dozen specialized open-source Web servers. No other Web server, though, boasts Apache's wide base of experienced users, mature feature set, and robust portability and scalability.

FURTHER READING

Laurie, Ben, and Peter Laurie. *Apache: The Definitive Guide.* Cambridge, Mass.: O'Reilly, 1997; 2nd ed., Beijing and Sebastopol, Calif.: O'Reilly, 1999.

Wainwright, Peter. *Professional Apache.* Chicago: Wrox Press, 1999.

—Cameron Laird

APL

APL (A Programming Language) is a very concise and cryptic general-purpose computing language, best suited for numerical applications. It is especially useful for computations involving matrices, vectors, and recursive operations.

APL was developed by Kenneth Iverson (1920–) at Harvard University in the early 1960s. Initially called *Iverson notation*, the system was used to teach applied mathematics. In 1962, Iverson described his approach in a book titled *A Programming Language*, and from it APL got its name.

The language really took off in 1965, when Larry M. Breed and Phil S. Abrams from the IBM Research Center at Yorktown Heights wrote the first APL implementation; the first commercial interactive interpreter for the IBM 360 series of computers appeared in 1968. In 1971, James Brown wrote a Ph.D. dissertation extending the APL notation. The new language, APL2, was intended to provide a whole computing environment for the scientist.

APL was designed without making any compromises with the underlying hardware. Thus, APL statements resemble mathematical expressions. The APL primitive functions can be applied iteratively, so that the programmer is not forced to write a loop to deal with repetitive calculations. Operations such as sorting and searching are language primitives. Since there are so many predefined primitive operations, knowledgeable APL programmers can write application prototypes in just a few minutes. However, the language is almost always interpreted and its performance is not comparable to similar programs written in **C** or **Pascal**. The advantage of an interpreted version is that the user can compute interactively, as when using a calculator. In this aspect, APL resembles more recent algebraic computing systems, such as Mathematica from Wolfram Research.

APL uses special symbols that require APL fonts, adding to the seeming impenetrability of the language for the uninitiated. Some transliterations of the APL symbols to plain **ASCII** text exist, which make it possible to send programs or comments to programs through **electronic mail**. Although APL is almost unknown to most computer programmers today, it commands a legion of faithful followers, and there is a Special Interest Group (SIG) in the **Association for Computing Machinery** devoted solely to the language. There are also several journals and conferences that deal with APL, and the Kenneth Iverson Award from the APL-SIG honors outstanding achievements related to the language.

FURTHER READING

Falkoff, Adin D., and Kenneth E. Iverson. "The Evolution of APL." In Richard L. Wexelblat ed., *History of Programming Languages.* Reading, Mass.: Addison-Wesley, 1996, Chap. 14.

Iverson, Kenneth E. *A Programming Language.* New York: Wiley, 1962.

———. *Elementary Functions.* Chicago: Science Research Associates, 1966.

———. "A Personal View of APL." *IBM Systems Journal*, Vol. 30, No. 4, 1991, pp. 582–593.

—Raúl Rojas

Apple Computer

Apple is one of the world's most highly respected computer corporations. Credited with launching the **personal computer** (PC) revolution in the late 1970s, it has since pioneered the graphical user interface (GUI), **desktop publishing**, digital cameras, and **personal digital assistants** (PDAs). But for all its innovation, the company has had a turbulent business history and there are still question marks over whether it can survive in a world dominated by "Wintel" (Windows–Intel) PCs.