

# This Week's Citation Classic™

Backus J W, Bauer F L, Green J, Katz C, McCarthy J, Naur P (ed.), Perlis A J, Rutishauser H, Samelson K, Vauquois B, Wegstein J H, van Wijngaarden A & Woodger M. Revised report on the algorithmic language ALGOL 60. *Commun. ACM* 6:1-17, 1963. (This paper was also published in *Computer J.* 5:349-67, 1963 and *Numer. Math.* 4:420-53, 1963.)

The report defines the algorithmic language ALGOL 60, designed by an international committee. This language is suitable for expressing programs executed by digital computers. Describing the syntax by formulas and the semantics by prose explanations, the report defines the form and meaning of all legal programs. [The SCI® indicates that this paper has been cited in over 185 publications (*Commun. ACM*, 105; *Computer J.*, 45; and *Numer. Math.*, 35 cites, respectively) since 1963.]

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"This report is the outcome of the work of a cross-Atlantic committee set up by the Association for Computing Machinery in the US and GAMM in the Federal Republic of Germany. The work was prompted by the rapid development of computers and the growing need for more convenient ways of programming them, including the use of the same notation (programming language) in computers of different types and makes. The work took place over the years 1957 to 1962 and was based on discussions by many people in meetings and publications. One decisive meeting took place in Paris in January 1960.<sup>1,2</sup>

"My own participation in the work was supported by my employer, Regnecentralen in Copenhagen, then an independent computer development laboratory set up by the Danish Academy of Technical Sciences, and particularly by its dynamic director, Niels Ivar Bech. We saw the international effort as a help to our own efforts in programming, more particularly as a counteragent to the dominance of IBM and Fortran.

"A programming language is not a scientific contribution in the ordinary sense, but a conceptual construction, and the discussions leading up to ALGOL 60 were dominated by the strong, personal opinions of the contributing individuals on what should be put into it. The emotional tensions created by the work had still not subsided in 1978 when a detailed historical study of the development of the language was made.<sup>3</sup>

"The reason why this report is so highly cited seems to be that it entered an accelerating activity of programming and programming language development at a fairly early stage and managed to contribute novel ideas and styles in several different areas of the work. Thus, the language ALGOL 60 is designed around a small number of very general notions, some of them original, particularly the block structure and the procedure concept. As a whole, the language combines a fair amount of expressive power with conceptual generality, economy, and elegance. In addition, in the manner the language is described in the report, a new kind of precision and completeness was achieved, partly through the use of a formal notation for describing the syntax. The report therefore became useful, not only as a description of a programming language which is useful and interesting on its own merits, but equally as a conceptual point of departure for many developments of concepts and languages in programming and, further, as a paradigm of programming language description. Thus, the notation used for describing the syntax is generally known as BNF or Backus-Naur-form. Also, the terminology of the report has been quite influential.

"My work in this area was honored by the G.A. Hagemann Medal in 1963."

1. Backus J W, Bauer F L, Green J, Katz C, McCarthy J, Naur P (ed.), Perlis A J, Rutishauser H, Samelson K, Vauquois B, Wegstein J H, van Wijngaarden A & Woodger M. Report on the algorithmic language ALGOL 60. *Commun. ACM* 3:299-314, 1960. (Cited 60 times.)
2. .... Report on the algorithmic language ALGOL 60. *Numer. Math.* 2:106-36, 1960. (Cited 20 times.)
3. Wexelblat R L, ed. *History of programming languages*. New York: Academic Press, 1981. 758 p.