

Lecture 1: Getting started...

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TWEB



Haute Ecole d'Ingénierie et de Gestion
du Canton de Vaud



Quick Poll

Quick Poll

- **What is your current perception of Web development?**
- **Personal interest**
 - Web apps? It's **for junior developers and kids**, but real software engineers have better things to do.
 - Web apps? I am not a **graphics designer**... what am I doing here?
 - The Web is where some of the **most exciting technologies** are emerging.
 - When I grow up, I want to be a **front-end engineer**.

Quick Poll

- **What is your current perception of Web development?**
- **Scope**
 - Web development is **purely about building user interfaces**. It's about HTML and CSS pages.
 - Web development is about building **complete applications**, including a user interface.
 - Is there **any kind of application** that does not rely on the Web, in one way or another? Mobile apps, interactive apps, business apps: all of this is built on the Web!

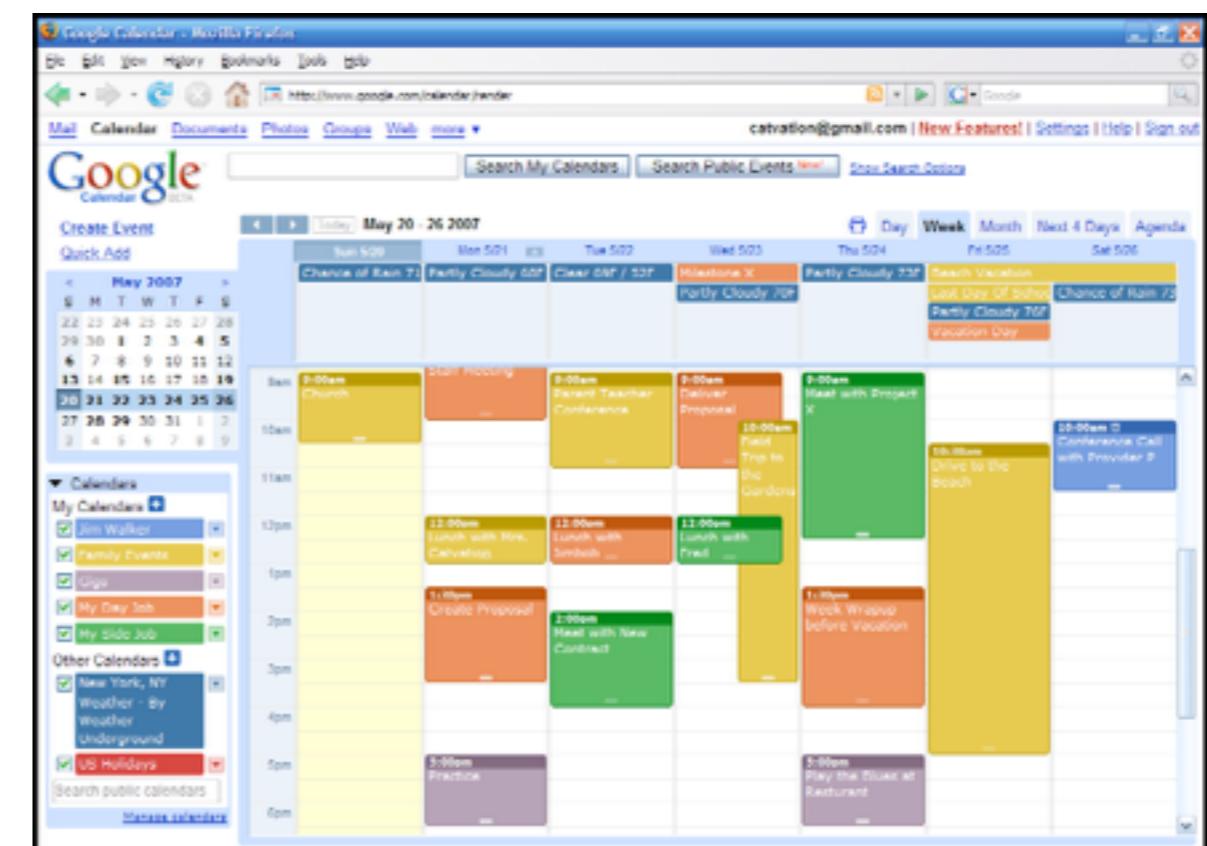
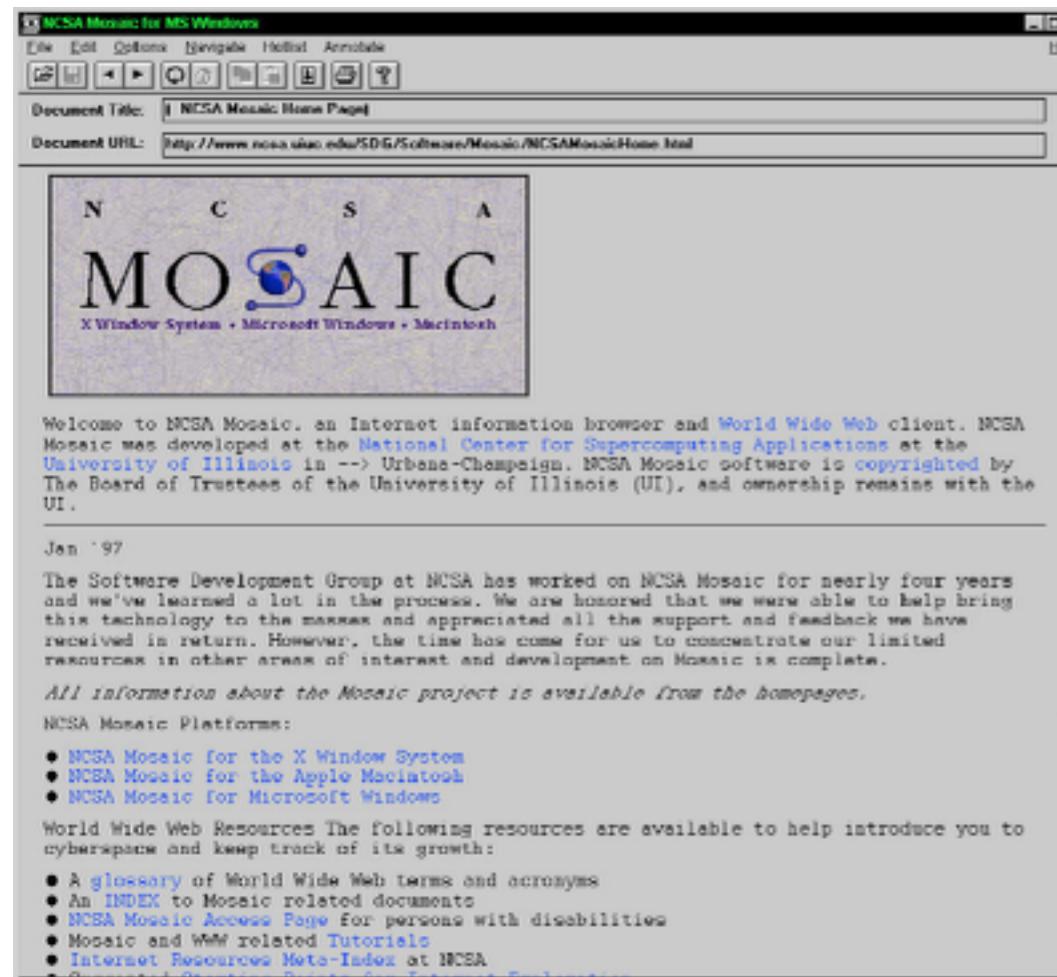


Introduction

The Web as an Application Platform

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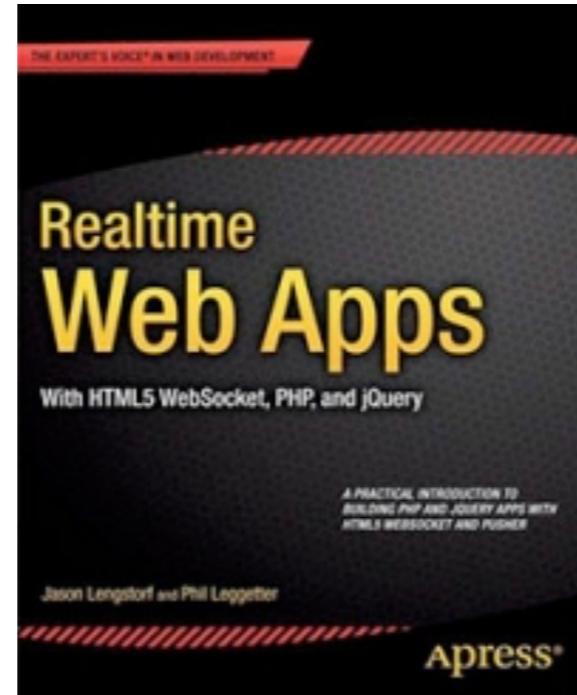
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Some Trends



SPA



Server Push



Automated Development Workflows



Mobile & RWD



Web of Things

Languages, Platforms, Communities

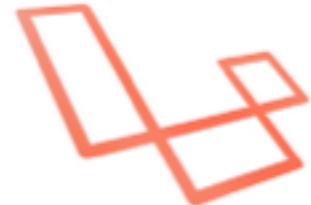


Client

Server



Languages, Platforms, Communities



laravel



Microsoft®
.NET

JavaScript - End to End



Client

express



Server

node.js™

SOCKET
IO



Meteor

A logo for Meteor, featuring a stylized white blob-like icon above the word 'Meteor' in a bold, sans-serif font.



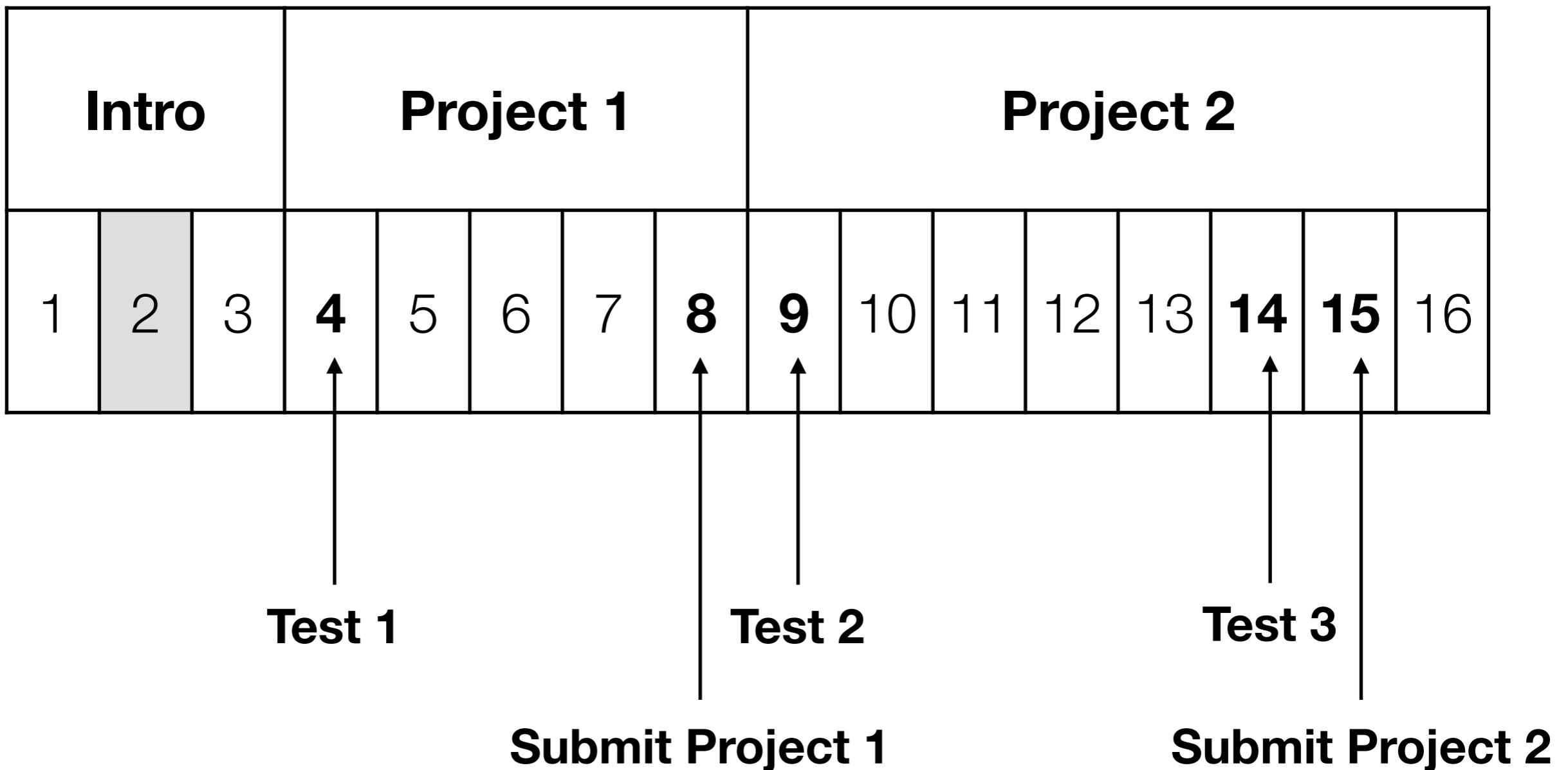
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Douglas Crockford: JavaScript: The Good Parts

[https://www.youtube.com/watch?v= DKkVvOt6dk](https://www.youtube.com/watch?v=DKkVvOt6dk)

Planning





Quick Poll

Quick Poll

- **What is your current perception of JavaScript?**
- **Scope**
 - It's a "**toy**" language for creating animations on web pages, but I would not use it for anything "serious".
 - It's a **very powerful language**. It is essential on the client side, but it is also really interesting on the server side.

Quick Poll

- **What is your current perception of JavaScript?**
- **Personal taste**
 - I hate it.
 - I am not a big fan.
 - It's kind of interesting.
 - I love it.
 - I don't care.

Quick Poll

- **What is your current perception of JavaScript?**
- **Relationship to Java**
 - It's Java, with a few syntactic differences.
 - It has nothing to do with Java, except for some common syntax.

Quick Poll

- **What is your current perception of JavaScript?**
- **Current knowledge**
 - **Novice:** I may have hacked a few scripts on web pages, but mostly by copy-pasting examples and without fully understanding the language (what is a prototype?).
 - **Intermediate:** I have used JavaScript quite a bit. I can describe the object-oriented model, I understand what a constructor is and how it works. I have quite a bit of experience with JQuery and other libraries. I am always working with a debugger.
 - **Expert:** closures and modules have no secret for me, I have read "JavaScript: the good parts". I have designed my development workflow with yeoman, grunt, bower and a few other tools. I know who Paul Irish is.

Quick Poll

TWEB Lab 01

127.0.0.1:50337/index.html

Playing with JavaScript and Libraries

- When you move the mouse, the coordinates should be displayed in the sticky footer.
- When you move the mouse, a person should be created with random attributes.
- The current time should be displayed in the Clock panel.
- When you click on the "Show alert" button, a dialog should appear.
- When you click on the "Toggle student" button, the panel should be hidden/shown.

Hello Bessie McCarthy (Female)

Room: A38, 50
Room: B22, 40
Room: C18, 200

Clock

Sun Sep 14 2014 11:19:03 GMT+0200 (CEST)

Show alert Toggle student

30, 153

Interactive Visualization of

127.0.0.1:64774/index.html

Simulation Mode:
 Barnes Hut Repulsion Hierarchical
Barnes Hut

gravitationalConstant	0	—	20000	2000
centralGravity	0	—	3	0.01
springLength	0	—	500	145
springConstant	0	—	0.5	0.2
damping	0	—	0.3	0.5

Options:

Toggle smoothCurves Reinitialize Generate Options

zip: 1700 FirstName: Hans

firstName: Seche lastName: Liechti zip: 1446 FirstName: Olivier lastName: Liechti

toy: Toy Object Cat

Playing with JavaScript objects and visualization libraries

Application Example 1

- **How hard would it be to implement this application?**
 - **Very hard:** I would not know where to start.
 - **Intermediate:** I don't know exactly what needs to be done, but I know where to look for information.
 - **Trivial:** I know exactly what to do.
- **How long would you need to implement this app?**
 - less than 30'
 - less than 2 hours
 - about 1 day
 - about 1 week

Application Example 2

- **How hard would it be to implement this application?**
 - **Very hard:** I would not know where to start.
 - **Intermediate:** I don't know exactly what needs to be done, but I know where to look for information.
 - **Trivial:** I know exactly what to do.
- **How long would you need to implement this app?**
 - less than 30'
 - less than 2 hours
 - about 1 day
 - about 1 week

Agenda

13h00 - 14h00	60'	Lecture General introduction Tools, Intro to JavaScript, part I
14h00 - 15h30	90'	Lab 01 Basic web app with Bootstrap and JQuery
<i>15h30 - 16h00</i>		Break
16h00 - 16h30	30'	Lecture Review of Lab 01 Intro to JavaScript, part II
16h30 - 17h45	75'	Lab 02 Interactive visualization of JavaScript objects
17h45 - 18h00	15'	Presentation, demonstrations & synthesis



Tools, part 1

Experimenting with JavaScript

What do I need to write, execute and debug JavaScript code?

- Should I work on the **server side** or on the **client side**?
- Should I use a **simple text editor** or a **complete IDE**?
- Should I rather use an **online programming environment**?
- What kinds of **developer tools**, such as debuggers, are available?

Browsers and Developers Tools

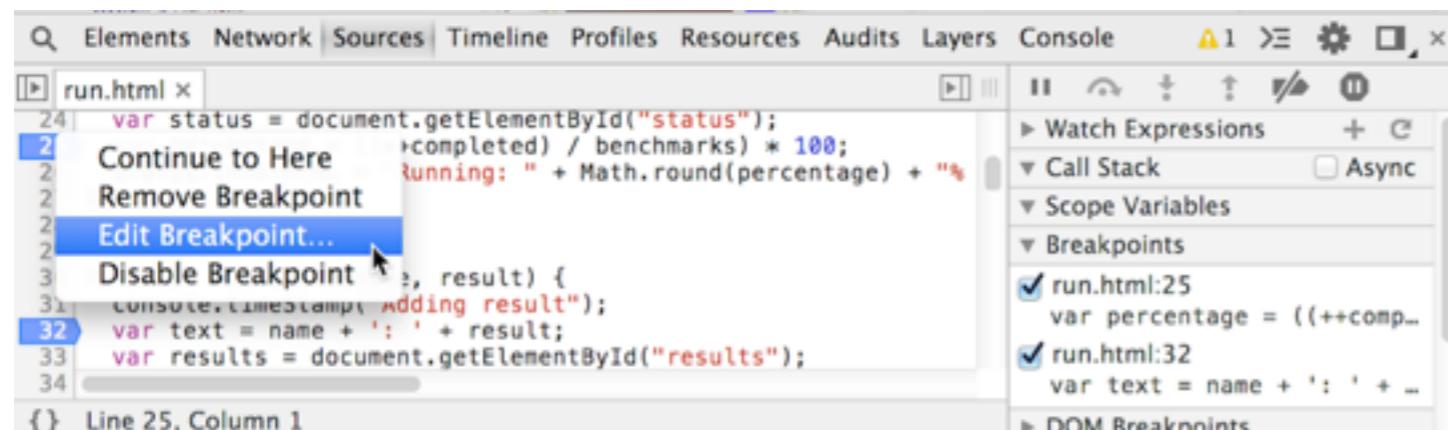


Browsers and Developers Tools

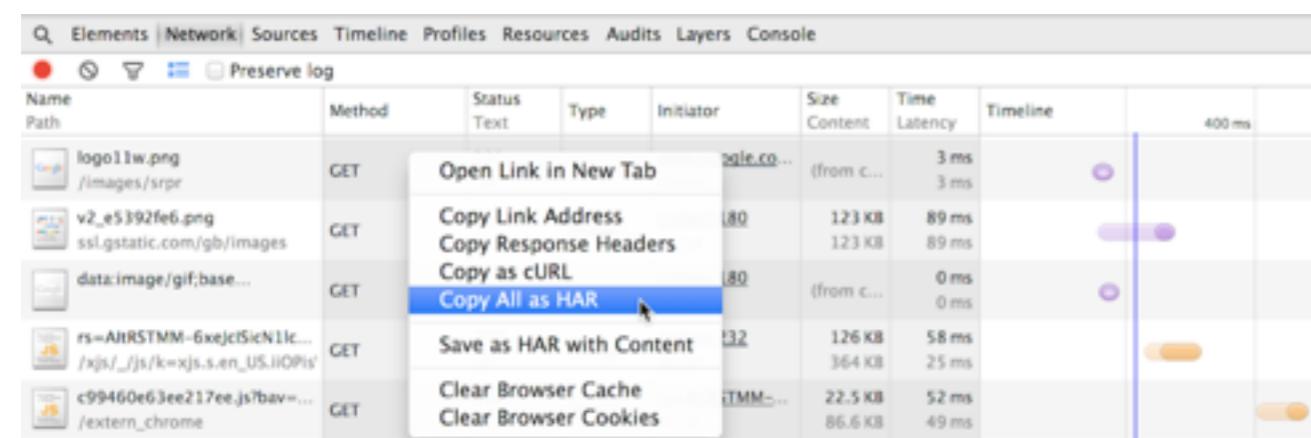
Chrome DevTools Overview

The Chrome Developer Tools (DevTools for short), are a set web authoring and debugging tools built into Google Chrome. The DevTools provide web developers deep access into the internals of the browser and their web application. Use the DevTools to efficiently track down layout issues, set JavaScript breakpoints, and get insights for code optimization.

Note: If you are a web developer and want to get the latest version of DevTools, you should use [Google Chrome Canary](#).



A screenshot of the Chrome DevTools Sources tab. The left pane shows a portion of a JavaScript file named 'run.html' with several lines of code. Line 24 has a red highlight, and line 25 is selected. A tooltip above the code says 'Continue to Here'. Lines 26 and 27 are 'Remove Breakpoint' and 'Edit Breakpoint...', respectively. Line 28 is 'Disable Breakpoint'. Lines 29 through 34 show console.log statements and variable assignments. The right pane shows the 'Breakpoints' sidebar with two checked entries: 'run.html:25' and 'run.html:32'. Other sections like 'Watch Expressions', 'Call Stack', and 'Scope Variables' are also visible.



A screenshot of the Chrome DevTools Network tab. It lists several network requests: 'log01w.png', 'v2_e5392fe6.png', 'data:image/gif;base...', 'rs=AIRSTMM-6xeJcIScN1e...', and 'c99460e63ee217ee.js?bav=...'. The last request has a context menu open with options: 'Open Link in New Tab', 'Copy Link Address', 'Copy Response Headers', 'Copy as cURL', and 'Copy All as HAR'. The 'Copy All as HAR' option is highlighted with a blue selection bar.

<https://developer.chrome.com/devtools>



How to access the DevTools

The DevTools window

Inspecting the DOM and styles

Working with the console

Debugging JavaScript

Improving network performance

Audits

Improving rendering performance

JavaScript CSS performance

Inspecting storage

Further reading

Further resources

Setup 1: Online Programming Environment

- There are several online environments, which can be used to write, execute, debug and **share** JavaScript programs.
- Use your browser and **developer tools** within your browser.



Experimenting with JavaScript

The screenshot shows the JSFiddle interface with the following details:

- Frameworks & Extensions:** jQuery 2.1.0 (selected), Bootstrap 3.2.0 (checked).
- onDomready:**

```
// this function will be called when the DOM is ready
$(function() {
  $("h2").html("...by this text");
  console.log("hello console");
});
```
- HTML:**

```
<div class="container">
  <h1>Sandbox</h1>
  <div class="panel panel-default">
    <div class="panel-body">
      <h2>This will be replaced...</h2>
      A simple demo of Bootstrap and JQuery.
    </div>
  </div>
</div>
```
- CSS:** None.
- Result:** Displays "Sandbox" and "...by this text".
- Bottom Left:** Keyboard shortcuts icon.

Experimenting with JavaScript

The screenshot shows the JS Bin interface. On the left, there's a sidebar with a bin icon, 'New bin' and 'Open bin...' buttons, and a checkbox for 'Textarea editor mode'. The main navigation bar includes 'File', 'Add library', 'Share', and tabs for 'HTML', 'CSS', 'JavaScript', 'Console', and 'Output'. The 'JavaScript' tab is active, displaying the following code:

```
// this function will be called
when the DOM is ready
$(function() {
  $("h2").html("...by this
text");
  console.log("hello console");
});
```

The 'Output' panel on the right shows the rendered result: **Sandbox** with the text "...by this text". Below it, a note says "A simple demo of Bootstrap and JQuery." At the bottom right, there's a 'Bin info' button.

Experimenting with JavaScript

The screenshot shows the CodePen interface with the following details:

- Header:** CodePen – A Pen by Olivier
- URL:** codepen.io/wasadigi/pen/imadn
- Editor:** Editor tab selected.
- HTML:** Contains a simple Bootstrap-based layout with placeholder text.
- CSS:** Empty file.
- JS:** Contains a jQuery script that replaces an

element with "...by this text" and logs "hello console".
- Preview:** Shows the rendered "Sandbox" page with the updated content.
- Bottom Bar:** Collections, Embed, Details & Comments, Delete, Last saved 1 minute ago, Keyboard, and other UI elements.

```
1<div class="container">
2  <h1>Sandbox</h1>
3  <div class="panel panel-default">
4    <div class="panel-body">
5      <h2>This will be replaced...</h2>
6      A simple demo of Bootstrap and
7      JQuery.
8    </div>
9  </div>
10 </div>
```

```
1// this function will be called when the
2DOM is ready
3$(function() {
4  $("h2").html("...by this text");
5  console.log("hello console");
6});
```

Sandbox

...by this text

A simple demo of Bootstrap and JQuery.

Experimenting with JavaScript



Codepen Vs JSFiddle Vs CSSDeck Vs Liveweave Vs JSBin Vs Dabblle

January 13, 2014

<http://mediaunmasked.com/reviews/software/codepen-jsfiddle-cssdeck-liveweave-jsbin-dabblle/>

Setup 2: IDE + Browser + Dev Tools

- Select an editor to write the JavaScript (and HTML/CSS) code.
- **Configure the editor with “JSLint” capabilities**
- Select one browser.
- Use developer tools within the browser.

Some of the Available Editors...



TextMate



Sublime Text



Cloud9 IDE



NetBeans



JS

JavaScript 101 (Part 1)

JavaScript is built on some very good ideas and a few very bad ones.

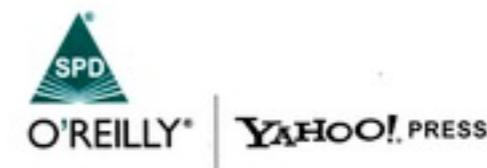
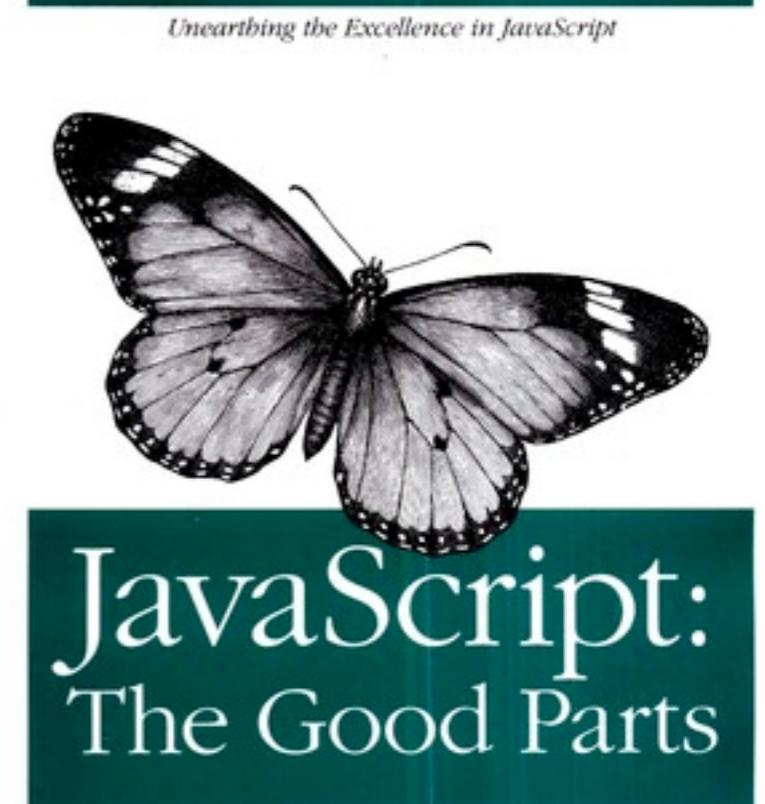
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JavaScript is an important language because it is the language of the web browser. Its association with the browser makes it one of the most popular programming languages in the world. **At the same time, it is one of the most despised programming languages in the world.** [...]

Most people in that situation **don't even bother to learn JavaScript first**, and then they are surprised when JavaScript turns out to have significant differences from the some other language they would rather be using, and that those differences matter.

The amazing thing about JavaScript is that it is possible to get work done with it without knowing much about the language, or even knowing much about programming. It is a language with enormous expressive power. It is even better when you know what you're doing. **Programming is difficult business. It should never be undertaken in ignorance.**



Douglas Crockford

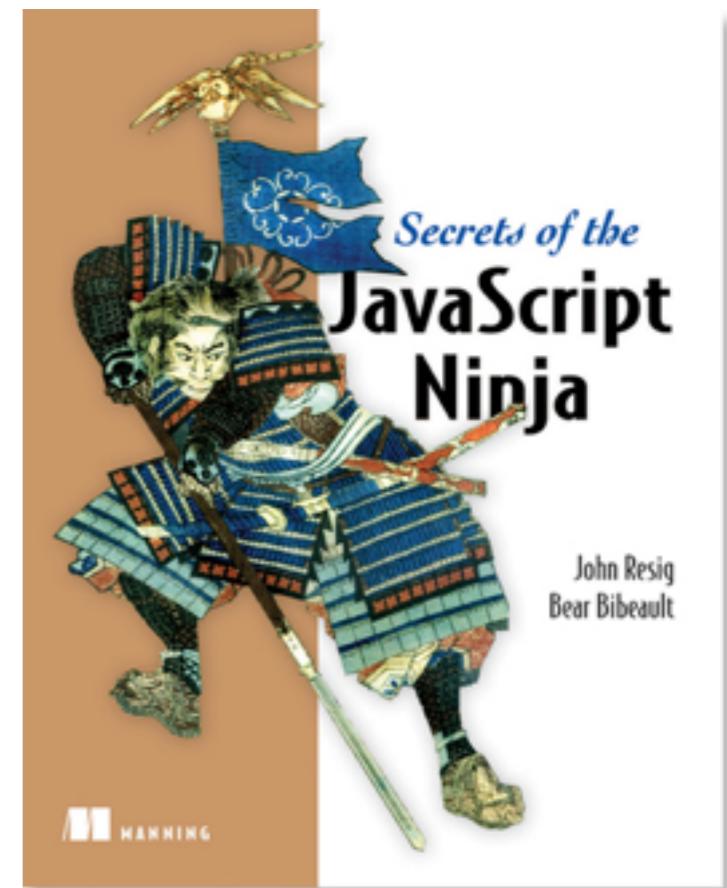
JavaScript is important. That wasn't always so, but it's true now.

Web applications are expected to give users a rich user interface experience, and without JavaScript, you might as well just be showing pictures of kittens. More than ever, web developers need to have a sound grasp of the language that brings life to web applications.

And like orange juice and breakfast, **JavaScript isn't just for browsers anymore**. The language has knocked down the walls of the browser and is being **used on the server** in engines such as Rhino and V8, and in frameworks like Node.js.

Although this book is primarily focused on JavaScript for web applications, the fundamentals of the language presented in part 2 of this book are applicable across the board.

With more and more developers using JavaScript, it's now more important than ever that they **grasp its fundamentals**, so that they can become true ninjas of the language.



JavaScript 101, Part 1

- Types
- Scopes
- Objects
- Prototypal inheritance
- Functions
- Constructors
- Arrays

Rule #1

JavaScript defines 6 types

```
var aNumber = 3.12;
var aBoolean = true;
var aString = "HEIG-VD";
var anObject = {
  aProperty: null
};

// t is true for all of these:
var t;
t = typeof aNumber === "number";💡
t = typeof aBoolean === "boolean";
t = typeof aString === "string";
t = typeof anObject === "object";
t = typeof anObject.aProperty ===
  "object";
t = typeof anObject.foobar ===
  "undefined";
```

- The 6 types are:
 - number
 - boolean
 - string
 - object
 - undefined
 - null
- null is a type, but `typeof null === object`.
- JavaScript is a dynamic language: when you declare a variable, you don't specify a type (and the type can change over time).

Rule #2

There are 2 scopes for variables:

the (evil) global scope and the function scope

```
var aVariableInGlobalScope;

function myFunction() {
    var aVariableInFunctionScope;
    anotherVariableInGlobalScope;
}

function myFunction2() {
    for (i=0; i<10; i++) {
        //i is in global scope!
    }
    for (var j=0; j<10; j++) {
        //j is in function scope!
    }
}
```

- A variable declared within a function is **not accessible** outside this function.
- Unless using **strict mode**, it is not mandatory to declare variables (beware of typos...)
- Two scripts loaded from the same HTML page share the same global scope (beware of **conflicts...**).
- There is **no block scope**.

Rule #3

Objects are dynamic bags of properties

```
// let's create an object
var person = {
  firstName: 'olivier',
  lastName: 'liechti'
};

// we can dynamically add properties
person.gender = 'male';
person['zip'] = 1446;

// and delete them
delete person.zip;

for (var key in person) {
  console.log(key + " : " +
person[key]);
};
```

- There are different ways to **access properties** of an object.
- JavaScript is **dynamic**: it is possible to **add** and **remove** properties to an object at any time.
- Every object has a different list of properties (**no class**).

Rule #4

The language has no support for classes

There are 3 ways to create objects

```
// create an object with a literal
var person = {
  firstName: 'olivier',
  lastName: 'liechti'
};

// create an object with a prototype
var child = Object.create(person);

// create an object with a constructor
var child = new Person('olivier',
  'liechti');
```

- **class** is a reserved word in JavaScript, but it is not used in the current version of the language (reserved for the future).
- A **constructor** is function like any other (uppercase is a coding convention).
- It is the use of the **new** keyword that triggers the object creation process.

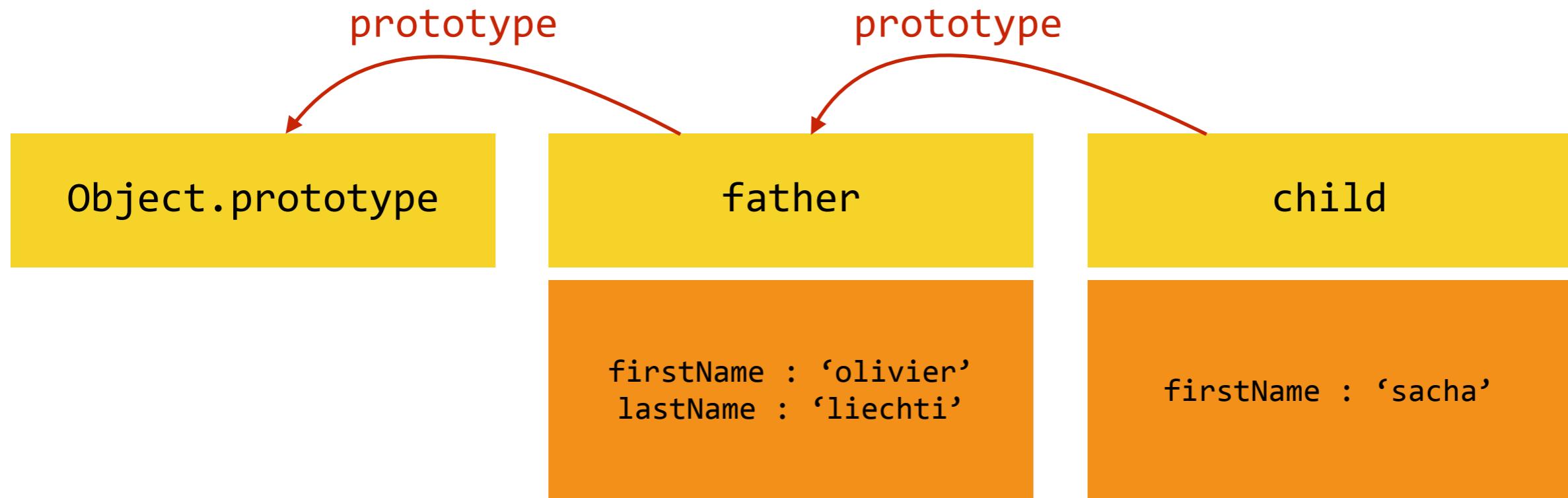
Rule #5

Every object inherits from a prototype object

```
var person = {  
    firstName: "olivier",  
    lastName: "liechti"  
};  
// person's prototype is Object.prototype  
  
var father = {};  
var child = Object.create(father);  
// child's prototype is father  
  
function Person(fn, ln) {  
    this.firstName = fn;  
    this.lastName = ln;  
}  
var john = new Person("John", "Doe");  
// john's prototype is Person.prototype
```

Rule #5

Every object inherits from a prototype object



```
console.log(child.lastName);
// prints 'liechti' on the
console
```

- Every object inherits from a prototype object. **It inherits and can override its properties**, including its methods.
- Objects created with object literals inherit from **Object.prototype**.
- When you access the property of an object, JavaScript **looks up the prototype chain** until it finds an ancestor that has a value for this property.

Rule #6

With patterns, it is possible to implement class-like data structures

```
function Person(fn, ln) {  
    var privateVar;  
    this.firstName = fn;  
    this.lastName = ln;  
    this.badGreet = function() {  
        console.log("Hi " + this.firstName);  
    };  
};  
  
Person.prototype.greet = function() {  
    console.log("Hey " + this.firstName);  
};  
  
var p1 = new Person("olivier", "liechti");  
  
p1.badGreet();  
p1.greet();
```

- **badGreet** is a property that will be replicated for every object created with the Person constructor:
 - poor memory management
 - not possible to alter behavior of all instances at once
- **greet** is a property that will be shared by all instances (because it will be looked up along the object inheritance chain).
- **privateVar** is not accessible outside of the constructor.
- **firstName** is publicly accessible (no encapsulation).

Rule #7

Arrays are objects

```
var fruits = ["apple", "pear"];

fruits.push("banana");
console.log(Object.getPrototypeOf(fruits));

for (var i=0; i<fruits.length; i++) {
  console.log("fruits[" + i + "] = " + fruits[i]);
}

var transformedFruits = fruits.map( function(fruit) {
  return fruit.toUpperCase();
});
transformedFruits.forEach( function(fruit) {
  console.log(fruit);
});

var count = fruits.reduce( function(val, fruit) {
  console.log("reducer invoked with " + val);
  return val+1;
}, 0);
console.log("There are " + count + " fruits in the array");
```



JavaScript Libraries

A screenshot of a web browser window displaying the Bootstrap website at getbootstrap.com/2.3.2/index.html. The browser interface includes standard controls like back/forward, search, and tabs.

The Bootstrap homepage features a large, bold title "Bootstrap" in white on a dark purple background. Below it is a subtitle: "Sleek, intuitive, and powerful front-end framework for faster and easier web development." A prominent blue button labeled "Download Bootstrap" is centered below the subtitle. At the bottom of the page, there are links for "GitHub project", "Examples", "Extend", and "Version 2.3.2".

A dark rectangular sidebar on the right side contains a blue advertisement for "HACK REACTOR". It features the text "Previously Only in San Francisco, attend the *Harvard* of coding schools wherever you are." and a "Carbon" logo. A small "Apply" button is visible at the bottom left of the ad.

WrapBootstrap - Bootstrap

https://wrapbootstrap.com

win a free theme in our weekly raffle! Tweet 10.6K a random tweeter is selected each week close

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Bootstrap Themes & Templates

Bootstrap is an HTML5 & CSS3 framework designed to help you kickstart the development of webapps and sites. WrapBootstrap is a marketplace for premium Bootstrap themes and templates. Impress your clients and visitors while using a single, rock-solid foundation.

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jQuery is a **fast**, **small**, and feature-rich JavaScript library. It makes things like HTML **document traversal** and **manipulation**, **event handling**, **animation**, and **Ajax** much simpler with an easy-to-use API that works **across a multitude of browsers**.



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Using jQuery Core

- [\\$ vs \\$\(\)](#)
- [\\$\(document \).ready\(\)](#)
- [Avoiding Conflicts with Other Libraries](#)
- [Attributes](#)
- [Selecting Elements](#)
- [Working with Selections](#)
- [Manipulating Elements](#)
- [The jQuery Object](#)
- [Traversing](#)
- [CSS, Styling, & Dimensions](#)
- [Data Methods](#)
- [Utility Methods](#)
- [Iterating over jQuery and non-jQuery Objects](#)
- [Using jQuery's .index\(\) Function](#)

<http://learn.jquery.com/using-jquery-core/>



Selecting Elements by ID

```
1 | $( "#myId" ); // Note IDs must be unique per page.
```

Selecting Elements by Class Name

```
1 | $(".myClass");
```

Selecting Elements by Attribute

```
1 | $("input[name='first_name']); // Beware, this can be very slow in older browsers
```

Selecting Elements by Compound CSS Selector

```
1 | $("#contents ul.people li");
```

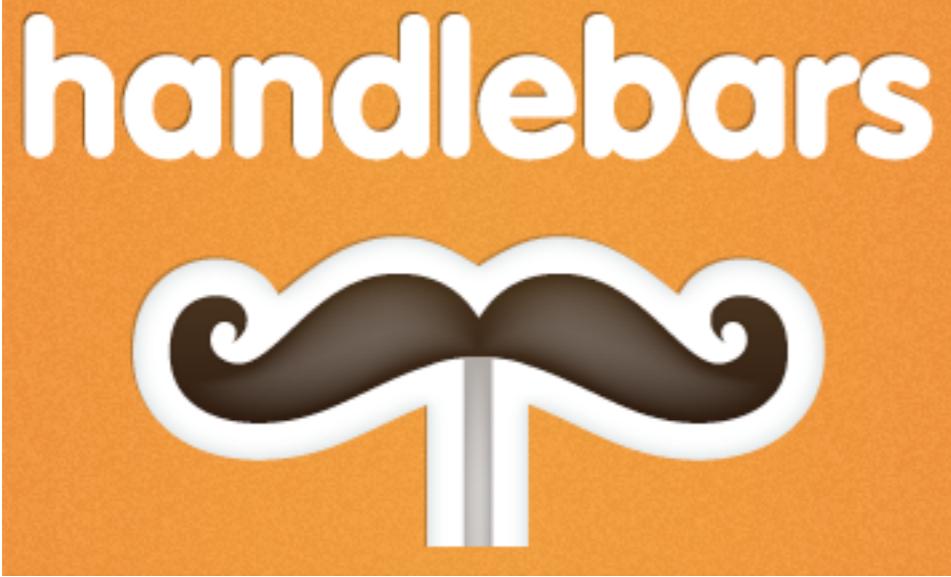


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Handlebars.js is an extension to the Mustache
templating language created by Chris Wanstrath.

Handlebars.js and Mustache are both **logicless**
templating languages that keep the view and the
code separated like we all know they should be.



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```
Hello  
{ {firstName} }  
!
```

template

```
var source = $("#student-template").html();  
var template = Handlebars.compile(source);  
var student = {firstName: 'Olivier'};  
var html = template(student);
```

```
{  
  firstName: "Olivier",  
  lastName: "Liechti"  
}  
.
```

object

```
Hello  
Olivier!
```

HTML

underscore.js

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Underscore is a JavaScript library that provides a whole mess of useful **functional programming helpers** without extending any built-in objects.

It's the answer to the question: "If I sit down in front of a blank HTML page, and want to start being productive immediately, what do I need?" ... and **the tie to go along with jQuery's tux and Backbone's suspenders**.

The screenshot shows a Mac OS X desktop environment with a browser window open to the underscore.js documentation at underscorejs.org/docs/underscore.html. The browser's title bar says "underscore.js". The main content area displays the "UNDERSCORE.JS" title and a "BASELINE SETUP" section. Below the setup section, there is a note about native function implementations. To the right of the browser window, the actual source code of underscore.js is visible, starting with a self-executing anonymous function.

```
(function() {  
  var root = this;  
  
  var previousUnderscore = root._;  
  
  var ArrayProto = Array.prototype, ObjProto = Object.prototype, FuncProto = Func  
  
  var  
    push      = ArrayProto.push,  
    slice     = ArrayProto.slice,  
    concat   = ArrayProto.concat,  
    toString  = ObjProto.toString,  
    hasOwnProperty = ObjProto.hasOwnProperty;  
  
  var  
    nativeIsArray = Array.isArray,  
    nativeKeys   = Object.keys
```

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Lab 01

color is mapped to gender

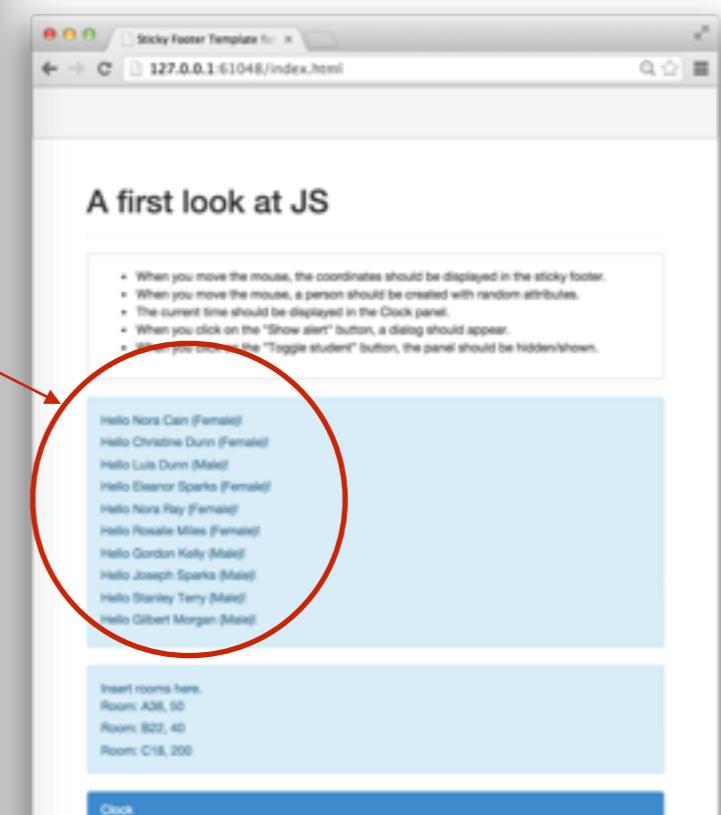
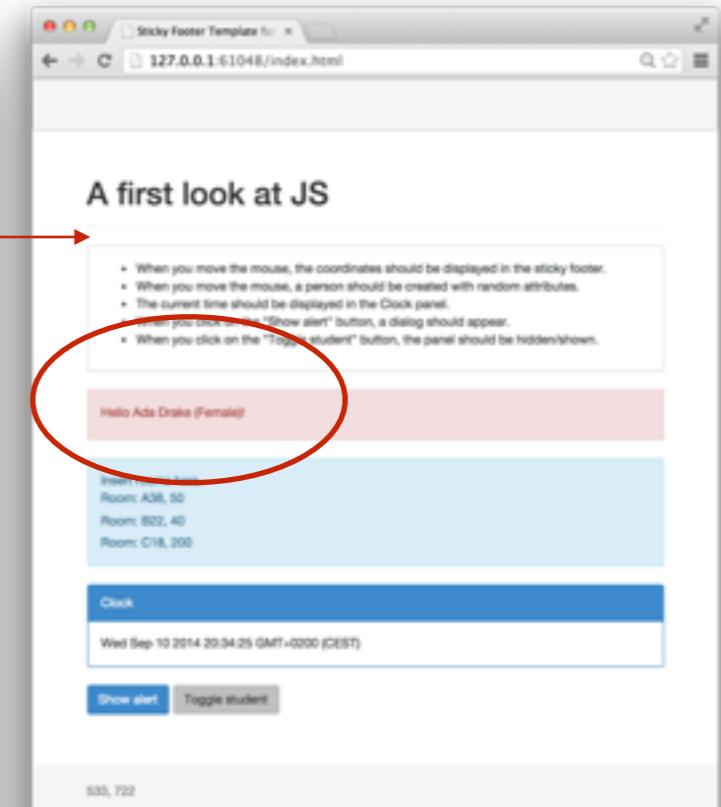
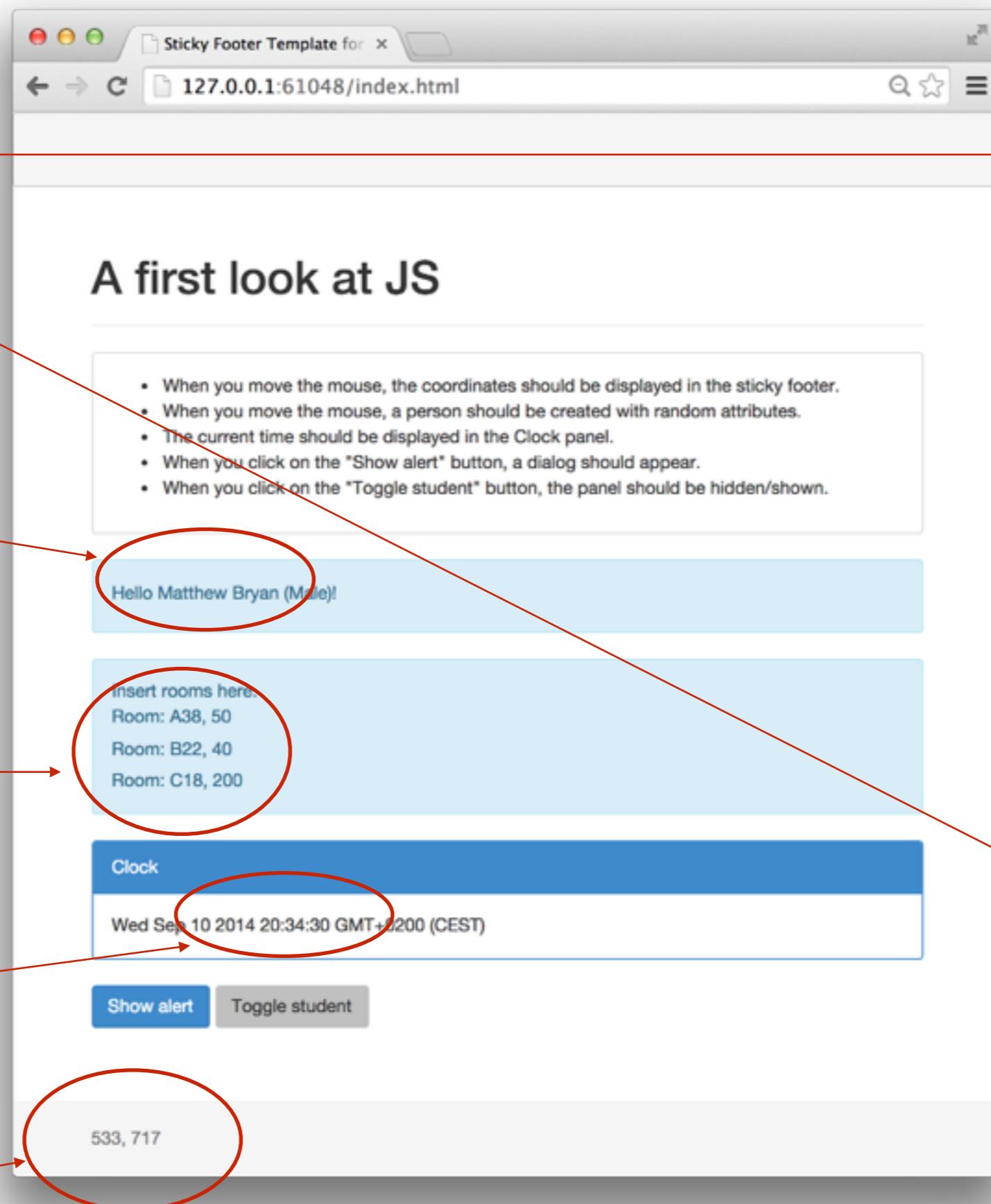
pressing SHIFT adds lines

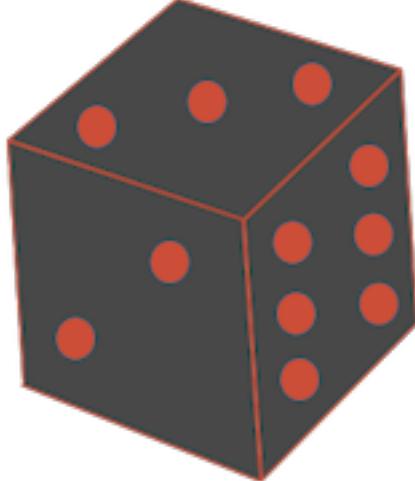
data is generated randomly when mouse moves

data is fetched via AJAX

clock is updated regularly

mouse coordinates are updated





Chance

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Chance is a **minimalist generator of random strings, numbers, etc.** to help reduce some monotony particularly while writing automated tests or anywhere else you need anything random.

GitHub Pages

https://pages.github.com

Pages Help

GitHub Pages

Websites for you and your projects.

Hosted directly from your [GitHub repository](#). Just edit, push, and your changes are live.

The screenshot shows a web browser window with the GitHub Pages interface. The URL in the address bar is <https://pages.github.com>. The main heading is "GitHub Pages" with a "Pages Help" link. Below it is the sub-headline "Websites for you and your projects." followed by the text "Hosted directly from your [GitHub repository](#). Just edit, push, and your changes are live." A large image below illustrates responsive web design, showing a desktop browser displaying the Foundation framework website, which is also shown on a smartphone and a tablet. The Foundation website features the text "Foundation" and "The most advanced responsive front-end framework in the world." with a "Download Foundation 5" button and social metrics: 14.9k stargazers and a Twitter handle @foundationzurb.

JS

JavaScript 101 (Part 2)

JavaScript 101, Part 2

- Functions are objects
- Function.prototype vs myFunction.prototype
- Closures
- Module patterns
- this

Rule #8

Functions are objects

```
function aFunction() {  
}  
  
var f = function() {  
}  
  
var g = function g() {  
    g(); // recursive call  
}  
  
var h = function(functionParam) {  
    functionParam();  
}  
  
h(f);  
h(g);
```

Rule #9

Whenever a function is defined, an object is created.

Its prototype is Function.prototype.

Its prototype property is the object that will be the prototype of instances created with the function used as a constructor.

```
function Robot() {  
}  
var r2d2 = new Robot();  
  
var t1 = Object.getPrototypeOf(Robot) === Function.prototype;  
var t2 = Robot.__proto__ === Function.prototype; //  
deprecated  
  
var t3 = Object.getPrototypeOf(r2d2) === Robot.prototype;  
var t4 = Object.getPrototypeOf(Robot.prototype) ===  
Object.prototype;
```

Rule #10

"new" makes constructors behave in a special way, but constructors are normal functions

```
function Animal(name) {  
    this.name = name;  
}  
  
var cat = new Animal("Félix");
```

1. A **new object** is created.
2. Its **prototype** is set to `Animal.prototype`
3. The constructor function is called; **this** is bound to the newly created object.
4. In general, the constructor does not return any object. In this case, the result of the `new` expression is the newly created object.

Rule #11

Functions can be nested

```
function f1(p1) {  
    console.log("f1 can see " + p1);  
    function f2(p2) {  
        console.log("f2 can see " + p2 + " " + p1);  
        function f3(p3) {  
            console.log("f3 can see " + p3 + " " + p2 + " " + p1);  
        }  
        f3(3);  
    }  
    f2(2);  
}  
f1(1);
```

- An **object** is created for every function.
- Each function has access to variables defined in the **parent** functions (an in the **global scope**).

Rule #12

A closure is formed when a nested function accesses a *free variable*

```
function f1(p1) {  
    console.log("f1 can see " + p1);  
    function f2(p2) {  
        console.log("f2 can see " + p2 + " " + p1);  
        function f3(p3) {  
            console.log("f3 can see " + p3 + " " + p2 + " " + p1);  
        }  
        f3(3);  
    }  
    f2(2);  
}  
f1(1);
```

- In a function, a **free variable** is a variable that is neither a local variable, nor a parameter of the function.
- A **closure** is the combination of a code block (the function code) and saved parent scopes.

```
▼ function f3(p3) { console.log("f3 can see " + p3 + " " + p2 + " " + p1); }  
  arguments: null  
  caller: null  
  length: 1  
  name: "f3"  
  ► prototype: f3  
  ► __proto__: function Empty() {}  
  ▼ <function scope>  
    ▼ Closure  
      p2: 2  
    ▼ Closure  
      p1: 1  
    ► Global: Window
```

Rule #13

Patterns are applied to create modules

```
var myModule = (function() {  
  
    var aPrivateVar;  
    var privateFunction_1 = function() {}  
    var privateFunction_2 = function() {}  
  
    return {  
        publicFunction: privateFunction_1  
    }  
  
})();  
  
myModule.publicFunction();
```

<http://codepen.io/wasadigi/full/GxsfC/>

- The function is **immediately invoked**.

- When `privateFunction_1` accesses `aPrivateVar`, a **closure** is formed.
- is **available even after** the immediately invoked function has returned.
- `privateFunction_1` and `privateFunction_2` share the same parent scope.

```
Hello world
> dir(myModule)
▼ Object ⓘ
  ▼ publicFunction: function () {
    arguments: null
    caller: null
    length: 0
    name: ""
    ► prototype: Object
    ► __proto__: function Empty() {}
    ▼ <function scope>
      ▼ Closure
        aPrivateVar: "world"
        ► Global: Window
        ► __proto__: Object
      ← undefined
    >
```

Rule #14

The value of this depends on the way a function has been called

```
function Robot(name) {  
  this.name = name;  
}
```

```
Robot.prototype.greet = function greet() {  
  debugger;  
  console.log("hello " + this.name);  
  if (this.name === undefined) {  
    return; // oops...  
  }  
  greet(); // no dot notation!  
}
```

```
var r2d2 = new Robot("r2d2");  
r2d2.greet();
```

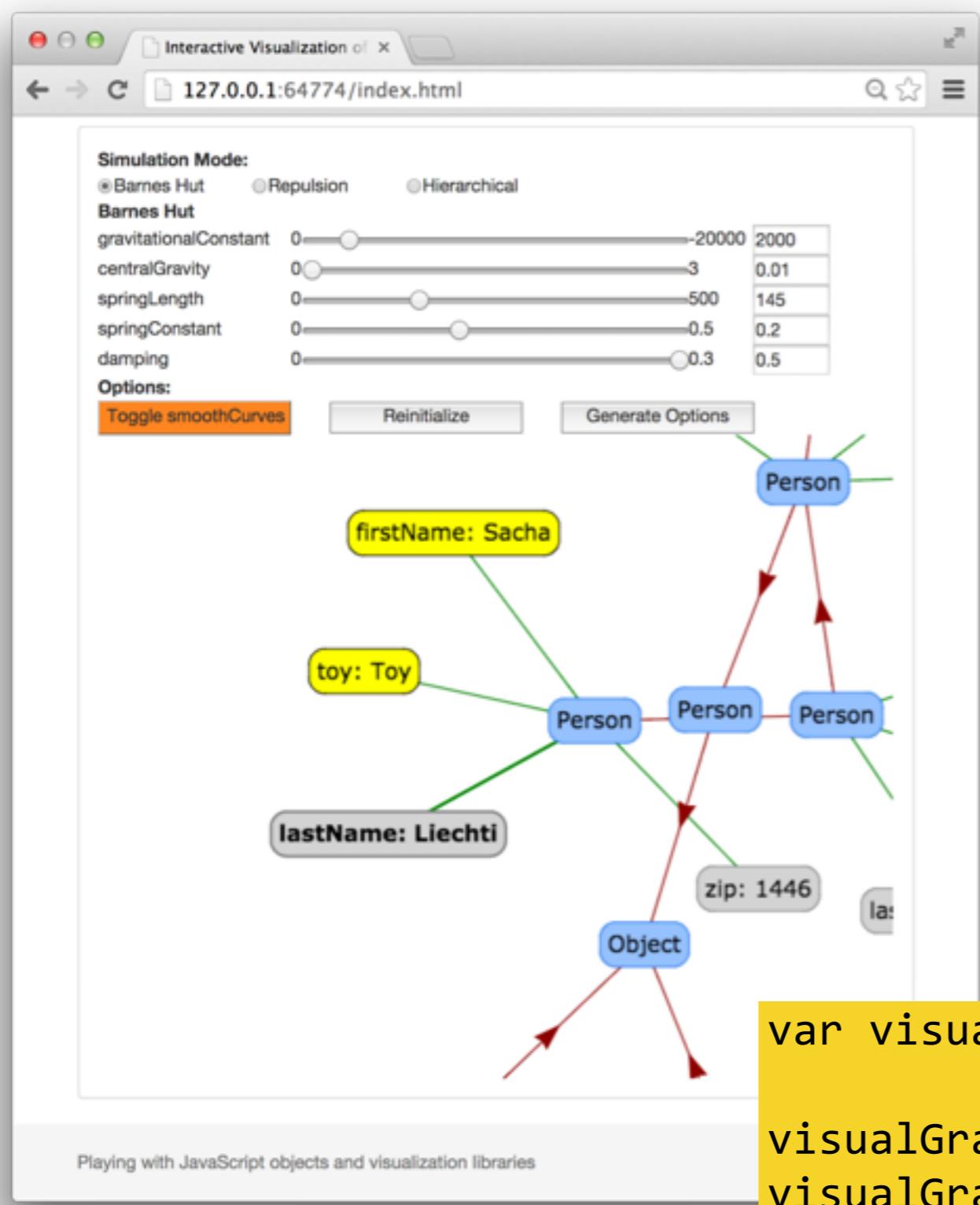
- When a function is called on an object (i.e. **as a method**), then this refers to the object.
- When a function is called **as a function** (no dot notation), then this refers to the global object).
- There are methods defined on **Function.prototype** to control the value of this: **apply** and **call**.

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Lab 02

Interactive Visualization of 

127.0.0.1:64774/index.html

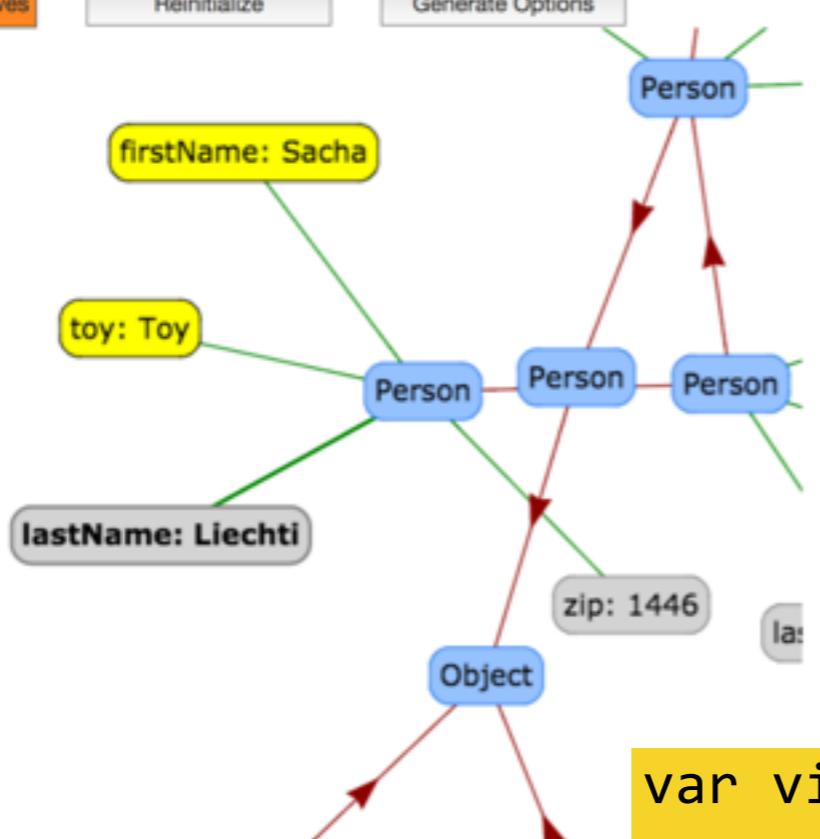
Simulation Mode:

Barnes Hut Repulsion Hierarchical

Barnes Hut

gravitationalConstant	0	20000	2000
centralGravity	0	3	0.01
springLength	0	500	145
springConstant	0	0.5	0.2
damping	0	0.3	0.5

Options:



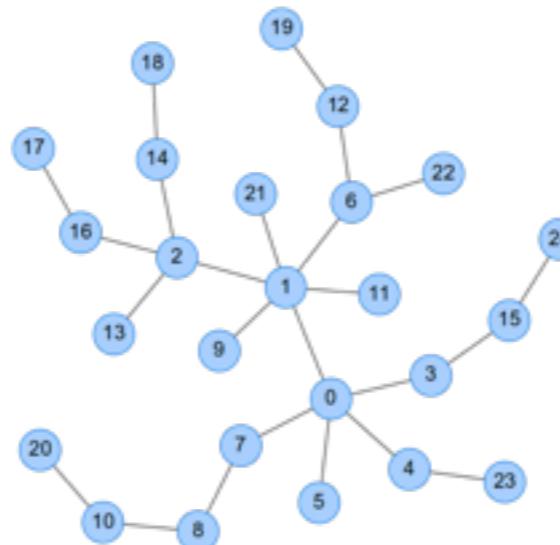
Playing with JavaScript objects and visualization libraries

```
var visualGraph3 = new jsvis.VisualizationGraph();

visualGraph3.addJsObjectToGraph(sacha);
visualGraph3.addJsObjectToGraph(sacha.toy);
visualGraph3.addJsObjectToGraph(stephan);
visualGraph3.addJsObjectToGraph(akebono);
```



Vis.js is a dynamic, **browser based visualization** library. The library is designed to be easy to use, to handle large amounts of dynamic data, and to enable manipulation of and interaction with the data.



Quick Poll

- **What is your current perception of Web development?**
- **Personal interest**
 - Web apps? It's **for junior developers and kids**, but real software engineers have better things to do.
 - Web apps? I am not a **graphics designer**... what am I doing here?
 - The Web is where some of the **most exciting technologies** are emerging.
 - When I grow up, I want to be a **front-end engineer**.

References

JavaScript | MDN

Mozilla Foundation [US] https://developer.mozilla.org/en/docs/Web/JavaScript

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ZONES WEB PLATFORM TOOLS DEMOS CONNECT

MDN > Web technology for developers > JavaScript

LANGUAGES EDIT ⚙️

JavaScript

▲ HIDE SIDEBAR

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 - Getting started
- JavaScript technologies overview
- Introduction to Object Oriented JavaScript
- ▼ Intermediate
 - A re-introduction to JavaScript
 - JavaScript data structures
 - Equality comparisons and when to use them
- ▶ Advanced

JavaScript® (often shortened to JS) is a lightweight, interpreted, object-oriented language with [first-class functions](#), most known as the scripting language for Web pages, but [used in many non-browser environments](#) as well such as [node.js](#) or [Apache CouchDB](#). It is a [prototype-based](#), multi-paradigm scripting language that is dynamic, and supports object-oriented, imperative, and functional programming styles. Read more [about JavaScript](#).

The JavaScript standard is [ECMAScript](#). As of 2012, all modern browsers fully support ECMAScript 5.1. Older browsers support at least ECMAScript 3. A 6th major revision of the standard is in the works.

This section of the site is dedicated to the JavaScript language itself, the parts that are not specific to Web pages, or other host environments. For information about APIs specific to Web pages, please see [Web APIs](#) and [DOM](#).

JavaScript is not to be confused with the [Java programming language](#). Java is a trademark or registered trademark of Oracle in the U.S. and other countries.

Tutorials

Learn how to program JavaScript.

Reference

Browse the complete [JS reference](#) documentation.

Standard objects

MUST READ for the Tests

- **A re-introduction to JavaScript**
 - https://developer.mozilla.org/en-US/docs/Web/JavaScript/A_re-introduction_to_JavaScript
- **Inheritance and the prototype chain**
 - https://developer.mozilla.org/en-US/docs/Web/JavaScript/Guide/Inheritance_and_the_prototype_chain
- **Introduction to Object-Oriented JavaScript**
 - https://developer.mozilla.org/en-US/docs/Web/JavaScript/Introduction_to_Object-Oriented_JavaScript

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JavaScript's core—most often used and most fundamental—data type is the Object data type. JavaScript has one complex data type, the Object data type, and it has five simple data types: Number, String, Boolean, Undefined, and Null. Note that these simple (primitive) data types are immutable, they cannot be changed, while objects are mutable.

What is an Object

An object is an unordered list of primitive data (and sometimes reference data types) types that are stored as name-value pairs. Each item in the list is called a property (functions are called methods) and each property name has to be unique and can be a string or a number.

Here is a simple object:

```
var myFirstObject = {firstName: "Richard", favoriteAuthor: "Conrad"};
```

To reiterate: Think of an object as a list that contains items and each item (a property) in the list is stored by a name-value pair. The property names in the example above are firstName and favoriteAuthor. And the values for each are "Richard" and "Conrad."

ECMA-262 » JavaScript. Th x

dmitrysoshnikov.com/ecmascript/javascript-the-core/

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JavaScript. The core.

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1. An object
2. A prototype chain
3. Constructor
4. Execution context stack
5. Execution context
6. Variable object
7. Activation object
8. Scope chain
9. Closures
10. This value
11. Conclusion

This note is an overview and summary of the "ECMA-262-3 in detail" series. Every section contains references to the appropriate matching chapters so you can read them to get a deeper understanding.

Intended audience: experienced programmers, professionals.

We start out by considering the concept of an *object*, which is fundamental to ECMAScript.

An object

ECMAScript, being a highly-abstracted object-oriented language, deals with *objects*. There are also *primitives*, but they, when needed, are also converted to objects.

An object is a *collection of properties* and has a *single prototype object*. The prototype may be either an object or the *null* value.

Search...

Articles

- ES6 Notes: Default values of parameters
- Pattern Matching
- Essentials of Interpretation. Checkpoint: part 1
- Essentials of Interpretation. Intro.
- ECMA-262-5 in detail. Chapter 3.2. Lexical environments: ECMAScript implementation.

Comments

◦  micha-s on Note 2. ECMAScript. Equality operators. Another way to check for NaN is [js]NaN != NaN[/js]

◦  micha-s on Note 1. ECMAScript. Bound functions. I am completely misunderstanding the "Constructor with various number of arguments" section.

◦  Dmitry Soshnikov on ES6

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