CODE 301

Intermediate Software Development

AGENDA

- Standup's
- Reduce Walkthrough
- CRUD & SQL
- Dev Tools SQL Demo
- Assignment Prep

CRUD

Code 301

WHY PERSISTENCE?

- It would be frustrating and disappointing if all your data kept disappearing.
- Web applications need a way to store data. This process is also called persistence.
- Persistence is typically on the server, but can also be in the browser.

WHAT IS A DATABASE?

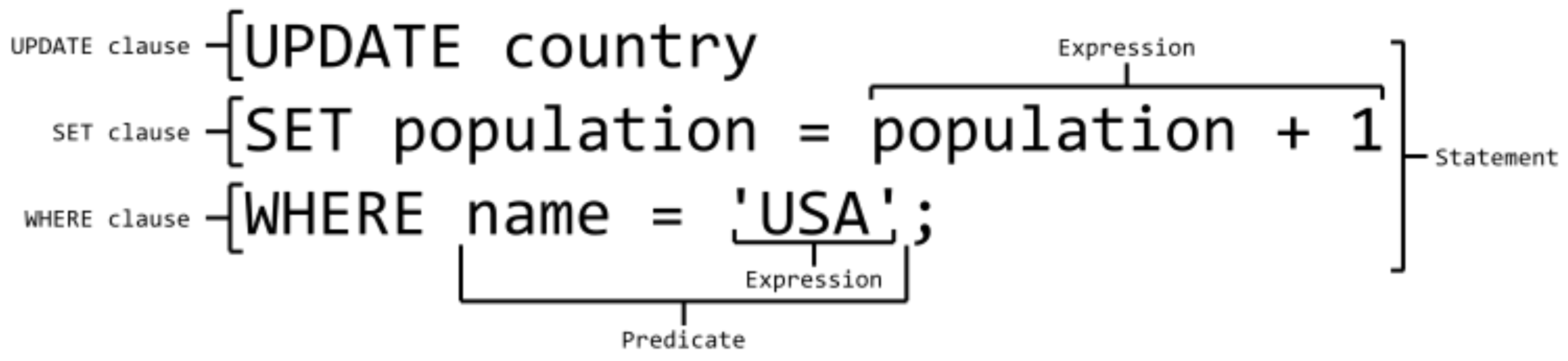
- A database is an organized collection of data.
- Database Management Systems (DBMS) have a wide variety of internal architectures, but typically they are composed of tables of data.
- Another rapidly growing alternative are documents.
- We will stick to table based databases because they are still the most common.

DATABASE TABLES

id	Name	Age	Billing Rate	Hours
01	Keesha	28	75.00	40
02	Mark	42	100.00	20
03	Pam	35	123.35	10

STRUCTURED QUERY LANGUAGE (SQL)

- Structured Query Language (SQL) is a special-purpose programming language designed for managing data. Developers use SQL for inserting new data, retrieving data, updating data, and deleting data.
- SQL statements are made up of clauses, expressions, and predicates as you can see in the image below:



```
UPDATE country
SET population = population + 1
WHERE name = 'USA';
```

QUERIES

- A query retrieves data from one or more tables, or expressions.

```
SELECT isbn,
       title,
       price,
       price * 0.06 AS sales_tax
 FROM  Book
 WHERE price > 100.00
 ORDER BY title;
```

DATA DEFINITION LANGUAGE

- Data Definition Language (DDL) manages the table and index structure.
- The most basic statements in DDL are:
  - CREATE (http://www.w3schools.com/sql/sql_create_table.asp)
  - ALTER (http://www.w3schools.com/sql/sql_alter.asp)
  - DROP (http://www.w3schools.com/sql/sql_drop.asp)
  - TRUNCATE (http://www.w3schools.com/sql/sql_drop.asp)

DATA DEFINITION LANGUAGE

- Here's an example of create:

```
CREATE TABLE example(
        column1 INTEGER PRIMARY KEY
        column2 VARCHAR(50),
        column3 DATE NOT NULL,
);
```

DATA TYPES

- A data type is a constraint on the kind of data a column can have.
- Having strong types helps you collect accurate and valid data.
- Example types are:
  - Integer
  - Float
  - Char
  - Varchar
  - Text
  - Date
  - Time

SO HOW DOES THIS RELATE TO MVC?

WHAT IS A MODEL?

- Models are, in essence, a simplified description of a real world object. A database table is a simple model.
- In object-oriented code, models are objects. The columns correspond to properties. Here's an example constructor in JavaScript:

```
function Employee(name, age, billingRate, hours) {
    this.name        = name;
    this.age         = age;
    this.billingRate = billingRate;
    this.hours       = hours;
}
```

MODELING YOUR DATA WITH SQL

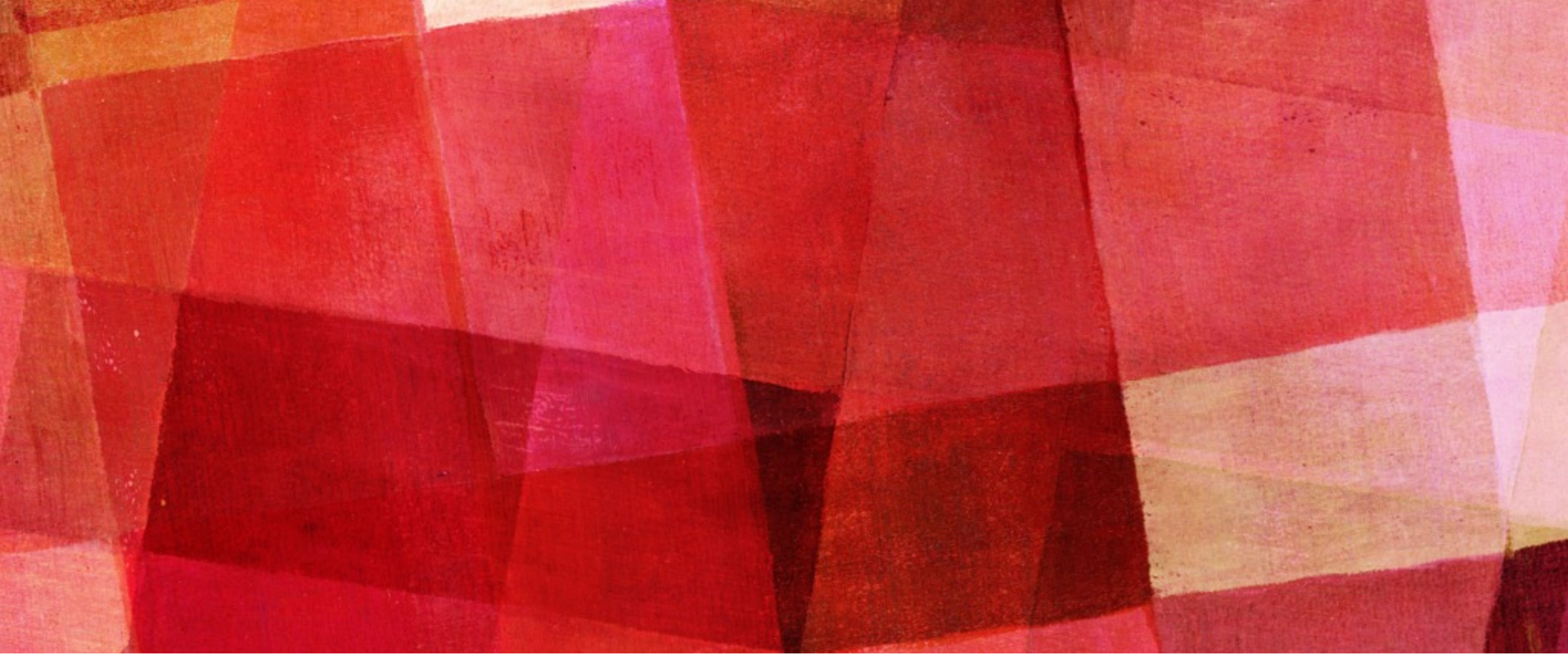
- Create tables to model your objects

```
CREATE TABLE employees(
        id INTEGER PRIMARY KEY
        name VARCHAR(50)
        age INTEGER,
        billingRate INTEGER,
        hours INTEGER
);
```

WHAT CAN WE DO WITH THIS?

CRUD

Create, Read, Update, and Destroy



CREATE

CRUD

CREATING A TABLE

- Name the table and list the desired columns and data types.

```
CREATE TABLE articles(
	id INTEGER PRIMARY KEY
	title VARCHAR(50)
	author VARCHAR(50),
	markdown TEXT,
	publishedOn DATETIME
);
```

RESULT: CREATED TABLE

id	title	author	markdown	publishedOn

INSERTING RECORDS

- Use INSERT INTO
- Name the columns you wish to affect and list the values for the record.

```
INSERT INTO articles (title, author, markdown, publishedOn)
  VALUES  ('Bacon Ipsum', 'Kevin Bacon', '# hickory smoked',
'2015-12-25');
```

RESULT: TABLE WITH NEW RECORD

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22

MORE RECORDS!

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	Keven Bacron	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18
4	Cajun Isum	Zatarans	# boudin cajun...	2012-06-05
5	Sagan Ipsum	Carl Sagan	# distant epochs...	2014-08-01
6	Hipsters Ipsum	Macklemore	# Freegan helvetica...	2015-12-02
7	Pirate Ipsum	Wesley	# prow scuttle	2015-06-08

READ

CRUD

QUERYING DATA

- Use the SELECT clause with optional constraints to build rich queries.

```
SELECT title, author, publishedOn
  FROM  articles
  WHERE publishedOn BETWEEN '2013-01-01' AND  '2013-12-31'
  ORDER BY publishedOn DESC;
```

ACTION: SELECT QUERY

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	Keven Bacron	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18
4	Cajun Isum	Zatarans	# boudin cajun...	2012-06-05
5	Sagan Ipsum	Carl Sagan	# distant epochs...	2014-08-01
6	Hipsters Ipsum	Macklemore	# Freegan helvetica...	2015-12-02
7	Pirate Ipsum	Wesley	# prow scuttle	2015-06-08

RESULT: QUERY

title	author	publishedOn
Bacon Ipsum	Kevin Bacon	2013-04-22
Cat Ipsum	Meow Meow	2013-07-18
Six Degrees	Keven Bacron	2013-12-13

RESULT: QUERY

title	author	publishedOn
Bacon Ipsum	Kevin Bacon	2013-04-22
Cat Ipsum	Meow Meow	2013-07-18
Six Degrees	Keven Bacron	2013-12-13

BAD DATA: WHAT TO DO?

title	author	publishedOn
Bacon Ipsum	Kevin Bacon	2013-04-22
Cat Ipsum	Meow Meow	2013-07-18
Six Degrees	**Keven Bacron**	2013-12-13

HOW CAN WE CHANGE THIS?

UPDATE

CRUD

UPDATING RECORDS

- Use the UPDATE clause to alter an existing record.

```
UPDATE articles

SET  author = 'Kevin Bacon'

WHERE author = 'Keven Bacron'
```

ACTION: UPDATE RECORD

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	**Keven Bacron**	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18

RESULT: UPDATED TABLE

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	**Keven Bacron**	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18

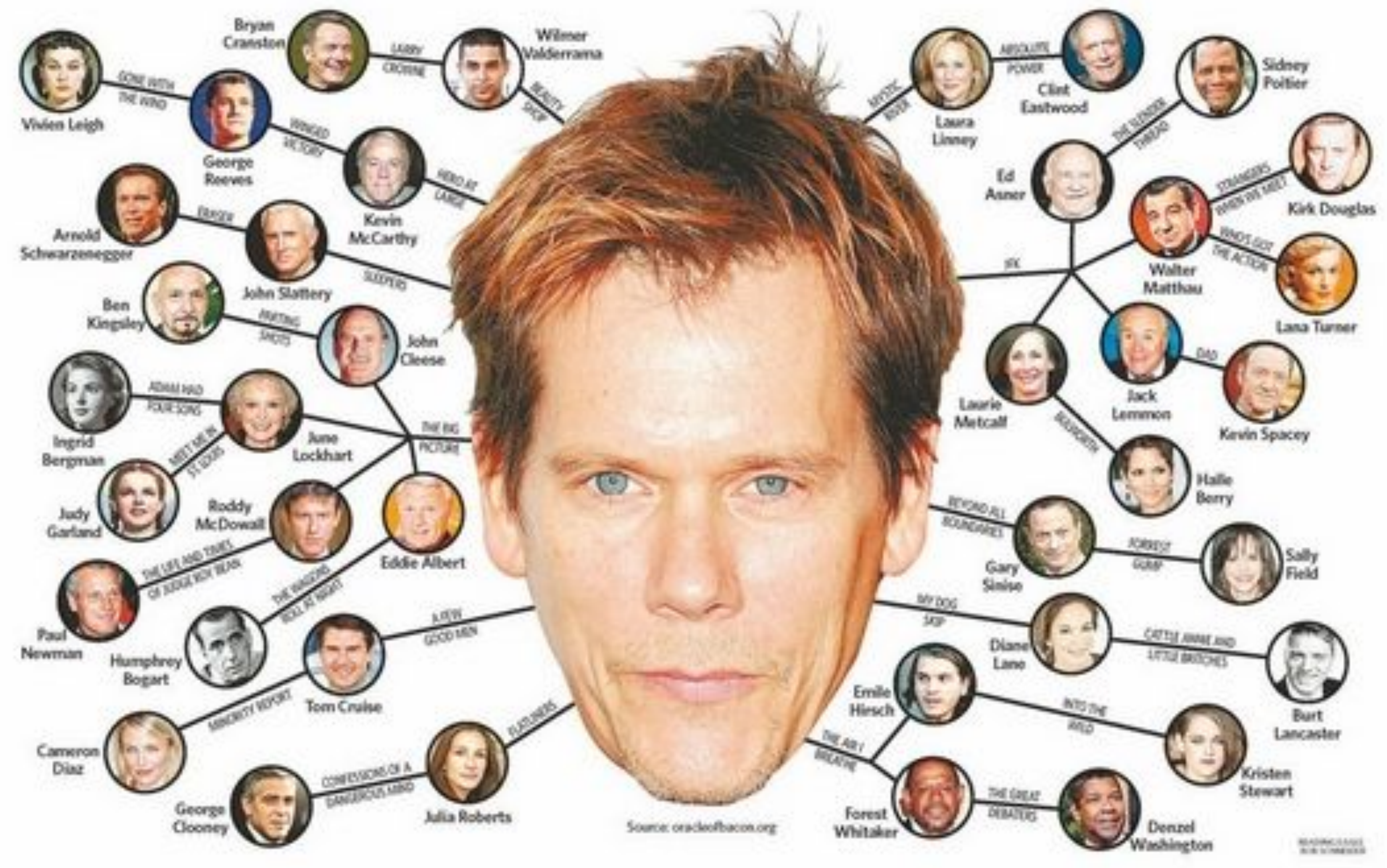
RESULT: UPDATED TABLE

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	**Kevin Bacon**	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18

ALWAYS USE A CONDITION WITH UPDATE!

- You must remember to use a condition when using update to avoid affecting ALL records.

```
UPDATE articles
SET  author = 'Kevin Bacon'
WHERE author = 'Keven Bacron'
```



Source: oracleofbacon.org

WHAT IF WE WANT TO REMOVE RECORDS?

DESTROY!

CRUD

DELETING RECORDS

- Use the DELETE FROM clause to remove an existing record.

```
DELETE FROM articles

WHERE author = 'Keven Bacron'
```

ACTION: DELETE

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked...	2013-04-22
2	Six Degrees	**Keven Bacron**	# I worked with...	2013-12-13
3	Cat Ipsum	Meow Meow	# chasing cute...	2013-07-18

RESULT: UPDATED TABLE (EXCERPT)

id	title	author	markdown	publishedOn
1	Bacon Ipsum	Kevin Bacon	# Hickory Smoked…	2013-04-22
~~2~~	~~Six Degrees~~	~~Keven Bacron~~	~~# I worked with…~~	~~2013-12-13~~
3	Cat Ipsum	Meow Meow	# chasing cute…	2013-07-18

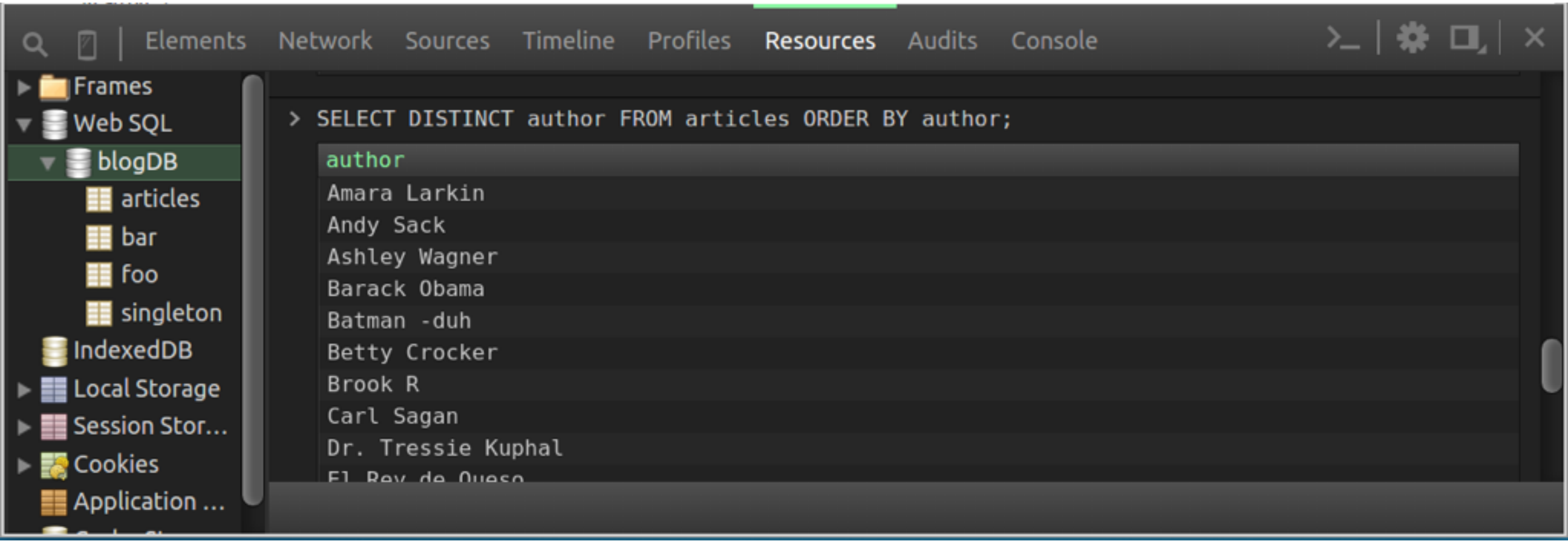
COOL. HOW CAN WE USE THIS ALL?

SQL IN BROWSER

WEBSQL DATABASE

- Provides in-browser SQL functionality
- Based on SQLite 3.1.19
- Best supported by Chrome

CHROME DEV TOOLS WEB SQL



```
> SELECT DISTINCT author FROM articles ORDER BY author;
author
Amara Larkin
Andy Sack
Ashley Wagner
Barack Obama
Batman -duh
Betty Crocker
Brook R
Carl Sagan
Dr. Tressie Kuphal
El Rey de Queso
```

WEBDB API

- Provides a simple JavaScript interface to Web SQL.
- Uses the html5sql.js library to allow *sequential* processing of SQL statements.

```
webDB.init();
webDB.execute();
```

WEBDB API: INIT METHOD

- Creates a connection to a Web SQL database.
- Provides useful defaults.
- Sets up success and error logging for SQL operations.

```
webDB.init();
```

WEBDB API: EXECUTE METHOD

- Allows you to execute SQL statements sequentially.
- You can specify a success callback function.

```
webDB.execute (sql, callback);
```

WEBDB API: EXECUTE METHOD

- SQL statements can be passed in many forms*.

```
webDB.execute (sql, callback);
```

* See http://html5sql.com/guide.html for full info.

WEBDB API: EXECUTE METHOD

- A single SQL string.

```
webDB.execute (
  'SELECT * FROM articles;',
  callback
);
```

WEBDB API: EXECUTE METHOD

- A single SQL string.
- An array of SQL strings.

```
webDB.execute (
  [
    'DELETE FROM articles WHERE id = 10;',
    'SELECT * FROM articles;'
  ],
  callback
);
```

WEBDB API: EXECUTE METHOD

- A single SQL string.
- An array of SQL strings.
- An array of SQL objects which can *safely* take dynamic data.

```
webDB.execute (
  [
    {
      sql: 'SELECT * FROM articles WHERE id = ?;',
      data: [id]
    }
  ],
  callback
);
```

WEBDB API: EXECUTE METHOD

- The success callback will be passed a *resultsArray* argument.
- For example, to select and log all records:

```
webDB.execute (
  'SELECT * FROM articles;',
  function(resultsArray) {
    console.log(resultsArray);
  }
);
```

GREAT. NOW SQL AND JS CAN BE FRIENDS.

RECAP

- Databases allow powerful interaction with data
- SQL -- language for relational databases
- CRUD -- Create, Read, Update, Destroy
- Web SQL -- Access to SQL in browser

REFERENCES AND SOURCES

- A Primer on SQL: https://leanpub.com/aprimeronsql/read
- Introducing Web SQL: http://html5doctor.com/introducing-web-sql-databases/
- HTML5SQL.js Library: http://html5sql.com/