

## Information Processing

- Chapter 1 of Levelt (1989). *Speaking: From intention to articulation*.
  - Describes a model of speech production using the basic principles of information processing.

## Basic principles of all Information Processing Systems

- IPS contain several components.
- These components are:
  1. Relatively autonomous (Informationally encapsulated)
    - Input is of a maximally restricted sort
    - Operation is minimally affected by the output of other components
    - A component does not interact with other components to do its job
    - A component does not require feedback to do its job.

## How do you know a component is autonomous?

- Accepts specific input and delivers certain output
- Has an algorithm to transform input to output
- That algorithm executes in real time
- You identify where input comes from and where output goes (can be one or more places).

## Basic principles of all Information Processing Systems

2. Processing is automatic
  - Executed without intention or conscious effort
  - Run on their own resources (do not share processing capacity with other processes)
  - Quick and efficient
  - Inflexible
  - Can run in parallel without mutual interference
  - Cognitively impenetrable
    - Not open to executive control

Basic principles of all  
Information Processing Systems

3. Each processing component has its own characteristic processing units
- syllable, segment
  - Lines, angles

Basic principles of all  
Information Processing Systems

4. Components can use incremental processing
- Next component can start to work on incomplete output of current component
  - Limited lookahead is possible.
    - This constraint limits the kind of algorithm that can be used in each component.

Basic principles of all  
Information Processing Systems

5. Components have storage or buffering facilities for intermediate results.

Basic principles of all  
Information Processing Systems

- These principles are found in all cognitive systems:
- Vision
  - Language
  - Categorization
  - Attention
  - Problem Solving
  - ***Memory***

## Assignment #1

Describe how these principles are found in the Modal Model of Memory (Atkinson & Shiffrin, 1968).

## Memory as an example of an Information Processing System

### The Modal Model of Memory

- Shiffrin & Atkinson (1969)
  - There are 3 “stages” of memory based on the duration a representation is stored.
  - Information passes from one stage to another.
    - Sensory Memory
    - Short Term Memory (STM)
    - Long Term Memory (LTM)

## Sensory Memory

- Holds the sensation of a sensory stimulus for a brief period of time after the stimulus ends.
- Two types of sensory memory:
  - **Iconic**
    - Holds a **visual** memory trace for about .3 seconds.
  - **Echoic**
    - Holds an **auditory** memory for 3-10 seconds.
- A memory “fades” unless we attend to it and transfer it to STM.

## Short-term Memory (STM)

- Holds a **limited amount of information** for a **short period of time** before it **decays** or is **displaced**.
  - Encoding is primarily **phonological** (sound-based) **even if it is visually presented**.
  - Representations last about 20 seconds without **maintenance rehearsal** (Peterson & Peterson, 1959).

## Long Term Memory (LTM)

- Representations get from STM to LTM through *elaborative rehearsal*.
  - Actively organizing and integrating new information into present knowledge structure.
- “Permanent” storage of memories.
  - Can be “forgotten.”
- Capacity of LTM may be unlimited.
  - Controversy about whether *all* memories are permanently stored or not.
  - Information is stored in many different formats
    - Schemas/scripts
    - Semantic Networks
    - Semantic vs. procedural/Implicit vs explicit memory