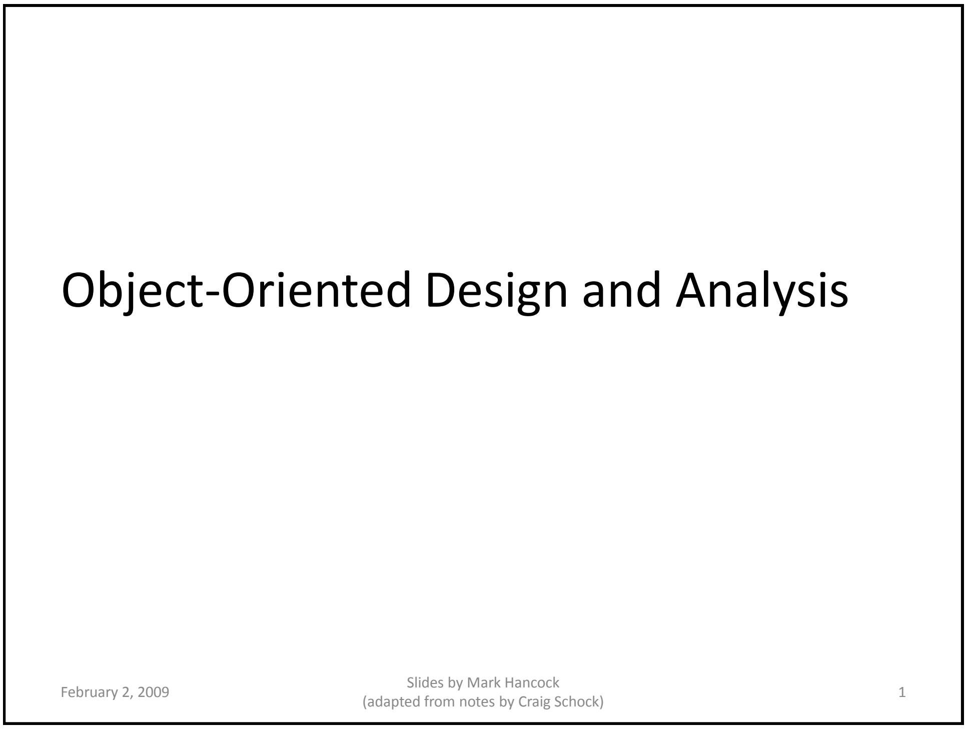
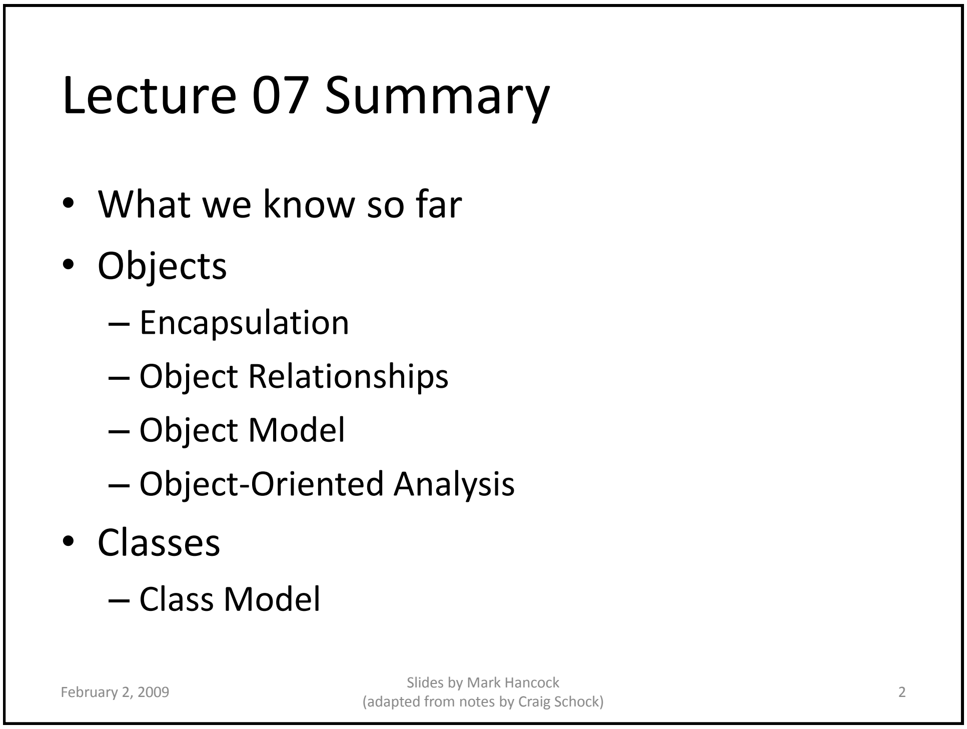


Object-Oriented Design and Analysis



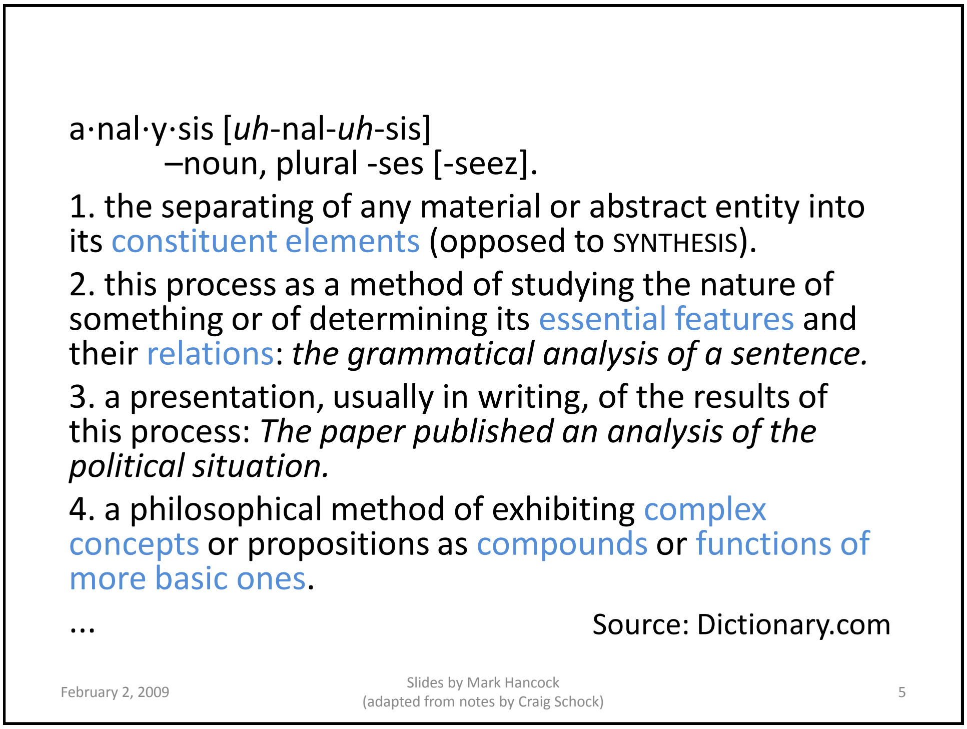
Lecture 07 Summary

- What we know so far
- Objects
  - Encapsulation
  - Object Relationships
  - Object Model
  - Object-Oriented Analysis
- Classes
  - Class Model

By the end of this lecture, you will be able to analyse a problem by breaking it down into *objects*.

You will also be able to identify *classes* of objects.

What is analysis (in any context)?



a·nal·y·sis [*uh*-nal-*uh*-sis]
–noun, plural -ses [-seez].

1. the separating of any material or abstract entity into its constituent elements (opposed to SYNTHESIS).

2. this process as a method of studying the nature of something or of determining its essential features and their relations: *the grammatical analysis of a sentence.*

3. a presentation, usually in writing, of the results of this process: *The paper published an analysis of the political situation.*

4. a philosophical method of exhibiting complex concepts or propositions as compounds or functions of more basic ones.

...

Source: Dictionary.com

February 2, 2009

Slides by Mark Hancock
(adapted from notes by Craig Schock)

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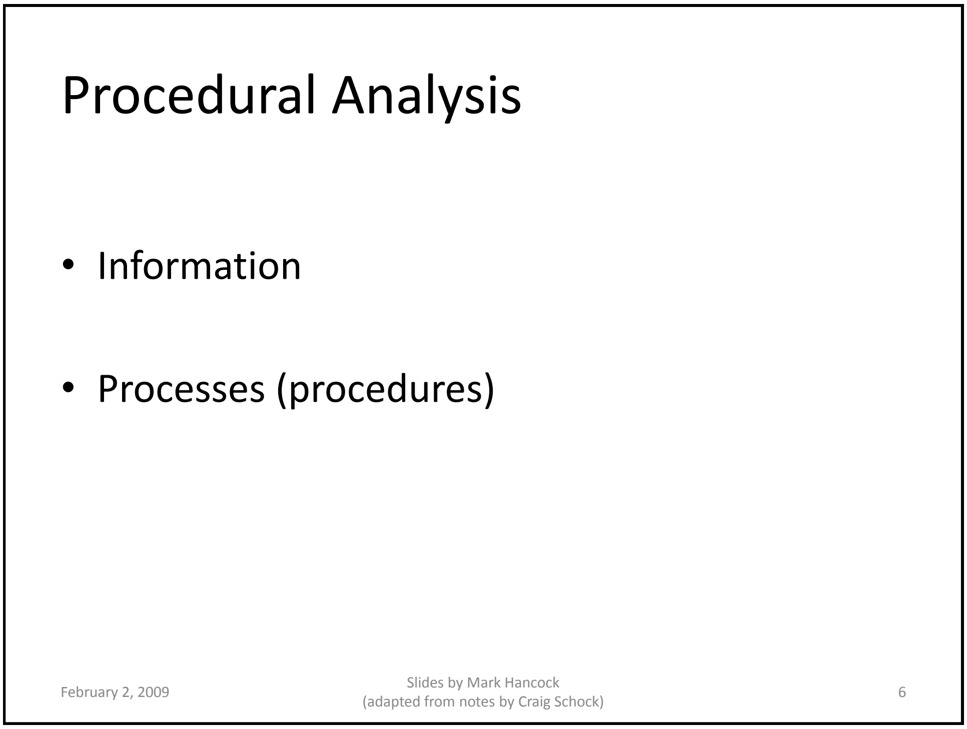

Procedural Analysis

- Information
- Processes (procedures)

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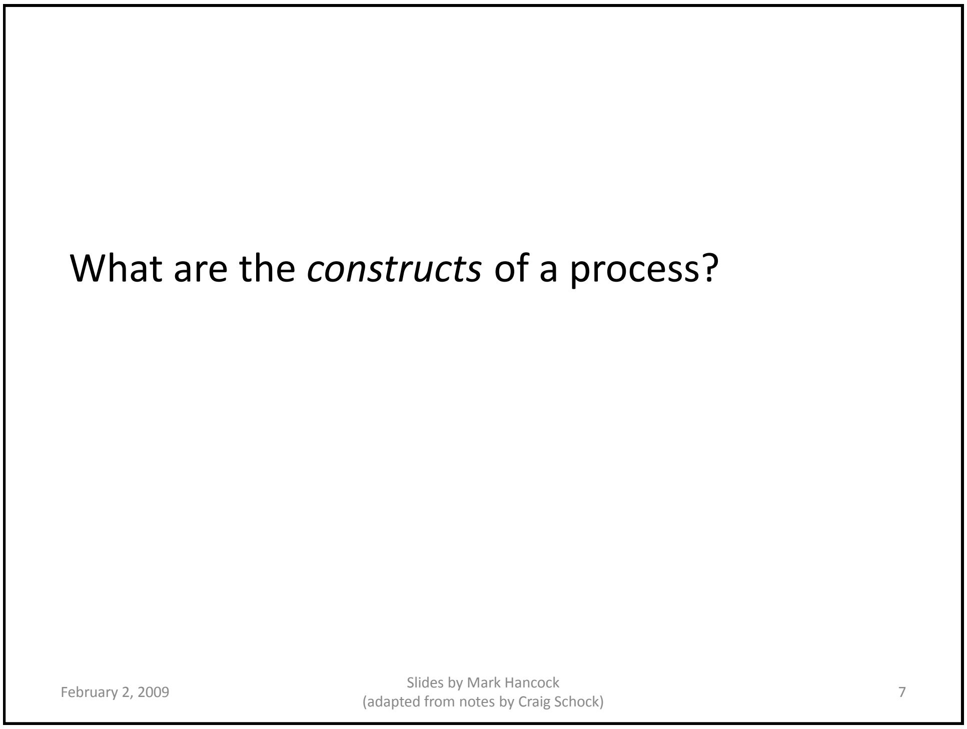
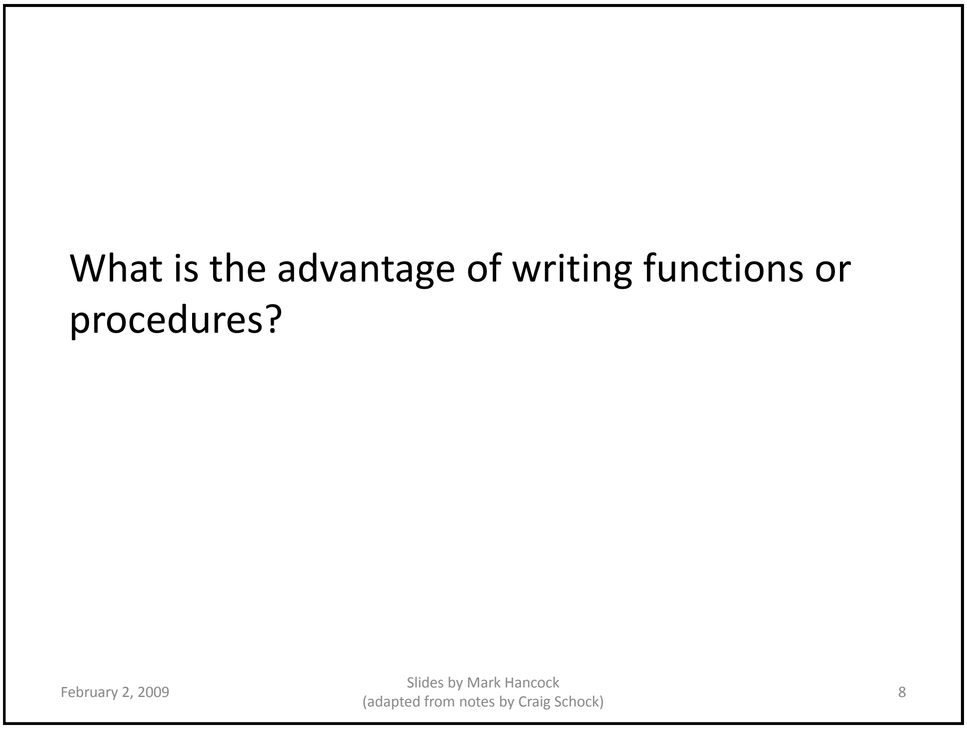
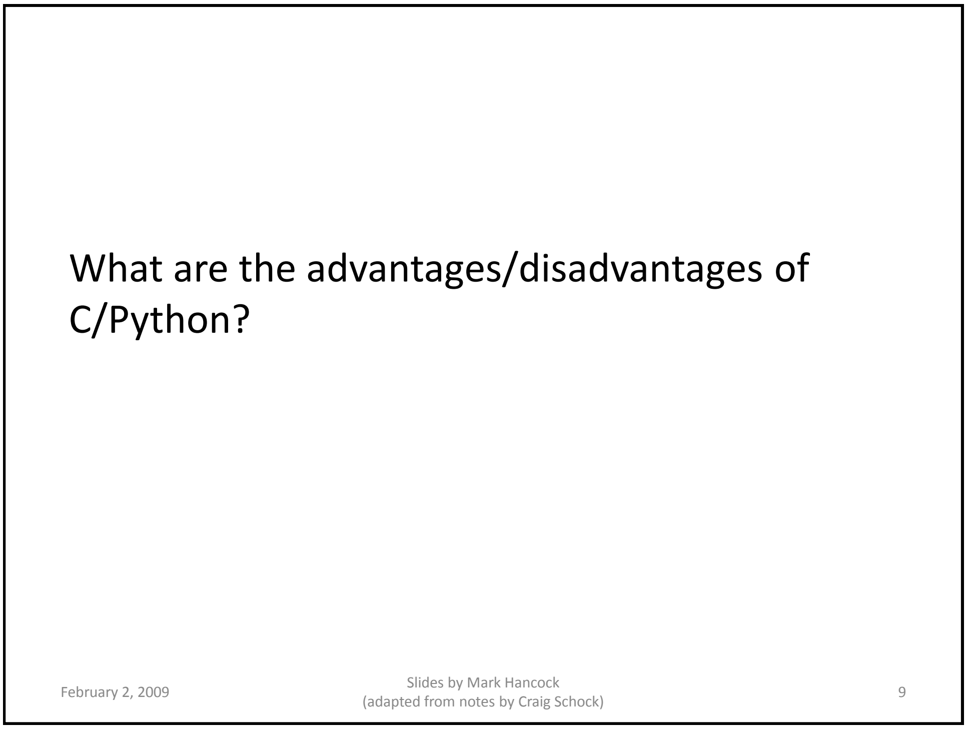


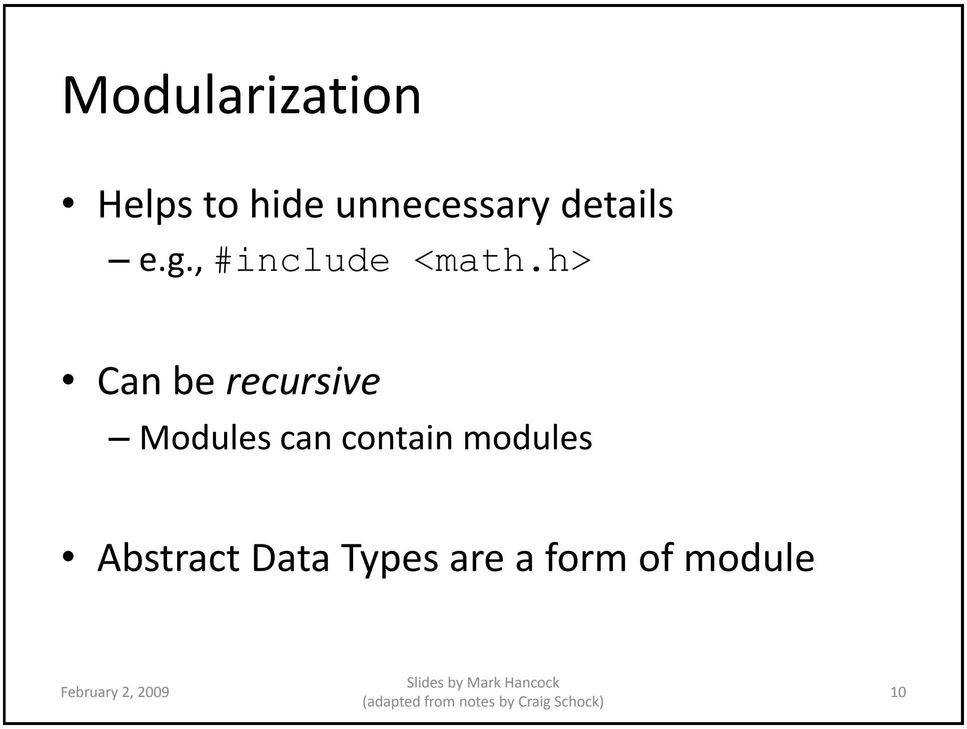
What are the *constructs* of a process?



What is the advantage of writing functions or procedures?



What are the advantages/disadvantages of C/Python?



Modularization

- Helps to hide unnecessary details
  - e.g., `#include <math.h>`
- Can be *recursive*
  - Modules can contain modules
- Abstract Data Types are a form of module

Procedural vs. Object-Oriented

- Procedural Decomposition/Analysis
  - – variables (information)
  - – functions (processes)
- Object-Oriented Analysis
  - – objects
  - – object relationships

What is the advantage of hiding implementation details?

Encapsulation

- Objects are said to *encapsulate* their implementation details
- To use an object, you don't need to know the details of how to manipulate its state
- E.g., inserting elements into a list in Python

Example: Tag Cloud

http://www.wordle.net

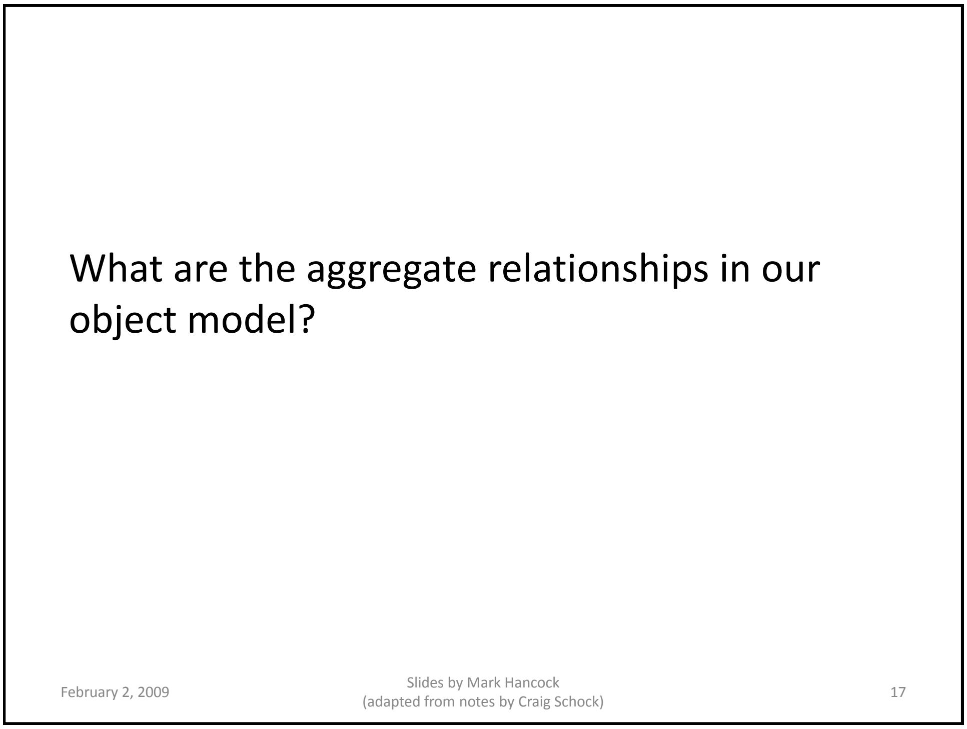
Hamlet
lord
Horatio
Claudius
Polonius
King
Laertes
Gertrude
Guildenstern
Rosencrantz
Ophelia
Thou
come
Enter
like
Queen
Marcellus
let
must
Well
go
Scene
know
good
now
thy
may
sir
speak
love
father
time
make
mother
first
hath
think
Tis
death
heaven
Exit
clown
thee
upon
Act
Look
Ghost
much

What object relationships exist in our *object model*?

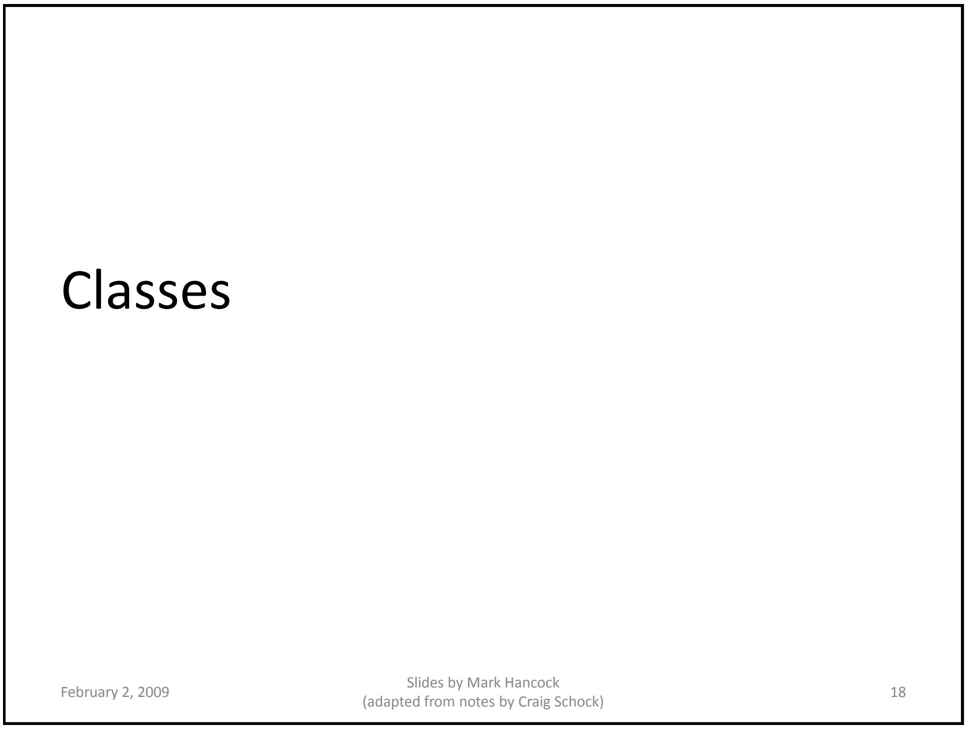
Aggregation

- "*Has-a*" relationship between objects

- E.g.,
  - A location *has a* latitude
  - A location *has a* longitude



What are the aggregate relationships in our object model?



Classes

Classify the following words

- absent
- invent
- lapdog
- lasted
- mascot
- napkin
- rented

- rested
- sunlit
- sunset
- suntan
- zigzag
- insect
- sudden

Linnaean Classification

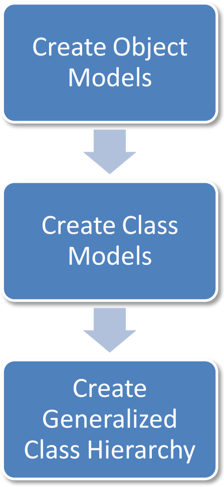
- Life
- Domain
- Kingdom
- Phylum
- Class
- Order
- Family
- Genus
- Species

- Hierarchical
  - Most general to most specific
- Called *generalization*
  - Use *inheritance* to create generalized classifications
  - But, not until later in the course

Linnaean Classification

- Method 1:
  - A biologist comes up with a category
  - Goes out and tries to find an instance of that new category.
- Method 2:
  - A biologist observes a form of life that may not exist within the classification system.
  - Once clear that the life form is not within the system, creates a new classification and adds it to the system.

Object-Oriented Design Process

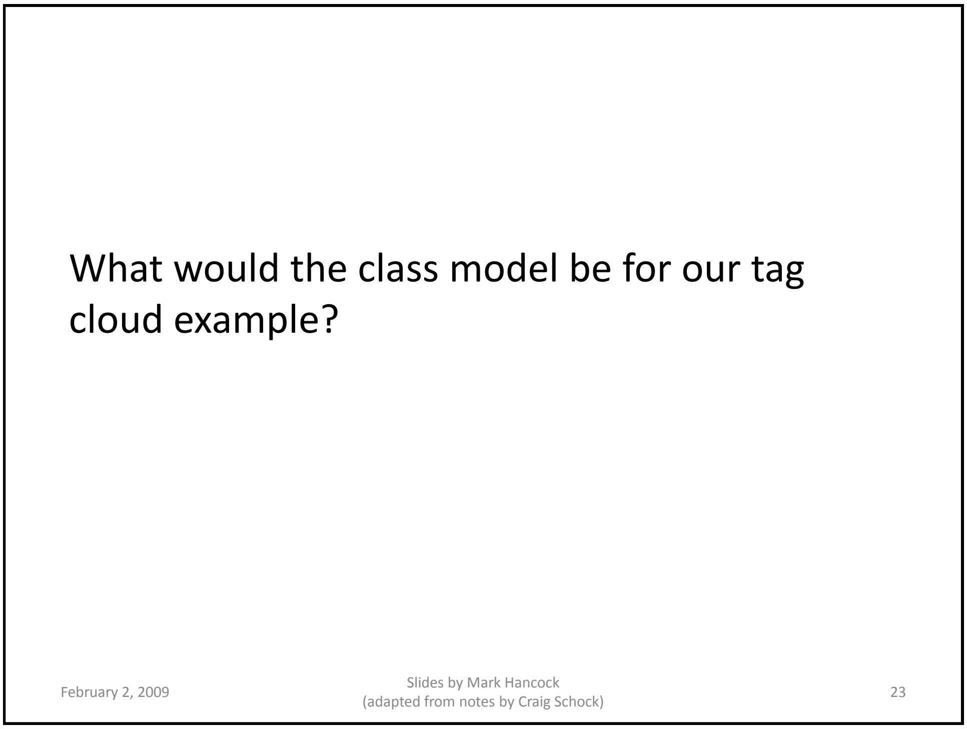


Create Object Models

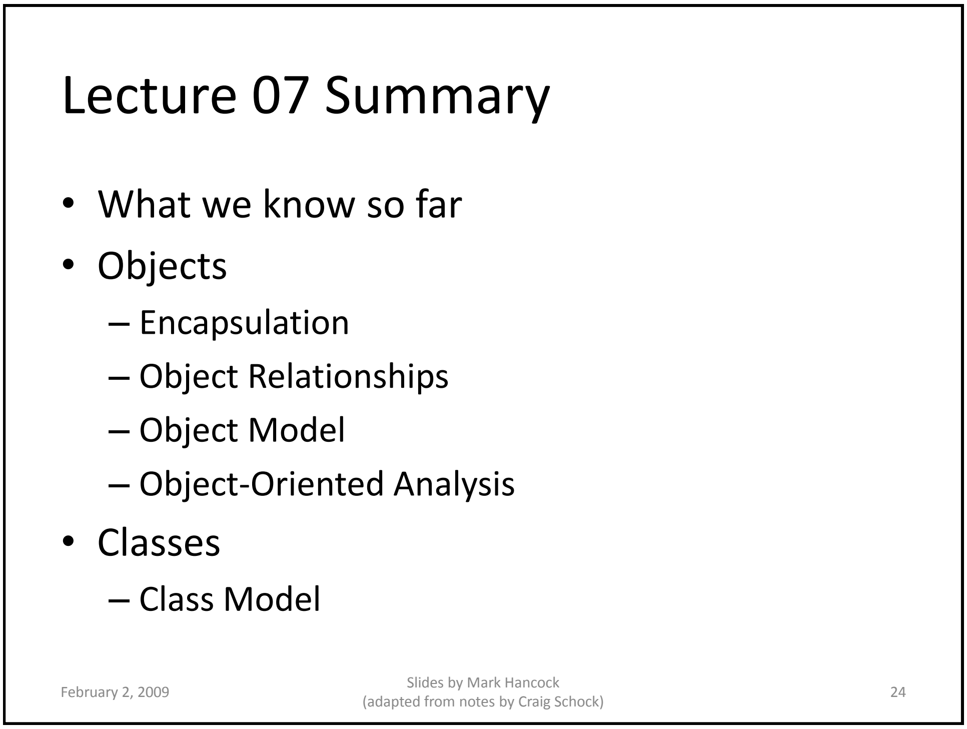
Create Class Models

Create Generalized Class Hierarchy

- Based on observations
  - of entities & relationships
  - within the problem space
- Based on commonalities
  - similar objects belong to the same class
- Based on commonalities
  - within class model



What would the class model be for our tag cloud example?



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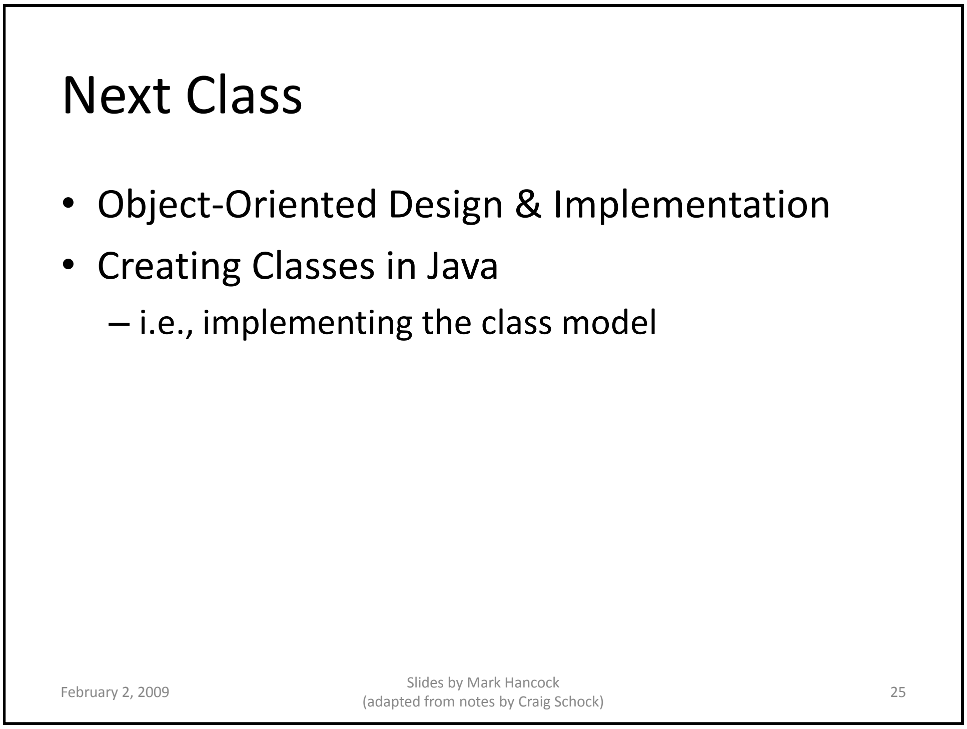

Next Class

- Object-Oriented Design & Implementation
- Creating Classes in Java
  - i.e., implementing the class model