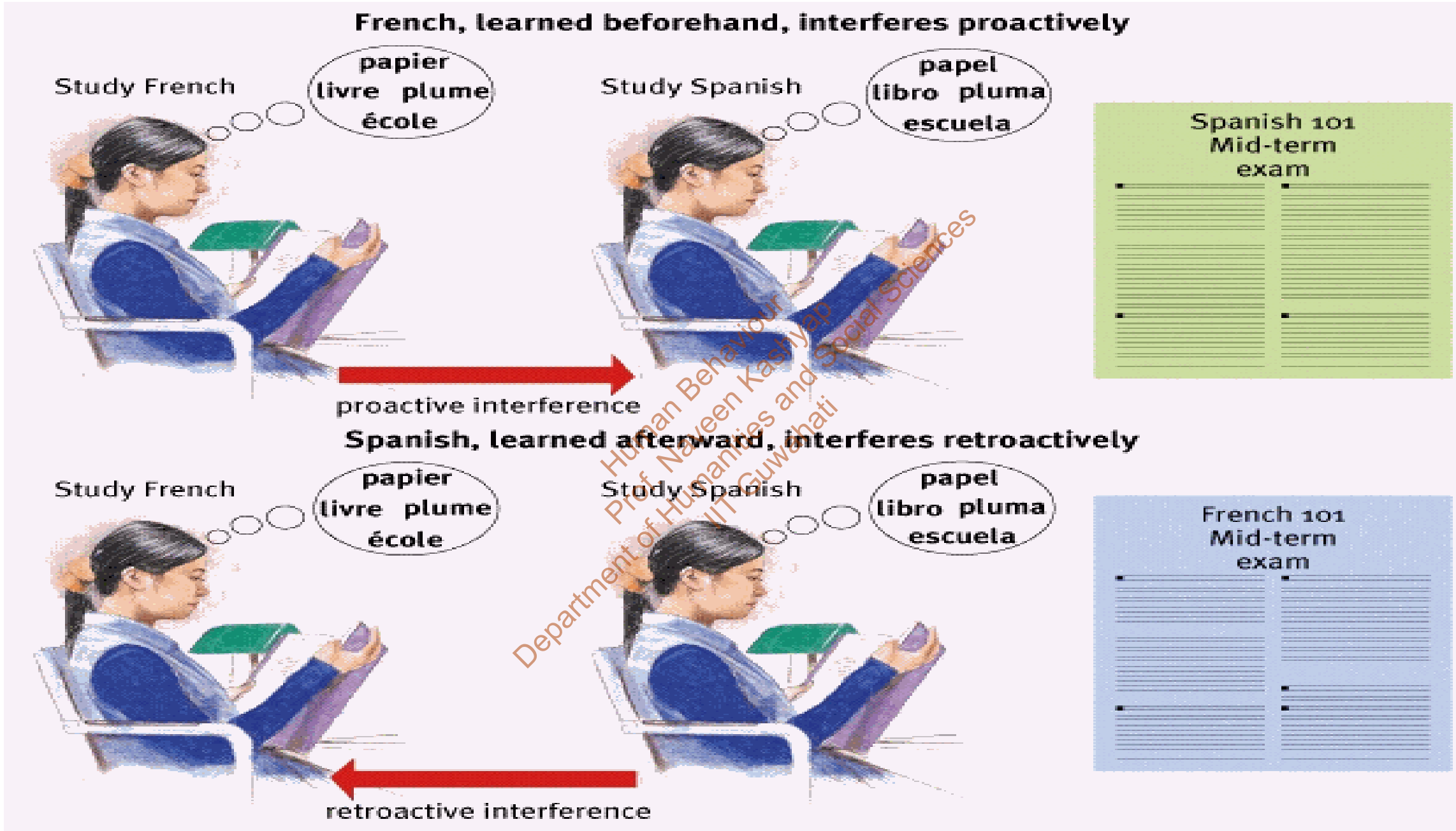
Forgetting as a Result of Interference

Forgetting can be caused by interference between items of information stored in memory. Such interference can be

- Retroactive – information currently being learned interferes with information already present in memory

- Proactive – previously learned information present in long term memory interferes with information currently being learnt.

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Forgetting

Forgetting and Retrieval Inhibition

Imagine a task which requires you to name all the states in India. How many could you report correctly? Would it help if you are provided with the name of half of the states and required to recall the other half?

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- the act of retrieval itself can cause forgetting – not of the information recalled, but of other related information. This phenomenon is known as ***retrieval inhibition*** – and its occurrences has been observed in serial experiments.

Memory Distortion and Memory Construction

Information entered into memory is often altered in various ways over time – and those alteration can reduce its accuracy and change its meaning. These can be of two types

- ***Distortions*** – alterations in what is retained and later recalled

- ***Constructions*** – the additions of information not initially present.

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Distortions and the Influence of Schemas

Distortions in memory can occur in response to false or misleading information provided by others. The cause of such distortions in many cases seem to involve operation of ***schemas*** – *structures representing individuals knowledge and assumptions about aspects of the world.*

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Another important cause of distortion in memory involves our ***motives***: we often distort our memories in order to bring them in line with whatever goals we are currently seeking.

Memory Distortion and Memory Construction

A final way of memory distortion involves confusions concerning the sources of information in memory. We often make errors in ***source monitoring*** – the process of identifying the origins of specific memories.

A related effect involves ***reality monitoring*** – the process of deciding whether memories stem from external sources (events we actually experience) or from internal sources (our imagination or thoughts).

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Memory Construction: Remembering What did not happen?

Not only can memories be distorted; they can also be constructed. False memories are both persistent and convincing – people strongly believe that they are real.

Eyewitness Testimony: Is it as accurate as we believe?

Eyewitness Testimony – evidence given by persons who have witnessed a crime – plays an important role in many trials

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Memory Distortion and Memory Construction

Factors affecting the accuracy of eyewitness testimony are

Suggestibility – witnesses are sometimes influenced by leading questions and similar techniques used by attorneys or police officers.

Source Monitoring – attributing one's memories to wrong source

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Illusion of out-group homogeneity – the fact that people outside our own group seem more similar in appearance and characteristics than people within our own group.

Enhancing eyewitness accuracy

- ***Cognitive Interviews*** – interviews that enhance the ability to remember crucial information accurately with the help of multiple retrieval cues.

- ***Hypnosis***

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Memory in Everyday Life

How does memory function in natural contexts? Three topics of special interest are

Repression of Emotionally Traumatic Events – Do *people repress traumatic events* of their life? Psychologists view this with skepticism do to the following reasons

despite its widespread acceptance there is still *very little scientific evidence* to support the theory of repression

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In some instances *therapists may act in ways that lead clients to report repressed memories* even if they don't really have them

People may not have repressed memories but get *influenced my media reports* that claim their memories to be common phenomenon

People may also generate *false memories* for events that never happened

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Memory in Everyday Life

Autobiographical Memory – Memory for information about events in our own lives fall under the category of episodic memory. Such memories are studied using either detailed questionnaires or the diary method

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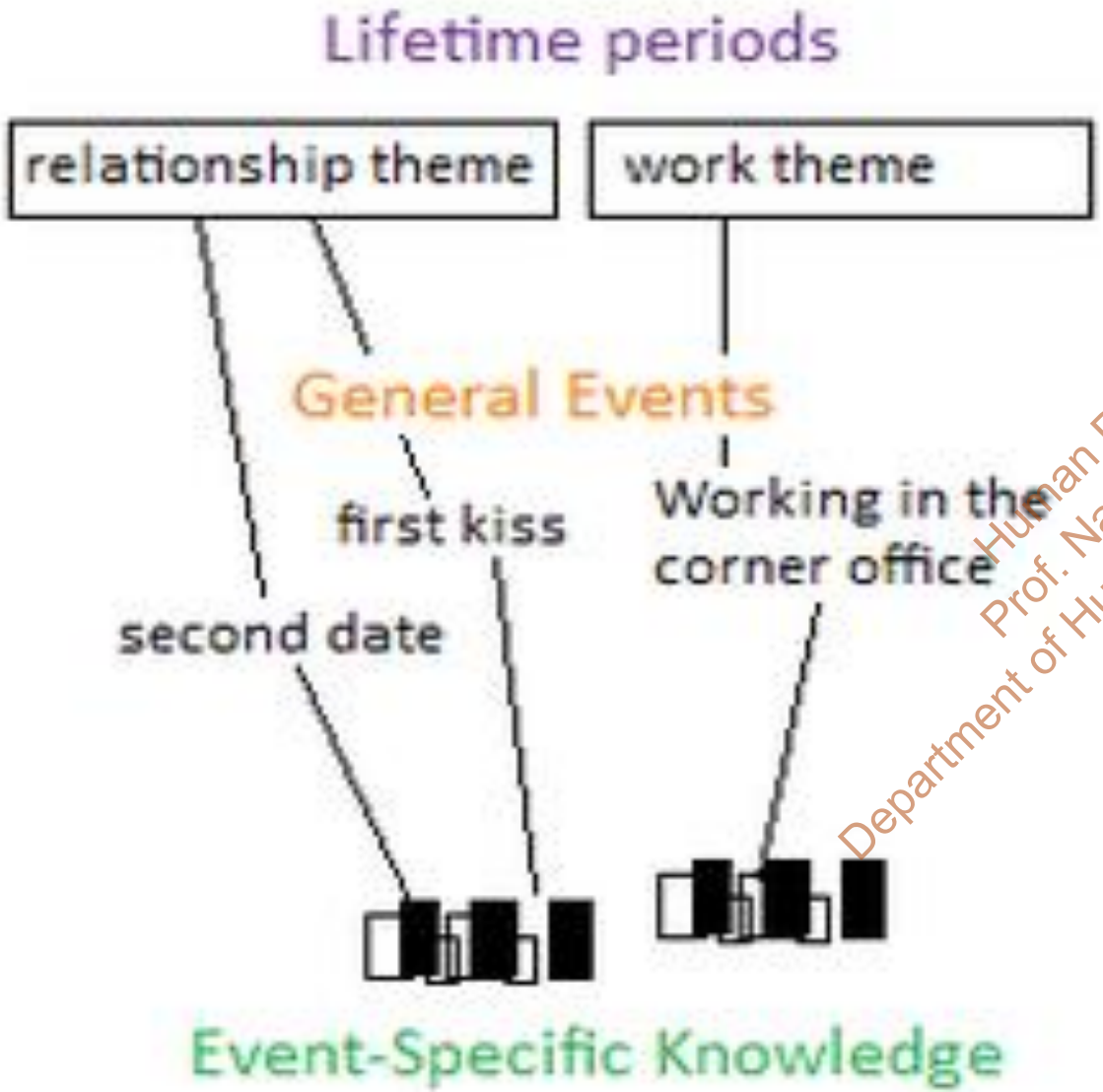
Memories for Emotionally Laden Events: Flashbulb Memories - are vivid memories of what we were doing at the time of an emotion-provoking event.

They are termed *“flashbulb memories”* because they seem to be *preserved in autobiographical memory* in considerable detail, *almost like a photograph*

Flashbulb memories seem to be *especially vivid or strong* because they are *triggered by events that are surprising, distinctive, and important to the people involved*. Contrary to popular belief, they are *often quite inaccurate*.

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Autobiographical Memory Base



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THE FAR SIDE



More facts of nature: All forest animals, to this very day, remember exactly where they were and what they were doing when they heard that Bambi's mother had been shot.