libraries, which provide their comprehensive knowledge of mathematics and its applications. The libraries provided by the supplier are supplemented by online libraries of applications made available by the community of users.

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—*Roger Bishop Jones*

ALGOL

ALGOL (Algorithmic Language) was a popular programming language in the 1960s and 1970s. Uniquely, ALGOL was a product of the deliberations of an international committee: Alan Perlis (1922–), American representative to the working group, called ALGOL a "miraculous product of its time."

In the early 1950s, the few computers that existed were programmed in complex, low-level **assembler** language. This changed after the 1957 introduction of the **Fortran** programming language, which was an IBM programming language for IBM machines. Other companies and universities began developing their own algebraic language—i.e., languages that could compile arithmetic expressions. Members of the **Association for Computing Machinery** (ACM) recognized a growing need to have a single and standardized programming language that could run on different machines. ACM appointed a committee in 1957 to look into this matter; in 1958, a subcommittee was formed to prepare a draft of the new programming language. Before this could happen, however, the German GAMM (Gesellschaft für Agewandte Mathematik und Mechanik, or Society for Applied Mathematics and Mechanics) proposed to the ACM development of a single language for computer users in the United States and Europe. The GAMM group had been discussing a unified algorithmic language since 1955 and had a draft of a proposal when they approached the ACM in 1957.

In 1958, an international committee met in Zurich, Switzerland, and produced a report proposing an International Algorithmic Language. The name did not stick, however, and the first draft of the language prepared by Perlis and Klaus Samelson (1918–80) came to be known as ALGOL 58. Eighteen months later, in 1960, the committee met again to prepare the final draft of the language. ALGOL 60 was an improvement over its predecessor and was implemented in many different machines. Its algorithmic flavor also made it the language of choice for scientific publications, in much the same way as pseudocode is used today to describe algorithms. ALGOL, however, was always more popular in Europe than in the United States, where Fortran, **COBOL**, and even LISP got an early grip on the scientific, business, and symbolic processing fields.

ALGOL 60 contained the following features, important for subsequent development of programming languages: (1) programs had a block structure, (2) parameters could be passed by name or by value, and (3) procedures could be recursive. The data types available were the canonical: integers, reals, booleans, characters, arrays, and user-defined structures. The control structures of ALGOL are similar to those available in **Pascal** or **C**. Indeed, ALGOL can be said to have a syntax closer to the programming languages that are popular today than the first versions of Fortran did.

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—*Raúl Rojas*

Algorithm

An algorithm is a well-defined set of elementary steps that have to be followed to solve a problem. Often, it is required additionally that the procedure