Simon Sarris

HTML5 UNLEASHED

SAMS

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Simon Sarris

HTML5 UNLEASHED

SAMS 800 East 96th Street, Indianapolis, Indiana 46240 USA

HTML5 Unleashed

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ISBN-13: 978-0-672-33627-0

ISBN-10: 0-672-33627-8

Library of Congress Control Number: 2013938300

Printed in the United States of America

First Printing July 2013

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About the Author

Simon Sarris is a web developer focusing primarily on the HTML5 Canvas. Simon has earned a reputation as a go-to source for HTML5 answers. He contributes to the question-and-answer website StackOverflow and has provided the most answers for both the Canvas and HTML5 tags. Simon blogs about Canvas and JavaScript topics, and you can find him online at www.simonsarris.com.

Dedication

To my parents

Acknowledgments

If you look at the hours involved, writing at length is decidedly a solitary act, but it would have been impossible for me to finish this book without the support of several friends.

Book writing is not just time consuming, but life consuming, and I'd like to thank my girlfriend, Betsy Green, for enduring with patience and support over nearly a year of research and writing.

I'd like to express my deepest thanks to Aaron Friel, the greatest friend and colleague I have ever known, for his encouragement and advice for my entire conscious life and for his suggestions and reviews of draft material. I also owe huge thanks to Walter van Roggen, for being the most important mentor of my programming career and for reviewing large portions of this book.

I would like to sincerely thank the people at Sams, especially Neil Rowe and Betsy Gratner, for guiding me through the book-writing process. I owe extra thanks to Spike Xavier for his technical editing and his excellent, thoughtful suggestions.

Many thanks are due to the StackOverflow JavaScript chat room crowd for their encouragement, friendship, and expertise during my research and writing. Among many others I'd like to thank are Jason Brown, Robert Lemon, Abhishek Hingnikar, Amaan Cheval, and Florian Margaine.

My parents are not technology people, but I owe them the biggest thanks. They have supported me from cradle through college with love and resources, allowing me to freely learn and explore in this wonderful world.

We Want to Hear from You!

As the reader of this book, *you* are our most important critic and commentator. We value your opinion and want to know what we're doing right, what we could do better, what areas you'd like to see us publish in, and any other words of wisdom you're willing to pass our way.

We welcome your comments. You can email or write to let us know what you did or didn't like about this book—as well as what we can do to make our books better.

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Introduction

IN THIS CHAPTER

- ▶ Who Should Read This Book?
- ▶ HTML5 and Related Technologies
- ▶ Software Requirements
- ▶ Code Examples
- ▶ How This Book Is Organized
- ▶ Links and Real-World Examples

This is a book about the future of the Web.

For most of human history, it has proven difficult to speculate about the future. Only since the Industrial Revolution have we gotten a grasp of what it might mean to predict things years in advance. Aside from the promise of flying cars that occurred every decade in the 1900s, the future of technological change was often about predictable refinement.

We can imagine that few people considered ambitious futures in the Middle Ages, and only in the 1900s did people begin to see an optimistic nearness: The future was a time just 10 years away. New televisions that were more accurate, better waste treatment, maybe even a man on the moon.

By 1980, the future was clearly a computer-centric world, albeit one still a few years out. By 2010, one third of the world carried in their pockets what would have been billed as a supercomputer in 1980.

Today, the future is near instant. New gadgets and impressive technologies are released almost daily. One set of new technologies is called HTML5, a series of refinements to the Web that has seen rapid adoption since 2010.

This is a book about the future of the Web, and, fortunately for us, it's already here.

HTML5 is an umbrella term for a series of new features, standards, and application programming interfaces (APIs) that collectively change the way web pages are created and used. With HTML5, applications that were once only possible on desktops or via browser plug-ins are now natively possible in modern browsers. The adoption of HTML5 aims to take us to an age where the Web is more interoperable, consistent, and easier to author.

Who Should Read This Book?

Web developers and web designers exist in a Yin-Yang of roles, sometimes filled by the same person and sometimes by very large teams. This book is intended for both roles, and not only the ones that deal with pure HTML and JavaScript but also the developers and designers who have up until now exclusively worked in Flash and Silverlight. HTML5 offers several replacement opportunities for these rich media plug-ins. The goal of HTML5 is not to obsolete plug-ins, but the new functionality does intend to herald a web where plug-ins, especially ones that provide now-common functionality, are much less necessary.

HTML5 has been around in some agreed-upon form since 2006 and starting in 2009 has had the force of all major browser vendors behind its implementation. In recent years, it has graduated from being a novelty to a set of standards in use by some of the world's largest websites. If you concern yourself with modern web development, then concerning yourself with HTML5 is essential, and you should read this book.

HTML5 is not strictly HTML; it also encompasses a good deal of new JavaScript APIs. Almost all the contents of HTML5 are relevant to both developers and designers, and even if you do not plan on using many of the parts of HTML5, it is a good idea to get a reading of what is now possible to achieve natively within the browser.

This book assumes basic prior knowledge of JavaScript and HTML. This book assumes no knowledge of JavaScript libraries, no matter how popular they may be, and this book's code examples do not reference or introduce any libraries except where it is necessary for a component to reasonably function.

HTML5 and Related Technologies

HTML5 typically refers to two concepts:

- Technologies and changes contained within the new HTML specifications put forth by the World Wide Web Consortium (W3C) and Web Hypertext Application Technology Working Group (WHATWG).
- The new HTML specifications plus a larger set of new web technologies. This is sometimes called *HTML5 and friends*, or *HTML5 and related technologies*, but is often shortened to just *HTML5*.

There are several common misconceptions about what precisely is contained within HTML5. Mozilla used to host a page titled, *"Technologies Often Called Part of HTML5 That Aren't."* They have since removed that page, and instead focus on covering HTML5 and related technologies like everybody else.

For those of us busy building the Web, any distinction does not matter. If a new technology is supported by enough browsers and suits your needs, then you should use it.

Therefore, like most of the HTML5 resources available today, this book encompasses *HTML5 and related technologies*, and we casually call this *HTML5*.

Software Requirements

The code in this book is intended for use in development on modern browsers. When the term *modern browser* is referenced in this book, it refers to the versions of any popular desktop browser commonly available, except for Internet Explorer, where it refers to only Internet Explorer 9 and above. Although there are less-modern fallback options for many areas of HTML5, it is expected that you will be using a modern browser during development.

If there is a discrepancy in browser support, topics typically note which desktop and mobile browsers are supported. However, no mention of browser support in this book will be as up to date as online compatibility guides, and several websites provide compatibility tables for HTML5 features.

Many JavaScript-centric examples make use of the browser developer console to output data. This console is a common feature of any desktop browser and is accessible through the browser's developer tools. Developer tools are different for every browser, but are typically enabled via a Tools menu, or with a hotkey such as Ctrl+Shift+I, or F12.

If you are a JavaScript developer or web designer and have never used the browser's developer tools, I *highly* recommend seeking out a tutorial. There are several online guides on using the developer console, such as the one for Chrome at https://developers.google.com/chrome-developer-tools/docs/console.

Code Examples

The numbered source code listings in this book can be downloaded via the online repository at http://github.com/simonsarris/HTML5Unleashed or http://simonsarris.com/HTML5Unleashed.

Occasionally, when a line of code is too long to fit on one line in the printed book, a code-continuation arrow (➥) is used to mark the continuation.

How This Book Is Organized

This book is arranged into four parts. The first provides a briefing on the history and terminology of HTML5, and the other three represent the main areas of HTML5.

HTML5 contains a very broad set of features, and it's unlikely that a developer would find all of them relevant for any given project. If you are totally new to HTML5 development, it would do you well to begin with Part I. After Part I, every chapter in this book is written to stand on its own, so that you may discover each topic as you please.

Part I: Background

Part I contains a short history and overview of HTML5, as well as explanations of common conventions used in many HTML5 resources, including this book.

- Chapter 1, "Why HTML5?"
- Chapter 2, "Important Concepts for HTML5"

Part II: New HTML Elements

Part II covers most of the new (and visual) HTML elements in HTML5. It begins with semantic tags, new HTML element attributes, and functionality. It then covers the new rich media tags, which enable native audio and video in the browser.

This part introduces two important concepts seen throughout HTML5: the semantic web (also visited in Chapter 13) and ways to achieve common functionality with less code and fewer plug-ins.

- Chapter 3, "Getting Started with HTML5: Semantic Tags, Forms, and Drag and Drop"
- Chapter 4, "Rich Media Tags: Video and Audio"

Part III: Canvas

Part III contains four chapters concerning HTML5 canvas. Those both new to and experienced with canvas will benefit from reading the first chapter, which gives a rundown of the API with many detailed notes about canvas context functionality. Canvas has a low-level API compared with Flash, and Chapter 6 covers basic interactivity and state management with the element. Chapter 7 covers canvas performance, but also contains a discussion on tips and peculiarities for canvas newcomers. Finally, Chapter 8 discusses the newer additions to the canvas API and briefly considers the 3D canvas (WebGL) API.

- Chapter 5, "2D Canvas"
- Chapter 6, "Making Canvas Interactive and Stateful"
- Chapter 7, "Canvas Performance, Tips, and Peculiarities"
- Chapter 8, "The Future of Canvas and 3D Canvas"

Part IV: HTML5's JavaScript APIs

Part IV is composed of *mostly* JavaScript APIs, and is more relevant to developers than artists or designers. The topics in these chapters cover the new native solutions to needs that have arisen over the years as the Web has progressed. The book ends with the small-but-powerful API for adding truly semantic markup to HTML pages, and a brief look at the future.

- Chapter 9, “Geolocation API”
- Chapter 10, “HTML5 Storage Options”
- Chapter 11, “Messaging and Web Workers”
- Chapter 12, “Network Communication: WebSockets and XMLHttpRequest Level 2”
- Chapter 13, “Microdata, Other Small Things, and Beyond HTML5”

Links and Real-World Examples

This book contains many links and real-world examples from existing websites. Links and project mentions do not constitute endorsement, and typically only the most popular projects and libraries are mentioned.

This book does not endorse any particular browser, but most examples try to use Chrome or Firefox because they are the most popular cross-platform browsers and widely support nearly every feature covered in the book.

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CHAPTER 2

Important Concepts for HTML5

IN THIS CHAPTER

▶ The Goals of HTML5

▶ Requisites for HTML5 Development

This short chapter covers some important information to begin our path to HTML5 technologies. It explains some vocabulary used throughout this book that may be new to some readers, and also begins with a briefing on the recurrent goals you see throughout this book.

The Goals of HTML5

HTML5 was born out of visible needs in the browser ecosystem, and the aims of its specifications are all responses to these needs. This section details the three most prominent goals of HTML5, which can be thought of as themes that you see throughout the book.

Improving the Native Web

According to the World Wide Web Consortium (W3C) specification, HTML5 "introduces markup and APIs for emerging idioms, such as Web applications." More specifically, HMTL5 adds syntactic features to the Web that could previously only be accomplished with plug-ins. For instance, if serving video on the Web is a nearly ubiquitous expectation, web browsers ought to be able to accomplish it without additional help. The same goes for audio and other animated or dynamic content. Thus the `<audio>`, `<video>`, and `<canvas>` elements are some of HTML5's most important additions to the Web.

HTML5 doesn't just make plug-ins less necessary, it also increases the browser's functionality to be more in line with native mobile applications. Browser vendors and standards committees have begun work on application programming interfaces (APIs) that expose functionality of (mobile) devices within the browser. The most prominent example of this is the Geolocation API, which allows browsers to retrieve geographical location much like native phone apps do. There are several smaller niche APIs (such as one for device orientation) that also promise to afford more utility in the browser.

More Done with Less Code

One much more subtle feature of HTML5 is the ability to do more with less code. There are a lot of *de facto* standard web page features, such as placeholder text in forms, autofocusing on a particular input element once the page loads, client-side validation of form input, date and time pickers, and so on.

All of these concepts are considered standard-issue stuff on a modern web page, but every one of them requires at least a little bit of JavaScript to work. Because of this, these concepts are implemented across websites in many different ways, and are at times buggy or inconsistent with each other.

HTML5 simplifies these common design patterns (and more) by creating standardized ways to accomplish them in HTML alone. This empowers designers and also reduces code maintenance and interoperability between platforms because the given feature's functionality can be more contextually handled by the browser.

The Semantic Web

The semantic web is a long-held dream of the Web's inventor, Tim Berners-Lee. He envisioned a web where content was not only readable by humans but also *understood* by machines. Just as we have to write carefully for humans to comprehend, it would also take a little footwork to make sure programs parsing web pages could pick up on meaningful content.

HTML5 represents the first big semantic push on the Web, and there are important semantic components discussed in Chapters 3 and 13 ("Getting Started with HTML5: Semantic Tags, Forms, and Drag and Drop" and "Microdata, Other Small Things, and Beyond HTML5," respectively). Now web pages can be marked up to be better understood and categorized by screen readers, search engines, and other web-crawling software. Chapter 13 also contains a brief history of web semantics and their current utility.

Requisites for HTML5 Development

This section covers a few important considerations for developing HTML5 web apps. These represent nothing new to a seasoned web developer but are otherwise important for understanding the rest of this book.

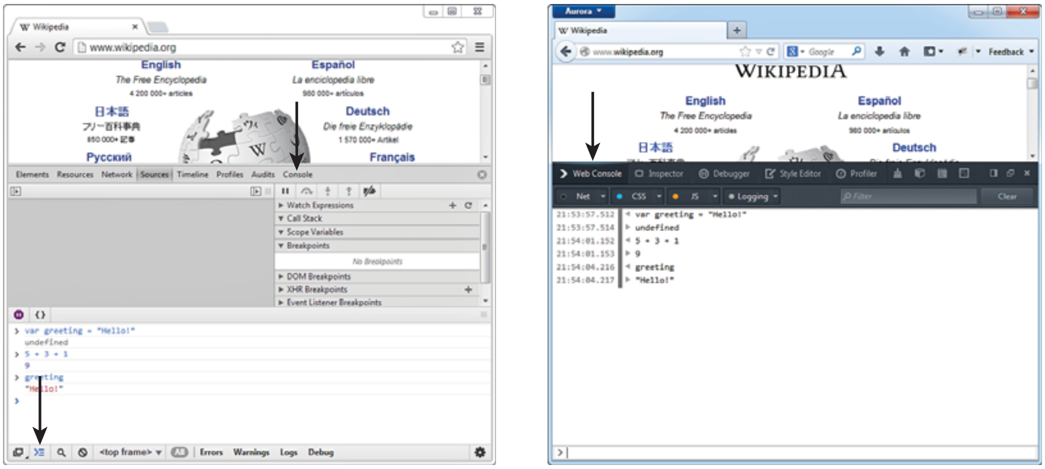
Modern Browser Developer Tools

Browser developer tools have matured rapidly over the past six years. For both developers and designers, it is strongly recommended that you familiarize yourself with them, as they are referenced occasionally in this book.

Specifically, this book utilizes the JavaScript console in many of its examples, which is used to log messages. This increases the simplicity of the book's code examples because we can create sample output without bothering with HTML page manipulation. We output to the console with the JavaScript method `console.log(someOutput)`.

Developer tools are typically launched via a Settings menu, or with the command Ctrl+Shift+I, or just F12 depending on the browser. The JavaScript console is found within most developer tools.

The developer console is very flexible, and can also be used to manipulate JavaScript on a page or merely for JavaScript experimentation. Writing directly into the console evaluates the statement and then provides its return value on the next line. Figure 2.1 shows the JavaScript console within the developer tools for Chrome and Firefox, with console-access buttons highlighted and a few commands entered.



```
> var greeting = "Hello!"
  undefined
> 5 + 3 + 1
  9
> greeting
  "Hello!"
>
```

```
21:53:57.512 var greeting = "Hello!"
21:53:57.514 undefined
21:54:01.152 5 + 3 + 1
21:54:01.153 9
21:54:04.216 greeting
21:54:04.217 "Hello!"
```

FIGURE 2.1 Chrome and Firefox with their developer tools open, with the console showing. Buttons to show/hide the console are indicated with arrows.

This book also mentions newer features of developer tools that specifically aid in debugging some HTML5 features, like local storage and web workers. These are referenced and explained in their respective chapters.

The importance of learning browsers' developer tools cannot be stressed enough. Familiarizing yourself with them is one of the most important job skills of web developers today. Chrome's developer tools are top notch, and Firefox has very recently (March 2013) debuted a huge amount of useful new functionality to its toolset.

HTML5 Fallbacks: Shims, Shivs, and Polyfills

You'll find the terms *shim*, *shiv*, and *polyfill* peppered throughout HTML5 resources. Where HTML5 is concerned, the three words represent roughly the same concept: a JavaScript library that provides HTML5-like functionality to older browsers, reproducing the native functionality as closely as possible.

In their most generous form, shims and polyfills are drop-in libraries that allow you to use HTML5 features without worrying about proper support for older browsers. The polyfill library detects these unsupporting browsers and attempts to re-create a particular HTML5 feature's functionality through JavaScript or other means. At the least, these libraries ensure that new HTML content is styled correctly on older browsers.

For a few years, the lack of support in older browsers stalled implementation of HTML5 features. Today, barring impossible-to-reproduce functionality in some features, HTML5 features can safely be used without fear of leaving older browsers in the dust.

Online, you will be able to find a good deal of these polyfill libraries and very good lists of such libraries, such as the one in the Modernizr project: https://github.com/Modernizr/Modernizr/wiki/HTML5-Cross-browser-Polyfills (the project itself is mentioned later in this chapter). Chapter 3 also contains a section on some of the most popular HTML5 polyfill libraries.

Feature Support and Detection

Not every HTML5 feature can be reasonably supported with a polyfill. For some features, such as complex canvas applications, it is necessary to support a different kind of fallback. In the case of canvas, that usually entails displaying an image instead of a dynamic animation or a "sorry, please consider upgrading your browser" message instead of interactive content.

How Do I Know What Features Are Supported?

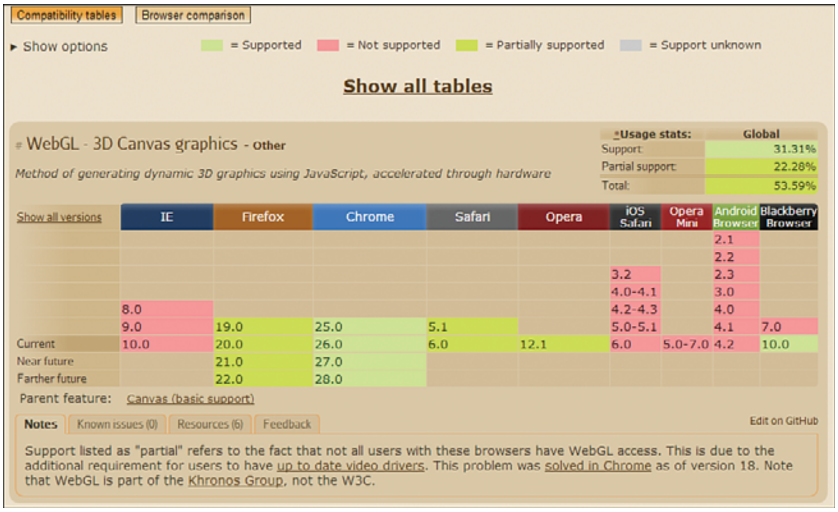
Before you use any particular HTML5 feature, it's a good idea to look at a website of compatibility tables to see which browser versions currently support the feature. There are several of these websites, and the most popular ones are as follows:

- caniuse.com
- html5please.com
- mobilehtml5.org

Figure 2.2 shows a typical compatibility table from caniuse.com. You can see that all versions of Internet Explorer and many mobile browsers do not support WebGL, the 3D specification for HTML5 canvas (2D canvas is much more widely supported).

Always Use Feature Detection

Sometimes you'll want to use a feature even if some browsers do not support it and there is no reasonable fallback. Instead of attempting to detect particular unsupporting browsers, it is always better to detect the existence of features.



Compatibility tables | Browser comparison

▸ Show options 🟩 = Supported 🟥 = Not supported 🟨 = Partially supported ⬜ = Support unknown

Show all tables

WebGL - 3D Canvas graphics - Other

Method of generating dynamic 3D graphics using JavaScript, accelerated through hardware

Usage stats:	Global
Support:	31.31%
Partial support:	22.28%
Total:	53.59%

Show all versions	IE	Firefox	Chrome	Safari	Opera	iOS Safari	Opera Mini	Android Browser	Blackberry Browser
								2.1	
								2.2	
						3.2		2.3	
						4.0-4.1		3.0	
	8.0					4.2-4.3		4.0	
	9.0	19.0	25.0	5.1		5.0-5.1		4.1	7.0
Current	10.0	20.0	26.0	6.0	12.1	6.0	5.0-7.0	4.2	10.0
Near future		21.0	27.0						
Farther future		22.0	28.0						

Parent feature: Canvas (basic support)

Notes | Known issues (0) | Resources (6) | Feedback — Edit on GitHub

Support listed as "partial" refers to the fact that not all users with these browsers have WebGL access. This is due to the additional requirement for users to have up to date video drivers. This problem was solved in Chrome as of version 18. Note that WebGL is part of the Khronos Group, not the W3C.

FIGURE 2.2 Compatibility table from caniuse.com showing WebGL support on major browser versions.

For instance, the HTML5 canvas element is not supported on Internet Explorer 8 or below. To test for its support, you could create a canvas element and then check for one of the methods that you would expect to exist:

```
var supportsCanvas = document.createElement('canvas').getContext != undefined;
```

The variable `supportsCanvas` will be true in Internet Explorer 9 and false in Internet Explorer 8. Using `document.createElement('canvas')` alone is not enough because it will successfully create an element of type `HTMLUnknownElement`. Instead, you check to see if the `getContext` method exists on the new element.

There are many other valid ways to test for canvas support (or most HTML5 features for that matter), and instead of bothering to find a working method for each, it is sometimes easier to use a library. The most popular feature detection library is Modernizr (modernizr.com), which can quickly detect all HTML5 and CSS3 (Cascading Style Sheets) features and enable you to respond by executing some appropriate JavaScript, or even conditionally loading different JavaScript and CSS files based on a feature's support.

Summary

The resources in this chapter were popular when this book was written, but there may be better (or more popular) libraries out there today. When considering any kind of library, it is always a good idea to do a fresh search to see what's most popular and why.

Now that you have the background and vocabulary needed for this book, it's time to explore the many features of HTML5.

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