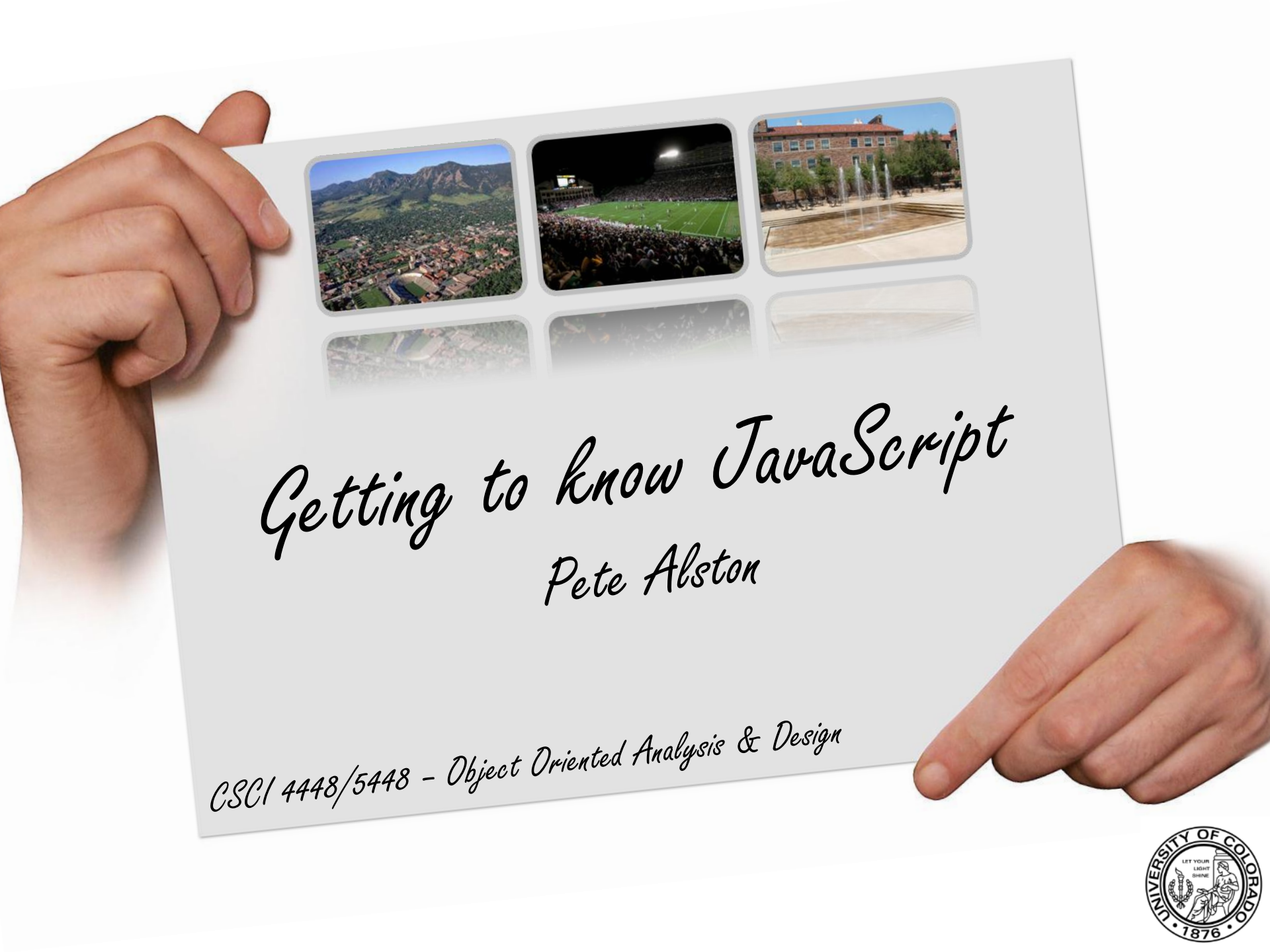

Getting to know JavaScript
Pete Alston
CSCI 4448/5448 - Object Oriented Analysis & Design

Overview

- In the beginning …
  - **Static vs. Dynamic Content**
- Issues with Client Side Scripting
- What is JavaScript?
- Syntax and the Document Object Model
- Moving forward with JavaScript
  - **AJAX**
- Libraries and Frameworks
- JavaScript 2.0 – A New Beginning?
- Resources

In the beginning …

- HTML allowed people to display content on the World Wide Web (WWW)
  - **Fairly straight-forward tags and easy to learn**
- As the WWW has evolved, demand for greater control over the '*look and feel*' of a page
  - **WWW is a dynamic medium and HTML is not able to handle this**
  - **Web pages need to interact with their users and vice-versa**
- Need to make use of a *scripting language* to handle interactivity
  - **Ability to render/produce HTML to be displayed in the browser**
  - **Users want *dynamic* web pages; not *static***

Static vs. Dynamic Content –
Why does it matter?

- Pre-determined vs. Interactive
- Persistent Layout vs. Personalisation
- Message vs. Service
- HTML/CSS vs. PHP, ASP, Ruby
- Implementation & Maintenance

Issues with Client Side Scripting

- Performance
- Dependency
- Incomplete Scripts
- Identification
- Flexibility
  - **Data**
  - **Layout**
- Language

What is JavaScript?

- JavaScript is **not** Java
  - **Although there are some similarities regarding syntax and functionality**
    - Cat.paws.back.left
    - Car.start(), document.write()
- Java is a fully functional object-oriented programming language
  - **JavaScript is designed to run within a Web browser and interact with HTML and DOM (Document Object Model)**
- JavaScript can be placed anywhere on a Web page
  - **Just need to be enclosed in a `<script>` tag**

What is JavaScript?

- A *client side* scripting language which can provide interactivity within Web pages
- Developed by Netscape in 1995
  - **Has evolved a lot since its creation**
  - **Depending on the browser, it has also developed in different directions**
- It is an *object based* language
  - **It uses *'prototypes'* to simulate inheritance, which means you can define classes and use them at the same time**
- Client side means it works on *your* machine
  - **Your Web browser processes the scripts, not the server**

Alternatives to JavaScript

- ECMAScript
  - **JavaScript**
  - **ActionScript**
- VBScript/JScript
- E4X (ECMAScript for XML)
- LiveScript
- TCL/TK
- XUL/XSLT

ECMAScript – What's that?

- Standardised scripting language
  - **Widely used on the Web**
- Developed out of a need for standards
  - **JavaScript & JScript (Microsoft version of JavaScript) were supposed to be the same, but they are not**
- Number of *dialects* or *implementations* of ECMAScript are available today
  - **ActionScript**
  - **Objective-J**
  - **WMLScript**

ECMAScript Dialects -
Syntax

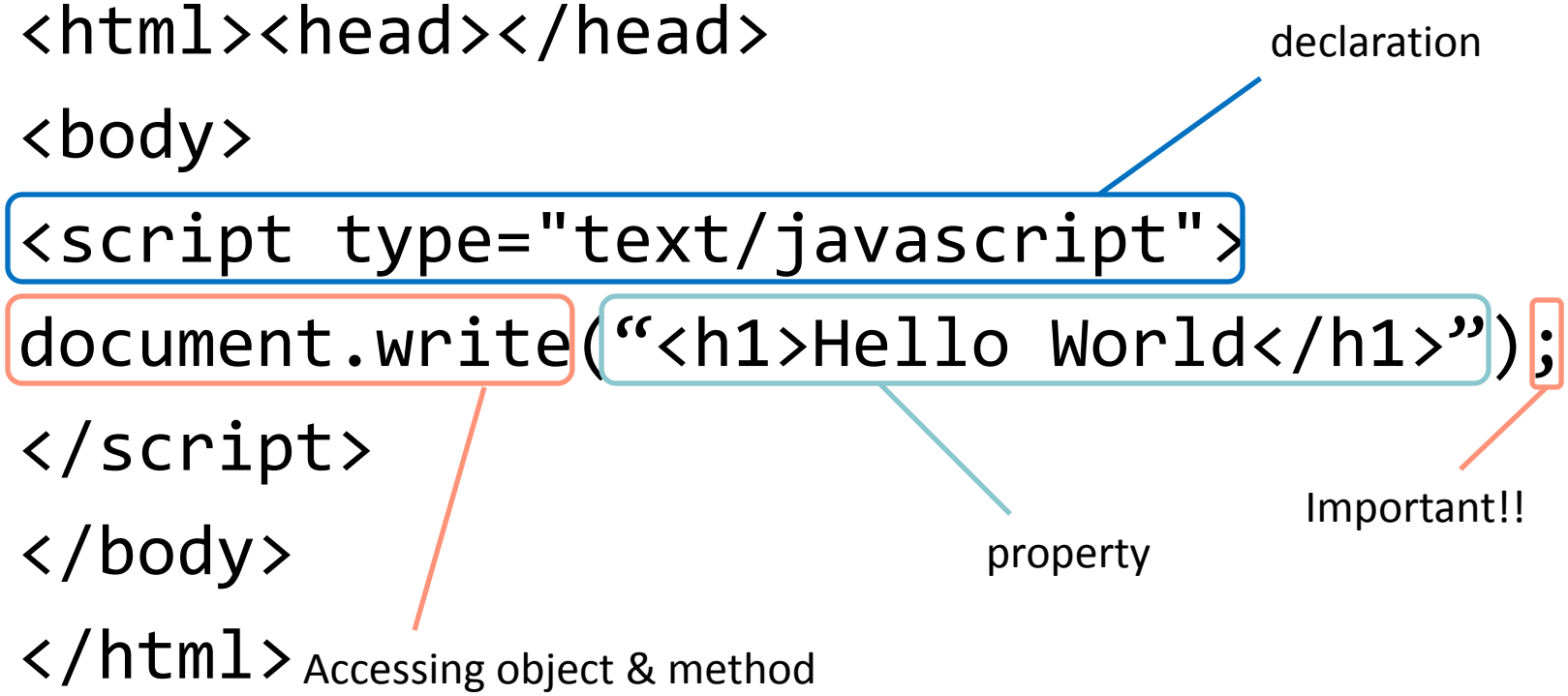
- JavaScript
  - `document.write('Hello World!');`
- ActionScript
  -
```
var greet:TextField = new TextField();
greet.text = "Hello World";
this.addChild(greet);
```
- JScript
  - `document.write(“Hello World");`

Syntax

- JavaScript offers similar functionality to Java
  - **Variables**
  - **Operators, Comparisons & Conditions**
  - **Control Structures**
    - if, else, for, switch, etc.
  - **Functions**
    - You can stop the browser executing code at runtime by putting it in a function
    - You then make a call to the function to execute the code
- In many ways, it looks very similar to Java
  - **But it isn't!**

Syntax – Example (1)

```
<html><head></head>
<body>
<script type="text/javascript">
document.write(“<h1>Hello World</h1>”);
</script>
</body>
</html>
```



Syntax – Example (2)

```
<html><head>
<script type="text/javascript">
function myfunc(value)
{ alert(value); }
</script></head>
<body><form>
<input type=“button”
  onclick="myfunction('Howdy')"
value=“Ok“></form>
</body>
</html>
```

Declaration

Declare function

Action to be executed

Calling the function

Argument/Parameter

Syntax – Example (3)

Control structures – `if else`

```
if (condition)
   { some code }
   else
   { some code }
```

```
var colorChoice = prompt("What is your favourite color?");

if (colorChoice=="Blue")
   { document.write("That's the right answer!");}
   else
   { document.write("Sorry, that's not correct!");}
```

Condition

Do this if *true*

Do this if *false*

Syntax – Example (4)

Conditions

```
var hour = 11;
var minute = 0;
```

- And = &&

```
if (hour==12 && minute==0) {
  alert("it's noon")
};
```

- Or = ||

```
if (hour==11 || hour==10) {
  alert("it's less than 2 hours till noon")
};
```

- Not = !

```
if (!(hour==11)) {
  alert("it's more than 1 hour till noon")
};
```

Document Object Model (DOM)

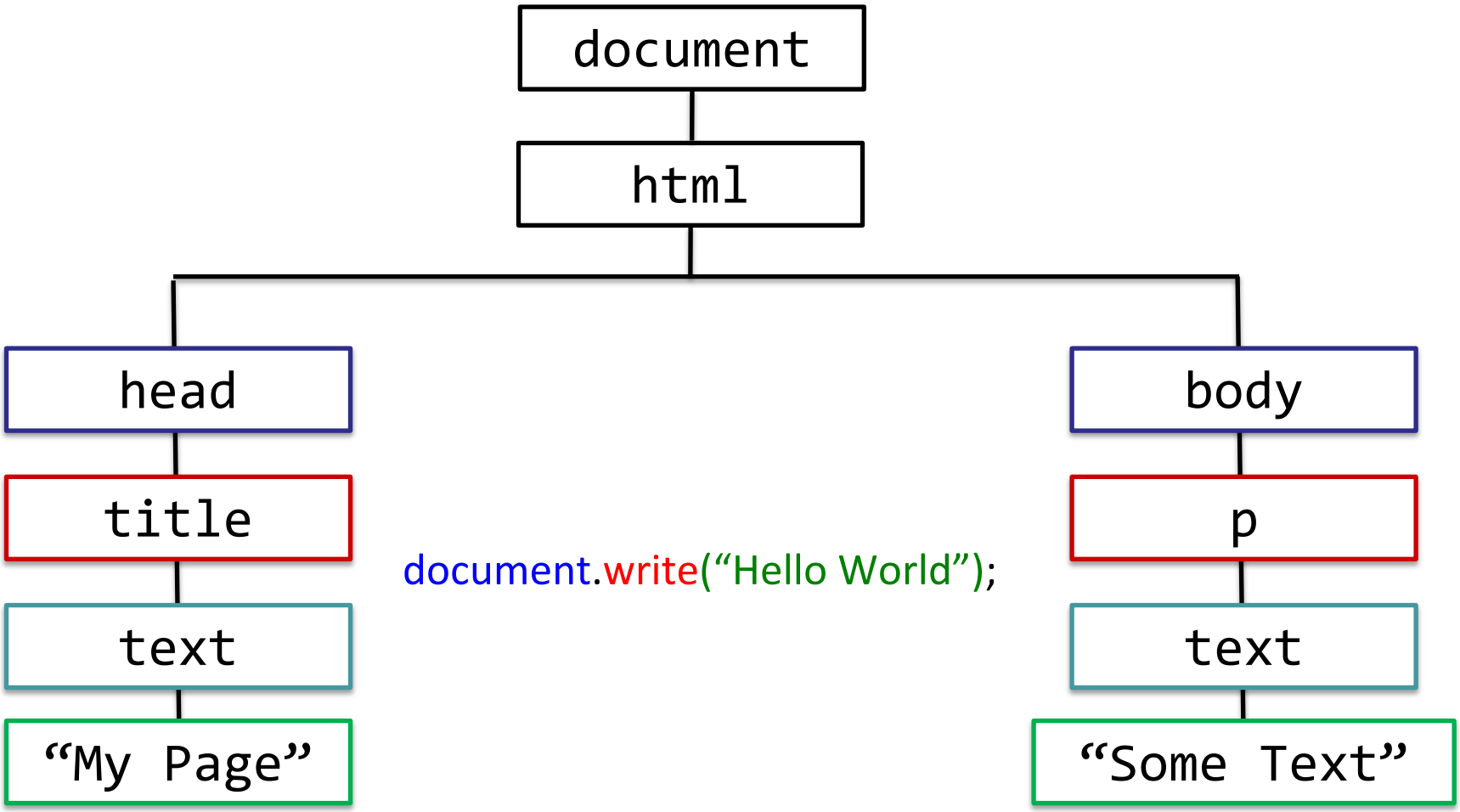


Figure 12.1 The tree structure, showing nodes is just another way of looking at how a HTML page is organised

Source: Negrino & Smith (2007:283)

DOM – Accessing data

- The DOM proves to be a useful tool when trying to add interactivity to your Web page
  - **Use the tree structure to *trace* the path through the nodes**
- How do we get access to that data?
  - **Follow the path!**

```
<html><head></head>
<body>
<form name="frmsample">
      <input type="text" name="txtname">
</form>
<body></html>
```

```
document.frmsample.txtname.value;
```

DOM – Retrieving data

- You can use the DOM to retrieve data /values contained within a web page

```
<form name="frmsample">
    <input type="text" name="txtname">
    <p id="text"></p>
</form>
```

- How do we get access to that data?

```
var uname =  document.frmsample.txtname.value;
alert("Text is: " + uname);
document.getElementById('text').innerHTML = uname;
```

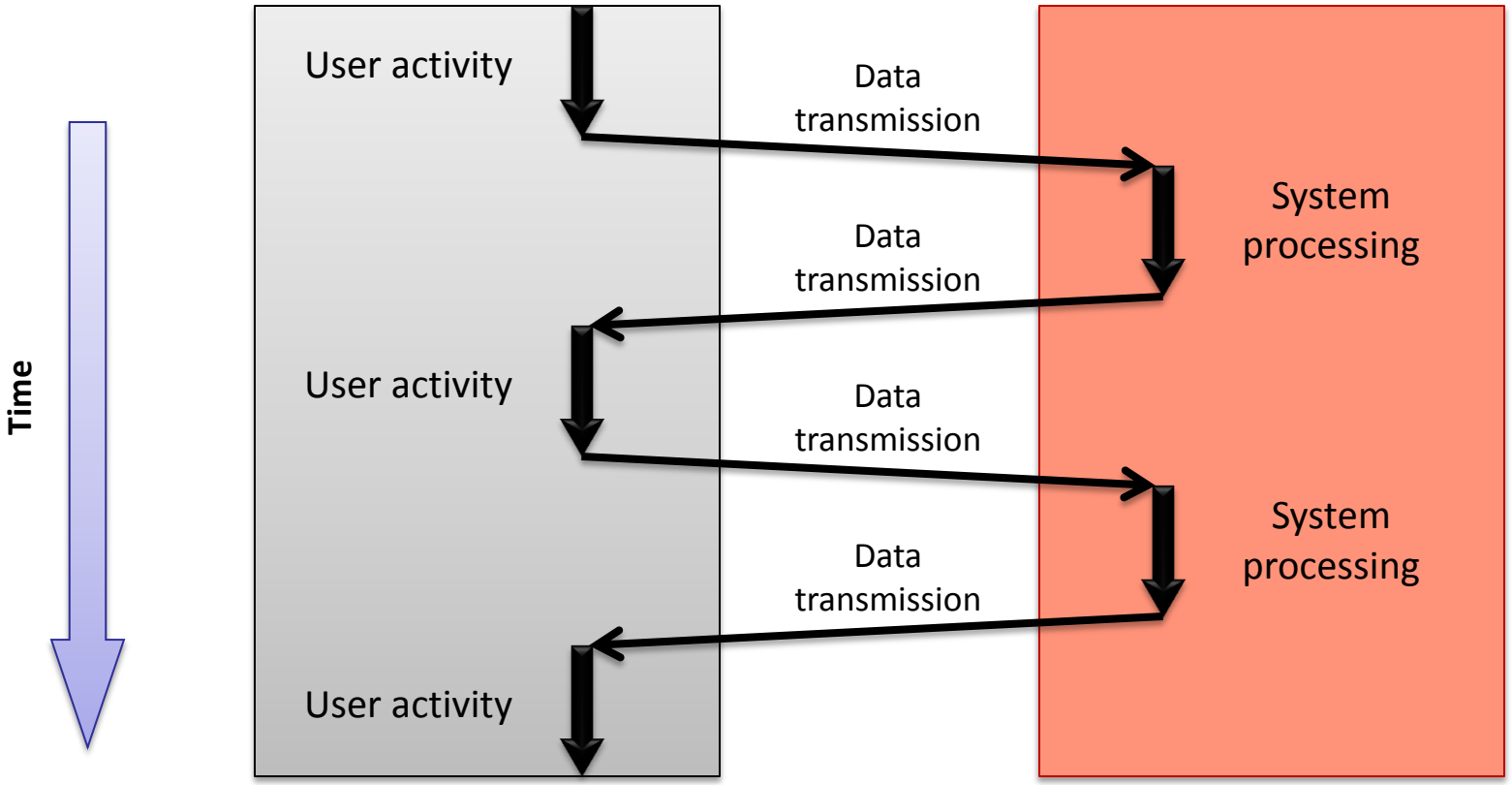
Moving forward with JavaScript

- The WWW is **always** changing
  - **Advances have given us Google Maps, Flickr, MyYahoo**
- These sites function more like desktop applications as opposed to Web sites
  - **Faster, more responsive User Interface (UI)**
  - **Superior interaction and a better User Experience (UE)**
- Technology behind these sites was AJAX
  - **Asynchronous JavaScript and XML**
- It is not a new technology ….
  - **Just a new way of using existing technologies**

What is AJAX?

- Coined by Jesse James Garret in 2005
- A technique combining long standing Web technologies
  - **XHTML and CSS for structure and presentation**
  - **DOM for displaying an manipulating pages**
  - **XML for formatting data**
  - **XMLHttpRequest object to transfer data**
    - Similar to Microsoft's ActiveX Object (the yellow bar in IE?!?)
  - **JavaScript to display and interact with the above**
- Web sites can offer more functionality by communicating with a Web server through JavaScript
  - **Normally, you need to make use of a server side scripting language to communicate with a server (e.g. PHP, Ruby, etc.)**

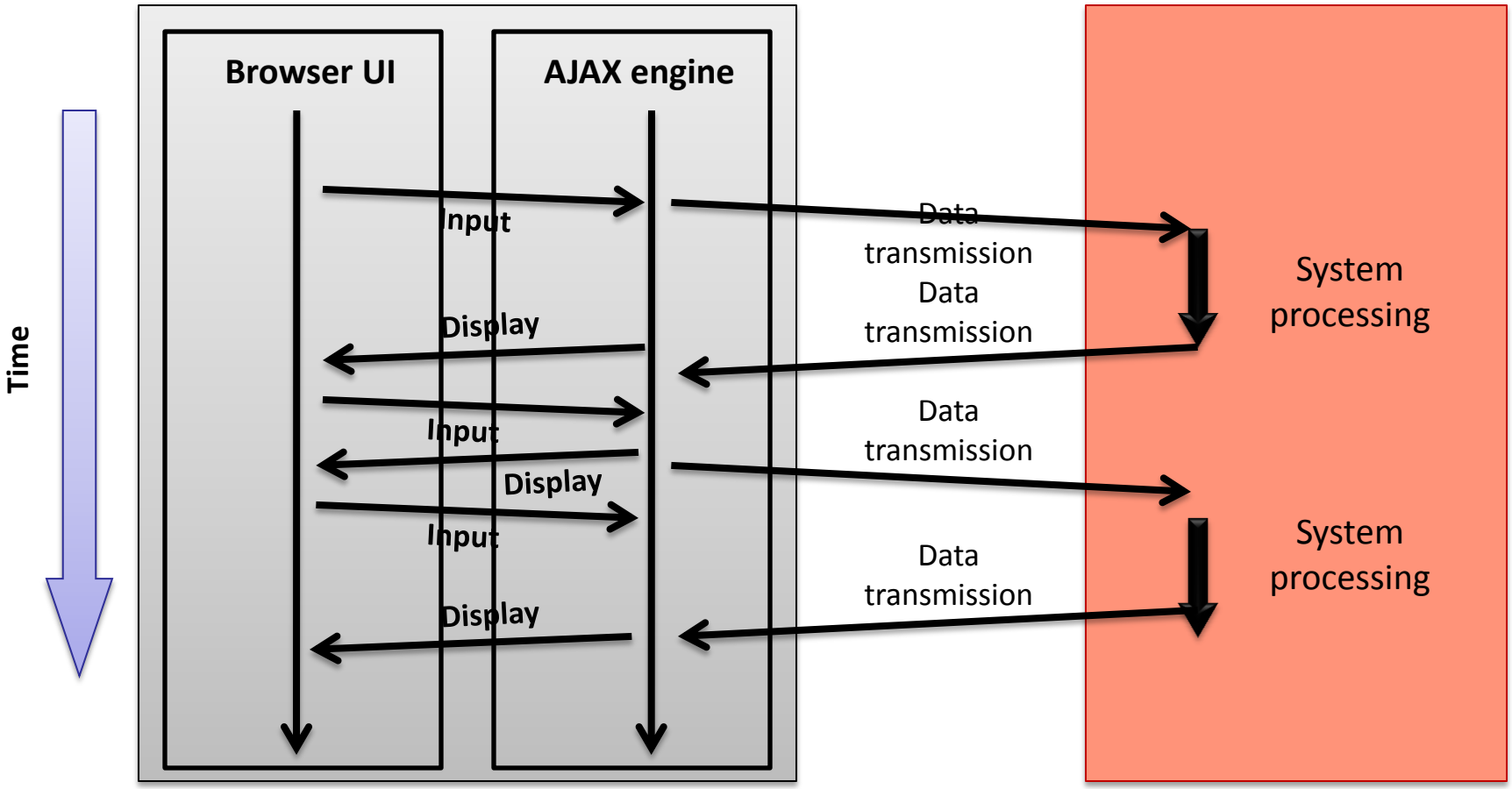
Traditional Web Application



Synchronous page requests and refreshes

Source: Vossen, G. & Hageman, S. (2007) *Unleashing Web 2.0* Morgan Kaufmann: USA p147

AJAX Web Application



Asynchronous page refreshes

Source: Vossen, G. & Hageman, S. (2007) *Unleashing Web 2.0* Morgan Kaufmann: USA p148

JavaScript Today

- As we have seen, it is pretty simple to make web pages dynamic
  - **Collecting user data, displaying a message, passing variables**
- You could create your own functions
  - **But it takes time and effort and you may get it wrong(!)**
- What if we could make it simpler
  - **Use pre-defined functions and features to ensure consistency across your Web site**
  - **All you need to do is to make a reference to them**
  - **In most cases, it reduces the amount of coding**

Libraries and Frameworks

- Pre-written functions which can aide in the development of Web apps
  - **Serve a number of purposes (Animation, DOM access, AJAX)**
  - **Allow integration with other languages such as CSS, PHP, Ruby**
- Similar thing when coding in ActionScript/Java
  - `import flash.display.Sprite;`
- Similar to referencing an external CSS
  - `<link href="mystyle.css" rel="stylesheet" media="screen" />`
- There is more of a demand for dynamic Web apps
  - **Less emphasis on simple things, more on AJAX**

Libraries vs. Frameworks

- Frameworks are more like APIs and are *different* to Libraries
  - **Enhances everything, not just the Document Object Model**
    - Arrays, Strings, Data Types, Classes
  - **Most 'libraries' state that they are frameworks**
    - Some may offer the functionality, but they not be known for it
- Why the fuss?
  - **Libraries can be easier to navigate understand**
  - **Frameworks take the *whole* of the JavaScript language into account**
    - But they will still offer all the 'goodies' of a library

What is available

- Libraries
  - **jQuery (Although it does have functionality to be a framework), Yahoo UI (YUI), MochiKit, Dojo Toolkit, script.aculo.us, Google Web Toolkit (GWT),**
- Frameworks
  - **Prototype, ExtJS, MooTools, Spry**
- What do they offer?
  - **DOM Manipulation & Traversal**
  - **Animation/Effects**
  - **AJAX & CSS**
  - **Plug-ins**

Examples

- jQuery
  - W3Schools.com/jquery / Animated Robot
- Yahoo UI
  - http://developer.yahoo.com/yui/3/ / Image Slideshow
- Script.aculo.us
  - http://script.aculo.us / Drag and drop functionality
- MooTools
  - http://mootools.net / Toggle display
- ExtJS
  - http://www.sencha.com/products/js/ / Drag and Drop

Making a choice

- Features
  - **What is that you are trying to create? Are any ruled out initially?**
- Documentation & Examples
  - **Clear instructions, Tutorials, Demos readily available?**
- File Size
  - **Is the whole of the file needed, or can you just make use with certain aspects? Is there a minified version?**
- License
  - **Is it free? Or is there a small print detailing a charge for commercial use?**
- Ease of use
  - **How easy is it to pick up? Libraries are easy to pick up**

JavaScript 2.0 –

A New Beginning?

- The next ‘major’ revision of the language
  - **Also known as ECMAScript 4**
  - **Currently under development, now under the code name ‘Harmony’**
- Motivated by the need to ‘achieve better support for programming in the large’ **(Horwat, n.d.)**
  - **Does not mean creating large programs, rather programs**
    - Written by more than one person
    - Assembled from packages
    - Live in heterogeneous environments
    - That evolve over time
- New functionality makes JavaScript look more like a *programming* language
  - **However, it is not meant be a high performance programming language for writing large, complex programs**
  - **Isn’t that what Java is for?!**
- Two key features
  - **Optional types and checking**
  - **Ability to support classes and objects**

JavaScript 2.0 –

A New Beginning?

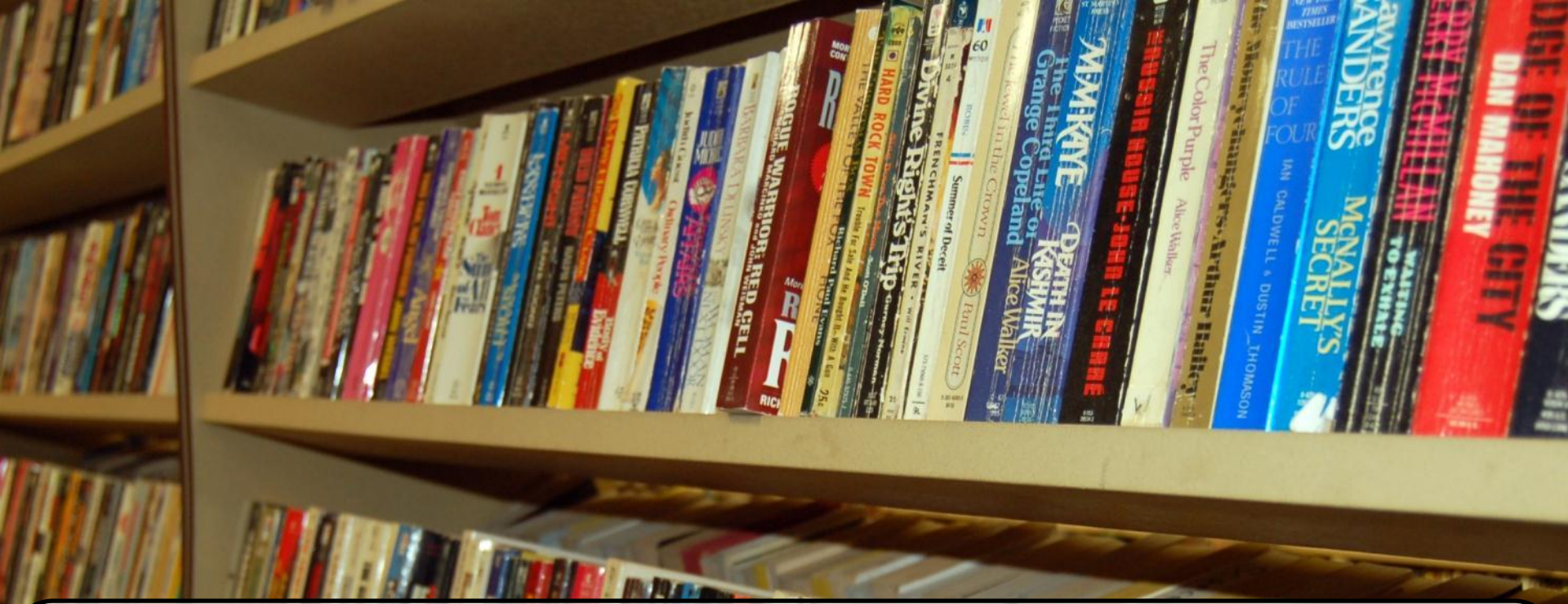
- Optional types & type checking
  - **More similar to Java when creating variables, e.g.**
    - `var username = 'Pete'` (old)
    - `var username:person = 'Pete'` (new)
- Ability to create classes
  - **No need for the use of functions to *simulate* inheritance**
  - **Can create classes in the same was as Java (for example)**
- Other features include
  - **Versioning**
  - **Conditional compilation**
    - Creating code to run in a number of environments
  - **Better mappings for data types and interfaces**
  - **And more ….**
- All in all, a much more structured language for the Web ☺
  - **But it has not been implemented for use yet!**
    - JavaScript 1.8.5 is the latest stable version, but does not support any of the above!

Summary

- JavaScript is a complex language
  - **Each section in this presentation could have one presentation to itself!**
- JavaScript ≠ Java
  - **Although there are some similarities**
- It is powerful language when it comes to creating content for the Web
  - **Has a number of benefits compared to Adobe Flash**
  - **But it is not the only language**
- Libraries and Frameworks are designed to make it *easier*
  - **You just need to pick the one(s) best for your project**
- JavaScript 2.0 is an attempt to make the language more *object oriented*
  - **Should make it easier when trying to create Web applications**
  - **But it is not ready for implementation yet**
- There are a LOTS of resources available to help you learn JavaScript
  - **Some are mentioned on the next slide**

Three resources I would recommend …

- W3Schools.com
  - http://www.w3schools.com/
    - Resources on JavaScript, AJAX, VBScript and others. One of the best sites I have found to give you an introduction to a particular langaage
- *"JavaScript and AJAX for the Web"*
  - **Tom Negrino and Dori Smith, 7th edition**
    - An excellent book, with plenty of examples you can use to help you learn the language
- *"Head First JavaScript"*
  - **Michael Morrison**
    - Part of the 'Head First' series, these books are really simple to understand and explain complex issues in a more 'interesting' way!



References/Bibliography

Chapman, N. & Chapman, J. (2006) *Web Design – A Complete Introduction*. John Wiley & Sons Ltd: Chichester.

Jackson, J.C. (2007) *Web Technologies – A Computer Science Perspective.* Pearson Education Inc.: USA.

Horwat, W. (n.d.) *JavaScript 2.0: Evolving a Language for Evolving Systems.* http://www.mozilla.org/js/language/evolvingJS.pdf

Morrison, M. (2008) *Head First JavaScript.* Sebastopol: O'Reilly.

Moseley, R. (2007) *Developing Web Applications*. Chichester: John Wiley & Sons Ltd.

Negrino, T. & Smith, D. (2008) *JavaScript and AJAX for the Web.*7th ed. Berkley, CA: Peachpit.

Resig, J. (2006) *Pro JavaScript Techniques*. APRESS

Top Ten JS Frameworks - http://speckyboy.com/2008/04/01/top-10-javascript-frameworks-which-do-you-prefer/

Compare JavaScript Frameworks - http://www.ibm.com/developerworks/web/library/wa-jsframeworks/

Ten Promising JS Frameworks - http://sixrevisions.com/javascript/promising_javascript_frameworks/

Choice of JavaScript Framework - http://www.cogniance.com/expertise/white_papers/web2.0-choice-of-javascript-framework

W3Schools (2007) *AJAX Tutorial*. http://www.w3schools.com/ajax

W3Schools (2007) *JavaScriptTutorial*. http://www.w3schools.com/js

Vossen, G. & Hagemann, S. (2007) *Unleashing Web 2.0*. Burlington: Morgan Kaufmann.