FINAL REPORT

CONTRACT NUMBER	:	Nonr 1358-(03)
AUTHORITY	:	Office of Naval Research Mathematical Sciences Division
NR-NUMBER	:	NR 044-047-/11-30-54 (L)
CONTRACTOR	:	The Institute for Advanced Study Electronic Computer Project Princeton, N. J.
PERIOD COVERED	:	1 January 1955 - 30 June 1957
DATE OF ISSUE	:	31 July 1957
AUTHOR	:	Hans J. Maehly Acting Project Director

INTRODUCTION

This report has been prepared in accordance with the terms of Contract Nonr 1358-(03) and constitutes the Final Report, called for under the terms of that contract, and covering the period from 1 January 1955 to 30 June 1957.

Said contract between the Institute for Advanced Study and the Department of the Navy, Office of Naval Research, was entered on 30 Nov. 1954 for "analysing and developing methods for high-speed automatic computing" in direct continuation of our work under Contract N7onr-388.

Contract Nonr 1358-(03), together with its amendments No.1 and 2, was in effect from 1 Jan. 1955 to 30 June 1957 and has supported, during this period, mathematical and numerical analysis, together with some programming and coding, of the problems listed in this report. Machine operation and maintenance, however, were supported by the following contracts:

(1) Contract No. DA-36-034-ORD-1646(1 July 1954 - 30 December 1956).

(2) Contract Nonr 1358-(04) (15 June 1956 - 30 June 1957).

The problems listed in this report fall, as far as their status is concerned, in two classes:

(1) Problems which have entered their "production phase" - requiring a substantial amount of machine operation - before the end of 1956; these problems have already been described in the Final Report on Contract No. DA-36-034-ORD-1646.

(2) Three recent problems, none of which was completed by 30 June 1957; these problems will be described in Technical Reports under the terms of this Contract or its eventual successor. Therefore, this Final Report does not contain any detailed technical information but merely a summary of our work.

It must be emphasized that this report does not list all research carried out in our Computer Project during the period mentioned above, but only that of the mathematical work which was supported by the Office of Naval Research through Contract Nonr 1358-(03).

Hans J. Maehly

SUMMARY OF WORK SUPPORTED BY CONTRACT Nonr 1358-(03)

1. ASBY – AN ASSEMBLY CODE

Originator and Coder : Bryant Tuckerman
Described in : Ref. (1), 14.0-14.2
Status : Completed.

This code has recently been superseded by a symbolic assembly code ("SASSY") which will be described in ref. (2) or, possibly, in a separate Technical Report.

2. NUMERICAL EXPERIMENTATION OF STELLAR EVOLUTION

Originator and Analyst : Martin Schwarzschild
Coder : Mrs. Hedy Selberg
Described in : Ref. (1), 21.10-21.16
Status : Continued.

Several minor changes in the code and some further results have been mentioned in our Monthly Progress Reports January 1957 through June 1957. It is planned to prepare technical reports and/or papers for a scientific journal (presumably the Astro-physical Journal and/or its Supplementary Series) whenever an important phase of this work has been finished.

3. THE GROUND STATE OF THE HELIUM ATOM

Originator : Toichiro Kinoshita
Coder : Mrs. Sonja Bargmann
Described in : Ref. (1), 22.10-22.12, and ref.(3)
Status : Completed.

The computations carried out on our Computer for Prof. Kinoshita were pilot computations only. Based on the experienced gained hereby he carried out the final computation on the UNIVAC at New York University where he was then located.

4. A MIXING PROBLEM

Originator and Analyst : H. H. Gildstine and J. Gillis
Coder : Mrs. Margaret Lamb
Described in : Ref.(1) 23.30 and ref.(4)
Status : Discontinued.

5. NUMERICAL CALCULATIONS OF THE ANGULAR DISTRIBUTIONS FOR THE DEUTERON-PROTON AND SIMILAR REACTIONS.

Originator	: William Tobocman
Analyst	: Hans J. Maehly
Coders	: Sonja Bargmann and Patricia Eberlein
Described in	: Ref. (1), 22.30 (short summary)
Status	: Code completed, now being tested.

It is planned to describe the mathematical methods used in this problem in a Technical Report for Contract Nonr 1358-(03) as soon as testing has proved their validity. An abstract of this Technical Report may, and the results obtained certainly will, be submitted to a scientific Journal for publication (presummably the Physical Review, 1958).

6. HISTORICAL EPHEMERIS FOR 600 B.C. TO THE YEAR ZERO

Originator and Coder	: Bryant Tuckerman
Described in	: Ref. (1) 23.70 (short summary)
Status	: Obtained first results.

It is anticipated that this ephemeris, when produced and thoroughly checked, will be published by a scientific society as a monograph of about 300 pages of tables with accompanying text explaining the method of computation. To complement this publication, a Technical Report for Contract Nonr 1358-(03) may be prepared.

7. AN IMPROVED METHOD FOR SOLVING LARGE LINEAR SYSTEMS

Investigator	: J. Paul Roth
Described in	: Technical Report, ref. (5)
Status	: Analysis only, no code.

This work was supported jointly by Contract Nonr 1358-(03) and DA-36-034-ORD-1646, for the latter of which the Technical Report was prepared (cf. footnote on page 1 of said report).

8. RATIONAL APPROXIMATIONS

Originator : Hans J. Maehly

Coder : Mrs. Patricia Eberlein

Described in : Monthly Reports, ref. (6)

Status : Preliminary testing

Our method lacks, at present, a rigorous mathematical basis and applications have just begun. It is anticipated that a discussion of the method together with numerous applications will be submitted to a scientific journal. This paper may be preceded or amended by a Technical Report for Contract Nonr 1358-(03) or its eventual successor.

INDEX OF REPORTS AND PAPERS

(1) Final Report on Contract No. DA-36-034-ORD-1646, Part II (Computer Use), May 1957.

(2) Final Report on Contract Nonr 1358-(04), August 1957.

(3) Toichino Kinoshita, "Ground State of the Helium Atom", Physical Review 105 (1957), pp.1490-1507.

(4) H. H. Goldstine and J. Gillis, "On the Stability of two Superposed Fluids". Annali di Matematica Pura ed Applicata Ser. IV., Vol. 39/40 (Perone Anniversary Vol.)

(5) J. Paul Roth, "A Method for Finding the General Solution to an Arbitrary Non-singular System of Linear Equations Involving $n^3/2$ Multiplications". The Institute for Advanced Study, Electronic Computer Project, Technical Report No. 56-01, Jan. 1956, Contract No. DA-36-034-ORD-1646.

(6) "Automatic Adjustment of Parameters for Rational Approximations", The Institute for Advanced STudy, Electronic Computer Project, Monthly Report May and June 1957 pp.2-4.