From Ford's binder of early documents.

NOTTINGHAM ALGORITHMS GROUP

1. Origins

In the Spring of 1970 six Computing Centres were notified by the Computer Board that they would be receiving ICL 1906A computers. The group consisted of the University Computing Centres of Birmingham, Leeds, Manchester, Nottingham and Oxford and the S.R.C. Atlas Computing Laboratory at Chilton.

The Numerical Analyst at Nottingham was asked by his Centre Director to review the numerical software currently made available by ICL with 1900 machines. The review revealed that the mathematical routines library was inadequate for a University environment. Since the numerical (or applications) section in each of the other centres was going to encounter exactly the same difficulty at the same time the numerical analysts from each of the other '6A centres were invited by their colleague at Nottingham to an informal meeting to discuss the creation of a joint numerical algorithms project.

At the first meeting of the group it was agreed that a co-operative effort to create a suitable numerical library was not only advisory but essential if a worthwhile library, on the required time scale, (the Oxford machine was expected to be fully operational by the Spring of 1971) was to be achieved.

2. Early Conclusions

The unanimous decisions by the representatives of all the '6A centres were:

2.1 A numerical library, even for a large computing environment, should be a selection of the best material available rather than a collection of all known routines. This is because of the need to encourage users to employ numerical software in a discriminating way and the storage required to hold and the time needed to search such libraries once they are implemented.

2.2 The criteria for selecting algorithms were their
(a) usefulness
(b) robustness
(c) stability
(d) accuracy
(e) speed.

Where many algorithms were available only the one (or two) most satisfactory would be included.

2.3 The initial aim of the project was a working serviceable library for the Oxford machine.

2.4 General numerical software of the required standard was either not currently available or not in a unified form nor would developments such as the SRC supported Chelsea project

produce software on the necessary timescale.

2.5 The software would thus have to be collated and developed by the 1906A centres themselves.

2.6 Membership of the project should be initially confined to 1906A centres, at least until a useful library was tested and documented. This would maintain a unity of purpose within the project, and would limit it to a working size.

2.7 The numerical software should be available in both Algol 60 and ANSI Fortran IV. This was due to certain incompatibilities between the Algol and Fortran compilers making mixed language programming very difficult and to satisfy the different high level emphases of the six centres.

2.8 Numerical software is of value to the computer user only if it is thoroughly tested and well documented, and if its inadequacies are known and documented.

2.9 The source text of the library and master file of the documentation must be carefully maintained and controlled by the group so that the stability and integrity of the library is secure.

2.10 Test programs for all software in the library would be available. These are considered an integral part of the library software.

2.11 The proposed contents of the library should be subdivided into distinct areas, and individual centres be responsible for the collection, collation, testing, development and documentation of material within their assigned areas (see Appendix 1).

2.12 Administration of the project would continue to be from Nottingham.

2.13 All software and documentation would be sent to Nottingham, who would then distribute them to the other centres. The master copy of all material would be retained at Nottingham.

3. Important Decisions

3.1 The group decided to call itself the Nottingham Algorithms Group (NAG).

3.2 With the expansion of the NAG activities there occurred a natural separation of the policy making from the library development functions of the Group. The NAG executive committee will be responsible for future policy decisions. The NAG Library Contents committee will be responsible for the contents of the library and its accompanying documentation. New members of NAG will generally first be invited to join the NAG Library Contents committee.

3.3 A documentation scheme, based on a manual made up of documents, was agreed. (A document is the smallest unit in the manual and is replaced in its entirety should this be necessary.) (See NAG Reference Documentation.)

3.4 The source text, which will also be supported, will be available to the numerical analysts in the NAG centres and in a restricted form (agreed by the NAG committee) to general users.

3.5 The Directors of the NAG centres have agreed to sign an undertaking not to release in full the source text of the NAG library without the prior agreement of the NAG executive committee.

3.6 A new Mark of the NAG library will be created about twice a year.

3.7 The NAG Library Manual will be updated to form a new Mark of the Manual to accompany each Mark of the Library. Hence with each Mark of the Library will be associated a Mark of the Manual.

3.8 A distribution scheme for the library software based on magnetic tapes, was agreed. (See document prepared for NAG by Mr. G. Eckersley of Leeds University.)

3.9 NAG applied to the Computer Board for funds for a NAG Library Co-ordinator. This was agreed and a Library Co-ordinator has been appointed.

3.10 A 'NAG Library Co-ordinations Manual', which will contain all information from the NAG Library Co-ordinator to each Numerical Analyst, relating to library software and documentation, will be the source of information on the current state of the software and documentation within the NAG project.

3.11 Within each NAG centre responsibility for the NAG Library rests with the Numerical Analyst. Hence both the Users and Director of the centre will regard the Numerical Analyst as the person who provides and supports the NAG Library and NAG Library Manual within that centre. Within NAG the individual Numerical Analysts have responsibility for their assigned numerical area(s); provision of the NAG Library and NAG Library Manual is the responsibility of the NAG Library Co-ordinator and Administrator.

3.12 Software for the NAG Library will be accepted only if:

(a) The source text of routines in Algol and Fortran is provided on cards (or magnetic tape) with printout.

(b) The stringent test of the software in Algol and Fortran is provided on cards (or magnetic tape) with printout and results.

(c) The example programs in Algol and Fortran included in the documentation are provided on cards (or magnetic tape) with printout and results.

(d) Documentation of the software is provided (documentation of the individual routines plus the chapter introduction).

Items (a) to (d) will only be accepted if they arrive together. All material should conform to the standards specified. In particular software should be written in Algol 60 (see the Algol 60 Report) or the agreed subset of ANSI Fortran IV (see the document prepared for NAG by Mr. C. Oliver of Birmingham University) or in carefully commented Plan (see the ICL Plan Reference Manual). Naming conventions for routines and the use of the IFAIL parameter will be strictly adhered to (see NAG Reference Documentation). All documentation should follow the formats defined in the Reference Documentation.

3.13 The centre responsible for the software in a particular numerical area is responsible both for correcting any errors in the software and accompanying documentation and the updating and development of the software in that area.

3.14 Any errors or inadequacies in the library software or manuals will generally be uncovered by Users in the NAG centres. The User will report such faults to his local Numerical Analyst.

The Numerical Analyst will report the fault to the NAG Library Co-ordinator, who will refer the error to the centre responsible for that software and circulate an error alert (a document in the 'NAG Co-ordination Manual') to all centres. The responsible centre will then prepare a corrected or extended version of the routine or documentation to overcome the difficulty, or notify the Library Co-ordinator that this cannot be done. The test program for that numerical area will be extended to include a test of the fault. The updated software plus revised documentation will be sent to the Library Co-ordinator for inclusion in the next Mark of the NAG Library.

4. Future Developments

4.1 Other machines

Discussions are taking place for the implementation of the library on several other series of machines. It is anticipated that a NAG Implementation and Testing Committee will co-ordinate this activity.