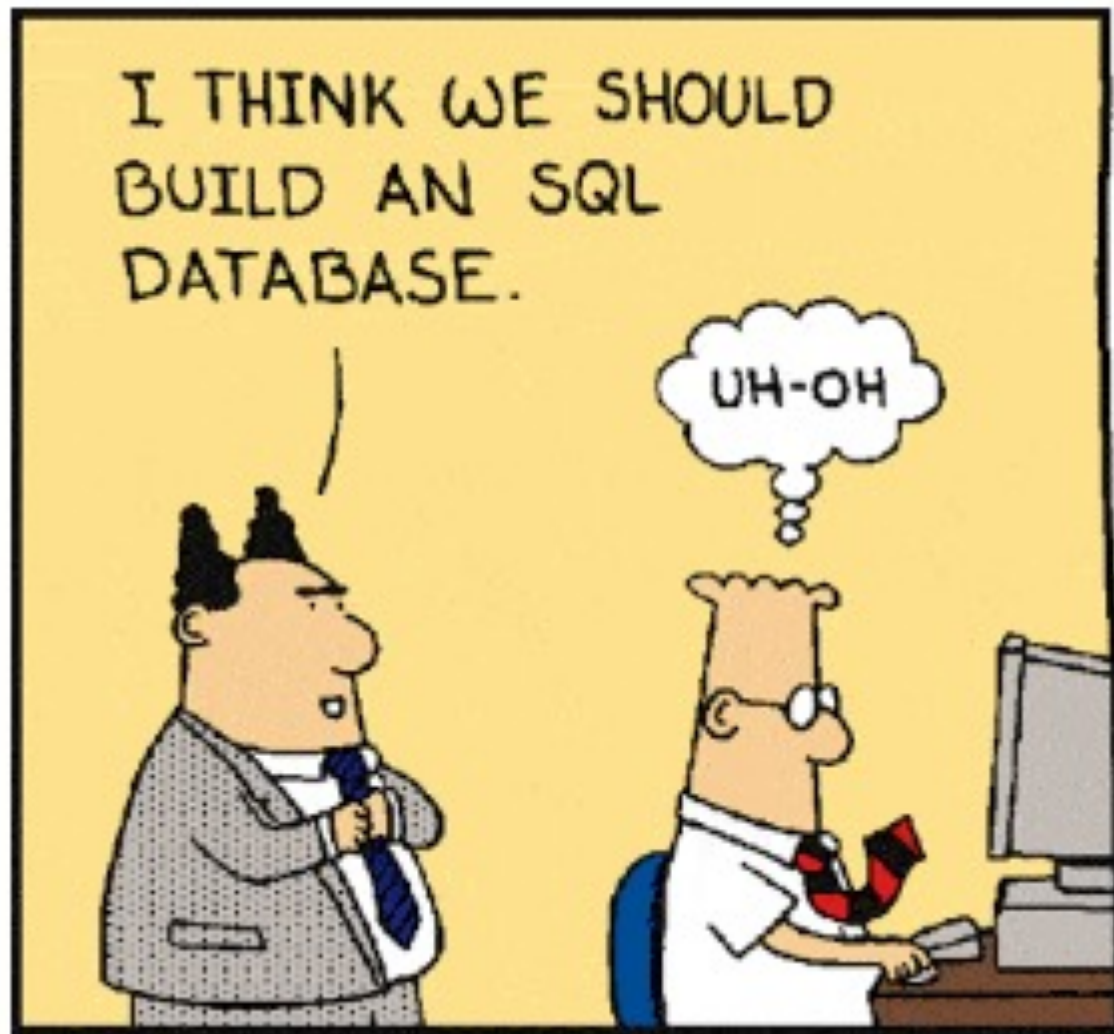


I THINK WE SHOULD  
BUILD AN SQL  
DATABASE.

UH-OH





WHAT COLOR DO YOU  
WANT THAT DATABASE?

I THINK  
MAUVE HAS  
THE MOST  
RAM.



# Databases

# Administrivia

- Course info:
  - Webpage will be the main source of knowledge.
  - Contact me through email or Slack (Slack is better for office hours and real-time discussion.)
- Pre-req: CS241
- Coursework:
  - Homework, group project, midterm, final
- Be prepared to bring laptops every so often.

# Group project

create  
read  
update  
delete  
CRUD

- You will design and implement your own database-driven website.
- Ideas: shopping, auctions, write a better BannerWeb, library/bibliography system, reviews (Yelp), bank, finance/stocks, job postings, social networking (Facebook, Twitter), recipes, movies, apartments (AirBnB), ...
- Groups: probably 4-5 people, formed on your own.
- Spread out over the whole semester; check-ins along the way.

# Office Hours ~~TBA~~

- Office hours will be held over Zoom and/or Slack while we are remote.
  - Send me an email or Slack message and I can open up a Zoom for us.
- Also send me email or a Slack message for "unscheduled" office hours.
  - I can't promise I'll respond immediately, but I'll always get back to you within a day, and we can most likely schedule a time to meet.

# Zoom Things

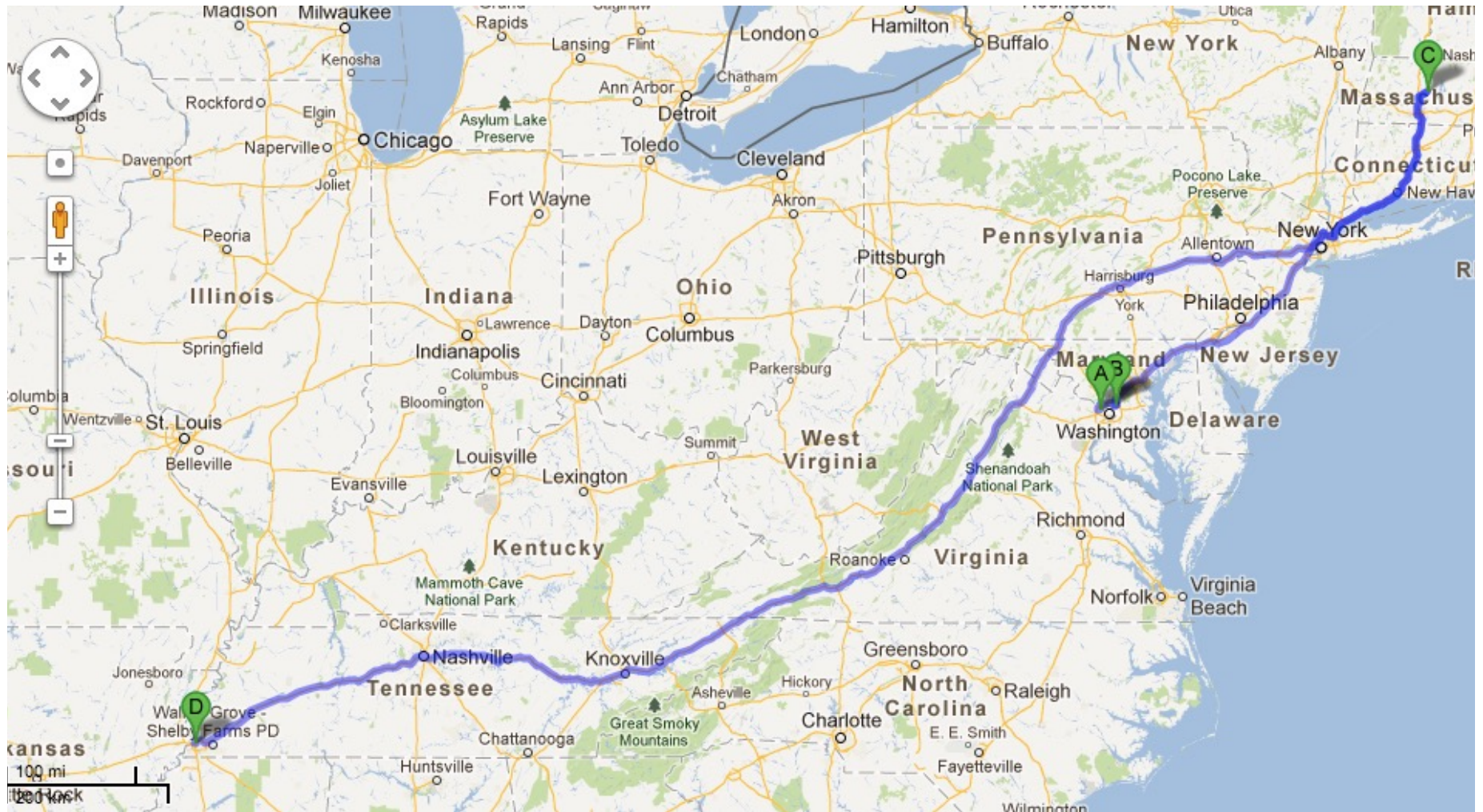
- Come to synchronous classes if possible.
  - Recordings available after class.
- Please turn on your cameras if you feel comfortable.
  - It helps us build a sense of community and your reactions do help me figure out how class is going.
- Please keep yourselves on mute unless talking.
- To ask a question:
  - Wait for a pause and just ask out loud. You can also use the "raise hand" feature.
  - Put it directly in the chat if it's short. (You can private-chat me as well if you want.)
- To answer a question:
  - Put the answer in the chat or, use "raise hand."
  - Or private-chat it to me if you want.



# How to succeed

- Come to class.
- Ask questions when you are confused: in class or office hours.
- Take notes, preferably on paper.
- Do not leave readings, homework, projects to the last minute. You can't BS (most) of these.

# A little about me



# A little about you

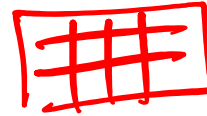
- Name
- Year at Rhodes (first-year, sophomore, etc.)
- Where you're from
- What is your favorite midnight snack?
- Bonus points if you introduce us to your pet(s) as well.

# Why study databases?

- Academic reasons
- Programming reasons
- Business (get a job) reasons
- Student reasons

# What will you learn?

- Database design
  - How do you model your data so it can be stored in a database?
- Database programming
  - How do I use a database to ask it questions about my data (*queries*)? **SQL**
  - – How do I use a programming language to interact with a database?
- Database implementation
  - How does the database itself work; i.e., how does it store, find, and retrieve data efficiently?



# What is the goal of a database?

- Electronic record-keeping, enabling **fast** and **convenient** access to the information inside.
- DBMS = Database management system
  - Software that stores individual databases and knows how to search the information inside.
  - RDBMS = Relational DBMS
  - Examples: Oracle, MS SQL Server, MS Access, MySQL, PostgreSQL, IBM DB2, SQLite

Oracle  
MySQL  
PostgreSQL  
SQL Server  
SAP  
DB2

# DBMS Features

- Support massive amounts of data
  - Giga-, tera-, petabytes
- Persistent storage
  - Data continues to live long after program finishes.
- Efficient and convenient access
  - Efficient: don't search the entire thing to answer a question!
  - Convenient: allow users to ask questions as easily as possible.
- Secure, concurrent, and atomic access

Climate 220 TB  
Nat'l Energy Research  
Computing Center  
2.8 PB

- Secure, concurrent, and atomic access

↳ Prevent people accessing your data who aren't supposed to.

↳ Multiple people can access simultaneously.

You can group operations together so  
either ALL of them happen  
OR NONE of them happen.



# Example: build a better BannerWeb

- Professors offer classes, students register, get grades
- What are some questions we (students or faculty) could ask of this database system?

– Find my GPA.

– ...*View a student schedule (prospective schedule)*

– Show classes. *Time of day* *– Show pre-reqs*

*Certain professor*

*Are it full*

*What you have the pre-reqs*

*– Non-conflicting classes*

# Example: build a better BannerWeb

- Why are (security,) concurrency, and atomicity important here?
- 
- Hand-drawn red annotations on the slide text. A red circle highlights the word "security" in the list item. A red arrow points from the underlined word "atomicity" back to the word "concurrency".