W3C is not a legal entity. W3C contracts and details of membership are established between each member company and the host institutions. Host institutions pledge that no member will receive preferential treatment within W3C and that individual contracts will remain confidential.

The W3C was founded in 1994, a year of intense activity for development of the Web. In March, **Marc Andreessen** (1972–) and colleagues left the National Center for Supercomputing Applications (NCSA) to form Mosaic Communications Corp., later called **Netscape**. In June, European commissar Martin Bangemann (1934–) issued his report to the European Commission on the Information Society, and CERN's first Web server registered a load 1000 times greater than that of three years earlier. In July a MIT/CERN agreement to start a W3 organization was announced in Boston by Bangemann. In September, **Tim Berners-Lee** (1955–) joined the MIT/LCS, and in October, W3C was formally founded. Later, in December, CERN decided not to continue Web development, and in an agreement with the European Commission and INRIA, transferred its role to the latter. INRIA became the consortium's second host institution in April 1995. In August 1996, Keio University joined MIT and INRIA in becoming the third site to host W3C.

The W3C team consists of a chairman, a director, and staff. The current W3C chairman is Jean-François Abramatic, who is responsible for managing the general operation of the consortium and chairing the advisory committee and board. The director of W3C is Tim Berners-Lee, the leading architect for the technologies developed at the consortium. He approves recommendations and activity proposals and designates group chairs.

The advisory committee (AC) consists of one representative from each member organization. It reviews proposals and annual plans, assesses W3C's progress, and suggests future direction. The advisory board (AB) is elected by the AC to provide guidance on strategy, management, legal matters, process issues, and conflict resolution. It ensures that W3C remains responsive to the needs of its members and to those of entities outside W3C (notably other standards bodies).

When W3C decides to become involved in an area of Web technology or policy, it initiates an activity in that area. An activity means that W3C resources (people, time, money, etc.) are dedicated to work in that area. Generally, an activity is carried out by one or more groups. W3C activities are reviewed at each AC meeting, which are held biannually. Each activity's progress is described by an activity statement, which is updated before the AC meetings. This list is also revised before the AC meeting.

All W3C technical reports and software are made available free of charge to the general public. This policy is part of the membership agreement and stems from the W3C's core goal of keeping the Web as one. Moreover, to ensure that its results are acceptable to the general public and to promote trial implementations, W3C may call for public comments about working drafts and software releases.

Any organization or company can become a member by signing a membership agreement with the W3C and paying the annual fees. The W3C has approximately 400 members.

FURTHER READING

Robischon, Noah. "The End of the Monolithic Browser." *Time*, 3 Jan. 1995.

Lohr, Steve. "His Goal: Keeping the Web Worldwide." *New York Times*, 18 Dec. 1995.

—*Manuel Sanromà*

Worm

A worm is a computer program that propagates autonomously from one computer to other computers in a network, infecting and using them as a new starting point for further propagation. A worm is different from a **virus** in that it does not attach itself to a program or to a boot diskette. A worm can exist only as long as the infected computer continues running.

Like so many elements of personal computing, the worm was conceived at the **Xerox Palo Alto Research Center** (PARC). In 1978, John Shoch and David Boggs developed a short program to search PARC's network of 200 Alto computers for idle processors. However, the worm spiraled out of control and had the unintended effect of invading networked computers, creating a security threat. Shoch bor-

rowed the term *worm* from the science fiction book *The Shockwave Rider*, by John Brunner (1934–95), in which an omnipotent "tapeworm" program runs amuck through a network of computers.

The most famous example of such an intruder is the Internet Worm, which is said to have infected 5 percent of the **Internet** hosts in 1988. The program was written by Robert Morris, Jr., a graduate student at Cornell University. It was sent via **electronic mail** using conventional **Unix** utilities. Started on 2 November, the worm began traveling the net faster than it could be deleted from host machines, so that many computers had to be taken off the network. This was actually a programming error because the worm created too many replicas of itself in the same machine, eventually overwhelming the **operating system**. This helped to detect the worm early, but the damage was nonetheless significant. By 4 November the code had been decompiled by specialists and it was clear that the program did not modify any system files.

The Internet worm exploited several security holes in some versions of the Unix operating system. The most significant was a **back door** left by the creators of the mailing protocol. To service the mailer, the code included a **debugging** option that allowed a remote user to execute commands in the machine receiving an electronic mail message. Robert Morris knew of this back door and let his worm execute in a remote computer. The worm started by finding the names of other hosts connected to the Internet. This is easy to do in many Unix systems since the relevant information is stored in public files with a standard name. The worm also checked users' passwords against a list of common passwords (first names, sports teams, etc.). Once a user account had been cracked, the worm sent a small *bootstrap program* to be executed by the compromised account and close the connection. The bootstrap program (also called a *vector*) then called back the original sender, retrieved all worm source code, compiled it, and executed it in the new host. A new infection cycle could then be started with the list of hosts found in this machine.

The size of the threat posed by worms in the networked age was driven home in the spring of 2000 when the "Love Bug" traveled around the world, crippling networks large and small, in a matter of hours. The Love Bug vaulted itself across the Net in the form of e-mail with the subject line "ILOVEYOU." When the attachment to the e-mail was opened, the worm invaded users' address books and sent itself to everyone in the contact lists. Thus the worm exploited not one but two security flaws—one in Microsoft's Outlook e-mail manager, and another in the minds of thousands of unsuspecting users who opened the e-mail attachment thinking that they had received a love letter from an admirer.

Other types of network intruders include viruses, **Trojan horses**, and logic bombs. *Logic bombs* are programs that run in the background waiting for a specific date or set of conditions in order to wreak havoc in the host machine. Most logic bombs are the work of disgruntled insiders.

FURTHER READING

Cohen, Frederick B. *A Short Course on Computer Viruses.* New York: Wiley, 1994.

Denning, Peter, ed. *Computers Under Attack: Intruders, Worms, and Viruses.* Reading, Mass.: Addison-Wesley, 1990.

Hiltzik, Michael A. *Dealers of Lightning: Xerox PARC and the Dawn of the Computer Age.* New York: Harper Business, 1999.

Smith, George. *The Virus Creation Labs: A Journey into the Underground.* Show Low, Ariz.: American Eagle, 1994.

—*Raúl Rojas*

Wozniak, Steve

1950–

U.S. Computer Engineer and Teacher

Steve "Woz" Wozniak is best known as the designer of the **Apple II**, the world's first easy-to-use **microcomputer**. After founding **Apple Computer** with **Steve Jobs** (1955–) in 1976, Wozniak continued to work for the company until 1985. He has also been involved in a number of other educational and charity projects and currently devotes much of his time to working as an elementary school teacher.

Wozniak always seemed destined to become a great scientist or engineer. At Homestead High School in