1 THE WORLD WIDE WEB

World History and Where We Are  (A)

Let us begin by trying to decide on the three most important events in human history! What three occurrences, since the beginning of time, have had the greatest impact on the human species? Which events marked the most dramatic turning points in our evolution? There are many that might deserve this honor and here are some that should be considered: The evolution of spoken language, the first usage of tools, the discovery of fire, the industrial revolution, the discovery of the scientific method, the invention of the printing press, and many others. One may argue at some length what the three greatest events have been. But this book will suggest that a sure contender for the honor is the evolution of the World Wide Web or, more specifically, the connection of every civilized human being to every other civilized human being and to almost every business, governmental institution, library, educational institution, political party, club, society, religious organization, computer, database, and possibly, in the future, almost every house, apartment, automobile, or even every briefcase, bicycle, or even home appliance!

We know that the World Wide Web has been growing at an exponential rate. We know that businesses and governmental institutions have been rushing to get connected. We have seen dramatic steps in communications capabilities as fiber optic cables are stretched everywhere and earth satellites are deployed by the dozen to keep us always in range. Almost every desk in every business is getting its own personal computer and we can now purchase laptop computers to carry around that communicate easily with the web. We know we can find almost every book title in print, every newspaper being published, every airline flight that is scheduled, every movie title being shown (or not being shown), every university course being taught, and much much more by simply clicking on the web and searching out the information. We know that we can sit at home and do our job (at least in some cases or part of the time), join and participate in clubs, shop for clothes or a new car, sit in a chat room and share stories with complete strangers, explore a foreign land electronically, and compete in games with people we have never met.

Where all of this will lead we do not know. It is both an exciting time and a frightening time to live. Of one thing we can be sure: It is a very good time to try to understand technology and especially networking. What is it, how does it work, what can it do, what can it not do, how do we use it, and how do we stay safe within its environment? This chapter will get us started on these issues.

Let's Create Some Web Pages  (B)

We will begin our study with an examination of the World Wide Web (WWW). We want to know what the World Wide Web is and we want to utilize its resources to help us learn the many topics on our agenda. The task for this chapter will be to learn to create web pages and to connect them to the World Wide Web. Our later studies will build from these beginnings.
Here is a page that we want to be able to view on our computer, and we will want others on the World Wide Web to see it also.

Alfred Nobel's Legacy

Alfred Nobel, a nineteenth century industrialist, died in 1896 and left a will establishing the Nobel Foundation. This organization has been awarding, from 1901 on, annual prizes for outstanding accomplishments to scholars, literary figures, and humanitarian leaders.

The Nobel Prizes are currently given for contributions in six different areas of endeavor.

Let us give this page the title "The Nobel Prizes."

If we want this page to be a part of the World Wide Web, we must add formatting markers to tell the computer display system how to present the text. The formatting markers must be written in a language called Hyper Text Markup Language or HTML. Here is our paragraph with all the HTML markers to tell a computer system how to format the page.

<HTML>
<HEAD>
<TITLE> The Nobel Prizes </TITLE>
</HEAD>
<BODY>
<H1> Alfred Nobel's Legacy </H1>
<P> Alfred Nobel, a nineteenth century industrialist, died in 1896 and left a will establishing the Nobel Foundation. This organization has been awarding, from 1901 on, annual prizes for outstanding accomplishments to scholars, literary figures, and humanitarian leaders. </P>
<P> The Nobel Prizes are currently given for contributions in six different areas of endeavor. </P>
</BODY>
</HTML>

The markers are easy to understand. There is no deep rocket science (or computer science) here. Each marker is clearly identifiable by the angled brackets that surround it. Thus if H1 is a marker name, <H1> is the marker. This marker refers to some text which begins at the point where <H1> appears and which ends at the marker </H1>.

Here are some examples of markers. The page title is presented as

<TITLE> The Nobel Prizes </TITLE>

and the heading at the top of the page is this:

<H1> Alfred Nobel's Legacy </H1>
The first paragraph of the text is typed as

\[
\text{\textless P} \quad \text{Alfred Nobel, . . . . .} \quad \text{\textgreater P}
\]

You, as the designer of the page, are telling the computer display system how you want the page to look. Here is a list of the markers being used and their meanings.

\[
\text{\textless HTML} \quad \text{The text surrounded by the markers} \quad \text{\textgreater HTML} \quad \text{and} \\
\text{\textless /HTML} \quad \text{constitute an HTML formatted page that is to be} \\
\text{displayed.}
\]

\[
\text{\textless HEAD} \quad \text{The text surrounded by these markers gives the heading} \\
\text{information for this page.}
\]

\[
\text{\textless TITLE} \quad \text{Part of the heading is the page title. This title will be} \\
\text{displayed by the computer system when the page is} \\
\text{displayed. But this} \\
\text{title will not be on the displayed} \\
\text{page.}
\]

\[
\text{\textless BODY} \quad \text{This marker defines the material to be on the displayed} \\
\text{page.}
\]

\[
\text{\textless H1} \quad \text{This tells the system to create a heading for the material.}
\]

\[
\text{\textless P} \quad \text{This tells the system to create a paragraph.}
\]

In all of these examples, every begin marker \textless M\textgreater has a complimentary end marker \textless /M\textgreater telling both the beginning and ending of the text being formatted. In later examples, some beginning markers will not have ending markers because the endings will be obvious without them.

Having designed a page and typed the HTML markers to display it, we would now like to see our page displayed on a computer screen. The program that will display it is called a browser. The browser is especially designed to obey the HTML commands and to put the material we specify on the computer screen. (Two well known browsers are the Netscape Navigator and the Microsoft Explorer.) We will type the HTML formatted version into a computer file called nobelinfo.html. You should type this into your own computer using whatever editor that may be provided. It should be in a directory labeled public_html so that the browser can find it. Also your computer must be attached to an Internet server. (You may need to get help from a friend to get started if you are not sure how to use your particular computer or if you do not know how to connect to an Internet server.)

Notice that when you use the browser to display your page, it will be formatted exactly as your HTML commands have stated but not necessarily as you have typed it. Thus if you typed two paragraphs but only marked one of them with the \textless P\textgreater markers, only one of them will be properly formatted by HTML. The browser follows the rules of HTML and it does not mimic the formatting you have typed.

Thus we have achieved a great thing. We have created a page and displayed it with a browser. This is the same browser that can reference pages from all over the world
and display what other people wanted us to see. Those people have learned HTML and used it to present their material to us. We are learning HTML so we can return the favor.

___

Alfred Nobel's Legacy

The Nobel Prizes

Let us create another page associated with the first. We will entitle it "Areas for Nobel Prizes."

Nobel Prizes are given for outstanding contributions in these areas:

- Physics
- Chemistry
- Physiology or Medicine
- Literature
- Peace
- Economic Science

Here is the HTML version:

```html
<HTML>
<HEAD>
<TITLE>Areas for Nobel Prizes</TITLE>
</HEAD>
<BODY>
Nobel Prizes are given for outstanding contributions in these areas:
<UL>
<LI>Physics
<LI>Chemistry
<LI>Physiology or Medicine
<LI>Literature
<LI>Peace
<LI>Economic Science
</UL>
</BODY>
</HTML>
```
This page uses the HTML construct called an unordered list and each entry in the list is called a list item.

<UL> Specifies an unordered list.
<LI> Specifies a list item.

Let us put this text into the computer file called nobelareas.html and see how it looks when viewed by a browser:

Nobel Prizes are given for outstanding contributions in these areas:

- Physics
- Chemistry
- Physiology or Medicine
- Literature
- Peace
- Economic Science

Now things get really interesting!!! Since we have two pages, we can build links from one page to the other. We will modify the first page so that the words "six different areas" are highlighted. Then if a person reads this page and wonders what the six different areas really are, he or she will be able to click on these words and see the other page. We can do this by putting in a special HTML marker <A HREF = ? > showing which words to highlight and what to do if someone clicks on those words.

<HTML>
<HEAD>
<TITLE> The Nobel Prizes </TITLE>
</HEAD>
<BODY>
<H1> Alfred Nobel's Legacy </H1>
<P> Alfred Nobel, a nineteenth century industrialist, died in 1896 and left a will establishing the Nobel Foundation. This organization has been awarding, from 1901 on, annual prizes for outstanding accomplishments to scholars, literary figures, and humanitarian leaders. </P>
<P> The Nobel Prizes are currently given for contributions in <A HREF = "nobelareas.html" six different areas </A> of endeavor. </P>
</BODY>
</HTML>

Now let's look at our displayed page:

Alfred Nobel's Legacy

Alfred Nobel, a nineteenth century industrialist, died in 1896 and left a will establishing the Nobel Foundation. This organization has been awarding, from
1901 on, annual prizes for outstanding accomplishments to scholars, literary figures, and humanitarian leaders.

The Nobel Prizes are currently given for contributions in **six different areas** of endeavor.

Here is a symbolic representation of the two pages and the link between them.

We are still not done, however. We can complete the picture by enabling a person who is looking at the second page to click on the words "Return to above." and have themselves transferred back to the previous page.

```html
<HTML>
<HEAD>
<TITLE> Areas for Nobel Prizes </TITLE>
</HEAD>
<BODY>
Nobel Prizes are given for outstanding contributions in these areas:
<UL>
<LI> Physics
<LI> Chemistry
<LI> Physiology or Medicine
<LI> Literature
<LI> Peace
<LI> Economic Science
</UL>
<A HREF = "nobelinfo.html"> Return to above. </A>
</BODY>
</HTML>
```

So this is how the two pages look with their installed links. You should type them in and make sure the links do properly enable you to jump from one page to the other.
This is a nice result! But on more careful thought, it is much more than nice; it is an incredible, astounding, and world-altering discovery. This is a "web"! It is our own web, but it is a web. And this is how the World Wide Web got started. Two pages of the kind we have shown were put together some years ago. Then more pages were added by various people and then more were added. Now there are tens of millions of people and pages all connected together by the means we have shown and they are changing the world in the manner we discussed in the first section.

We can make still another change to our pages; we can put in an address to a remote site. Why not enable our user to click on the words "Nobel Foundation" and see the entry page of the Nobel Foundation in Stockholm, Sweden? Not only will our reader be able to see our pages, he or she will have a convenient way to jump to the source documents prepared by the originating organization. So here is another version of page one.

```
<HTML>
<HEAD>
<TITLE> The Nobel Prizes </TITLE>
</HEAD>
<BODY>
<H1> Alfred Nobel's Legacy </H1>
<P> Alfred Nobel, a nineteenth century industrialist, died in 1896 and left a will establishing the <A HREF = "www.nobel.se"> Nobel Foundation </A>. This organization has been awarding, from 1901 on, annual prizes for outstanding accomplishments to scholars, literary figures, and humanitarian leaders. </P>
<P> The Nobel Prizes are currently given for contributions in <A HREF = "nobelareas.html"> six different areas </A> of endeavor. </P>
</BODY>
</HTML>
```

Suddenly our toy classroom network has jumped to mammoth size because the Nobel Foundation page has numerous additional links for us to follow:
A large number of pages that are so interlinked is called a hypertext and such entities have been studied by scientists for years. One can have arbitrarily many links from any page to any others. It contrasts with the standard notion of a book which orders all of its pages in a simple row. The psychological, artistic, and pedagogical characteristics of these two forms of organizing pages remains an issue for research.

As an additional feature, the pages we have created are also reachable by anyone on the net if we have placed them in the proper directory and if our computer is connected to an Internet server as described above. All that person needs to do is to use their browser and go to the address of your home site adding /nobelinfo.html to the end of your address. For example, the first author of this book has a WWW address of http://www.cs.duke.edu/~awb and the Nobel prizes information page can be referenced by typing http://www.cs.duke.edu/~awb/nobelinfo.html into anyone’s WWW browser. (Remember that file nobelinfo.html was typed into directory public_html so that the browser could find it.)

In order to make these links to distant pages actually work, the browsers that interpret the HTML and display the text have to have a feature not yet discussed. If one has an HREF which points to another page, the browser must be able to follow that address and obtain the HTML document to display. In fact, this address following capability is quite complex because it must send a request across communications networks to foreign computers and do the retrieval. There is an array of features that browsers must have to enable such references to succeed and they will not be discussed further here. We will only acknowledge that they must exist, that they are complex, and that the browser must have them.

This concludes an ambitious section of this book. We examined a single page and how to display it with an ordinary browser. Then we showed how to construct links between pages and build a whole network. Finally, we connected our net with pages on the World Wide Web and linked ourselves to the dragon that is changing the world.

Exercises
1. Give, in your opinion, the three most significant events in the history of human kind.
2. Name a type of business (if you can) that will not be affected by the WWW in the coming years.
3. Type in the pages shown in this section and view them with a browser as described.
4. The first HTML page in this section has three different types of titles. Explain each one, its function, and where it appears on the display: The Nobel Prizes, Alfred Nobel’s Legacy, and nobelinfo.html.
5. Create a home page for yourself using HTML giving the major things that you would like the world to know about you. Have a friend view your web page from a separate computer to be sure that the addressing conventions are working and that your page is truly on the WWW.
6. Who won the Nobel Prize in Economics in 1982? What was the first year in which this prize was given? You should be able to answer these questions by following links from The Nobel Prizes page created in this section.

More HTML (B)

This section will describe a few more features of HTML. The reader should examine a standard reference for a complete description of this language and its many capabilities. (This section largely follows A Beginners Guide to HTML as it appears at http://www.ncsa.uiuc.edu/General/Internet/WWW/HTMLPrimer.html.)

In addition to the unordered lists described above, the reader might like to have the list items numbered. This is done with the <OL> tag in the expected way.

```html
<OL>
  <LI> Physics
  <LI> Chemistry
  <LI> Economics
</OL>
```

will yield a numbered list:

1. Physics
2. Chemistry
3. Economics

Another characteristic of lists is that they can be nested. Thus one can have a list of lists. We leave the exploration of this idea to the exercises.

One can create a list of definitions with the tag <DL> as in the following:

```html
<DL>
  <DT> HTML
  <DD> Hyper Text Markup Language
  <DT> WWW
  <DD> World Wide Web
</DL>
```
This will produce this output:

HTML
   Hyper Text Markup Language
WWW
   World Wide Web

In the earlier example, \(<H1>\) was used to create a heading for a section of text. There are additional tags \(<H2>\), \(<H3>\), . . . . , \(<H6>\) which create sequentially lower levels of headings. Thus if we wanted to write a section on HTML lists which contains subsections on unordered lists and ordered lists, we might use the following:

\(<H1>\) Lists \(<H1>\)
\(<P>\) There are two types of lists, unordered lists and ordered lists. \(</P>\)
\(<H2>\) Unordered Lists \(<H2>\)
\(<P>\) Unordered lists have the properties that . . . . \(</P>\)
\(<H2>\) Ordered Lists \(<H2>\)
\(<P>\) Ordered lists are also quite useful . . . . \(</P>\)

This is formatted as

Lists
   There are two types of lists, unordered lists and ordered lists.

   Unordered Lists
      Unordered lists have the properties that . . . .

   Ordered Lists
      Ordered lists are also quite useful . . . .

If you wish to put something into bold face or italics type use \(<B>\) or \(<I>\), respectively.

Suppose you wish to type something and be guaranteed that exactly the characters and spacing (assuming fixed-width font) that you use will be followed. You can use the tag \(<PRE>\) to do this. Thus the HTML

\(<PRE>
   H   H   I
   H   H   I
   HHHHH I
   H   H   I
   H   H   I
\(</PRE>\)

will result in this:
If you wish to put in a horizontal line, try <HR>. You can put parameters on this as in <HR SIZE= 4 WIDTH="50%"> which means use a size 4 line and cover only 50 percent of the window width.

The addressing scheme for the World Wide Web uses what are called Uniform Resource Locators or (URLs). The format for these addresses is

\[
\text{scheme}://\text{host.domain} [ : \text{port} ] / \text{path} / \text{filename}
\]

where \textit{scheme} is one of these:

- file which means that a file on your local system is being referenced
- ftp a file on an anonymous ftp server
- http a file on a World Wide Web server
- gopher a file on a Gopher server
- WAIS a file on a WAIS server
- news a USEnet newsgroup
- telnet a connection to a Telnet-based service

The \textit{port} number is usually be omitted and the other parts must be specified as key segments of the address.

You can include an image such as your own picture on a page by storing the image at a URL address in a standard format and then using <IMG SRC=ImageName> where \textit{ImageName} is the URL of the image file. You will need to check a standard manual for details on how to do this.

There are extensive other features in HTML such as the ability to have a table created. If you format things correctly, the system will create a table and put in all of the entries as you specify them. You can have HTML ask the user to fill in a form and then gather the information that people may enter and send it to you.

An interesting exercise for anyone who wants to study HTML is to examine WWW pages that others have created and to see how they formatted them. You can do this by finding a page of interest on the web and then clicking on the View menu item of the browser to see the actual HTML that created that page. For example, if you go to the first author's web page and then click on View, you will get this:

\[
\text{<HEAD>}
\text{<TITLE>Alan W. Biermann</TITLE>}
\text{</HEAD>}
\text{<BODY><P>}
\text{<HR>}
\text{<A NAME=tex2html1 HREF=sectionstar3_1.html>}
\text{<IMG ALIGN=MIDDLE SRC="next.gif"></A><BR>}
\text{</BODY>}
\text{</HEAD>}
\]
Exercise
1. Create one or several web pages that use all of the features described in this section. Use a standard browser to view your page to make sure it formats your text in the expected way.
2. Find a standard HTML reference manual on the WWW and read about formatting tables. Put a table into one of your pages using this feature.

We Love HTML But . . . .(B)

We are not going to spend more time on HTML in this book. You may never see very much of it again after reading this chapter. We study HTML not because we will use it a lot. We study it because we cannot understand what the World Wide Web is unless we do study it. HTML is so much at the center of what the World Wide Web is that we cannot understand it without understanding HTML. But once we have them both, we can go on to the next level of our computer science and networking course. Many people make a lot of money programming HTML, but that is not our goal here.

In fact, you may be able to create all the HTML you need by using programs designed to do that automatically. If you wish to do a standard job such as create a personal web page, there are programs that will ask you a series of questions and then synthesize the needed HTML.

Exercises
1. Call up a program that will automatically create HTML code and use it to create a web page without writing any HTML. Then study the HTML code that it created automatically.

Summary (B)

Observing the many changes in lifestyle and capabilities that the World Wide Web is enabling, we suspect that human kind is entering an new era. One cannot predict what wonderful things and what new dangers may present themselves in the coming years. But certainly, we are wise to try to understand the World Wide Web so that we will be prepared to profit from its strengths and protect ourselves from its dangers. This chapter gives us a basis for that understanding by showing how to create a simple two page web and then how to make it part of the WWW.

We learned the basics of HTML in this chapter and the use of a browser for viewing HTML pages. In the next chapter, we will learn that HTML is but a kindergarten
level introduction to what really can be done. Besides simply displaying a page on the screen, we might like to see lots of action on our page. Perhaps we would like the page to ask questions and respond to answers. Maybe we would like the page to have buttons that can be pushed to activate actions of one kind or another. It is possible, we would like the page to calculate some useful numbers or to display little cartoon figures running around. All of this and more we can do with the programming language Java and you will see it begin in the next chapter.