AB28.3.3. Successes and Failures of the ALGOL Effort

Peter Naur

Talk given at the colloquium titled "Ten Years of Algol",
Eidgenössische Technische Hochschule, Zürich, 31. May 1968.

Abstract

The development of Algol during 1958 to 1968 is reviewed.
The influences leading up to the Algol 60 report are singled
out and the directions of stimulus from that report are evaluated.
The later relations of Algol with IFIP are critically reviewed,
and the need for a drastic revision of the constitution of IFIP
is pointed out.

To set the tone for what I am going to say, I must warn
you right away that my feelings at being present at this occasion
are very mixed. I am certainly happy to be among many old friends,
with whom I have had both many stimulating battles and many hours of
pleasant social interchange. On the other hand, where the topic of
our colloquium, Algol, is concerned, I have to confess a deep feeling
of unhappiness. In fact, this feeling is so strong that it has needed
more than an ordinary dose of persuasion from our host, Heinz Rutishauser,
to talk me out of my decision to stay away from this meeting altogether.
Also, this dose of persuasion includes an explicit permission to express
my current feelings about the development of Algol.

It is also relevant for you to know that these my feelings have
been growing over the last several years. Already some time ago I
have turned my efforts away from programming languages to other fields
of computer science, and I have resigned from IFIP Working Group 2.1
on Algol.

What I will do is to review the past 10 years of development, with
an eye to the successes and failures of our enterprise. This perhaps
will justify my present attitude and the recommendations which I shall
make at the end.

The period leading up to Algol 60, i.e. the years 1958 to 1960
was of course the decisive one in the development, and taken as a whole
a success for the Algol effort. To understand the subsequent development
better it is, however, necessary to take a closer look at this period and
to disentangle the various influences and achievements.

As I see it, this first period was characterized by an unusual
combination of mutually supporting circumstances. One very important
factor was the strong activity in central Europe, carried by several
groups, including the one around Rutishauser here in Zürich and the
one around Bauer and Samelson in Mainz. Through this activity there
was a deep understanding of both language and compiler problems, and
of the need for a sound, common programming language. Another vital
factor was the similar development in the United States, including

the then recent successful development of Fortran. A third envigorating factor was the influence of the Amsterdam school, supplying powerful and general ideas about the central features of programming languages. A fourth factor was the development, by Backus, of a suitable syntax notation. More important still than any of these single factors, there was a general sense of urgency and a will to cooperate.

The spectacular outcome of this lucky combination of circumstances was the Algol 60 report. However, let us not be mislead into believing that this alone represents all what may reasonably be called the Algol effort. This depends as much on the subsequent developments. It is significant that the Algol 60 report has stirred work in at least five distinctly different directions.

As the first direction of influence from the Algol 60 report I would like to put the programming of computers. In this field I will judge the Algol effort to be a partial success. As a core language Algol 60 is excellent, but the absense of input and output facilities of all sorts is, and remains, a serious shortcoming.

The second distinct influence from Algol 60 is in the publication of algorithms. I would judge this to be the most successful part of the Algol effort, and one where the benefits are only about to be tapped in full measure.

As the third influence, Algol 60 has acted as a strong stimulus to compiler designers. Again this influence may be judged to be largely beneficial. However, it does contain in it the seed of corruption; it cannot be the task of the designers of common programming languages to produce hard nuts for the compiler designers to crack.

Fourth, Algol 60 has stimulated research on formal languages, far beyond the needs of compiler design. Again I would consider this success to be of doubtful value for the primary aim of our effort.

Fifth, the Algol 60 report, through its very form has had considerable influence on the thinking about the proper ways to describe programming languages. In so far as the Algol 60 report has made it clear that a carefully worded, defining description is of great value for the work with programming languages, so far the description of Algol 60 may be counted as a success of our effort. But this must not blind us to the need for descriptions oriented to human readers. In view of the fact that the Algol 60 report has gained the reputation of being very hard on the uninitiated reader, we must conclude that on this score our efforts have been a failure. The Algol 60 report ought to have contained an informal introduction and description of the language, including an account of the reasons for including the various features. We failed in this and suffered a great deal of lack of understanding thereby.

During the two years following 1960 the official activity centered around the revision of the Algol 60 report. This in itself I would count as rather insignificant. But it is symptomatic of the reduction of the sense of urgency and purpose among the authors.

Far more important than the revision was the transition to being Working Group 2.1 of IFIP. In this there were two immediate failures: (1) The extreme clumsiness with which it was done, due, I am sure, to the fact that IFIP needed Algol far more badly than Algol needed IFIP. (2) The use of the vague concept "Algol" in the name of the Working Group 2.1. A more appropriate name would have been "General Purpose Programming Languages". Perhaps the worst consequence of this failure was that the Algol-Fortran antagonism was made official, with the further extremely unfortunate consequence that PL/I was developed without any official connection with Algol.

The first period of the lift of IFIP Working Group 2.1 on Algol was dominated by the definitions of the IFIP Subset of Algol 60 and the IFIP Input-Output Procedures for Algol 60. These I consider to be rather insignificant events. The Subset I believe is reasonably successful, while the Input-Output Procedures are largely a failure, being too late to have much influence and too limited in scope.

After these minor incidents, the urge to produce a new language, or even two new languages, arose. Perhaps we should count it as a major failure of the Algol 60 effort that it had created the false impression that this could be done fairly easily by an act of will. The attitude within IFIP Working Group 2.1 became dominated by the desire to produce a monument, an urge that I consider extremely harmful. It has distorted the idea of what was, and what was not, achieved in the Algol 60 report. As one consequence on the road, the excellent work of Wirth and Hoare, published in their Contribution to the Development of Algol (Comm. ACM, June 1966), was swept aside. Instead Van Wijngaarden was allowed to continue alone, along the tangent of formalized description. The latest result of this is the report MR93 of the Mathematical Center in Amsterdam.

I feel that the direction taken in the report MR93, viewed within the context of a committee established to work on programming languages of broad common utility and appeal, is completely wrong. Instead of learning from the experience gained in the work leading to Algol 60, it amplifies the failures of that effort. It sets out to provide the ultimate in formality of description, a point where Algol 60 was strong enough. In doing so, MR93 sets a new record of lack of appeal to human readers. In fact, it makes an attempt to create, not only its own special terminology, but a linguistic universe wholly of its own, and requires, to quote Mike Woodger, that the reader will have "his normal reading instincts .. thoroughly suppressed". In MR93 nothing seems to have been learnt from the outstanding failure of the Algol 60 report, its lack of informal introduction and justification.

In saying this I do not wish to imply that the MR93 report does not contain good work. Admittedly, I have found myself unable to discover it - that is the primary reason why I felt that I could not honestly remain a member of IFIP Working Group 2.1 - but the critical reviews of it which have been produced by various people, better equipped to understand it than I, make me feel confident that it does contain brilliant ideas and concepts. On the same evidence I have got the impression that it contains flaws reaching its very core.

If MR93 were just promoted as a contribution from its authors this would not give any special cause for concern. However, this work has been tied in with the plans of IFIP to such a degree that the possibility of a further development of the ideas of MR93 in a sensible fashion has been closed. In fact, IFIP calls for a virtual wholesale acceptance or rejection of MR93, now.

The true villain of this unreasonable situation is the big international organization, IFIP. In fighting IFIP I of course make myself ridiculous, for what is the use of fighting such a thing - whatever you say about it, it will just continue. The trouble is that no-one questions the construction of this type of organization. It is accepted as a necessary evil by most, used for personal advancement by a few. It is overlooked that the performance of such an organization depends critically on its laws.

One thing which is wrong with IFIP is that it is totally authoritarian and thus entirely out of keeping with the needs of a rapidly developing field like computing, with the intensive exchange of ideas among many individuals. Think of the communication channels within IFIP: committee chairman reporting at long intervals to their superior bodies. We must imagine that the people who decided this structure had never heard of the principle of feedback and its importance in well-adjusted systems. Or take the rules for the life of committees and working groups. Is there a forum for an open debate around the selection of chairmen? No sir, this is done in closed meetings. Is there a provision for regular replacement of chairmen? No sir, they just go on and on. Is there a provision for killing a Technical Committee or a Working Group? No sir, this will have to wait for a catastrophe or a scandal.

But still, the supporter of IFIP will say, we do need this organization for doing big, significant things outside the realm of the giant manufacturers. Well, this claim is just wrong, as evidenced by the construction of SIMULA.

By seizing the name of Algol, IFIP has used the effort done before it even existed, for its own glorification. At the same time IFIP has entirely lost control, not only over the use of the word Algol, but over the names of the members of the Working Group 2.1. In fact, a document claiming to be the draft report of Algol 68, quoting the names of the members of Working Group 2.1, is for sale, publicly, in London and elsewhere. I consider this a thorough misuse of authority. But who is there to stop it?

Let it be quite clear: in my opinion the intervention of IFIP, with its heavy organizational structure and pretentiousness, has caused far more harm than good to the Algol effort. The present dilemma is just the final confirmation of this. The honest thing to do now is to admit failure. More specifically, what IFIP should do is: first, make a formal decision that the name Algol will only be used within IFIP and its organizations to denote Algol 60, thus admitting defeat in the attempt to create new Algols. Second, as an obvious consequence, dissolve Working Group 2.1 Third, subject the rules and regulations of IFIP itself to a thorough revision, to achieve a proper flow of information, feedback, and check of authority.

Lest this may give the impression that I consider the whole field of programming languages to be finished or out, I wish to add that I see very important problems crying to be attacked. To give but one example, I will refer to Comm. ACM January 1968, pp 55 - 56, where, in connection with some critical remarks about PL/I, the urgent need for independent criteria identifying the characteristics of a new generation common computer language is strongly emphasized. Now, who is it that stresses this obvious, basic point, the need for independent criteria? Is it a member of WG 2.1? No! Or of the IFIP Council? No! Who then? Well, his name is Jack Brooks, congressman of the U.S. This is where we have come to, we have to be told of the basic needs of our activity from a non-professional. I think it is time to stop this hunt for the ultimate monument on which to stick the name Algol, and to get down to the real problems.

A/S Regnecentralen, Copenhagen.

1st July, 1968