"Did you ever start to do something and then forget what the heck it was?"
What is memory?

It is a system that receives, stores, organizes, alters, and recovers information so it can be used.

Is it a foolproof system? That is, can you remember everything you have learned before in your life?

- No
  - This is a good thing and a bad thing. Why?
What Affects Our Ability To Recall Some Information But Not Others?

Without looking or feeling, how many sides do most pencils have?

Six

In what hand does the Statue of Liberty carry the torch?

Right
Finish the following:
I gotta feeling. Tonight’s going to be a...

...good night.

The way we process information impacts our ability to recall it.
Processing? That sounds like what computers do!
Yes, our brains process information a lot like computers do. This is how we process information in order to have it available for use later!

What happens if any part of this process is inefficient?

- **Encoding**: Translate the information into a form that can be stored.
- **Storage**: Warehouse encoded information over a period of time.
- **Retrieval**: Locate the stored information and bring it back to conscious thought.

**Forget**
Encoding: The First Process of Memory

Translate the information into a form that can be stored...

...or it's what we do when we take stimuli from our environment and convert it into something that our brain can handle.
We code information in three different ways...

Make a mental picture of the information

Visual Code
Record the information in your memory as a series of sounds

Acoustic Code

Can you remember the first song you ever learned? How about this one...

Acoustic codes often work better than visual codes
Represent the information in terms of its meaning

**Semantic Code**

Try memorizing the following series of letters by making some meaning of it (don’t blurt it out if you get it)

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What does “Roy G. Biv” represent? What is this called?

Semantic codes work best of all

You can remember more information more easily if you can associate some kind of meaning with it
Let’s Practice!

I’m going to open a website with some memory games
It will allow you to use all encoding methods

http://human-factors.arc.nasa.gov/cognition/tutorials/index.html
Summary

What did you learn so far?

The Processes of Memory
Our brains process information similar to a computer

Encoding
- Visual Codes
- Acoustic Codes
- Semantic Codes

Storage

Retrieval

When would a visual code work best for you? An acoustic code? A semantic code?
Storage:
The Second Process of Memory

Warehousing encoded information over a period of time

...or filing away information until we need it
Storage Demonstration

I need two volunteers, one boy and one girl

How did it work? Did he remember it? How long do you think he will remember it?
We use different strategies to store information. They are related to how the information is encoded.

Repeating information over and over again until it is in your memory.

**Maintenance Rehearsal**

867-5309, 867-5309, 867-5309...

What encoding methods are typically used with maintenance rehearsal?
Relate it to information you already know well – attach it to a previous memory

**Elaborative Rehearsal**

Based on your experience and what you have learned in this unit, which is the better strategy to store information for a long time, maintenance rehearsal or elaborative rehearsal? Why?

How often do I ask you to write about or discuss a concept we are learning and relate it to something in your life?

How many times have I asked you to put things into your own words?

Based on what we have discussed, why do you think we do that?

Based on your experience and what you have learned in this unit, which is the better strategy to store information for a long time, maintenance rehearsal or elaborative rehearsal? Why?

1. Remembering a phone number (maintenance rehearsal)
2. Memorizing lines for a play (maintenance rehearsal)
3. Methods you see teachers use every day (elaborative rehearsal)
The Three-Box/Information-Processing Model of Memory Storage

- **Sensory Memory**
  - Sensory stimuli
  - Information lost because it is not encoded

- **Short-Term Memory**
  - Encoding
  - Information lost because it is not encoded

- **Long-Term Memory**
  - Encoding
  - Information lost because it is not encoded

- Retrieval
Sensory Memory

*Sensory Memory*: repository for incoming sensory information

- Last just a few seconds or less
- *Iconic memories* – visual image
  - Lasts for about a half-second
- *Echoic memories* – activity in auditory system
  - Lasts about two-four seconds
- Sensory memories are encoded (by using visual codes, acoustic codes, etc.) and moved to the next stage, short-term memory
- What causes some sensory input to get encoded and some not to?
  - *Selective attention* – we encode what we are concentrating on at that particular moment or what is important to us
  - Did you do the “feel your foot inside your sock” thing in Barron’s (p.153)?
Short-Term Memory

*Short-Term Memory*: place where encoded sensory memories go so they can be part of our conscious awareness

- Aka “*working memory*”, especially when it is being used for thinking and problem solving
- Stays in our conscious awareness for about 12 seconds
- Can be stored as images, but more often are stored as sounds
- We typically can remember, on average, seven units of information in our STM’s (+/- two) before it starts getting difficult
- *Chunking* helps us get over this
- Try to remember this series of numbers in order: 2, 0, 3, 3, 9, 3, 9, 6, 9, 2
  - Is it easier if I do this? -> 203-393-9692
- Can be subject to *interference* (both *retroactive* and *proactive*)
- STM’s that is linked to information that is important or meaningful by semantic codes are transferred to long-term memory
Long-Term Memory

*Long-Term Memory:* where we keep information to be accessed when we need it

- Don’t bring to our conscious awareness until we need it
- Never gets full – matter of fact, we build on it as we associate more information with stuff you have already learned
- Memories in our LTM are those that had the greatest impact on us
- Memories are not recorded and played back like videos or movies – reconstructed from the bits and pieces of our experience
- Therefore, they are shaped according to the ways we view the world
  - i.e. brothers and sisters can have different memories of the same event
- Can *decay* ("Lose it if you don’t use it")
- Two different formats
  - *Procedural memory:* Memories of skills and how to do them
  - *Declarative memory:* Memories of specific factual information
    - *Episodic memory:* Specific events, stored sequentially
    - *Semantic memory:* General knowledge, you don’t necessarily remember where you learned it
- Types
  - *Explicit:* information we try to remember/retrieve consciously (ex. Studying)
  - *Implicit:* Information we remember even though we did not try to remember/retrieve unconsciously
  - *Eidetic:* aka photographic memory
What have we learned so far about the processes of memory?

**The Processes of Memory**
Our brains process information similar to a computer

- **Encoding**
  - Visual Codes
  - Acoustic Codes
  - Semantic Codes

- **Storage**
  - Maintenance Rehearsal
  - Elaborative Rehearsal
  - Sensory
    - Short-Term
    - Long-Term

- **Retrieval**
  - Organizational Systems

We have many memories filed away in our long-term memories. Are they organized in some way?
The way we organize all of our stored memories

Organizational Systems

Do we just store memories in an organized manner, like the way I have paper all over my desk?

No, we organize them by similar traits, like a well-organized filing cabinet.
When we are young, we start files and then fill them up with information as we learn more related information.

When you were little (around kindergarten or so), you learned about a thing called “American History.”

You created an “American History” file and put information in there – give me some examples.

What went in there when you were in 5-6th grade?

Sophomore/Junior year?

What happens when these “files” fill up?

Create subfiles organized by common features.
Example Of Organizational Systems in Action

Anyone ever hear of George Carlin?

• He used organizational systems to create and remember his routines

• Example: The Little Things (disclaimer – he has a political point of view some may disagree with)
  http://www.youtube.com/watch?v=cgps85scy1g

• “George Carlin’s Last Interview” handout

• Another example: Baseball vs. Football
  http://www.youtube.com/watch?v=om_yq4L3M_I

I think Louis CK is the contemporary version of him (without being so political)

• “Of Course But Maybe”
  http://www.youtube.com/watch?v=bkjmezEQUIE
What have we learned so far about the processes of memory?

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- Storage
  - Maintenance Rehearsal
  - Elaborative Rehearsal
  - Sensory
    - Short-Term
    - Long-Term

- Retrieval
  - Organizational Systems
Retrieval:
The Third Process of Memory

...or retrieving the information to help us deal with whatever we thinking about right now

Locating the stored information and bring it back to conscious thought

Two types:
Recognition: Matching stimulus with similar one already in memory
Recall: Stimulus brings memory of past event to conscious awareness
Retrieval Demonstration

What are the series of letters I had you try to remember before? (Don’t call them out)

We were talking about encoding

There were 12 of them

The first letter is a “J”

They had something do to with the calendar

Now write them down

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What does this tell you about the use of semantic codes when trying to remember information?
“Putting Memory To Good Use”

Read the article I am about to hand out

Answer the questions at the end – yes, we will discuss them once everyone is done

1. Why did the author write this article?
2. In your own words, what are retrieval cues? Why are they helpful in recalling memories?
3. How does putting something in your own words help you remember it better? Put this answer in, um, your own words 😊.
4. Consider this quote from the reading -- “All of us benefit from experience, and we use that benefit whenever we realize that new experiences are often nothing more than new arrangements of information that we already possess.” What does that mean in your own words? Give an example from your own life that demonstrates this.
5. Explain how you can use what you learned today in your academic career, starting right now.
Coming close to retrieving information that you can almost remember it

“Tip-of-the-tongue”

Retrieval cues help to bring in back

Example: First letter of the month example

Cues can be involve any of the five senses

I can't remember it right now, but it's on the tips of my tongue...
Some information, like our names, are almost impossible to forget. For some information need simple retrieval cues to retrieve it. For some we need elaborate retrieval cues. Memories that come back to you when you are aware of the place where they were encoded and stored. **Context-dependent memory**

Whenever I am in the “middle gym” I have a flashbulb memory of trying out for the basketball team when I was a sophomore. Can you think of any examples? Not limited to visual codes. How about acoustic codes. Any other senses? How can you use this to help you in your academic career?
Memories that come back to you when you are in the same emotional state/state of consciousness they were in when the information was encoded and stored

State-dependent memory

WARNING:
While being in the same emotional state/state of consciousness as you were when you encoded and stored information may help you retrieve memories, why is this a risky strategy?

1. It's not healthy to be in certain emotional states/states of consciousness
2. Encoding and storage processes can be thrown off by certain emotional states/states of consciousness
Why do we remember some things and forget others?

Try to memorize the following string of numbers:

83069485205034857

Were certain numbers easier to recall than others?

**Serial position effects**

- *Primacy effect*: tend to remember **first** item of a list easier compared to the middle
- *Recency effect*: tend to remember **last** item of a list easier compared to the middle

**Constructed memory**: Gesalt theory shows that we fill in gaps and then swear that it’s part of the event

- Ex. Eyewitness testimony not that reliable – needs to be corroborated
Summary
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  - Acoustic Codes
  - Semantic Codes
- Sensory
  - Short-Term
  - Long-Term

Storage
- Maintenance Rehearsal
- Elaborative Rehearsal

Retrieval
- Organizational Systems
  - Context-Dependent Memory
  - State-Dependent Memory
- Tip-of-Tongue
- Cues/Priming