



## INF5020

### *Philosophy of Information:*

### *The Reasoning Mind and Language*



### THIS SESSION – *The goal*

#### History:

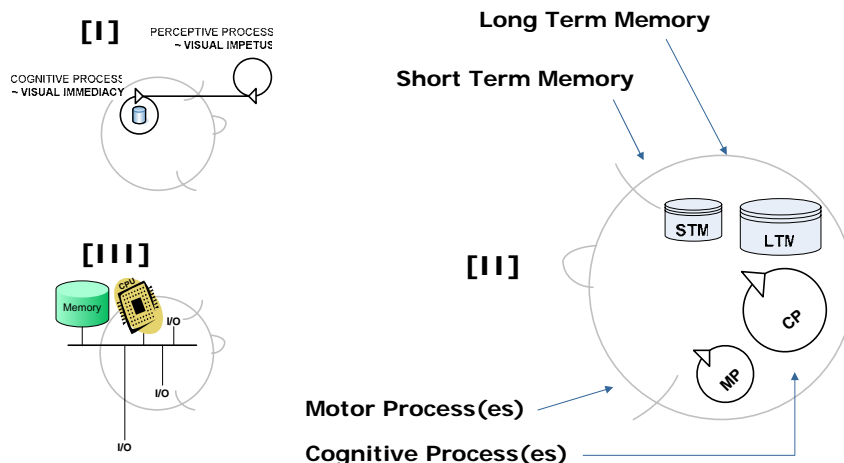
- We began with computation, complexity and looked at several definitions of information.
- We tried to understand information within the context of data, knowledge, communication and language.
- We looked at the relation between data processing and information processing.
- We looked at Ontology and IS “ontologies”, trying also to understand their use in IS and their implications upon data (actually information or knowledge) representation, storage and retrieval.

#### Goal:

- In this section, we will look at the reasoning mind and its models, as well as the discussions around the existence of a universal language.



## Mind Models – *The classical cognitive model of the human mind*

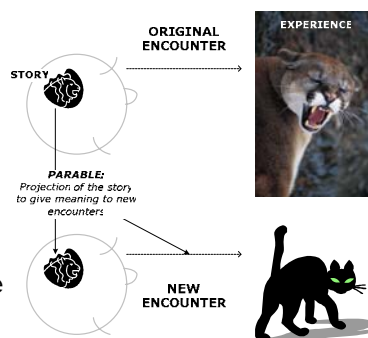


## Mind Models – *The Literary Mind*

- Mark Turner, in his book called "The Literary Mind" (ISBN 0195-12667-X), offers an interesting model of the reasoning mind.
- He claims that the literary mind – the mind that reasons in stories – is basic to thought

He says:

- Story is the central principle of our experience and knowledge.
- Parable – the projection of story to give meaning to new encounters – is the indispensable tool of everyday reason.



### Mind Models and Categories – *What does the mind know initially?*

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- Keith Devlin, in one of his (many) well known popular mathematics books called “The Math Gene” (ISBN 0-465-01619-7), points out that the mind has
  - A number sense
  - A language sense, a “universal” protolanguage with a “universal” syntax-like rule tree
  - A pattern sense
- Findings (experiments) support these
- Thus, human beings being fond of matching patterns, comparing and counting in a more-or-less structured manner is no real surprise
- Thus, the reasoning and categorizing mind is very plausible



### NOTE – *The importance of categorization*

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- Note that we are slowly moving over to categorization...
- Categorization is very central in mind models, cognitive studies, reasoning etc.
- WHY?

**PLEASE DISCUSS!**

- IS CATEGORIZATION MORE THAN WHAT WE KNOW AS CATEGORIZATION?

**PLEASE DISCUSS!**



## Classical Classification/Categorization Theory – *The classical one*

Principles governing the organization of objects into groups according to their similarities and differences or their relation to a set of criteria. Classification theory has applications in all branches of knowledge, especially the biological and social sciences. Its application to mathematics is called **set theory** (*q.v.*).

According to strict logic, organizing a domain of objects into classes must leave no two classes with any object in common; also, all of the classes together must contain all of the objects of the domain. This theory, however, disregards the frequency in practice of borderline cases—*i.e.*, objects that can with equal correctness be accepted or rejected as members of two otherwise exclusive classes. This is often seen in biology, where the theory of evolution implies that some animal populations will have characteristics of two distinct species.

In practice, the principles used to classify a domain of objects depend upon the nature of the objects themselves. In forming classes of perceptual objects—*e.g.*, the class of green things or of elephants—the perceived similarities and differences between the objects are important. The classification of such objects requires a standard object against which all others are compared in including them within or excluding them from a class. A domain of objects that never change is classified morphologically (*i.e.*, according to form or structure). If, on the other hand, the domain comprises changing or developing objects—*e.g.*, evolving plants or animals—then it is likely to be classified genetically (*i.e.*, in reference to crucial developmental stages). Sometimes objects are classified not so much by their characteristics as by the degree to which they possess them; minerals, for example, may be classified by their varying hardnesses rather than by the characteristic of hardness itself. Finally, classification by differences of quantity and of quality establishes equalities and inequalities of order or rank between different single objects within a domain as well as between different combinations of them.

"Classification Theory" from *Encyclopædia Britannica*. Retrieved 15 Sept. 2004.  
URL <http://www.britannica.com/eb/article?tocId=9024237>.



## Classical Categorization vs. Prototypicality – *A view*

- Prototype theory is a cognitive theory of categorization that describes many aspects of Multidimensional separation of concerns (MDSOC) better than the classical theory of hierarchical categories.
- Prototype theory implies that composition is a more natural means of specifying components than is inheritance.
- Prototypes are useful in organizing information and workflows in component composition systems.

Stanley M. Sutton Jr. and Isabelle Rouvellou, "Applicability of Categorization Theory to Multidimensional Separation of Concerns", OOPSLA 2001



NEXT TIME:  
MORE CATEGORIZATION



ANY QUESTIONS SO FAR?

