piler, called the A-0, to translate mathematical code into **machine language**. She refined the A-0, making the A-1 and later, the A-2. The A-2 was to become the first compiler to be used on a large scale. For **UNIVAC**, she developed the B-0 compiler, later called the FLOW-MATIC, to be used in businesses for payroll, billing, and so on. Hopper used FLOW-MATIC successfully to make UNIVAC I and II understand 20 English-like statements. She resisted critics who questioned whether a complete programming language using English words could feasibly be developed. In just a few years, her FLOW-MATIC compiler became instrumental in developing the first implemented business data processing language, Common Business Oriented Language (COBOL).

While on active duty with the Naval Data Automation Command, Hopper was also an enthusiastic speaker regarding the future of computing. The analogies and examples she used in her speeches have become legendary. For example, she presented a piece of wire about a foot long and explained that it represented a nanosecond, since it was the maximum distance electricity could travel in wire in one-billionth of a second. She often contrasted this nanosecond with a microsecond, a coil of wire nearly 1000 feet long.

"Amazing Grace," as she became known, was recalled to active duty in the Navy in August 1967. In 1983, she was promoted to the rank of Commodore in a White House ceremony. Two years later, Congress raised her rank to rear admiral, a position never before held by a woman. Hopper, the Navy's oldest and highest-ranking woman commissioned officer on active duty, retired in 1986 at the age of 79. The USS *Hopper*, an Arleigh Burke–class guided missile destroyer, was christened at Bath Iron Works (Bath, Maine) in January 1996.

BIOGRAPHY

Grace Brewster Murray Hopper. Born 9 December 1906 in New York. Graduate of Hartridge School, 1924. B.A. in mathematics and physics, Phi Beta Kappa from Vassar College, 1928. M.A. in mathematics from Yale University, 1930. Ph.D. in Mathematics from Yale, 1934; first woman awarded a Ph.D. in mathematics from Yale. Taught at Vassar, 1931–43. Left Vassar to join the Navy, 1943. Joined the U.S. Naval Reserve (USNR), 1944. Served as a mathematical officer, U.S. Navy Bureau of Ordinance, 1944–46. Worked for Eckert-Mauchly (later Remington Rand/Sperry Rand), 1949–67. Wrote first compiler, the A-0, 1952; refined version, A-2, 1953; FLOW-MATIC compiler, 1957. Recipient of many honors, including Computer Sciences Man of the Year of 1969; U.S. Navy Distinguished Services Medal, 1986; and more than 40 honorary degrees. Died 1 January 1992 in Arlington, Virginia.

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—*Amita Goyal Chin*

HTML

The Hypertext Markup Language (HTML) is the lingua franca of the **World Wide Web**. HTML "tags," which are simple keywords that enclose page elements like a pair of parentheses, are used to prepare pages for the Web; they indicate different **font** styles and sizes as well as the position and size of pictures and buttons.

HTML is based on SGML (Standard Generalized Markup Language), which was developed by the **International Standards Organization** (ISO) in 1986. SGML is a large and complex system, but HTML uses only its general guidelines.

The original HTML was developed by **Tim Berners-Lee** (1955–) in 1990 while working at CERN (Centre Européan pour la Recherche Nucléaire; European Laboratory for Particle Physics). In the summer of 1991 he posted the specifications for the new markup language to the **Internet**. Several **browsers** that implemented different, incompatible versions of HTML emerged immediately. Incompatibility prevailed until HTML 2.0 appeared in 1995. Both Netscape Navigator and Internet Explorer supported HTML 2.0 when it was published, and compatibility was restored.

Some examples of the use of HTML tags can better clarify the nature of the language. A page for the Web is written in plain **ASCII** text. The title of the page can be defined by writing.

```
<title>My HTML document</title>
```

There is always an initial tag, which is enclosed in triangular parentheses, and a final tag, which is the same, but with a slash in front of the name of the tag. Italics can be used in a text using the "em" (meaning, for emphasis) tag:

```
The following word is in <em> italics </em>
as you can see.
```

With the following mark, a picture can be inserted in a page using 200 by 150 pixels:

```
<img src="picture.jpeg" width="200"
height="150">
```

One of the main features of HTML is that it contains hyperlinks—by clicking on special text (a link), a connection to another Web page can be followed. A hyperlink can be defined in the following way:

```
This is a link to <a href="http://www.w3.org/">
W3C </a>
```

Notice that the tag "a" includes the hyperlink with address *http://www.w3.org*, but that the text displayed instead of the link address is "W3C." The tag closes the text that will be highlighted to indicate the presence of the hyperlink.

Several versions of HTML have become available. The latest version, as of late 1999, is HTML 4.0, which includes new features such as support for tables and forms, accessibility methods for impaired persons, internationalization commands that work better with non-English languages, and support for style sheets. Some of the features of HTML are called *dynamic HTML* because they allow dynamic changes in home pages: for example, modifying the color of text when the mouse goes over it. Dynamic HTML is a step toward making home pages resemble the current desktops of operating systems such as **Windows**. However, old browsers do not support the new dynamic features of HTML.

The **World Wide Web Consortium** has also produced a new recommendation for an Extensible Markup Language (**XML**), which is vastly superior to HTML.

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—*Raúl Rojas*

Human–Computer Interaction

The term *human–computer interaction* (HCI) describes the psychology of how people use computers. Also known as human factors or usability, it is closed related to *ergonomics*, the principle of fitting jobs to workers and people to machines. Motivated chiefly by the need to produce computers that are easier to use, HCI has produced a dramatic increase in the usability of computers since the 1960s. Key milestones include the handheld **mouse**, the **graphical user interface** (GUI), the development of speech recognition and speech synthesis, and the use of **artificial intelligence** and **virtual reality** to make working with computers more intuitive.