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Mathematics and Computers
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AEC Research and
Development Report

ARGONNE NATIONAL LABORATORY
9700 South Cass Avenue
Argonne, Illinois 60440

# APPLIED MATHEMATICS DIVISION SUMMARY REPORT

July 1, 1962 through June 30, 1963

William F. Miller, Division Director

Preceding Summary Reports:

| | |
|---|---|
| ANL-6641 | July 1, 1961 through June 30, 1962 |
| ANL-6453 | July 1, 1960 through June 30, 1961 |
| ANL-6195 | July 1, 1959 through June 30, 1960 |
| ANL-6089 | July 1, 1958 through June 30, 1959 |
| ANL-5954 | November 1956 through June 1958 |

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## DISCLAIMER

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# PREFACE

The objective of the Applied Mathematics Division is to provide mathematical support for the research and development programs of the Laboratory. This goal is achieved, in particular, by (1) conducting research in applied mathematics, theory, and practice of computation. and design of computers and information-processing equipment, (2) providing mathematical consultation, and (3) operating a computational service, using both digital and analog machines. The Division is prepared to provide mathematical assistance at any stage of the development of a problem from its initial formulation to its final solution.

The Consultation and Research Section is available to assist Laboratory personnel by mathematical consultation, in problem formulation, and in selection of appropriate mathematical and numerical techniques, and to carry out analyses of problems. The Applied Programming Section is specifically set up to program digital computing problems for members of other Divisions. The members of this Section generally work from a problem description provided either by the problem originator or jointly by the problem originator and a member of the Consultation and Research Section. In addition, this Section also performs hand computations that arise and provides production services for machine programs.

It is the responsibility of the Programming Development Section to conduct research and development in new programming techniques, to develop needed subroutines, and to provide training courses and instruction in programming techniques for the benefit of members of the Division, as well as of other Laboratory personnel. The Digital Operations Group prepares machine-input data, schedules machine time, and operates the digital machines. The Analog Group is prepared to assist in the formulation, programming, and running of problems for the analog computer or to accept the problem and carry out these services entirely within the Group.

The function of the Computer Engineering Section is the design and development of computers and information processing devices which have specific application in the nuclear sciences.

# APPLIED MATHEMATICS DIVISION

## ORGANIZATION OF PERSONNEL
July 1, 1962 through June 30, 1963

### DIVISION OFFICE

W. F. Miller, Director
J. W. Givens, Assoc. Director (E)
R. F. King, Asst. Director
D. A. Davis, Exec. Assistant

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E. J. Dreifuerst
M. H. Jedlicka
P. J. Johnson
G. M. Krause (E)
K. Perry

### MATHEMATICAL CONSULTATION AND RESEARCH SECTION

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D. L. Phillips
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K. Smith
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D. L. Woodward
L. T. Wos

### PROGRAMMING RESEARCH AND DEVELOPMENT SECTION - G. A. Robinson, Section Head

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N. A. Clark
A. F. Joseph (E)
R. F. Krupp
N. J. Purcell

M. A. Fisherkeller, Gr. Ldr.
D. M. Brooks (E)
C. Harrison
K. E. Hillstrom
A. Sandrin (E)

R. T. Daly
E. A. Thieleker (E)

Clerical:
J. M. Beumer

### APPLIED PROGRAMMING SECTION - M. K. Butler, Section Head

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C. E. Burlson (E)
D. F. Carson
J. S. Dick (T)
W. L. Hafner (E)
R. C. Hamelink (E)
W. J. Snow
F. R. Taraba
M. E. Welch (T)
J. A. Wenger (E)

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S. M. Cavanaugh (T)
S. G. Dean
G. J. Duffy
G. C. Jensen
N. W. Jesse (E)
J. J. Kaganove
J. A. Koerner
A. L. Rago
M. G. Schlapkohl
J. V. Zapatka (E)

J. M. Heestand, Gr. Ldr.
J. L. Anderson (E)
C. Chamot
F. L. Clark (E)
J. Gvildys
J. D. Miller
A. J. Strecok
N. K. Williamson (E)
M. Yoshimine (T)

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R. K. Clark (E)
J. A. Gregory
K. A. Martin (E)
P. R. Pennock (E)
C. J. Smith (E)

T. M. Barts (T)
H. Greenspan (E)
R. M. Morrill
S. Zawadzki

Clerical:
D. Boe (T)
H. M. Glen
S. Katilavas
L. E. Meyer
E. L. Plummer
J. L. Zeman (E)

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R. G. Barr (E)
J. A. Becker
K. G. Bish (E)
J. R. Bowers
J. A. Byram
W. J. Dougherty
H. L. Gray
J. R. Haasl
D. Hodges
D. H. Jacobsohn
K. M. Krafthefer
H. F. Krejci
B. Kroupa
D. A. LeBuis
F. O. Salter
C. B. Shelman
N. N. Sobol
V. V. Tantillo
R. H. Vonderohe
R. H. Wehman
G. W. Wittmus

### DIGITAL MACHINE OPERATIONS SECTION - C. G. LeVee, Section Head
W. G. Greenhow, Asst. Section Head

L. C. Douglas (E)
E. A. Fearnow
C. D. Freeman (T)
D. P. Griffin
D. G. Hatcher
R. H. Ivan
C. J. Kilty
L. T. Michel
R. L. Mueller
J. A. Nelson
L. J. Nelson
J. A. Ohde
C. M. Ramos
V. M. Richards
S. A. Raso (E)
E. N. Singletary
D. M. Surdey
A. R. Turk
T. J. Unger (E)
R. E. Van Buskirk (E)
E. S. Wiener (E)
P. L. Zaleski (E)

### ANALOG PROBLEM ANALYSIS - PROGRAMMING AND MACHINE OPERATIONS GROUP - N. F. Morehouse, Gr. Ldr.

L. T. Bryant
L. C. Just
F. J. Maletich
W. E. Scott

### TEMPORARY PROGRAM

#### SUMMER 1962

Resident Research Assoc.
R. T. Gregory
R. A. Kliphardt
C. D. LaBudde
B. E. Rhoades
J. A. Robinson

Resident Student Assoc.
L. P. Bush
L. R. Herche
A. E. Obrock
R. K. Rosich

#### LONGER TERM

Staff
J. H. McAllister
G. J. Mitsis
M. Ribaric
C. J. Witzgall

Co-op Technician
L. L. Brown
C. H. Conley
D. L. Laughlin
J. G. Potter

#### SUMMER 1963 (To June 30)

Assistant Mathematician
P. R. Kosinski
C. L. Robinson

Resident Student Assoc.
F. D. Anger
J. M. Cooper
J. Eisenfeld
R. E. Greene
L. R. Herche
Y. Ikebe
K. L. Modesitt
D. R. Nelson
W. R. Nico
R. K. Rice
R. K. Rosich

## ORGANIZATION OF PERSONNEL (Contd.)

SUMMER 1962

Student Aide
R. F. Berland
A. R. Bernstein
E. T. Cline
J. M. Cooper
L. F. Lane
R. A. Liesemer
B. T. Miller
K. H. Miller
M. C. Reed
R. T. Sakata

SUMMER 1963 (To June 30)

Student Aide
N. J. Friedman
J. P. Herner
J. M. Karon
R. A. Liesemer
B. T. Miller
K. H. Miller
M. C. Reed
R. L. Ward
D. E. Wulbert

## CONSULTANTS

P. M. Anselone, University of Wisconsin
G. Birkhoff, Harvard University
J. C. Chu
H. Cohn, University of Arizona
R. Courant, New York University
L. Fosdick, University of Illinois
M. Golomb, Purdue University
P. C. Hammer, University of Wisconsin
R. Hermann, Northwestern University
J. H. Holland, University of Michigan
R. Kliphardt, Northwestern University
B. H. McCormick, University of Illinois
N. Metropolis, University of Chicago
W. Orvedahl, Rice University
R. K. Osborn, University of Michigan
N. S. Prywes, University of Pennsylvania
J. A. Robinson, Rice University
N. R. Scott, University of Michigan
J. N. Snyder, University of Illinois
P. M. Weichsel, University of Illinois
C. H. Wilcox, University of Wisconsin
H. S. Wilf, University of Pennsylvania

(E) Entered during period.
(T) Terminated during period.

# COMPUTER PROGRAMS

The listing which follows contains a summary of each computer program initiated during the report period together with code symbols indicating the extent to which information concerning the program is readily available. In addition, programs previously reported are included if during this reporting period changes were made or additional information concerning them was placed in the program library.

Each summary contains, in order, a job number, program identification number and title, the requestor's name and division affiliation, the consultant's and programmer's names (if different), a brief description of the program and a final line encoded to indicate the machine for which the program was prepared, references applicable to the program, the status of library information concerning the program, and its mathematical classification. This final line uses the abbreviations 704, 401, 620, 790, 794, 160, 360, ASI, CHL, GEO, and ANA to refer to the computer (IBM 704, 1401, 1620, 7090, 7094; CDC 160A, 3600; ASI 210, CHLOE, GEORGE, or PACE Analog, respectively) for which the program was developed. The file codes: D, M, A, P, S, B, G, and O, are used to indicate the library information available and may be interpreted as follows:

D - source deck,
M - OOPS monitor-compatible,
A - mathematical analysis effort,
P - programming effort,
S - symbolic or source program listing,
B - binary or source deck or tape,
G - GEORGE or other paper tape, and
O - operating instructions.

Following the "on file" symbols the AMD program library classification code, if any, appears. The classification codes used currently are:

C. Polynomials and Special Functions

1. Evaluation of Polynomials
2. Roots of Polynomials
3. Evaluation of Special Functions
4. Simultaneous Nonlinear Algebraic Equations
5. Simultaneous Transcendental Equations

D. Operations on Functions and Solutions of Differential Equations

1. Numerical Integration
2. Numerical Solutions of Ordinary Differential Equations
3. Numerical Solutions of Partial Differential Equations
4. Numerical Differentiation

E. Interpolation and Approximations

1. Table Look-up and Interpolation
2. Curve Fitting
3. Smoothing

F. Operations on Matrices, Vectors, and Simultaneous Linear Equations

1. Matrix Operations
2. Eigenvalues and Eigenvectors
3. Determinants
4. Simultaneous Linear Equations

G. Statistical Analysis and Probability

1. Data Reduction: is interpreted as the calculation of the more common statistical parameters such as mean, median, and standard deviation.
2. Correlation and Regression Analysis: includes curve fitting which is explicitly for statistical purposes.
3. Sequential Analysis
4. Analysis of Variance
5. Random Number Generators
6. Monte Carlo Problems

H. Operations Research and Linear Programming

M. Information Processing

1. Sorting
2. Report Preparation
3. Checking of Experimental Recording

R. Geometry

1. Pattern Recognition

S. Machine Design

T. Automata Studies

U. Number Theory

Z. All Others: contains all programs for which no primary class has been selected. Programs which seem to be included in a primary class but which are not adequately described by a subclass are assigned the subclass designation of zero within the applicable primary classification.

727 MET124 CRYSTAL LATTICE PARAMETER DETERMINATION

REQUESTOR M. MUELLER METALLURGY

PROGRAMMER J. MILLER

THIS PROGRAM CALCULATES THE LATTICE PARAMETERS AND STANDARD ERRORS FOR AN ORTHOGONAL CRYSTAL SYSTEM AND ANY OTHER CRYSTAL SYSTEM OF HIGHER SYMMETRY, WITH PROVISION FOR UP TO THREE CORRECTION TERMS.

704F REFERENCES ANL6176 ON FILE DM PSB 0 E2

1012 CHM131 RELATIVE CROSS SECTIONS OF ISOMERS PRODUCED IN NUCLEAR REACTIONS

REQUESTOR J. HUIZENGA CHEMISTRY

PROGRAMMER W. HAFNER

COMPUTE RELATIVE CROSS SECTIONS OF ISOMERS PRODUCED IN NUCLEAR REACTIONS.

THE COMPUTATION IS IN THREE PARTS -

PART I. COMPUTATION OF THE PARTIAL COMPOUND NUCLEUS CROSS SECTION AND THE NORMALIZED INITIAL COMPOUND NUCLEUS SPIN DISTRIBUTION.

PART II. COMPUTATION OF THE NORMALIZED SPIN DISTRIBUTION FOLLOWING PARTICLE EMISSION.

PART III. COMPUTATION OF THE NORMALIZED SPIN DISTRIBUTION FOLLOWING GAMMA RAY EMISSION.

7 4F REFERENCES ON FILE DM PSB 0 C4

1013 AMD132 WEIGHTED LEAST SQUARES FIT OF THE PARAMETERS OF A SPIN HAMILTONIAN TO MAGNETIC RESONANCE DATA

REQUESTOR W. MILLER APPLIED MATHEMATICS

PROGRAMMER D. HALFORD

EXPERIMENTALLY DETERMINED TRANSITION FREQUENCIES AMONG LEVELS IN THE MANIFOLD DESCRIBED BY S=1/2 AND I=7/2 ARE USED TO PERFORM A WEIGHTED LEAST SQUARES FIT OF THE PARAMETERS OF A SPIN HAMILTONIAN. PARAMAGNETIC RESONANCE AND ELECTRON NUCLEAR DOUBLE RESONANCE (ENDOR) DATA ARE TREATED IN THE CASES OF TRIVALENT ND143 AND ND145 IN CRYSTALLINE LANTHANUM TRICHLORIDE, WITH EITHER PARALLEL OR PERPENDICULAR MAGNETIC FIELD ORIENTATIONS RELATIVE TO THE PRINCIPAL CRYSTAL AXIS.

GEO REFERENCES ON FILE F2,G1

1129 PHY222

REQUESTOR T. CARPENTER PHYSICS

CONSULTANT L. WOS PROGRAMMER W. SNOW

IT IS DESIRED TO DETERMINE A LEAST SQUARES FIT OF A NUMBER OF GAMMA RAY SPECTRA TO A SUM OF REFERENCE SPECTRA WHOSE INTENSITIES AND LINE POSITIONS ARE REQUIRED. LINEAR CONSTRAINTS ARE TO BE IMPOSED ON THE LINE POSITIONS.

AN INCORPORATED FEATURE WILL ALLOW FOR A CHANGE IN FORM OF THE REFERENCE SPECTRA AS A FUNCTION OF POSITION.

VARIOUS FUNCTIONS WILL BE PLOTTED VIA THE CATHODE-RAY TUBE PLOTTER.

7094F REFERENCES ANZ013 ON FILE D APSB 0 E2
GEO REFERENCES ON FILE E2

1204 CHM141,M

REQUESTOR A. ZIELEN CHEMISTRY

CONSULTANT J. BUTLER PROGRAMMER S. JANOUSEK

LEAST SQUARES FITTING OF DATA TO A DESIGNATED ONE OF FOURTEEN ALGEBRAIC CURVES.

7094F REFERENCES ANE208 ON FILE D PSB 0 E2

1347 CHM16C ENERGIES OF THE ROTATIONAL STATES IN EVENT NUCLEI

REQUESTOR P. DAY CHEMISTRY

PROGRAMMER W. HAFNER

THE MODEL SET FORTH BY A. S. DAVYDOV (NUCLEAR PHYSICS 24 (1961) 682) HAS BEEN USED TO CALCULATE THE ENERGIES OF THE ROTATIONAL STATES IN EVEN NUCLEI. THESE CALCULATIONS WERE PERFORMED ON THE 7094 AND CONSIST OF A TABLE OF ABOUT 71,000 ENERGIES AS A FUNCTION OF SIX PARAMETERS STORED ON MAGNETIC TAPE. A PRELIMINARY COMPARISON OF THESE CALCULATIONS WITH SOME EXPERIMENTAL DATA INDICATE THAT THE MODEL MAY HAVE CONSIDERABLE VALIDITY. IT IS PROPOSED AT THIS TIME TO ATTEMPT TO FIND CONSISTENT SETS OF PARAMETERS WHICH WILL FIT AS MUCH OF THE EXISTING EXPERIMENTAL DATA AS POSSIBLE. DUE TO THE MATHEMATICAL FORMULATION OF THE DAVYDOV MODEL, IT IS NOT POSSIBLE TO FIND A SET OF PARAMETERS FOR A SET OF ENERGY LEVELS. THEREFORE IT WAS NECESSARY TO CALCULATE A SUFFICIENTLY FINE NET OF VALUES AND THEN USE MULTI-DIMENSIONAL INTERPOLATION METHODS TO FIND THE PARAMETERS FOR A GIVEN SET OF EXPERIMENTAL DATA.

7094F REFERENCES CN FILE E1

150[illegible] PHY255 DATA REDUCTION FOR THE ARGONNE BENT-CRYSTAL SPECTROMETER

REQUESTOR R. SMITHER PHYSICS

CONSULTANT J. BUTLER PROGRAMMER R. MORRILL

OVERLAPPING PEAKS OF RAW GAMMA RAY COUNTS ARE FITTED TO STANDARD CURVES IN THE LEAST-SQUARES SENSE. THIS PROGRAM REPRESENTS A FURTHER ATTEMPT TO PROGRAM 709/PHY159 WHICH TURNED OUT UNSUCCESSFULLY.

7[illegible]4F REFERENCES ON FILE DM APSB E2

1501 PHY256 EIGENVALUES AND EIGENVECTORS OF REAL MATRICES

REQUESTOR M. SOGA PHYSICS

PROGRAMMER B. GARBOW

EIGENVALUES AND EIGENVECTORS OF CERTAIN REAL, NON-SYMMETRIC MATRICES ARE TO BE COMPUTED. THE ORDERS OF ALL CURRENT CASES ARE LESS THAN OR EQUAL TO 5.

A THREE-STEP OPERATION IS ANTICIPATED -

1) DETERMINE THE COEFFICIENTS OF THE CHARACTERISTIC POLYNOMIAL.
2) SOLVE THE POLYNOMIAL EQUATION.
3) DETERMINE AN EIGENVECTOR CORRESPONDING TO EACH REAL EIGENVALUE.

7 4F REFERENCES ANC203 ON FILE D PSB O C2,F1,2
GEO REFERENCES P-3-245 ON FILE PS GO C2,F1,2

1502 AMD161 BI-COMPLEX MAPPINGS

REQUESTOR H. COHN APPLIED MATHEMATICS

PROGRAMMER C. HARRISON

FIND TWO COMPLEX FUNCTIONS OF TWO COMPLEX VARIABLES. THE FUNCTIONS INVOLVE 1[illegible]0 EXPONENTIAL TERMS STORED IN MEMORY.

GEO REFERENCES ON FILE C[illegible]

1503 PHY257

REQUESTOR J. WEINMAN PHYSICS

PROGRAMMER D. CARSON

THE INTEGRAL OF B/8PI*(2XSIN(A)+COS(A))**2/((X**2+.25)*((X+Z)**2+B**2/4.)) FROM Z=-INFINITY TO Z=+INFINITY IS TO BE EVALUATED FOR VARIOUS VALUES OF B,A, AND Z.

7094F REFERENCES ON FILE D PSB 0 D1, E2

1504 PHY258 TRAJECTORY CALCULATION FOR MASS SPECTROMETER

REQUESTOR L. GOODMAN PHYSICS

CONSULTANT J. COOK PROGRAMMER R. HAMELINK

THIS PROGRAM DETERMINES THE BOUNDARY OF THE REGION OF STABILITY FOR A PARTICLE WHOSE MOTION IS GOVERNED BY A PAIR OF SIMULTANEOUS DIFFERENTIAL EQUATIONS WHICH ARE SIMILAR TO THE MATHIEU EQUATIONS, EXCEPT THAT FIRST ORDER TERMS OCCUR.

7094F REFERENCES ON FILE D2

1506 PAD HORN OF PLENTY HEAT TRANSFER CALCULATION

REQUESTOR H. VOGEL PARTICLE ACCELERATOR

PROGRAMMER L. JUST

SOLVE HEAT TRANSFER EQUATIONS FOR OHMIC HEATING LOSS IN THE INNER CYLINDER OF THE HORN.

ANA REFERENCES ON FILE

1507 SSS QUENCHING KINETICS

REQUESTOR J. JACKSON SOLID STATE SCIENCE

CONSULTANT N. MOREHOUSE PROGRAMMERS L. JUST, J. MCALLISTER

CALCULATE CHANGE IN INITIAL THERMAL DEFECT CONCENTRATION DUE TO FINITE COOLING RATES IN METALS.

ANA REFERENCES 1474/SSS131 ON FILE

1508 SSS132 DATA ANALYSIS FOR MOSSBAUER EXPERIMENT

REQUESTOR J. MULLEN SOLID STATE SCIENCE

PROGRAMMER J. ANDERSON

ANALYSIS AND PLOTTING OF DATA FOR MOSSBAUER EXPERIMENT.

704F REFERENCES ON FILE DM PSB 0 Z0

1509 HEP116 MONTE CARLO CONCERNING DALITZ PAIR IN SIGMA-LAMBDA PARITY EXPERIMENT

REQUESTOR L. HYMAN HIGH ENERGY PHYSICS

CONSULTANT J. BUTLER PROGRAMMER M. BUTLER

MONTE CARLO CALCULATION AND LIKELIHOOD FUNCTION EVALUATION STUDY FOR DALITZ PAIRS IN THE SIGMA-LAMBDA PARITY EXPERIMENT.

704F REFERENCES ON FILE G6

1510 HEP117 PRODUCTION IN PI-NUCLEON COLLISIONS

REQUESTOR T. FIELDS HIGH ENERGY PHYSICS

PROGRAMMER D. CARSON

DATA RECORDED ON PAPER TAPE AT THE HERMES MEASURING TABLE ARE TO BE CONVERTED IN A PRESCRIBED FORMAT TO PUNCHED CARDS. THE DATA CONSIST OF DIGITIZED TRACK INFORMATION FROM PHOTOGRAPHS MADE AT THE ALVAREZ 72-INCH BUBBLE CHAMBER AT BERKELEY. THE CARDS WILL BE INPUT TO A PROGRAM PRELIMINARY TO THE BERKELEY PACKAGE OF PANG, KICK, ETC., AND RUN ON THE IBM 709 AT NORTHWESTERN UNIVERSITY.

GEO REFERENCES ON FILE P GO M0
401 REFERENCES ON FILE P B M0

1513 CEN108 METAL-WATER REACTION STUDY

REQUESTOR L. BAKER CHEMICAL ENGINEERING

PROGRAMMER J. GVILDYS

THIS PROGRAM ATTEMPTS TO DESCRIBE THE REACTION KINETICS OF A FISSIONABLE METALLIC PARTICLE OF SPHERICAL GEOMETRY, EXPOSED TO A TIME-VARYING NEUTRON FLUX—THAT IS, CHEMICALLY REACTING WITH WATER WHILE UNDERGOING TRANSIENT NUCLEAR HEATING.

704F REFERENCES ON FILE DM APSB 0 D2

1514 PHY259 EQUIPOTENTIAL CONTOURS

REQUESTOR R. SMITHER PHYSICS

PROGRAMMER R. ROSICH

CALCULATION AND PLOTTING OF EQUIPOTENTIAL CONTOURS ON A GIVEN N X M ARRAY. THE EQUIPOTENTIALS ARE TO BE DETERMINED BY LINEAR INTERPOLATION. THE OUTPUT FROM THE 704 (1401) WILL BE A SET OF CARDS TO BE INPUT TO THE POINT PLOTTER, WHICH CAN HANDLE SEVERAL PLOTS AT A TIME.

THE EXPECTED RANGE OF CONTOURS IS 50-1500 UNITS AT INTERVALS OF 50.

704F REFERENCES ON FILE D PSB 0 Z0
401F REFERENCES ON FILE D PSB 0 Z0

1515 AMD162 LIST PROCESSING ON THE LISP COMPILER

REQUESTORS R. BUCHAL, APPLIED MATHEMATICS
J. REYNOLDS, AND
C. WITZGALL

PROGRAMMERS J. REYNOLDS, C. WITZGALL, R. GREENE

EXPERIMENTS USING THE LISP COMPILER IN THE REDUCTION OF ALGEBRAIC EXPRESSIONS TO A NORMAL FORM.

704 REFERENCES ON FILE Z0

1518 CHM156 TABLES OF AX + BX(2)

REQUESTOR J. STOESSEL CHEMISTRY

PROGRAMMER A. STRECOK

GIVEN INPUT VALUES A AND B, THIS PROGRAM GENERATES A TABLE OF (A+B*X)*X FOR INTEGERS X FROM 0 TO 500.

704F REFERENCES ON FILE D PSB 0 C1

1520 RE277 COMPLEX CURVE FITTING

REQUESTOR W. LIPINSKY REACTOR ENGINEERING

PROGRAMMERS J. KOERNER, C. SANATHANAN

THE EXPERIMENTALLY DETERMINED VALUES OF THE MAGNITUDE AND PHASE OF A TRANSFER FUNCTION ARE USED TO DESCRIBE THE TRANSFER FUNCTION AS A RATIO OF TWO COMPLEX POLYNOMIALS OF FREQUENCY, HAVING THE MINIMUM MEAN SQUARE ERROR IN MAGNITUDE AS CRITERION.
THE PROGRAM USES MATRIX INVERSION FOR ORDER UP TO 25 X 25.

704F REFERENCES ON FILE P B O E2

1521 CEN109 LEAST SQUARES ANALYSIS OF GAMMA SPECTRA

REQUESTOR W. SEEFELDT CHEMICAL ENGINEERING

PROGRAMMER R. SAKATA

DETERMINE BY THE LEAST SQUARES METHOD THE PROPORTIONS OF EACH OF EIGHT GIVEN REFERENCE SPECTRA THAT MAKE UP A GIVEN UNKNOWN SPECTRUM.

704F REFERENCES 1467/CEN107 ON FILE D APSB O E2

1524 PHY260 Q VERSUS D PROGRAM (MIT)

REQUESTOR J. SCHIFFER PHYSICS

PROGRAMMER M. BUTLER

THE ORIGINAL MIT PROGRAM IS MODIFIED FOR THE 704. THIS PROGRAM LISTS THE Q-VALUES OF A NUCLEAR CHARGED PARTICLE REACTION FOR DISTANCES ALONG THE FOCAL PLANE OF A MAGNETIC SPECTROGRAPH.

704 REFERENCES ON FILE APSB O Z0

1525 MET145 LEAST SQUARES POLYNOMIAL FIT

REQUESTOR L. LLOYD METALLURGY

PROGRAMMER J. HEESTAND

TO LEAST SQUARES FIT A SET OF DATA TO POLYNOMIALS OF DEGREE M-1, WHERE M CAN RANGE FROM 2 TO 8.

704F REFERENCES ON FILE D PSB O E2

1526 TIN101 KWIC PROGRAM FOR ANL PUBLICATION LISTING

REQUESTOR M. FIELDHOUSE TECHNICAL INFORMATION

PROGRAMMER L. LANE

THIS PROGRAM PREPARES BOTH A BIBLIOGRAPHY AND A KWIC LISTING OF ANL PUBLICATIONS. PRELIMINARY TO THE FINAL LISTING A DIVISION LISTING BREAKDOWN IS RUN TO PERMIT FINAL CHECKING BY TIN PRIOR TO PUBLICATION.

704 REFERENCES ON FILE APSB 0 Z0

1531 PHY261 NDA PAPER TAPE TO CARD PROGRAM

REQUESTOR B. ZEIDMAN PHYSICS

PROGRAMMER R. ROSICH

DATA RECORDED ON PAPER TAPE BY THE NUCLEAR DATA ANALYZER WILL BE CONVERTED IN A PRESCRIBED FORMAT TO PUNCHED CARDS FOR FURTHER PROCESSING ON THE PHYSICS 1620 AND ASSOCIATED PLOTTER.

A BOARD HAS BEEN WIRED TO READ THIS TAPE ON THE 1903 AND THE GENERAL PURPOSE ROUTINE FOR 1401 PAPER TAPE USE CAN PERFORM THE OPERATIONS DESIRED WITH THE FOLLOWING EXCEPTION -

THE RUN NUMBER WHICH PRECEDES THE 256 OR 512 CHANNEL READINGS MUST BE INSERTED IN COLS. 73-80 OF EACH OF THE 26 OR 52 CHANNEL READING CARDS.

ANTICIPATED USE - 100RUNS/MONTH.

401F REFERENCES ON FILE D PSB 0 Z0

1535 HEP118 COSMIC RAY ELECTRON DETECTOR EFFICIENCY

REQUESTOR S. WARSHAW HIGH ENERGY PHYSICS

CONSULTANT J. BUTLER PROGRAMMER R. CLARK

AN EXPERIMENT IS PLANNED TO MEASURE THE ENERGY SPECTRUM OF THE ELECTRON COMPONENT OF COSMIC RADIATION. THE ELECTRONS WILL BE DETECTED IN THREE COUNTER-TRIGGERED SPARK CHAMBERS PLACED IN THE RADIAL PLANE OF A SMALL SUPERCONDUCTING MAGNET. THIS PROGRAM IS TO CALCULATE THE EFFICIENCY OF THE DETECTION SYSTEM AND TO STUDY THE EFFECT OF CHANGES IN ITS CONFIGURATION ON THE EFFICIENCY. IN ADDITION, PARTICLE TRAJECTORIES AND GRAPHS OF ACCEPTABLE REGIONS IN ENTRANCE PARAMETER SPACE ARE FURNISHED.

704F REFERENCES ON FILE G6

1536 RPY136 CALCULATION OF SWINBANK PARAMETERS USING THE METHOD OF LEAST SQUARES

REQUESTOR H. MOSES RADIOLOGICAL PHYSICS

PROGRAMMER R. ROSICH

CALCULATIONS FOR - 1) THE SWINBANK WIND PROFILE
2) THE LOG PLUS LINEAR WIND PROFILE

704F REFERENCES ANZ013 ON FILE D PSB 0 E2

1537 PHY262

REQUESTOR G. PERLOW PHYSICS

PROGRAMMER M. WELCH

A MODIFICATION OF THE EQUATIONS FIT IN 1120/PHY220.

704F REFERENCES 1120/PHY220 ON FILE PSB 0 E2

1538 HEP119

REQUESTOR L. HYMAN HIGH ENERGY PHYSICS

PROGRAMMERS R. ROYSTON, C. SMITH

THIS PROBLEM IS A MONTE CARLO PROGRAM FOR SIMULATING EVENTS IN THE HEP SIGMA-LAMBDA PARITY EXPERIMENT AT THE BROOKHAVEN COSMOTRON, INVOLVING THE PRODUCTION AND DETECTION OF DALITZ PAIRS PRODUCED IN THE DECAY OF THE SIGMA HYPERON. EFFECTS OF FERMI MOMENTUM OFF THE TARGET NUCLEON ARE INCLUDED.

704F REFERENCES ON FILE G6

1540 RE278 GRID PLATE DEFLECTION

REQUESTOR A. MARCHERTAS REACTOR ENGINEERING

PROGRAMMER G. JENSEN

DETERMINATION OF THE DEFLECTION IN THE GRID PLATES OF A REACTOR ASSEMBLY AS A FUNCTION OF THE LOAD AND THE STRUCTURE.

704F REFERENCES ON FILE M PSB F4

1541 RE279 FISSION FRAGMENT MATRIX ANALYSIS

REQUESTOR J. WHALEN REACTOR ENGINEERING

PROGRAMMER S. ZAWADZKI

FORMS MATRIX FROM PAIRS OF DATA TAKEN ON PUNCHED TAPE. CONVERTS PAIRS TO CORRESPONDING FISSION FRAGMENT ENERGIES. SUMS MATRIX OVER A(I) AND B(I) AND TAKES APPROPRIATE SLICES OF SPECTRUMS.

704F REFERENCES ON FILE ZJ
GEO REFERENCES ON FILE ZJ

1542 PHY263 GAMMA RAY SPECTRAL ANALYSIS

REQUESTOR R. SMITHER PHYSICS

PROGRAMMER B. GARBOW

A MODIFICATION TO 573/PHY130 PART II THAT PRINTS OUT THE ENTIRE LIST OF SUMS AND DIFFERENCES OF LEVELS AND GAMMA RAYS, RATHER THAN ONLY THOSE THAT SUGGEST POSSIBLE NEW LEVELS.

704F REFERENCES 573/PHY13J ON FILE D PSB 0 M1

1544 RE280 DETERMINATION OF TRANSFER OF A SYSTEM WITH NOISE BY A DIGITAL TIME-DOMAIN TECHNIQUE

REQUESTOR W. LIPINSKI REACTOR ENGINEERING

PROGRAMMERS J. KOERNER, C. SANATHANAN

NOISE IN THE SYSTEM IS BELIEVED TO HAVE BEEN ELIMINATED BY SIMPLY AVERAGING THE SAMPLED OUTPUT.

THE ABOVE AVERAGED VALUES OF THE SAMPLED INPUT AND OUTPUT ARE USED TO SYNTHESIZE THE TRANSFER FUNCTION BY A DIGITAL TECHNIQUE DEVISED BY DR. L.E. WEAVER ET AL. (AIEE TRANSACTIONS - APPLICATIONS AND INDUSTRY, MAY-1961 PP. 5J - A DIGITAL TIME-DOMAIN SYNTHESES TECHNIQUE FOR FEED-BACK CONTROL SYSTEMS.)

704F REFERENCES ON FILE G2

1545 RE281

REQUESTOR B. HOGLUND REACTOR ENGINEERING

PROGRAMMER I. BAKSYS

TO DETERMINE THERMAL AND HYDRAULIC ENTRANCE EFFECTS IN A RECTANGULAR CHANNEL.

704F REFERENCES ON FILE DJ

1546 PHY264

REQUESTOR J. WEINMAN PHYSICS

PROGRAMMER J. DICK

CALCULATION AND TABULATION OF GIVEN FUNCTIONS FOR A GIVEN RANGE OF PARAMETERS.

704F REFERENCES ON FILE D PSB 0 ZO

1548 PHY VELOCITY INCREMENTS FOR MOSSBAUER CAM

REQUESTOR R. RENO PHYSICS

CONSULTANT N. MOREHOUSE PROGRAMMERS L.BRYANT, L.JUST

GIVEN THE EQUATION OF POSITION FOR A POINT TRAVELING ALONG THE SURFACE OF A CAM, AND THE EQUATION ALONG THE RADIUS VECTOR. THERE EXISTS A MINIMUM VALUE A SUCH THAT A GREATER THAN OR EQUAL TO F(X) GREATER THAN OR EQUAL TO -A. F(X)=A AT SOME NEGATIVE ANGLE Y.
DIVIDE THE ANGULAR SEGMENT BETWEEN X=Y AND X=90 DEGREES INTO 50 INCREMENTS SUCH THAT F(X) CHANGES BY A/50 IN EACH ANGULAR INCREMENT.

ANA REFERENCES ON FILE

1549 HEP120 TYPICAL PHOTOMULTIPLIER RESPONSE (HEP)

REQUESTOR L. HYMAN HIGH ENERGY PHYSICS

PROGRAMMER R. ROYSTON

THIS IS A MONTE CARLO PROGRAM FOR GENERATING TYPICAL RESPONSE VS. TIME CURVES FOR A PHOTOMULTIPLIER TUBE, KEEPING TRACK OF RESPONSE PEAKS FOR EACH TRIAL. DIFFERENT RUNS WILL BE MADE WITH DIFFERENT NUMBERS OF PHOTOELECTRONS PER EVENT.

704F REFERENCES ON FILE G6

1552 MET146 ATOMIC CENTER LOCATION

REQUESTOR M. MUELLER METALLURGY

PROGRAMMER F. CLARK

LEAST SQUARES FIT TO A 10 PARAMETER GAUSSIAN FUNCTION
RHO=EXP(P-R/2X**2-S/2Y**2-T/2Z**2+UX+VY+WZ+LY+MXZ+NXY)
DATA USED ARE 27 CALCULATED POINTS OF A 3X3X3 RECTANGULAR PARALLELEPIPED AS CLOSE AS POSSIBLE TO THE PEAK MAXIMUM.

704F REFERENCES ANF402 ON FILE DM PSB E2

1556 TIN102 JOURNAL LISTING

REQUESTOR J. ANDREWS TECHNICAL INFORMATION

PROGRAMMER M. BUTLER

TWO LISTINGS ARE PREPARED FROM A LIBRARY OFFICE CARD DECK.
THE FIRST IS A LINE FOR LINE LISTING OF THE CARDS.
THE SECOND IS A LISTING BY READING ROOM OF THE TITLES OF JOURNALS, CURRENT AND NON-CURRENT, HELD BY THAT LOCATION.

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| 704 | REFERENCES | ON FILE | SB 0 | M2 |
| 401 | REFERENCES | ON FILE | SB 0 | M2 |

1557 RE283 THERMOS, A THERMALIZATION TRANSPORT THEORY CODE FOR REACTOR LATTICE CALCULATIONS (BNL)

REQUESTOR E. PENNINGTON REACTOR ENGINEERING

PROGRAMMER I. BAKSYS

COMPUTES THE SCALAR THERMAL NEUTRON SPECTRUM AS A FUNCTION OF POSITION IN A LATTICE BY SOLVING NUMERICALLY THE INTEGRAL TRANSPORT EQUATION WITH ISOTROPIC SCATTERING. ONE DIMENSIONAL SLAB OR CYLINDRICAL GEOMETRY CAN BE USED. ALLOWS A MAXIMUM OF 30 VELOCITY GROUPS, 20 SPACE POINTS AND 5 MIXTURES COMPOSED OF 10 ISOTOPES. AN ADDITIONAL 10 ISOTOPES CAN BE USED FOR EDITING PURPOSES.

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| 704F | REFERENCES | ON FILE | D0,D1 |

1558 RE284 EBR II ANALYSIS

EQUESTOR J. KAELLIS REACTOR ENGINEERING

PROGRAMMER J. KAGANOVE

REVISION OF 1341/RE268 TO PERMIT INPUT OF THE CONSTANTS IN THE (UA) EQUATIONS AND TO INCLUDE AN ITERATIVE SCHEME FOR COMPUTING K(S) WHICH TAKES INTO CONSIDERATION EACH OF THE SUB-SECTIONS IN THE HEAT EXCHANGER.
SELECTED OUTPUT IS ALSO TO BE GRAPHED ON THE DATAPLOTTER.

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| 704F | REFERENCES 1341/RE268 | ON FILE | Z0 |

1561 PAD MESON AREA BEAM DESIGN

REQUESTORS C. LAVERICK, L. RADNER, AND S. MARKIEWICZ — PARTICLE ACCELERATOR

PROGRAMMER L. BRYANT

CALCULATE THE BEAM TRANSPORT SYSTEM COMPOSED OF QUADRUPOLES AND BENDING MAGNETS.

ANA REFERENCES — ON FILE

1562 PHY265 I1 AND I2 INTEGRALS

REQUESTOR B. NIGAM — PHYSICS

CONSULTANT W. CODY — PROGRAMMER J. DICK

CALCULATE AND TABULATE VALUES OF THE GIVEN INTEGRALS.

704F REFERENCES — ON FILE D PSB 0 D1

1564 LD0101 BUDGET DATA PROCESSING

REQUESTOR C. QUINLAN — LABORATORY DIRECTORS OFFICE

PROGRAMMER J. MILLER

TO CREATE A BUDGET DATA PROCESSING SYSTEM DESIGNED TO
A. PREPARE AND REVISE VARIOUS BUDGET REPORTS
B. PERFORM COMPARISON AND FORECASTING CALCULATIONS
C. HANDLE THE ADDITION OF OTHER BUDGET CALCULATIONS THAT MAY BE REQUIRED IN THE FUTURE.

704F REFERENCES — ON FILE M2

1567 RE

REQUESTOR C. COHN — REACTOR ENGINEERING

CONSULTANT N. MOREHOUSE — PROGRAMMER L. BRYANT

ERROR ANALYSIS OF NARROW BAND NOISE MEASUREMENTS WITH LINEAR AND SQUARE LAW DETECTORS.

ANA REFERENCES — ON FILE

1568 BIM109 CUMULANT FUNCTION DETERMINATION FOR SPECIFIED FORCE FUNCTIONS

REQUESTOR G. SACHER BIOLOGICAL AND MEDICAL RESEARCH

CONSULTANT J. BUTLER PROGRAMMER F. CLARK

THE CUMULANT FUNCTION, C(T,H)=INTEGRAL, OVER T, OF S(T-R)A(R)DR IS TO BE TABULATED FOR A VARIETY OF FORCE FUNCTIONS A(R). S(U) IS OBTAINED FROM THE STEP FUNCTION RESPONSE C(U) BY DIFFERENTIATION WITH RESPECT TO TIME.

704F REFERENCES ON FILE D1

1569 RE285 BARNS (HAPO)

REQUESTOR M. GROTENHUIS REACTOR ENGINEERING

PROGRAMMER G. DUFFY

PROGRAM BARNS COMPUTES GROUP-AVERAGED OR POINT CROSS SECTIONS FOR AN ARBITRARY ARRAY OF ENERGIES. UNIT WEIGHTING OR 1/E WEIGHTING MAY BE EMPLOYED. THE LIBRARY USED IS THE RBU PROGRAM LIBRARY.

704F REFERENCES GE-HW-72117 ON FILE Z3

1571 AMD164 THE ELASTIC SCATTERING OF POSITRONS BY HELIUM ATOMS

REQUESTOR K. SMITH APPLIED MATHEMATICS

CONSULTANTS K. SMITH, W. CODY PROGRAMMER D. CARSON

THE PURPOSE OF THIS CODE IS TO SOLVE A PAIR OF COUPLED INTEGRO-DIFFERENTIAL EQUATIONS AT INCIDENT POSITION ENERGIES TOO LOW FOR EITHER REAL POSITRONIUM FORMATION OR REAL EXCITATION OF THE HELIUM ATOM. HOWEVER, IN ORDER TO INVESTIGATE THE POLARIZABILITY OF THE ATOM, VIRTUAL POSITRONIUM FORMATION IS TAKEN INTO ACCOUNT TOGETHER WITH THE INDUCED DIPOLE POLARIZATION POTENTIAL.

THE KERNELS OF THE PROBLEM ARE DEFINED AS INTEGRALS OF LEGENDRE POLYNOMIALS TIMES LAGUERRE POLYNOMIALS DIVIDED BY ALGEBRAIC FUNCTIONS WHICH CAN BE SINGULAR IN THE DOMAIN OF INTEGRATION.

704F REFERENCES ON FILE D3

1572 PHY266 RAW DATA PLOTTING FROM MULTICHANNEL ANALYZER

REQUESTOR J. SCHIFFER PHYSICS

PROGRAMMER F. TARABA

THIS PROGRAM PLOTS THE RAW DATA COUNTS VS. CHANNEL NUMBER FOR A MULTICHANNEL ANALYZER. OPTIONS FOR EITHER A LINEAR OR LOGARITHMIC SCALE AND POSSIBLE SCALE FACTOR SPECIFICATION ARE INCLUDED.

704F REFERENCES ON FILE DM PSB Z2

1573 CHM157

REQUESTOR A. ZIELEN CHEMISTRY

PROGRAMMER J. GVILDYS

LEAST SQUARES FIT FOR ELECTROMOTIVE FORCE OF AG-AG CL.

704F REFERENCES ON FILE D APSB 0 E2

1576 RE288 NUMERICAL CHECK OF SOLUTION TO ELASTICITY PROBLEM

REQUESTOR C. YOUNGDAHL REACTOR ENGINEERING

PROGRAMMER M. CAVANAUGH

A NUMERICAL CHECK OF SOLUTION TO ELASTICITY PROBLEM. THIS PROGRAM IS A REVISION OF A BROWN UNIVERSITY FORTRAN CODE TO HANDLE A POORLY CONVERGENT INTEGRAL.

704F REFERENCES ON FILE D1

1577 IINSE ANALOG COMPUTER EXPERIMENTS FOR AMD

REQUESTOR J. BAIRD INTERNATIONAL INSTITUTE

PROGRAMMERS L. BRYANT, L. JUST

DO EXPERIMENTS OF THE FOLLOWING TYPES -
(1) HEAT TRANSFER
(2) FLUX CALCULATION
(3) IODINE-XENON SPATIAL OSCILLATION.

ANA REFERENCES ON FILE

1578 RE SOLUTION OF CYLINDRICAL SPACE RADIATOR PROBLEM

REQUESTOR D. MACFARLANE REACTOR ENGINEERING

PROGRAMMER L. JUST

CALCULATE FIN EFFICIENCY FOR A CYLINDRICAL FIN OPERATING IN A SPACE ENVIRONMENT.

ANA REFERENCES ON FILE

1581 PHY267 ACOUSTIC REFLECTION FROM A WASHBOARD

REQUESTOR J. URETSKY PHYSICS

CONSULTANT D. PHILLIPS PROGRAMMER R. MORRILL

TO ADAPT A PREDOMINANTLY FORTRAN PROGRAM RUN ON THE CDC1604 FOR THE 704.
THIS PROGRAM IS A MODIFICATION OF 1360/PHY242 - DIFFRACTION GRATING, AND OBSOLETES IT.

704F REFERENCES 1360/PHY242 ON FILE D APSB 0 Z0

1582 CEN110 MEASUREMENT OF MASS TRANSFER RATES IN FLUIDIZED BEDS

REQUESTOR J. HOLMES CHEMICAL ENGINEERING

PROGRAMMER A. STRECOK

THIS PROGRAM DETERMINES UNKNOWN PARAMETERS IN THE EQUATION FOR MEASURING MASS TRANSFER RATES IN FLUIDIZED BEDS.

704F REFERENCES ANZ013 ON FILE D APSB 0 E2,Z0

1585 PAD139 MAGNET TESTING PROGRAMS

REQUESTOR T. KHOE PARTICLE ACCELERATOR

CONSULTANT W. COWELL PROGRAMMERS J. GVILDYS, J. DICK

A NUMBER OF PROGRAMS TO BE USED IN CONNECTION WITH THE PAD MAGNET TESTING PROJECT WILL BE PREPARED AND/OR USED UNDER THIS JOB. THESE PROGRAMS INCLUDE -

1) DRIFT CALIBRATION PROGRAM,
2) REFERENCE BLOCK CALIBRATION,
3) UNSCRAMBLE,
4) PLOTTING PROGRAM,
5) COMPARE PROGRAM,
6) DATA PROCESSING,
7) ANALYSIS PROGRAM,
8) MAGNET BLOCK SHUFFLING, AND
9) ORBIT CALCULATION.

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| 704F | REFERENCES | ON FILE D | PSB 0 Z0 |
| GEO | REFERENCES | ON FILE | PS GO Z0 |

1588 HEP122 TWO-BODY KINEMATICS TABLE (HEP)

REQUESTOR R. HILDEBRAND HIGH ENERGY PHYSICS

PROGRAMMER R. CLARK

THIS PROGRAM CALCULATES A TABLE OF KINEMATICALLY POSSIBLE OUTCOMES TO A TWO-PARTICLE INTERACTION FOR GIVEN INPUT VALUES OF MASS, ENERGY AND DIRECTION.

THE PROGRAM IS A MODIFICATION FOR THE 704 OF AN EXISTING 7090 FORTRAN PROGRAM.

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| 704F | REFERENCES | ON FILE D | APSB 0 Z0 |

1592 AMD PARTITIONED RATIONAL TCHEBYCHEFF APPROXIMATIONS

REQUESTOR W. CODY APPLIED MATHEMATICS

TO PROVIDE AND USE A CODE FOR CALCULATING PARTITIONED RATIONAL TCHEBYCHEFF APPROXIMATIONS TO FUNCTIONS OF A SINGLE REAL VARIABLE OVER A FINITE INTERVAL.

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| 704F | REFERENCES | ON FILE | E0 |
| 790 | REFERENCES | ON FILE | E0 |

1594 SSS133 EVALUATION OF ZEROS OF SOLUTIONS TO A LINEAR SECOND ORDER DIFFERENTIAL EQUATION

REQUESTOR O. SIMPSON SOLID STATE SCIENCE

PROGRAMMER A. STRECOK

STARTING WITH KNOWN VALUES OF THE DEPENDENT VARIABLE PHI(Y) AND ITS DERIVATIVE AT Y=0, BOTH THE SYMMETRIC AND ANTISYMMETRIC SOLUTIONS TO A GIVEN LINEAR SECOND ORDER DIFFERENTIAL EQUATION ARE OBTAINED BY USING TAYLOR EXPANSION TO EVALUATE PHI(Y+H). THE ROOTS OF PHI(Y) AND ITS FIRST DERIVATIVE ARE ROUGHLY ISOLATED BY WATCHING FOR A DISAGREEMENT IN SIGN AT THE COORDINATE Y AND Y+H. IF A DISCREPANCY IN SIGN OCCURS, THEN H IS ADJUSTED UNTIL THE APPROPRIATE ROOT IS ISOLATED TO THE DESIRED ACCURACY.

704F REFERENCES ON FILE D APSB 0 D2

1595 PHY268 CHOPPER DATA ANALYSIS

REQUESTOR H. JACKSON PHYSICS

PROGRAMMER R. HAMELINK

THIS PROGRAM PUTS IN ASCENDING ORDER THE BINARY NUMBERS ON A TAPE OF A MILLION OR MORE WORDS. THEN IT PROCESSES THIS LIST ESSENTIALLY BY COUNTING THE DUPLICATES OF CERTAIN SPECIFIED NUMBERS.

704F REFERENCES ON FILE Z0

1596 PHY269 REDUCED WIDTHS FOR ROTATIONAL LEVELS

REQUESTOR J. ERSKINE PHYSICS

PROGRAMMER M. WELCH

THIS PROGRAM CALCULATES REDUCED WIDTHS AS A FUNCTION OF CERTAIN CLEBSCH-GORDON COEFFICIENTS, NORMALIZED NILSSON WAVEFUNCTIONS, AND SEVERAL INPUT PARAMETERS.

704F REFERENCES ANC308 ON FILE DM APSB 0 C3

1597 PHY270 CHARGED PARTICLE DATA REDUCTION PROGRAM FOR MULTICHANNEL ANALYZER

REQUESTOR J. SCHIFFER PHYSICS

PROGRAMMER F. TARABA

GIVEN RUN PARAMETERS SUCH AS - NUMBER OF CHANNELS, NUMBER OF REGIONS TO BE SUMMED, RUN IDENTIFICATION, CROSS SECTION TYPE, I.E., SCATTERING OR REACTION, LABORATORY ANGLE, OPTIONS, SUCH AS - HOW BACKGROUND WILL BE CALCULATED, WHETHER SUMMING CHANNELS ARE TO BE SPECIFIED OR COMPUTED FROM A KINEMATICS ROUTINE, KINEMATICS PARAMETERS, SUCH AS LABORATORY ENERGY, MASSES OF INCIDENT, OUTGOING PARTICLES AND TARGET, Q VALUE FOR EACH PARTICLE FOR ALL DIFFERENT TYPES OF PARTICLES APPEARING, AND SPECIFICATION OF CHANNEL PAIRS FOR SUMMING AND/OR BACKGROUND IF THESE ARE TO BE SPECIFIED, ALONG WITH THE MULTICHANNEL ANALYZER DATA FOR A RUN, THIS PROGRAM IS TO -

1) CHECK RUN IDENTIFICATION ON ALL ANALYZER DATA CARDS.
2) SUM COUNTS IN DESIGNATED REGIONS, OR OVER COMPUTED LIMITS.
3) SUBTRACT BACKGROUND FROM EACH CHANNEL, DETERMINING APPROPRIATE BACKGROUND EITHER FROM REGRESSION LINE FORMED BY A SPECIFIED PAIR OF CHANNELS OR FROM MINIMUM CHORD TECHNIQUE.
4) DIVIDE CHANNEL COUNTS BY MONITOR AND CONVERT COUNTS TO CENTER OF MASS SYSTEM.
5) IF SCATTERING IS BEING CONSIDERED, DIVIDE CHANNEL COUNTS BY RUTHERFORD CROSS SECTION.

FOR EACH RUN, THE RUN IDENTIFICATION, LABORATORY ANGLE, SUMS OF COUNTS - BACKGROUNDS OVER DESIGNATED OR COMPUTED REGIONS, THE CENTER OF MASS ANGLE, CENTER OF MASS CROSS SECTION, ASSOCIATED PER CENT ERROR, AND RATIO OF THE CROSS SECTION TO RUTHERFORD CROSS SECTION ARE REQUIRED OUTPUT.

WHEN THE APPROPRIATE REACTION KINEMATICS ARE GIVEN, AN ENERGY SCALE FOR EITHER THE EXCITATION ENERGY OF THE RESIDUAL NUCLEUS OR THE LABORATORY ENERGY OF THE EMERGING PARTICLE WILL BE PRINTED ON THE GRAPH. NON-LINEARITY OF THIS SCALE MUST BE TAKEN INTO ACCOUNT. PULSE HEIGHT IS GENERALLY PROPORTIONAL TO KINETIC ENERGY PLUS OR MINUS A CONSTANT, WITH CORRECTION NECESSARY FOR THE TYPE OF PARTICLE AND ABSORBING MATERIAL PRESENT.

704F REFERENCES ON FILE ZJ

1604 PAD BENDING MAGNET COIL TESTING SYSTEM

REQUESTOR H. VOGEL PARTICLE ACCELERATOR

PROGRAMMER L. BRYANT

SOLVE THE DIFFERENTIAL EQUATION FOR A TRANSFORMER WITH IRON CORE WITH BOUNDARY CONDITIONS AND THREE PARAMETERS SET, SUCH THAT THE FIELD ENERGY WILL BE RELEASED IN PULSES OF KNOWN LENGTH. FIND THE RELATIONSHIP OF THE THREE PARAMETERS TO THE PULSE SHAPE.

ANA REFERENCES ON FILE

1605 RE REACTOR KINETICS TRANSIENT ANALYSIS

REQUESTOR C. KELBER REACTOR ENGINEERING

CONSULTANT N. MOREHOUSE PROGRAMMER L. BRYANT

DETERMINE K(T) FOR THE ROD SUCH THAT P(T) LESS THAN 150 AS T APPROACHES INFINITY AND INTEGRAL P(T)DT LESS THAN 20 FOR THE GIVEN REACTOR PARAMETERS.
* NOTE P LESS THAN OR EQUAL TO 150 WHEN INTEGRAL PDT=20.

ANA REFERENCES ON FILE

1608 RE SPHERICAL SHELL TEMPERATURE DISTRIBUTION

REQUESTOR D. MACFARLANE REACTOR ENGINEERING

PROGRAMMER L. JUST

CALCULATE TEMPERATURE DISTRIBUTION IN A SPHERICAL SHELL WITH INTERVAL HEAT SOURCE.

ANA REFERENCES ON FILE

1614 RE TEMPERATURE DISTRIBUTION IN A TAPERED CYLINDRICAL FIN

REQUESTOR D. MACFARLANE REACTOR ENGINEERING

PROGRAMMER L. JUST

VARY CROSS-SECTION, LENGTH AND THERMAL PROPERTIES TO MAXIMIZE SPECIFIC POWER.

ANA REFERENCES ON FILE

1615 PHY271 COULOMB WAVE FUNCTIONS

REQUESTOR L. MEYER PHYSICS

CONSULTANT W. CODY PROGRAMMER J. WENGER

COULOMB WAVE FUNCTIONS ARE CALCULATED FOR CERTAIN SETS OF INPUT PARAMETERS.

704F REFERENCES ANC307 ON FILE D PSB 0 C3

1618 BIM110 CALCULATION OF ABSORPTION COEFFICIENT FROM EXPERIMENTAL DATA

REQUESTOR E. TRUCCO BIOLOGICAL AND MEDICAL RESEARCH

PROGRAMMER A. STRECOK

IN MATHEMATICAL TERMS THIS PROGRAM OBTAINS TABLES OF I1 AND I2, WHICH ARE DEFINITE INTEGRALS DETERMINED BY TWO INPUT PARAMETERS ETA AND Z. IN ADDITION FOR FIXED Z, THIS PROGRAM EVALUATES THE ETA VALUE FOR WHICH I2 EQUALS A KNOWN CONSTANT DETERMINED FROM INPUT PARAMETERS.

7094F REFERENCES ON FILE D APSB 0 D1,C5

1622 RE XENON POISONING OF REACTOR DUE TO OPERATION AT HIGH FLUX FOR SHORT INTERVALS

REQUESTOR M. JANICKE REACTOR ENGINEERING

PROGRAMMER L. JUST

DETERMINE POISONING DUE TO XENON FORMATION IN A HIGH FLUX REACTOR.

ANA REFERENCES ON FILE

1623 HEP123 CONVERT PAPER TAPE TO MAGNETIC TAPE

REQUESTOR R. HILDEBRAND HIGH ENERGY PHYSICS

CONSULTANT W. SNOW PROGRAMMER C. SMITH

READ INFORMATION FROM PAPER TAPE AND WRITE THIS INFORMATION ONTO MAGNETIC TAPE WITH WORD AND RECORD LENGTHS THAT CAN BE SPECIFIED BY CONTROL CARDS AT RUN TIME.

401 REFERENCES ON FILE APSB 0 Z0

1624 CEN111 PROCESS SCALE UP AND ECONOMIC EVALUATION

REQUESTOR D. RAMASWAMI CHEMICAL ENGINEERING

PROGRAMMER F. CLARK

THE OBJECT OF THIS STUDY IS TO ASSIST IN THE DEVELOPMENT OF FUEL REPROCESSING TECHNIQUES OF FLUIDIZATION AND VOLATILITY METHODS. THE PROGRAM HELPS IN PREDICTING THE BEHAVIOR OF SCALED UP UNITS USING THE EXPERIMENTAL DATA OBTAINED IN THE CHEMICAL ENGINEERING DIVISION AND SOME DATA PUBLISHED IN THE LITERATURE.

7094F REFERENCES ON FILE Z0

1625 AMD166 SPARK PICTURE FILTERING BY LINEAR DECISION FUNCTIONS

REQUESTOR J. BUTLER APPLIED MATHEMATICS

PROGRAMMER H. GRAY

THE PURPOSE OF THIS PROGRAM IS TO TEST THE EFFECTIVENESS OF A LINEAR DECISION FUNCTION METHOD FOR DISCRIMINATING BETWEEN (GOOD) AND (BAD) SPARK PICTURES. SEVERAL THOUSAND SYNTHETIC PICTURES WILL BE GENERATED BY THE COMPUTER TO SERVE AS INPUT DATA FOR THE PROCESS.

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| 704F REFERENCES | ON FILE | T1 |
| GEO REFERENCES | ON FILE | T1 |

1628 RPY137 NUCLEAR DATA GAMMA RAY DATA ANALYZER

REQUESTOR H. LUCAS RADIOLOGICAL PHYSICS

PROGRAMMER W. SNOW

THIS IS A MODIFICATION OF THE RPY134 CODE TO PROCESS THE TAPES FROM THE NUCLEAR DATA 512 CHANNEL ANALYZER AND TO INCLUDE ERROR CALCULATIONS. THE PROGRAM WILL PRODUCE OUTPUT SUITABLE FOR PLOTTING ON THE EAI DATAPLOTTER.

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| GEO REFERENCES | ON FILE | Z0 |

1629 CHM158 BARDEEN-COOPER-SCHRIEFFER SUPERCONDUCTOR EQUATIONS

REQUESTOR R. VANDENBOSCH CHEMISTRY

PROGRAMMER S. ZAWADZKI

SOLVES ABOVE EQUATIONS FOR THE CHEMICAL POTENTIAL, THE CORRELATION FUNCTION, AND THE GROUND STATE ENERGY. CAN ALSO BE USED TO DETERMINE THE EFFECTS OF BLOCKING IN CERTAIN APPLICATIONS.

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| 704F REFERENCES | ON FILE | Z0 |

1630 PHY272 CALCULATION OF H-COEFFICIENTS

REQUESTOR R. LANE PHYSICS

CONSULTANT K. SMITH PROGRAMMER W. SNOW

TO CALCULATE THE VALUES OF THE GEOMETRICAL FACTORS WHICH APPEAR IN THE EXPRESSIONS WHICH REPRESENT THE AVERAGE VALUE OF THE SPIN OPERATOR IN THE EMERGING BEAM OF NUCLEONS AFTER SINGLE AND DOUBLE SCATTERING FROM UNPOLARIZED DEUTERONS.

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| GEO REFERENCES 633/PHY145 | ON FILE | Z0 |

1631 PER104 TECHNICAL SUPPORT SALARY ANALYSIS

REQUESTOR H. SMITH PERSONNEL

PROGRAMMER J. HEESTAND

A PROGRAM IS DESIRED THAT WILL PERFORM A STATISTICAL ANALYSIS OF TECHNICAL SUPPORT SALARIES SIMILAR TO THAT DONE FOR SCIENTIFIC STAFF SALARIES BY PER102. THE RESULTS ARE TO BE TABULATED IN A FORM SUITABLE FOR PUBLICATION.

704F REFERENCES 1266/PER102 ON FILE G1

1633 CHM159 CALCULATION OF SIN SQUARED THETA FROM POWDER PHOTOGRAPHS

REQUESTOR E. SHERRY CHEMISTRY

PROGRAMMER F. CLARK

GIVEN A VALUE OF L, A PARAMETER IC DESIGNATING CAMERA TYPE, A CAMERA CONSTANT CC, AND SETS OF VALUES FOR INTENSITY, A, AND B, EVALUATE AND OUTPUT CORRESPONDING VALUES OF THETA, D, SIN THETA, AND (SIN THETA)**2.

FOR BRADLEY-JAY CAMERA
C=A-B, THETA=C*(-CC)+90(DEGREES), AND D=L/2*SIN THETA.
FOR NORELCO C=A-B, THETA=C*CC, AND D=L/2*SIN THETA.

704F REFERENCES ON FILE DM PSB Z0

1634 BIM111 EVALUATION OF FUNCTIONS FOR USE IN THE STOCHASTIC THEORY OF MORTALITY

REQUESTOR E. TRUCCO BIOLOGICAL AND MEDICAL RESEARCH

PROGRAMMER J. ANDERSON

THIS PROGRAM IS TO EVALUATE SEVERAL FUNCTIONS USED IN THE STOCHASTIC THEORY OF MORTALITY.

704F REFERENCES ON FILE D PSB O Z0

1637 RPY138

REQUESTOR J. KASTNER RADIOLOGICAL PHYSICS

PROGRAMMER M. WELCH

A LEAST SQUARES FIT IS TO BE MADE OF EXPERIMENTAL POINTS TO A RATIONAL FUNCTION OF EITHER ONE OF TWO FORMS.
PROVISION FOR SUPPLYING ERRORS ON THE POINTS WILL BE MADE.
INITIAL ESTIMATES OF THE PARAMETERS WILL BE PROVIDED.

7094F REFERENCES ANE208 ON FILE D PSB 0 E2

1638 PHY273 EQUILIBRIUM CONSTANTS RELATING SULFUR SPECIES

REQUESTOR J. BERKOWITZ PHYSICS

PROGRAMMER B. GARBOW

THE REFINEMENT, BY MEANS OF A LEAST SQUARE FIT, OF THE EXPERIMENTAL DETERMINATION OF THE EQUILIBRIUM CONSTANTS RELATING THE MOLECULAR SPECIES CONSTITUTING SULFUR VAPOR MADE UNDER VARYING CONDITIONS OF TEMPERATURE AND PRESSURE.

7094F REFERENCES ANZ013 ON FILE D PSB 0 E2,C2

1642 PHY224 RELATIVE INTENSITIES

REQUESTOR S. WEXLER PHYSICS

PROGRAMMER J. WENGER

SEVERAL FUNCTIONS OF PROTON ENERGY ARE EVALUATED FOR EACH OF THE CHARGE STATES OF A SELECTED GAS AMONG HELIUM, NEON, ARGON, OR KRYPTON.

7094F REFERENCES ON FILE DM PSB Z2

1641 BIM112 ANALYSIS OF BLOOD ELEMENT DATA FROM IRRADIATED RATS

REQUESTOR G. SACHER BIOLOGICAL AND MEDICAL RESEARCH

PROGRAMMER F. CLARK

USING HEMATOLOGY DATA FROM BIM 105 PERFORM THE FOLLOWING CALCULATIONS -

(1) FOR A SPECIFIED GROUP OF BLOOD ELEMENTS CALCULATE THE COVARIANCE AND RELATIVE COVARIANCE FOR EVERY DOSE AND TIME GROUP. CALCULATE THE REGRESSION COEFFICIENTS IN THE FOLLOWING EQUATION

R(I,J)=A(I,J)+B(I,J)I+C(I,J)I**2+D(I,J)T+E(I,J)X(I)+F(I,J)X(J)

WHERE R(I,J)=RELATIVE COVARIANCE AT SPECIFIC DOSE AND TIME (I,T).
(I,J) REPRESENTS ELEMENT COMBINATION.
X(I)=AVG. RESPONSE READING FOR ELEMENT I
X(J)=AVG. RESPONSE READING FOR ELEMENT J

CALCULATE THE ERROR OF THE ESTIMATE FOR ALL ELEMENT COMBINATIONS AND THE ERRORS IN THE COEFFICIENTS.

(2) GIVEN A SECOND SET OF ELEMENTS, CALCULATE THE VARIANCE AND RELATIVE VARIANCE AND PROCEED AS IN (1).

(3) FOR EACH BLOOD ELEMENT AND SEX, DO SPLINE FITS OF THE SETS OF REGRESSION COEFFICIENTS FROM BIM105 VERSUS TIME. CALCULATE AND TABULATE INTERPOLATED VALUES FOR T. CALCULATE FIRST DERIVATIVES AT T AND TABULATE.

704F REFERENCES 1301/BIM105,1372/BIM106 ON FILE E2

1642 PAD140 SPOTS ON SCREEN PROGRAM

REQUESTOR D. COHEN PARTICLE ACCELERATOR

CONSULTANT W. COWELL PROGRAMMER J. GVILDYS

A PROGRAM IS TO BE PREPARED FOR USE IN CONJUNCTION WITH THE ZGS TUNE-UP PROCEDURE. DURING THIS PROCEDURE DATA READ FROM ZGS CONTROL ROOM TV SCREENS WILL BE FED INTO THIS PROGRAM TO COMPUTE SOME OR LIST PROPERTIES REQUIRED TO FACILITATE THE TUNE-UP PROCEDURE.

THE PROGRAM WILL INVOLVE THE SOLUTION OF 12-14 SIMULTANEOUS NON-LINEAR EQUATIONS FOR 8-10 UNKNOWNS WITH LEAST-SQUARES FITTING TO UTILIZE THE REDUNDANCY. THE TERMS IN THE EQUATIONS ARE TRIGONOMETRIC FUNCTIONS.

704F REFERENCES ON FILE F4

1644 AMU102 TILT

REQUESTOR D. HARDEN ASSOCIATED MIDWEST UNIVERSITIES

PROGRAMMER J. KOERNER

TO INVESTIGATE THE BEHAVIOR OF NATURAL CIRCULATION SYSTEMS IN THE REGION NEAR THE THERMODYNAMIC CRITICAL POINT OF THE FLUID.

704F REFERENCES ON FILE DM P B DO

1646 CHM FERRO-SULPHATE DOSIMETER

REQUESTOR H. FRICKE CHEMISTRY

PROGRAMMER L. JUST

INVESTIGATE THE TIME-BEHAVIOR OF IONS UNDER VARYING CONDITIONS OF PH AND RADIATION INTENSITY.

ANA REFERENCES ON FILE

1647 SSS ISOTOPE SEPARATION BY FORCED DIFFUSION IN LIQUID METALS

REQUESTOR J. JACKSON SOLID STATE SCIENCE

CONSULTANT N. MOREHOUSE PROGRAMMERS L. JUST, W. SCOTT

SHOW THE DEGREE OF SEPARATION BY MEANS OF ENERGY GRADIENTS.

ANA REFERENCES ON FILE

1648 HEP124 GRIND (CERN)

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

CONSULTANT J. BUTLER PROGRAMMERS R. ROYSTON, K. MARTIN

TO INVESTIGATE THE 709 FORTRAN/FAP PROGRAM GRIND OBTAINED FROM CERN AND ADAPT IT FOR USE AT ARGONNE.

GRIND MAKES KINEMATIC FITS TO BUBBLE CHAMBER EVENTS WHICH HAVE BEEN SPATIALLY RECONSTRUCTED. IT IS DESIGNED TO OPERATE ON DATA TO WHICH NO MOMENTUM-DEPENDENT CORRECTIONS HAVE BEEN MADE AT THE SPATIAL RECONSTRUCTION STAGE, AS IT MAKES ITS OWN CORRECTIONS FOR THESE EFFECTS.

704F REFERENCES ON FILE ZO

1649 PAD INVESTIGATION OF RING MAGNET POWER SUPPLY TRANSIENT BEHAVIOR UNDER FAULT CONDITIONS

REQUESTOR G. CINELLI PARTICLE ACCELERATOR

CONSULTANT N. MOREHOUSE PROGRAMMERS L.JUST,F.MALETICH

PLOT CURRENTS AND VOLTAGES IN THE RING MAGNET UNDER FAULT CONDITIONS.

ANA REFERENCES ON FILE

1650 SSS134 KINEMATICAL CALCULATION OF DIFFRACTION EFFECTS

REQUESTOR W. BOLLMANN SOLID STATE SCIENCE

PROGRAMMER C. CHAMOT

TO DETERMINE THE INTENSITY OF DIFFRACTED ELECTRONS IN GRAPHITE.

704F REFERENCES ON FILE D APSB 0 Z0

1651 CHM161 CALCULATION OF AVERAGE GAMMA-RAY ENERGY

REQUESTOR J. HUIZENGA CHEMISTRY

PROGRAMMER W. HAFNER

THE AVERAGE GAMMA RAY ENERGY IS GIVEN AS THE QUOTIENT OF TWO INTEGRALS.
THIS PROGRAM EVALUATES EACH INTEGRAL AND TABULATES THEIR VALUES AND THEIR QUOTIENT AS FUNCTIONS OF SEVERAL INPUT PARAMETERS.

704F REFERENCES GLFGAU2 ON FILE D PSB 0 D1

1652 PHY HISTOGRAM RE-GROUPING

REQUESTOR R. ALLAS PHYSICS

PROGRAMMER L. MICHEL

GIVEN A HISTOGRAM WITH BASE LINE INTERVAL DELTA, THIS PROGRAM WILL REGROUP THESE INTERVALS KEEPING AREAS PROPORTIONAL TO AREAS OF ORIGINAL HISTOGRAM.

704F REFERENCES ON FILE E0

1654 PAD 6 QUADRUPOLE PROFILE PROGRAM

REQUESTOR E. CROSBIE PARTICLE ACCELERATOR

PROGRAMMER L. BRYANT

SOLVE FOR THE BEAM ENVELOPE FOR PHASE SPACE ELLIPSE PASSING THRU SIX QUADRUPOLES.

NA REFERENCES ON FILE

1656 PHY275 ANALYSIS OF FOCUSING MAGNET

REQUESTOR L. GOODMAN PHYSICS

CONSULTANT J. BUTLER PROGRAMMER D. CARSON

THE BASIC MATHEMATICAL PROBLEM INVOLVED IS THE CALCULATION OF CHARGED PARTICLE TRAJECTORIES IN A MEASURED MAGNETIC FIELD. IN THIS PARTICULAR SITUATION, THE MAGNETIC FIELD VALUES ARE MEASURED ON A PLANE GRID AND THE ORBITS IN THE PLANE ARE TO BE DETERMINED. TYPICALLY, INITIAL CONDITIONS FOR TWO ORBITS WILL BE GIVEN AND THE POINT AT WHICH THEY INTERSECT WILL BE CALCULATED.

IN ORDER TO AVOID MAKING DIFFERENTIABILITY ASSUMPTIONS ABOUT THE MEASURED FIELD, THE TRAJECTORIES WILL BE DETERMINED BY AN INTRINSIC GENERALIZATION OF THE WELL-KNOWN CIRCLE METHOD.

704F REFERENCES ON FILE D2

1657 HEP125 RAYSE(NWU)

REQUESTOR T. FIELDS HIGH ENERGY PHYSICS

PROGRAMMER R. ROYSTON

RAYSE IS A 709 FORTRAN PROGRAM WHICH IS TO BE MADE AVAILABLE FOR USE ON THE 704.

RAYSE IS A RAY TRACING PROGRAM FOR FOLLOWING A BEAM OF PARTICLES COMING OUT OF AN ACCELERATOR THROUGH A SYSTEM OF BENDING, FOCUSSING AND DEFOCUSSING MAGNETS.

704F REFERENCES ON FILE Z0

1659 HEP126 GEORGE-SCAMP TRANSLATOR

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

PROGRAMMER W. SNOW

TO TRANSLATE SPARK CHAMBER TRACK DATA, DIGITIZED BY THE SCAMP MEASURING TABLE ONTO 7 CHANNEL PUNCHED PAPER TAPE, TO MAGNETIC TAPE, AND TO PERFORM VARIOUS ERROR CORRECTING FUNCTIONS. THIS MAGNETIC TAPE WILL BE USED AS INPUT TO EDIT (1660/HEP127).

GEO REFERENCES 1660/HEP127 ON FILE P GO Z0

1660 HEP127 EDIT

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

PROGRAMMER W. SNOW

TO EDIT SPARK CHAMBER TRACK DATA, CORRECT ERRORS, AND PREPARE MAGNETIC TAPES FOR USE AS INPUT TO TRAFIT (1242/HEP108). THE INPUT WILL BE ON MAGNETIC TAPE OBTAINED FROM EITHER THE GEORGE-SCAMP TRANSLATOR (1659/HEP126) OR FROM THE 1401 PROGRAM, TRANSCRIBE (1623/HEP-123).

704 REFERENCES ON FILE 0 Z0

1661 HEP128 EVENAL

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

PROGRAMMER R. ROYSTON

THIS PROGRAM PREPARES VARIOUS SUMMARIES OF THE OUTPUT FROM THE SPARK-CHAMBER TRACK RECONSTRUCTION PROGRAM TRAFIT (1242/HEP108). IT ALSO EDITS THE DATA FOR INPUT TO KINEMATICS PROGRAMS.

704F REFERENCES ON FILE Z0

1662 PHY276 TAPE TO CARD CONVERSION OF CHANNEL ANALYZER COUNTS

REQUESTOR R. SINGH PHYSICS

PROGRAMMER D. CARSON

CONVERSION OF ANALYZER DATA RECORDED ON PAPER TAPE TO CARDS IN A FORMAT SUITABLE FOR INPUT TO THE LINE SHAPE FITTING PROGRAMS, 1120/PHY220 AND 1537/PHY262.

GEO REFERENCES ON FILE P GO Z0

1663 BIM113 ANALYSIS OF SURVIVAL TIME OF IRRADIATED MICE

REQUESTOR D. GRAHN BIOLOGICAL AND MEDICAL RESEARCH

PROGRAMMER J. ANDERSON

THIS PROGRAM IS TO PERFORM AN ANALYSIS OF VARIANCE ON EACH OF SEVERAL SETS OF SURVIVAL TIME DATA OF IRRADIATED MICE.

7J4F REFERENCES ON FILE DM PSB G1

1665 CHM162 CALCULATION OF SORET COEFFICIENTS FROM GOUY REFRACTOMETER STUDIES

REQUESTOR J. SULLIVAN CHEMISTRY

PROGRAMMER F. CLARK

GIVEN A SET OE OBSERVED DATA, Y(I), EACH Y(I) ASSOCIATED WITH A PATTERN NUMBER M(I), AND SEVERAL TABLES OF X(J), EACH TABLE ASSOCIATED WITH A GIVEN VALUE OF A, AND EACH X(J) ASSOCIATED WITH A PATTERN NUMBER M(J).

1. EACH TABLE IN WHICH THERE IS AN M(J) CORRESPONDING TO EACH M(I) FROM THE OBSERVED DATA, PAIR THE OBS. Y(I) WITH THE X(J) OF CORRESPONDING PATTERN NUMBER, DO A LINEAR LEAST SQUARES FIT, AND CALCULATE THE FOLLOWING -
   S**2=SUM(OBS.Y(I)-CALC.Y(I))**2 (1)
2. ON THE BASIS OF THE CALCULATED VALUES ABOVE AND THEIR ASSOCIATED VALUES OF A, DETERMINE THE VALUE OF A WHICH WOULD MINIMIZE (1).

7J4F REFERENCES ON FILE DM PSB E2

1666 BIM114 GRAIN COUNT DISTRIBUTION CURVES

REQUESTOR E. TRUCCO BIOLOGICAL AND MEDICAL RESEARCH

PROGRAMMER N. WILLIAMSON

DETERMINATION OF MEAN, MEDIAN, STANDARD DEVIATION, AND COEFFICIENT OF VARIATION FOR 2 SPECIFIED DISTRIBUTION CURVES F(N) AND G(N), AND FOR A COMPUTED BINOMIAL DISTRIBUTION F*T*(N).

THESE THREE DISTRIBUTIONS WILL BE PLOTTED AS A SINGLE GRAPH EITHER ON THE EAI DATAPLOTTER OR PREFERABLY, IF POSSIBLE, THE GEORGE CRT. PROVISION WILL BE MADE FOR LATER INCORPORATION OF A SUBPROGRAM TO SMOOTH IN A PRESCRIBED FASHION THE SPECIFIED DISTRIBUTIONS PRIOR TO THE STATISTICAL CALCULATIONS.

7J4F REFERENCES ON FILE DM PSB G1

1668 MET THE CLUSTERING OF POINT DEFECTS

REQUESTOR R. COTTERILL METALLURGY

PROGRAMMER L. BRYANT

THIS PROGRAM IS DESIGNED TO DETERMINE THE CLUSTERING OF POINT DEFECTS IN QUENCHED METALS.

ANA REFERENCES ON FILE

1670 RE290

REQUESTOR D. SPARKS REACTOR ENGINEERING

PROGRAMMER J. DICK

BY MODIFYING ANC001 FOR USE AS A SUBROUTINE, CALCULATE THE SYSTEM TRANSFER FUNCTIONS OF THE GIVEN SYSTEM WHERE THE PARAMETERS K AND N/NO ARE VARIED OVER 10 VALUES EACH, YIELDING 10[illegible] SOLUTIONS.
OUTPUT RESULTS ON PUNCHED CARDS IN A FORM SUITABLE FOR USE AS INPUT TO A FURTHER ROOT-FINDING PROGRAM.

704F REFERENCES ANC001 ON FILE D PSB 0 C[illegible]

1675 PHY277 ANGULAR CORRELATION DATA ANALYSIS

REQUESTOR S. BURSON PHYSICS

CONSULTANT W. CODY PROGRAMMER R. HAMELINK

THIS PROGRAM MAKES A LEAST SQUARES FIT OF SOME DATA TO A LINEAR SUM OF THE FIRST 3 EVEN ORDERED LEGENDRE POLYNOMIALS.

704F REFERENCES 1180/RE256 ON FILE DM APSB E2

1677 CHM163 ZEEMAN AND HYPERFINE TENSOR PROJECTIONS FOR PARAMAGNETIC RESONANCE SPECTRA

REQUESTOR J. WEIL CHEMISTRY

PROGRAMMER A. STRECOK

THIS PROGRAM IS DESIGNED TO CALCULATE THE G-VALUES AND HYPERFINE INTERACTION ENERGIES FOR A SET OF ELECTRONS AND NUCLEI, TAKING INTO ACCOUNT THE POSSIBLE OCCURRENCE OF SYMMETRY-RELATED NON-EQUIVALENT SITES IN THE CRYSTAL UNIT CELL. STARTING FROM THE TENSORS G-BAR AND A-BAR OF THE SPIN HAMILTONIAN, THE PROGRAM WILL COMPUTE THE DESIRED PARAMETERS, INCLUDING THE EFFECTS OF THE NUCLEAR ZEEMAN TERMS, FOR A SERIES OF LOCATIONS OF THE EXTERNALLY APPLIED MAGNETIC FIELD. IT WILL ALSO GIVE THE FACTORS NECESSARY TO COMPUTE RELATIVE INTENSITIES OF SATELLITE LINES, AS WELL AS THE EIGENVALUES AND EIGENVECTORS OF THE INPUT TENSORS.

704F REFERENCES ON FILE F1,F2

1678 PHY278 DWB DEUTERON STRIPPING PROGRAM (UT)

REQUESTOR J. ERSKINE PHYSICS

PROGRAMMER B. GARBOW

CALCULATION OF (D,P) AND (D,N) STRIPPING ANGULAR CROSS SECTIONS WITH COULOMB EFFECTS INCLUDED AND WITH NUCLEAR INTERACTIONS REPRESENTED BY OPTICAL MODEL POTENTIALS. INTENDED TO SERVE AS A REPLACEMENT FOR BUTLER CALCULATIONS IN THE DETERMINATION OF NUCLEAR SPINS AND PARITIES OF THOSE LEVELS WHERE THE Q-VALUE IS GREATER THAN -2.226MEV.

704F REFERENCES ON FILE DM APSB D2

1682 HEP129 PHOTOMULTIPLIER RESPONSE DISTRIBUTION

REQUESTOR L. HYMAN HIGH ENERGY PHYSICS

CONSULTANT J. BUTLER PROGRAMMER P. PENNOCK

THE RESPONSE OF A PHOTOMULTIPLIER VARIES RANDOMLY BECAUSE OF THE RANDOM NATURE OF THE PROCESS OCCURRING AT EACH STAGE. IN THIS, EACH INCIDENT ELECTRON GIVES RISE TO A RANDOM NUMBER OF ELECTRONS WHICH MOVE ON TO THE NEXT STAGE. THIS NUMBER HAS A POISSON DISTRIBUTION.

THE PROGRAM COMPUTES THE DISTRIBUTION OF THE TOTAL NUMBER OF ELECTRONS PRODUCED AT EACH STAGE AND THE FIRST FOUR MOMENTS OF THIS DISTRIBUTION, FROM WHICH THE MEAN, DISPERSION, SKEWNESS AND KURTOSIS CAN BE DEDUCED. THE TOTAL NUMBER OF STAGES AND THE MEAN NUMBER OF ELECTRONS PRODUCED BY ONE INCIDENT ELECTRON AT EACH STAGE CAN BE VARIED.

704F REFERENCES ON FILE DM APSB Z0

1686 PHY279 AUTOPLOTTER

REQUESTOR T. BRAID PHYSICS

PROGRAMMER H. GRAY

PROGRAM IS TO ACCEPT SUITABLE OUTPUT OF A FORTRAN GRAPH-PLOTTING PROGRAM (E.G.,1619/PHY) AND PREPARE CARDS FOR 836 AUTOPLOTTER INPUT.

704F REFERENCES ON FILE Z

1687 RE291 2 DXY (AGN)

REQUESTOR B. TOPPEL REACTOR ENGINEERING

PROGRAMMER M. CAVANAUGH

A REVISION OF TDC TO SOLVE THE CARLSON SN EQUATION IN TWO DIMENTIONAL X-Y GEOMETRY. THE PRESENT VERSION PERMITS ONLY ISOTROPIC SCATTERING AND FOR DELTA CALCULATIONS ALLOWS ONLY UNILATERAL EXPANSION OF X OR Y ZONES.

704 REFERENCES AGN TM-392 ON FILE P B 0 DO

1689 RE TEMPERATURE ANALYSIS OF EMITTERS

REQUESTOR R. HOLTZ REACTOR ENGINEERING

PROGRAMMERS L. BRYANT, F. MALETICH

DETERMINE THE TEMPERATURE DISTRIBUTION IN A WIRE WITH JOULE HEATING AND WITH RADIATION AND CONDUCTION HEAT LOSS.

ANA REFERENCES ON FILE

1693 PHY280 NUCLEAR SHELL MODEL

REQUESTOR S. COHEN PHYSICS

PROGRAMMER J. WENGER

A SERIES OF PROGRAMS IS NOW UNDER DEVELOPMENT TO CALCULATE THE ENERGY EIGENSTATES FOR NUCLEAR PROBLEMS, COLLECTIVELY ENTITLED RICHMAN. THESE PROGRAMS ARE TO BE MODIFIED, EXTENDED, AND PUT INTO SUITABLE PRODUCTION LIBRARY FORM. PROGRAMS TO BE INCLUDED ARE -

1. A CALCULATION OF THE COMPLETE SET OF BASIC STATES FOR A NUCLEAR SYSTEM. (POORBOY)
2. CONDENSATION OF 2 BODY MATRIX INPUT DATA INTO THE FORM REQUIRED BY THE WAVE FUNCTIONS. (BEGGARMAN)
3. CONSTRUCTION OF AN ENERGY MATRIX. (POORMAN)
4. DIAGONALIZATION OF THE ENERGY MATRIX AND COMPUTATION OF ENERGY EIGENVALUES AND EIGENFUNCTIONS. (THIEF)
5. CONDENSATION OF 2 BODY MATRIX INPUT DATA INTO THE FORM REQUIRED FOR CALCULATION OF TRANSITION PROBABILITIES. (SPMEL).
6. CALCULATION OF TRANSITION PROBABILITIES USING PROGRAMS 1, 4, AND 5.

704F REFERENCES ON FILE F0
790 REFERENCES ON FILE F?

1694 RE292 EQUIPOTENTIAL CONTOURS

REQUESTOR J. WHALEN REACTOR ENGINEERING

PROGRAMMER G. DUFFY

REVISION OF PHY259 TO CHANGE INTERPOLATION SCHEME TO A 3 POINT LOGARITHMIC FIT AND TO INVESTIGATE USE OF 160-A OUTPUT TO BE USED AS INPUT TO THIS CODE.

704F REFERENCES 1514/PHY259 ON FILE Z0

1695 RE SODIUM EXPULSION STUDIES

REQUESTOR R. SINGER REACTOR ENGINEERING

CONSULTANT N. MOREHOUSE PROGRAMMERS L.BRYANT, W.SCOTT

AN ANALYTICAL STUDY OF THE TRANSIENT TEMPERATURE OF A NON-LINEAR RESISTOR IN AN INDUCTIVE CIRCUIT WITH LARGE POWER PULSES.

ANA REFERENCES ON FILE

1696 RE TRANSIENT FILM BOILING WITH VARIABLE WALL TEMPERATURE

REQUESTOR R. SINGER REACTOR ENGINEERING

PROGRAMMERS L. JUST, J. MCALLISTER

AN ANALYTICAL STUDY OF THE TRANSIENT BEHAVIOR OF FILM BOILING WITH ARBITRARY WALL TEMPERATURE.

ANA REFERENCES ON FILE

1699 LDO102 QUADRUPOLE LENS PROBLEM

REQUESTOR A. CREWE LABORATORY DIRECTORS OFFICE

CONSULTANT J. BUTLER PROGRAMMER M. BUTLER

DETERMINATION OF THE FREQUENCIES OMEGA1 AND OMEGA2 OF A DOUBLET LENS SYSTEM WITH AN INTERMEDIATE FIELD-FREE REGION, GIVEN THE DISTANCE S1 OF THE OBJECT FROM THE LENS IN OBJECT SPACE AS 10CM. AND FOR A SET OF DISTANCES, S2, IN IMAGE SPACE.

704F REFERENCES ON FILE DM SB FO

1700 RE293 CHOPPED

REQUESTOR B. HOGLUND REACTOR ENGINEERING

PROGRAMMER D. BINGAMAN

A REVISION OF 593/RE160 TO CHANGE THE INPUT FROM THE LOCAL VOID FRACTION TO A DISTRIBUTED POWER SOURCE.

704F REFERENCES 593/RE160 ON FILE DO

1701 MET147 SPECIAL POLYNOMIAL EVALUATIONS

REQUESTOR K. MYLES METALLURGY

PROGRAMMER J. ANDERSON

EVALUATION OF THREE POLYNOMIALS WITH OUTPUT IN SPECIAL TABULAR FORM.

704F REFERENCES ON FILE DM PSB C1

1702 CHM164 TABULATION OF THE GREEN MASS EQUATION

REQUESTOR G. WING CHEMISTRY

PROGRAMMER J. GVILDYS

EVALUATE THE GREEN MASS EQUATION FOR SPECIFIED COMBINATION OF N AND Z, WHERE N RANGES BETWEEN 2 AND 160, Z BETWEEN 2 AND 102.

704F REFERENCES ON FILE DM APSB ZJ

1703 HEP130 PATTERN MOMENTS

REQUESTOR R. HILDEBRAND HIGH ENERGY PHYSICS

CONSULTANT J. BUTLER PROGRAMMER R. CLARK

VARIOUS MOMENTS ARE COMPUTED FOR PATTERNS DEFINED IN A 2**K X 2**K ARRAY OF CELLS (K=0,1,2,3,4,5,6,7). MOMENTS CAN BE COMPUTED FOR THE ENTIRE PATTERN OR FOR INDIVIDUAL CELLS. THE RESULTS OF THIS PROGRAM WILL BE USED TO FURNISH INFORMATION ON THOSE MOMENTS THAT CAN BE USED IN (A) PATTERN RECOGNITION AND (B) IN THE RECONSTRUCTION OF PARTICLE PATHS IN A SPARK CHAMBER.

704F REFERENCES JACM4-62,IREII2-62 ON FILE DM APSB T1

1704 HEP131 TRAMP (NIRNS)

REQUESTOR P. KALMUS HIGH ENERGY PHYSICS

PROGRAMMER C. SMITH

TRAMP WAS ORIGINALLY WRITTEN AT THE HIGH ENERGY LABORATORY OF THE NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE AT HARWELL FOR THE MERCURY COMPUTER. IT WAS SUBSEQUENTLY ADAPTED FOR USE AS A FORTRAN PROGRAM ON THE IBM 709 AT CERN AND THIS VERSION IS NOW AVAILABLE ON THE 704 AT ANL.

TRAMP IS FOR TRACKING AND MATCHING BEAM PROPERTIES IN HIGH ENERGY BEAM DESIGN. IT WILL TRACK PARTICLE TRAJECTORIES AND BEAM ELLIPSES IN PHASE SPACE THROUGH SYSTEMS OF QUADRUPOLES, BENDING MAGNETS AND VELOCITY SEPARATORS. IT ALSO CONTAINS A NUMBER OF MATCHING ROUTINES FOR ADJUSTING QUADRUPOLE STRENGTHS OR POSITIONS IN ORDER TO OBTAIN DESIRED BEAM CONFIGURATIONS.

704F REFERENCES NIRL-M-44 ON FILE ZJ

1709 CEN112 LEAST SQUARES FIT

REQUESTOR M. FOSTER CHEMICAL ENGINEERING

PROGRAMMER C. CHAMOT

PERFORM A LEAST SQUARES FIT TO THE FUNCTION Y=F+GX+H/XSQUARED.

7094F REFERENCES ON FILE D PSB 0 E2

1710 PHY281 CORRELATION COEFFICIENT

REQUESTOR J. MARION PHYSICS

PROGRAMMER R. MORRILL

GIVEN 2 SETS OF INTEGERS, THE PROGRAM FINDS THE CORRELATION COEFFICIENT BETWEEN THE TWO SETS.

7094F REFERENCES ON FILE DM PSB 0 G1

1711 PHY282 INTEGRAL MOMENTS OF THE SPACING DISTRIBUTION

REQUESTOR N. ROSENZWEIG PHYSICS

PROGRAMMER B. GARBOW

THE INTEGRAL OF MOMENTS OF THE FUNCTION F(T) PREVIOUSLY TABULATED IN 788/PHY174 IS TO BE EVALUATED.

7094F REFERENCES 788/PHY174 ON FILE D PSB 0 D1

1713 CHM165 PATTERSON SHARPENING PROGRAM (CU)

REQUESTOR M. SCHIFFER CHEMISTRY

PROGRAMMER C. CHAMOT

ADAPT A PROGRAM WRITTEN AT COLUMBIA UNIVERSITY FOR SHARPENING, BY A LEAST SQUARES TECHNIQUE, THE COEFFICIENTS OF A PATTERSON FOURIER SERIES. INPUT AND OUTPUT ARE TO BE MADE COMPATIBLE WITH 1178/MET133.

7094F REFERENCES ON FILE DM PSB E2

1714 MET148 GENERATION OF TABLES OF RESISTANCE VS. TEMPERATURE FOR PLATINUM RESISTANCE THERMOMETERS

REQUESTOR R. VOGT METALLURGY

PROGRAMMER N. WILLIAMSON

GIVEN THE CONSTANTS C, DELTA, AND BETA FOR SPECIFIC THERMOMETERS, CALCULATE THE RELATIVE RESISTANCE, W, AS A FUNCTION OF THE TEMPERATURE, T, USING THE CALLENDAR-VAN DUSEN EQUATION - W=1+C*T*(1+DELTA/100)-C*DELTA*T**2/100**2-C*BETA*T**3*(T-100)/100**4 WHERE BETA IS SET EQUAL TO ZERO FOR POSITIVE T. FOR EACH DEGREE IN THE SPECIFIED TEMPERATURE RANGE, CALCULATE W AND THE FIRST DIFFERENCE.

704F REFERENCES ON FILE DM PSB Z3

1715 CHM166 COMPUTER DETERMINATION OF CRYSTAL STRUCTURES

REQUESTOR M. SCHIFFER CHEMISTRY

PROGRAMMER N. WILLIAMSON

A GENERAL-PURPOSE PROGRAM FOR ANALYZING X-RAY DIFFRACTION DATA BY A DIRECT METHOD IN ORDER TO DEDUCE THE TRUE ATOMIC STRUCTURES OF COMPLEX CRYSTALLINE MATERIALS. THIS IS AN EXPERIMENTAL PROGRAM DESIGNED FOR SOLVING THE CRYSTALLINE STRUCTURE TO A FIRST APPROXIMATION, AFTER WHICH STANDARD REFINEMENT TECHNIQUES MAY BE APPLIED.

704F REFERENCES IBM, M AND A-16 ON FILE SB 0 Z3

1717 CHM167 U(2) FOR P(N)

REQUESTOR G. GOODMAN CHEMISTRY

PROGRAMMER C. CHAMOT

GIVEN THREE SETS OF 5X5 MATRICES A(N), B(N), C(N) FOR N=2,3,4, AND SEVERAL CHOICES OF THE PARAMETER X, BETWEEN 0 AND 1, IT IS DESIRED TO FIND THE EIGENVALUES AND EIGENVECTORS OF THE (SYMMETRIC) MATRICES M(N)=(1-X)*A(N)+X*B(N). THE EIGENVECTOR MATRIX S(N) IS THEN USED TO PRODUCE THE TRANSFORMED MATRIX E(N)=S(N)*C(N)*(S(N) INVERSE), VECTORS OF M, AND THE MATRIX E. X IS THE RATIO (DIMENSIONLESS) Z/G+Z WHERE Z IS SPIN ORBIT COUPLING ENERGY, G IS COULOMB ENERGY.

704F REFERENCES ON FILE DM PSB F2

1718 CHM168 CALCULATION OF AVERAGE GAMMA-RAY ENERGY

REQUESTOR J. HUIZENGA CHEMISTRY

PROGRAMMER W. HAFNER

THE AVERAGE GAMMA-RAY ENERGY IS OF THE FORM E=(A+B)/(C+D) WHERE A, B, C, D ARE INTEGRALS.
THIS PROGRAM EVALUATES ALL INTEGRALS AND TABULATES THEIR VALUES AND THEIR QUOTIENT AS FUNCTIONS OF SEVERAL INPUT PARAMETERS.

704F REFERENCES 1651/CHM161 ON FILE DM PSB D?

1720 RPY139 LEAST SQUARES ANALYSIS OF GAMMA-SPECTRA

REQUESTOR R. PARR RADIOLOGICAL PHYSICS

CONSULTANT L. WOS PROGRAMMER W. SNOW

THE PROBLEM TO BE SOLVED CONSISTS IN TAKING DATA FROM A 512 CHANNEL NUCLEAR DATA ANALYZER AND PREPARING A LIBRARY OF REFERENCE SPECTRA, ACCURATELY STANDARDIZED WITH RESPECT TO GAIN AND ZERO-ENERGY CHANNEL INTERCEPT, AND TO CALCULATE BY MEANS OF A WEIGHTED LEAST SQUARES METHOD OF ANALYSIS, THE PROPORTIONS OF SPECIFIED LIBRARY REFERENCE SPECTRA CONSTITUTING A GIVEN COMPLEX SAMPLE SPECTRUM.

704F REFERENCES ON FILE M B E2
GEO REFERENCES ON FILE GO E2

1722 RE294 INTERPRETATION AND PROCESSING OF GAUSSIAN DATA DISTRIBUTIONS

REQUESTOR A. SMITH REACTOR ENGINEERING

PROGRAMMER G. DUFFY

Y=(1+AX+BX**2)EXP(-((Z-X)/SIGMA)**2).

704F REFERENCES ON FILE E2

1723 PHY283

REQUESTOR J. MARION PHYSICS

PROGRAMMER S. ZAWADZKI

LOCATES RESONANCES FROM RAW DATA ON CHOPPER TAPES.

GEO REFERENCES ON FILE Z?

1725 CHM169 EVALUATION OF THE TALMI MASS FORMULA

REQUESTOR J. WING CHEMISTRY

PROGRAMMER N. WILLIAMSON

GIVEN VALUES OF THE PARAMETERS A, SMALL A, AND D, EVALUATE E=N*A+(0.5*N*(N-1)*SMALL A)+Y*D FOR N=1(1)16 AND Y=0 FOR EVEN N, =1 FOR ODD N.
OUTPUT SHOULD CONSIST OF THE CASE IDENTIFICATION AND COLUMNS OF N, N*A,0.5*N*(N-1)*SMALL A,Y*D, AND E, ALL WITH 3 DIGITS TO THE RIGHT OF THE DECIMAL POINT.

704F REFERENCES ON FILE DM PSB ZC

1726 ID107 USE OF GEORGE AS AN OFF-LINE PROCESSOR OF IDAHO TRANSMISSION DATA

REQUESTOR B. BEARDSLEY IDAHO DIVISION

PROGRAMMER G. ROBINSON

THIS JOB IS ESTABLISHED TO ACCOUNT FOR GEORGE USE IN THE OFF-LINE PROCESSING OF DATA ASSOCIATED WITH IDAHO DATA TRANSMISSION.

GEO REFERENCES ON FILE ZJ

1728 CEN113 CALCULATION OF MASS TRANSFER COEFFICIENT FOR WETTING OF URANIUM CYLINDERS BY CADMIUM

REQUESTOR I. DILLON CHEMICAL ENGINEERING

PROGRAMMER N. WILLIAMSON

CALCULATION OF MASS TRANSFER COEFFICIENTS FOR THE RATE OF SOLUTION OF URANIUM CYLINDERS INTO LIQUID CADMIUM AT 500 C IN A VESSEL USING AN IMPELLOR HAS BEEN MADE FOR VARIOUS VALUES OF AGITATOR SPEED AND PARTICLE SIZE. THESE COEFFICIENTS PERMIT COMPARISON OF THESE DATA WITH DATA OBTAINED WITH MORE CONVENTIONAL FLUIDS.

704F REFERENCES ON FILE D1

173- HEP132 MONTE CARLO CALCULATION OF THE EFFICIENCY WITH WHICH OMEGA DECAYS CAN BE OBSERVED

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

PROGRAMMER P. PENNOCK

THE PROGRAM IS TO COMPUTE THE EFFICIENCY WITH WHICH ONE CAN DETECT THAT MODE OF DECAY OF THE OMEGA-ZERO IN WHICH IT DECAYS INTO A PI-ZERO AND A GAMMA RAY AND THE PI-ZERO THEN DECAYS INTO TWO GAMMA RAYS. THE EFFICIENCY IS CALCULATED FOR VARIOUS ANGLES OF PRODUCTION OF THE OMEGA ZERO.

THE OMEGA-ZERO IS PRODUCED ALONG WITH A NEUTRON IN THE INTERACTION BETWEEN A PI-MINUS BEAM PARTICLE AND A PROTON IN THE TARGET. THE GAMMA RAYS ARE OBSERVED BY THE ELECTRON PAIRS THEY PRODUCE IN A LEAD PLATE BEHIND THE TARGET. THE TWO POINTS TO BE DETERMINED IN EACH TRIAL ARE - FIRST, ARE THE GAMMA RAYS TRAVELLING TOWARDS THE LEAD PLATE AND SECOND, DO THEY PENETRATE RIGHT THROUGH THE PLATE.

704F REFERENCES ON FILE DM APSB G6

1731 HEP133 KADYK THREE-BODY DECAY BY MONTE CARLO (UCRL)

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

PROGRAMMER C. SMITH

THIS IS A 704 FORTRAN PROGRAM FOR THE GENERATION OF THREE-BODY PRODUCTION AND DECAY PROCESSES FOLLOWING PHASE-SPACE DISTRIBUTION BY MONTE CARLO METHOD. IT IS DESCRIBED IN UCRL 9614.

THE PROGRAM IS TO BE AMENDED AND AUGMENTED TO STUDY HOW THE DECAY OF A K ZERO PARTICLE INTO TWO PIONS CAN BE DISTINGUISHED FROM OTHER MODES OF THE K ZERO.

704F REFERENCES 1366/HEP111 ON FILE G6

1734 BIM116 4 PI COMPENSATOR PATH

REQUESTOR S. GORDON BIOLOGICAL AND MEDICAL RESEARCH

CONSULTANT J. COOK PROGRAMMER A. STRECOK

THE PROBLEM IS TO FIND A MECHANICALLY FEASIBLE FAMILY OF ORIENTATIONS OF A SPHERE SUCH THAT - (1) THEY APPROACH, SUFFICIENTLY RAPIDLY, THE A PRIORI EQUIDISTRIBUTION ON ORIENTATIONS - (2) THE FORCES ACCOMPANYING ORIENTATION CHANGES REMAIN BELOW CERTAIN THRESHOLDS.

704F REFERENCES ON FILE Z6
GEO REFERENCES ON FILE Z7

1735 PAD141 INTEGRALS FOR BEAM EXIT HOLE MEASUREMENTS

REQUESTOR R. LARI PARTICLE ACCELERATOR

PROGRAMMER J. GVILDYS

THIS CODE IS TO PERFORM VARIOUS ARITHMETIC CALCULATIONS USING MAGNET TESTING DATA TAPES OF THE SAME GENERAL FORM AS FOR 1585/ PAD139.

704F REFERENCES 1585/PAD139 ON FILE DM APSB D1

1736 RPY140 FLUORESCENCE DECAY TIME

REQUESTOR I. BERLMAN RADIOLOGICAL PHYSICS

PROGRAMMER B. GARBOW

A SUPERPOSITION THEOREM FOR COMPUTING THE FLUORESCENCE PULSE CONTOUR FROM THE INSTRUMENT RESPONSE FUNCTION.

704F REFERENCES ON FILE DM PSB D1,E2

1738 AMD168 STEREOGRAM

REQUESTOR J. COOK APPLIED MATHEMATICS

PROGRAMMER D. CARSON

GIVEN THE COORDINATES OF POINTS REPRESENTING A CONFIGURATION IN 3-SPACE, THE ROUTINE USES THE CATHODE RAY TUBE OUTPUT TO OBTAIN TWO PICTURES WHICH, WHEN VIEWED IN A STEREOSCOPE, RECONSTRUCT THE ORIGINAL CONFIGURATION AS SEEN IN DEPTH BY BINOCULAR VISION.

704F REFERENCES ON FILE Z3
GEO REFERENCES ON FILE Z3

1743 CEN114 LEAST SQUARES FIT OF PROPERTIES OF MIXTURES

REQUESTOR T. YOUNG CHEMICAL ENGINEERING

PROGRAMMER F. CLARK

DETERMINE BY LEAST SQUARES THE CONSTANTS IN THE FOLLOWING FUNCTION, Y=X(1-X)(C(1)-C(2)X).

704F REFERENCES ON FILE E2

1744 AMD169 RESULTANT PROCEDURE NO. 2

REQUESTOR E. BAREISS APPLIED MATHEMATICS

PROGRAMMER R. HAMELINK

A FORTRAN PROGRAM TO FIND THE ROOTS OF A POLYNOMIAL EQUATION IN A REORGANIZATION OF THE RESULTANT METHOD.

704F REFERENCES ANC203 ON FILE C2

1745 PHY284 CHARGED PARTICLE DATA REDUCTION PROGRAM FOR MULTI-CHANNEL ANALYZER

REQUESTOR L. MEYER PHYSICS

PROGRAMMER F. TARABA

SPECTRA TAKEN WITH A MULTICHANNEL ANALYZER ARE TO BE ANALYZED - THE AREAS UNDER TEN PEAKS ARE TO BE DETERMINED BY ADDING UP THE NUMBERS IN SPECIFIED CHANNELS. BACKGROUND WILL ALSO BE DETERMINED.
THE OUTPUT SHOULD IDENTIFY THE SPECTRUM, THE TOTAL SUM IN EACH PEAK A, ITS BACKGROUND B, A-B AND THE SQUARE ROOT OF A.
MUCH OF THE COMPUTATION HAS ALREADY BEEN PROGRAMMED AS A SUB-ROUTINE FOR PHY270 WHICH WILL BE ADAPTED FOR USE HERE.

704F REFERENCES 1597/PHY270 ON FILE M Z0

1746 MET149 THE CLUSTERING OF POINT DEFECTS

REQUESTOR R. COTTERILL METALLURGY

CONSULTANT L. BRYANT PROGRAMMER C. HARRISON

CALCULATE THE STEADY STATE SOLUTION OF THE CLUSTERING OF POINT DEFECTS IN METAL WATER REACTION.

704 REFERENCES ON FILE F4
GEO REFERENCES ON FILE F4

1748 CHM170 AUTOMATIC ANALYSIS OF EPR SPECTRA OF HYDRAZYLS

REQUESTOR J. WEIL CHEMISTRY

PROGRAMMER F. CLARK

THE PARAMAGNETIC RESONANCE ABSORPTION LINESHAPE IS GENERATED BY SUPERPOSITION OF A SET OF INDIVIDUAL HYPERFINE COMPONENTS OBEYING THE GAUSSIAN FIRST DERIVATIVE LINE SHAPE FORMULA.

704F REFERENCES ON FILE E2

1749 RE PERIOD METER

REQUESTOR G. RUSCH REACTOR ENGINEERING

PROGRAMMERS L. JUST, W. SCOTT

DETERMINE THE FEASIBILITY OF FINDING THE PERIOD OF EXPONENTIALLY RISING SIGNALS BY ANALOG METHODS.

ANA REFERENCES ON FILE

1750 RE ELECTRODE HEAT TRANSFER

REQUESTOR J. MARCHATERRE REACTOR ENGINEERING

CONSULTANT N. MOREHOUSE PROGRAMMER L. BRYANT

DETERMINE THE TEMPERATURE DISTRIBUTION ALONG THE ELECTRODE TO BE USED IN THERMAL CONDUCTIVITY APPARATUS.

ANA REFERENCES ON FILE

1751 PAD HORN OF PLENTY TEMPERATURE STUDY

REQUESTOR H. VOGEL PARTICLE ACCELERATOR

CONSULTANT N. MOREHOUSE PROGRAMMER L. JUST

CALCULATE THE TEMPERATURE DISTRIBUTION IN A THIN METAL HORN UNDER VARIOUS CONDITIONS.

ANA REFERENCES ON FILE

1752 CHM171 EVALUATION OF THE BAKER FORMULA

REQUESTOR J. WING CHEMISTRY

PROGRAMMER J. GVILDYS

EVALUATION OF THE BAKER FORMULA FOR SPECIFIED COMBINATIONS OF A, N, AND Z.

704F REFERENCES AN M101 ON FILE DM PSB ZJ

1753 AMD172 STREAM LINES FOR HIGH OROLOGICAL OBSTACLES

REQUESTOR M. RIBARIC APPLIED MATHEMATICS

PROGRAMMER W. HAFNER

THE APPROXIMATE SOLUTION OF TWO SIMULTANEOUS FIRST ORDER DIFFERENTIAL EQUATIONS IS DESIRED.

7094F REFERENCES ON FILE D2

1755 HEP134 TAPE PREPARATION PROGRAM

REQUESTOR S. WARSHAW HIGH ENERGY PHYSICS

PROGRAMMER J. GREGORY

THE TRAFIT PROGRAM (1242/HEP108) REQUIRES A TAPE WITH SPECIAL BINARY LABELLING ON WHICH TO WRITE ITS OUTPUT. THIS PROGRAM IS FOR LABELLING SUCH TAPES.

7094F REFERENCES ON FILE 0 ZO

1756 RE ANALOG CALCULATION OF EBRII WITH POSITIVE POWER COEFFICIENT

REQUESTOR H. HUMMEL REACTOR ENGINEERING

CONSULTANT N. MOREHOUSE PROGRAMMERS L.BRYANT, W.SCOTT

DETERMINE THE FEASIBILITY OF OPERATING EBRII WITH A POSITIVE FEEDBACK COEFFICIENT.

ANA REFERENCES ON FILE

1758 CHM172 ANALYZING MAGNETS FOR THE CYCLOTRON

REQUESTORS W. RAMLER, CHEMISTRY
J. LIVINGOOD PHYSICS

PROGRAMMER J. WENGER

THIS PROGRAM PERFORMS CALCULATIONS FOR THE ANALYSIS OF MOMENTUM-ANALYZING MAGNETS FOR THE CYCLOTRON.

7094F REFERENCES ON FILE Z

1761 CEN(E212)GENERAL LEAST SQUARES PROGRAM

REQUESTOR W. SEEFELDT CHEMICAL ENGINEERING

PROGRAMMER C. CHAMOT

A GENERAL PROGRAM FOR THE LEAST SQUARES DETERMINATION OF THE COEFFICIENTS OF AN ARBITRARY FUNCTION, LINEAR IN THE COEFFICIENTS, INVOLVING ONE OR MORE VARIABLES.

704F REFERENCES ON FILE E2

1762 CEN116 GENERAL LEAST SQUARES PROGRAM

REQUESTOR W. SEEFELDT CHEMICAL ENGINEERING

PROGRAMMER N. WILLIAMSON

THIS IS TO BE A GENERAL PROGRAM TO PERFORM A LEAST SQUARES FIT OF DATA TO AN ARBITRARY FUNCTION. IT WILL ACCOMMODATE SEVERAL (INCLUDING ONE) INDEPENDENT VARIABLES, AND SEVERAL (INCLUDING NONE OR ONE) UNKNOWN NORMALIZING FACTORS ON SPECIFIED SUBSETS OF THE OBSERVED DATA.

704F REFERENCES ON FILE E2

1763 MET150 PREPARATION OF DATA CARDS FROM MET135 OUTPUT

REQUESTOR A. BERNDT METALLURGY

PROGRAMMER C. CHAMOT

CHANGE THE FORMAT OF THE MET135 OUTPUT TAPE FOR USE IN A SPECIAL REPORT.

704F REFERENCES 1209/MET135,ANL-6519 ON FILE DM PSB MO

1764 MET151 CRYSTAL COMPUTER GEOMETRY PROGRAM

REQUESTOR L. LLOYD METALLURGY

PROGRAMMER J. GVILDYS

A MONITOR VERSION OF MET143, MODIFIED TO ACCOMODATE THREE REFERENCE TRIPLETS IF DESIRED, INSTEAD OF TWO, AND TO ALTER THE OUTPUT FORMAT ACCORDINGLY.

704F REFERENCES ANL 6592,1482/MET143 ON FILE DM APSB MO

1766 RE295 DTK (LASL)

REQUESTOR L. TEMPLIN REACTOR ENGINEERING

CONSULTANT H. GREENSPAN PROGRAMMER G. DUFFY

THE CARLSON REVISION AND MODIFICATION OF DSN. THE METHOD WILL BE DESCRIBED IN A BOOK TO BE PUBLISHED BY ACADEMIC PRESS, METHODS IN COMPUTATIONAL PHYSICS, A CHAPTER ENTITLED, - THE NUMERICAL THEORY OF NEUTRON TRANSPORT.

THE DTK CODE INCLUDES A NEW SET OF DIFFERENCE EQUATIONS, AND IS INTENDED TO REPLACE DSN. IT IS WRITTEN IN FLOCO LANGUAGE.

790 REFERENCES ON FILE D2

1767 RE296 GAMMA SPECTRUM COMPUTATIONS

REQUESTOR R. ARMANI REACTOR ENGINEERING

PROGRAMMER G. JENSEN

TO FIT EXPERIMENTAL DATA TO A GAUSSIAN AND ALSO TO COMPUTE AREA, AREA CORRECTED FOR DECAY TIME, AND DISINTEGRATIONS PER SECOND PER MILLIGRAM.

704 REFERENCES 1021/RC101Z ON FILE E2

1768 RE297 ORTHONORMAL CONSTRUCTION

REQUESTOR R. GOLD REACTOR ENGINEERING

PROGRAMMER J. KOERNER

GIVEN A SET OF N LINEARLY INDEPENDENT FUNCTIONS F OF X THIS PROBLEM CONSTRUCTS THE MATRIX FORMED BY THE PRODUCT OF A ROW MATRIX CONTAINING CONSTANT ELEMENTS BY THE MATRIX WHICH TAKES F TO ORTHONORMAL FORM BY THE MATRIX F. IT ALSO CONSTRUCTS THE ABOVE MATRIX WHEN ZERO, PLUS OR MINUS DELTA IS RANDOMLY ADDED TO THE ELEMENTS OF MATRIX F.

704F REFERENCES ON FILE Z2

1769 RE298 CRAM (UKAEA)

REQUESTOR W. LOEWENSTEIN REACTOR ENGINEERING

PROGRAMMER A. RAGO

SOLVES THE MULTIGROUP DIFFUSION EQUATIONS IN BOTH ONE DIMENSION (SLAB, CYLINDER OR SPHERE) AND TWO DIMENSIONS (RZ, XY, R-THETA). UP TO 100 ENERGY GROUPS MAY BE USED WITH NEUTRONS SCATTERING FROM ANY GROUP TO ANY OTHER.

THE CODE WILL COMPUTE K EFFECTIVE OR WILL SEARCH FOR CRITICALITY BY VARYING MATERIAL COMPOSITION, REACTOR BUCKLING OR SPATIAL BOUNDARIES. IT WILL ALSO SOLVE SOURCE TYPE PROBLEMS.

THERE IS A STANDARD PRINT OF FINAL FLUX VALUES AND ADDITIONAL OUTPUT MAY BE OBTAINED THROUGH THE USE OF COMPILE ROUTINES.

79[illegible] REFERENCES TRG REPORT 229(R) ON FILE DO

1772 HEP135 AROMA

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

CONSULTANT J. BUTLER PROGRAMMER R. CLARK

THIS IS A PROGRAM FOR THE CHLOE SYSTEM WITH INCIDENTAL PROGRAMMING DEVELOPMENT TO BE DONE ON THE 704. THE OBJECTIVE IS THE ANALYSIS OF SPARK PHOTOGRAPHS TAKEN BY THE ARGONNE GROUP AT CERN, WITH A VIEW TOWARD RECOVERING INFORMATION ON ASSOCIATED LAMBDA PRODUCTION AND PERHAPS OTHER PHYSICAL INFORMATION.

704 REFERENCES ON FILE MO
CHL REFERENCES ON FILE MO

1773 IHS103 CALCULATION OF SOURCE TERMS FOR USE IN RE34

REQUESTOR N. DYER INDUSTRIAL HYGIENE AND SAFETY

PROGRAMMER J. MILLER

ASSUMING ISOTROPIC FLUX CALCULATE THE FIRST COLLISION SOURCE TERM IN A SPHERE.

704F REFERENCES ON FILE C3

1774 CHM173 DETERMINATION OF PEAKS OF ALPHA-RAY SPECTRUM

REQUESTOR J. MILSTED CHEMISTRY

CONSULTANT D. WOODWARD PROGRAMMER C. CHAMOT

THE ENERGY PEAKS OF ALPHA-RAY SPECTRUM ARE TO BE DETERMINED BY MAKING FITS TO GAUSSIAN DISTRIBUTION AND DENSITY FUNCTIONS.

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| 7094F REFERENCES | ON FILE | E2,G2 |
| GEO REFERENCES | ON FILE | E2,G2 |

1776 CHM174 AN X-RAY DIFFRACTION DATA PRELIMINARY REDUCTION PROGRAM (NRL)

REQUESTOR M. SCHIFFER CHEMISTRY

PROGRAMMER J. GVILDYS

THIS PROGRAM IS INTENDED TO ACCEPT ORDERED X-RAY DIFFRACTION INTENSITY DATA AND TO CALCULATE THE AVERAGE INTENSITIES FOR THE FILM PACK, CORRECTED FOR LORENTZ AND POLARIZATION EFFECTS. THE TAPE OUTPUT TO BE CONSISTENT WITH THE INPUT OF MET133 AND CHM154 PROGRAMS. THIS PROGRAM IS A SUBSET OF 1468/CHM153 PROGRAM.

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| 7094F REFERENCES USNRL5739 | ON FILE | MD |

1778 CHM175 CRITICAL IONIZATION CALCULATIONS FOR RARE GASES

REQUESTOR D. HUTCHISON CHEMISTRY

CONSULTANT D. PHILLIPS PROGRAMMER J. ANDERSON

THE CALCULATION OF IONIZATION CURRENTS FOR RARE GASES BY USE OF NUMERICAL INTEGRATION AND LINEAR PROGRAMMING TECHNIQUES.

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| 7094F REFERENCES | ON FILE | HDFOD1 |

1780 IINSE ANALOG COMPUTER INSTRUCTION

REQUESTOR J. BAIRD INTERNATIONAL INSTITUTE

PROGRAMMERS J. MCALLISTER,
L. JUST, W. SCOTT

PROVIDE ANALOG COMPUTER INSTRUCTIONS FOR STUDENTS FROM ST. PROCOPIUS COLLEGE.

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| ANA REFERENCES | ON FILE | |

1781 CEN117 TABULATION OF VAPOR PRESSURE OF PLUTONIUM HEXAFLUORIDE AND URANIUM HEXAFLUORIDE

REQUESTOR M. STEINDLER CHEMICAL ENGINEERING

PROGRAMMER J. ANDERSON

EVALUATION OF SEVERAL POLYNOMIALS TO OBTAIN A TABULATION OF VAPOR PRESSURE FOR PLUTONIUM HEXAFLUORIDE AND URANIUM HEXAFLUORIDE.

704F REFERENCES ON FILE DM PSB ZO

1782 CHM176 TABULATION OF DIFFERENCES AND AVERAGES OF EXPERIMENTAL ISOTOPE MASS DATA

REQUESTOR J. WING CHEMISTRY

PROGRAMMER J. GVILDYS

EVALUATION OF DIFFERENCES AND AVERAGES FOR SPECIFIED COMBINATIONS OF A, Z AND M.

704F REFERENCES ON FILE DM APSB ZO

1783 RPY141 MEASUREMENT OF SMOKE PLUMES

REQUESTOR H. MOSES RADIOLOGICAL PHYSICS

CONSULTANT J. BUTLER PROGRAMMER J. WENGER

ORTHOGONAL VIEWS OF SMOKE PLUMES ARE GIVEN AS PHOTOGRAPHS ON 35 MM FILM. A PROGRAM FOR THE CHLOE SYSTEM IS TO BE PREPARED TO ENABLE THE DIMENSIONS OF THE PLUMES TO BE MEASURED AUTOMATICALLY. THESE MEASUREMENTS ARE TO BE USED FOR RECONSTRUCTION OF THE GENERAL SHAPE OF THE PLUMES IN THREE DIMENSIONS AND DETERMINATION OF THEIR DIRECTION OF FLOW AND RATE OF SPREAD.

THE LATER STAGES OF THE CALCULATION PROCEDURE MAY REQUIRE USE OF THE 704.

704F REFERENCES ON FILE MO
CHLF REFERENCES ON FILE MO

1784 HEP136 MONTE CARLO CALCULATION OF THE BACKGROUND IN THE PION-PROTON CHARGE EXCHANGE SCATTERING EXPERIMENT

REQUESTOR S. WARSHAW HIGH ENERGY PHYSICS

PROGRAMMER P. PENNOCK

THIS PROGRAM USES A THREE-BODY DECAY MONTE CARLO PROCEDURE TC GENERATE THE NEUTRON AND THE TWO PIONS WHICH CAN ARISE FROM THE INTERACTION BETWEEN A NEGATIVE PION AND A PROTON. IT THEN USES A TWO-BODY DECAY PROCEDURE ON EACH OF THE PIONS SEPARATELY TC GENERATE THE GAMMA RAYS ARISING FROM THEIR DECAY. THE DIRECTIONS OF THE GAMMA RAYS ARE THEN CHECKED TO SEE HOW MANY ARE DETECTED IN EACH EVENT.

THE RESULTS CAN BE USED TO ESTIMATE THE BACKGROUND ARISING IN AN EXPERIMENT WHERE THE INTERACTION BEING STUDIED GIVES RISE TO ONE NEUTRAL PION AND A NEUTRON.

704F REFERENCES 1784/HEP136B ON FILE DM APSB G6
704F REFERENCES ON FILE DM APSB G6

1785 RE299 HECTIC-II (AGN)

REQUESTOR B. HOGLUND REACTOR ENGINEERING

PROGRAMMER M. SCHLAPKOHL

HEAT TRANSFER ANALYSIS OF GAS OR LIQUID-COOLED REACTOR PASSAGES.

790 REFERENCES IDO-28595 ON FILE DJ

1786 HEP137 MONTE CARLO CALCULATION OF THE EFFICIENCY WITH WHICH NEUTRAL DECAYS CAN BE OBSERVED

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

PROGRAMMER P. PENNOCK

THE PREVIOUS MONTE CARLO PROGRAM (1730/HEP132) CALCULATES THE PROBABILITY OF INTERSECTION WITH A PLANE AREA OF A GAMMA RAY EMITTED IN OMEGA DECAY. THE FOLLOWING MODIFICATION IS PROPOSED TO TREAT DECAYS INTO CHARGED PARTICLES, TAKING ACCOUNT OF A MAGNETIC FIELD. THE MAGNETIC FIELD IS, AT LEAST TO START WITH, ASSUMED TO BE UNIFORM.

CONSIDER, AS AN EXAMPLE, THE REACTION PI-MINUS+PROTON GOES TO LAMBDA-ZERO+K-ZERO, FOLLOWED BY K-ZERO GOES TO PI-PLUS+PI-MINUS, LAMBDA-ZERO GOES TO PROTON+PI-MINUS AND ASK, WHAT IS THE LIKELIHOOD OF DETECTION OF THE TWO PIONS INTO WHICH THE K-ZERO DECAYS. THE PROCEDURE IS THE SAME AS BEFORE, FIRST CHOOSE A RANDOM DIRECTION IN SPACE FOR THE PION DIRECTION IN THE K-ZERO CM SYSTEM, LORENTZ-TRANSFORM BACK TO THE LAB TO OBTAIN THE INITIAL MOMENTUM AND DIRECTION OF THE PIONS. NEXT LOOK FOR AN INTERSECTION OF THE PION TRAJECTORY AND THE DETECTOR, HOWEVER, NOW THE PION TRAJECTORY IS A HELIX RATHER THAN A STRAIGHT LINE, SO THAT THE COMPUTATION IS SOME-WHAT DIFFERENT.

AN EXACTLY SIMILAR COMPUTATION CAN BE MADE TO FIND THE PROBABILITY OF DETECTION OF ONE OR BOTH PARTICLES FROM LAMBDA DECAY INTO PROTON PLUS PION.

ONE ADDITIONAL MODIFICATION NECESSARY IS TO FIND THE DISTANCE TRAVERSED BY THE DECAYING STRANGE PARTICLE FROM ITS PLACE OF BIRTH TO ITS DECAY, AND TO ADD A FACTOR FOR SURVIVAL PAST THE BOUNDARY OF AN ANTI-COINCIDENCE COUNTER.

7?4F REFERENCES 173C/HEP132 ON FILE R?

1787 BIM117 CHROMOSOME PAIRING

REQUESTOR A. STROUD BIOLOGICAL AND MEDICAL RESEARCH

CONSULTANT J. BUTLER PROGRAMMER M. BUTLER

CULTURES OF LIVE CELLS ARE TREATED WITH THE DRUG COLCEMIDE IN ORDER TO ARREST THE MITOSIS PROCESS IN METAPHASE AND THUS INCREASE THE PROPORTION OF THE POPULATION IN THIS STAGE OF DIVISION. THE CULTURE IS THEN TREATED WITH A HYPERTONIC SOLUTION TO DISPERSE THE CELL MATERIAL AND EXHIBIT THE CHROMOSOMES AS DISTINCT ENTITIES, BUT IN A MORE OR LESS RANDOM ARRANGEMENT. AFTER STAINING, PHOTOMICROGRAPHS OF THE IRREGULARLY ARRANGED CHROMOSOMES ARE TAKEN ON 35 MM FILM SO THAT THEY CAN BE MEASURED WITH THE CHLOE MACHINE. THE OBJECTIVE OF THE COMPUTER PROGRAMS IS TO PAIR EACH CHROMOSOME WITH ITS CORRESPONDING ONE ON THE BASIS OF SHAPE SIMILARITY. THE INITIAL APPROACH TO THE PROBLEM IS TO EFFECT A TAXONOMIC CLASSIFICATION, USING AS (CONTINUOUS) ATTRIBUTES ALGEBRAIC COMBINATIONS OF MOMENTS WHICH ARE INVARIANT UNDER THE GROUP OF RIGID MOTIONS IN THE PLANE.

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| 7?4F | REFERENCES | ON FILE | T1 |
| CHL | REFERENCES | ON FILE | T1 |

1791 CHM MULTIPLE-ION TRAJECTORIES IN A NON-UNIFORM MAGNETIC FIELD

REQUESTOR G. MAVROGENES CHEMISTRY

CONSULTANT N. MOREHOUSE PROGRAMMER L. BRYANT

ION TRAJECTORIES IN A NON-UNIFORM MAGNETIC FIELD WERE STUDIED TO DETERMINE THE POSSIBILITY OF USING THE FIELD TO FOCUS THE IONS.

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| ANA | REFERENCES | ON FILE | |

1795 RE300 MAGNETOHYDRODYNAMIC EFFECTS UPON LAMINAR FILM CONDENSATION

REQUESTOR R. SINGER REACTOR ENGINEERING

PROGRAMMER C. BURLESON

THE EFFECTS OF AN ELECTROMAGNETIC FIELD UPON THE HYDRODYNAMIC AND HEAT TRANSFER CHARACTERISTICS OF A CONDENSING VAPOR ARE STUDIED. THE FIELD IS IMPOSED IN SUCH A FASHION TO PROVIDE AN ADDITIONAL FORCE TO ACCELERATE OR DECELERATE THE FLOW OF THE ELECTRICALLY CONDUCTING CONDENSATE, THUS INCREASING OR DECREASING THE HEAT TRANSFER RATES.

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| 7?4F | REFERENCES | ON FILE | D2 |

1797 MET152 SPECIAL POLYNOMIAL EVALUATION

REQUESTOR K. MYLES METALLURGY

PROGRAMMER N. WILLIAMSON

EVALUATION OF THE POLYNOMIAL -
T=406.61026+107.629232ER-1.233480ER**2 FOR ER=4.5(.01)10.5.

704F REFERENCES ON FILE DM PSB M2

1798 RPY142 WIND MATRICES

REQUESTOR H. CRUTCHER RADIOLOGICAL PHYSICS

CONSULTANT D. WOODWARD PROGRAMMER B. GARBOW

TO DETERMINE DIRECTION COSINES, EIGENVALUES AND THEIR SQUARE ROOTS, AND EIGENVECTORS OF APPROXIMATELY 200 3X3 REAL SYMMETRIC MATRICES.

704F REFERENCES AN F203 ON FILE DM PSB F2

1799 SSS135 DIFFUSION OF PARTICLES IN A CYLINDER TOWARD A SINK

REQUESTOR J. JACKSON SOLID STATE SCIENCE

PROGRAMMER J. GVILDYS

GIVEN AN INITIAL (UNIFORM) CONCENTRATION AND TEMPERATURE, DETERMINE THE PARTICLE CONCENTRATION ALONG THE RADIUS OF A CYLINDER TOWARD A CENTRAL SINK AS A FUNCTION OF RADIUS AND TIME (TEMPERATURE).

704F REFERENCES ON FILE D2

1800 AMD171 ASSOCIATIVE LAW IN FINITE TABLES

REQUESTOR W. GIVENS APPLIED MATHEMATICS

CONSULTANT H. WILF PROGRAMMER N. CLARK

GIVEN A MULTIPLICATION TABLE T ON N SYMBOLS, THE INTEGER FUNCTION M(T) IS CALCULATED, WHERE M IS THE NUMBER OF CASES IN WHICH THE ASSOCIATIVE LAW HOLDS. SINCE THE NUMBER OF POSSIBLE TABLES IS N TO THE N**2 POWER, A RANDOM NUMBER GENERATOR IS USED TO PRODUCE STATISTICAL SAMPLES FOR N GREATER THAN 3. ALL VALUES IN THE RANGE (0,N**3) ACTUALLY OCCUR FOR N=3,4,5,6 AND 7 BY MACHINE COMPUTATION AND FOR ALL LARGER N BY AN INDUCTION DUE TO WILF AND STRAUS. FOR N=3 THE 19,683 VALUES OF M HAVE BEEN TABULATED AND ARE BEING ANALYZED.

704 REFERENCES ON FILE Z0

1802 CEN119 METAL FLUX DISTRIBUTION STUDIES

REQUESTOR J. KNIGHTON CHEMICAL ENGINEERING

PROGRAMMER F. CLARK

THIS PROGRAM CONSISTS OF THREE PARTS -

PART 1 METAL PHASE CALCULATIONS - GIVEN THE WEIGHT PERCENTS AND MOLECULAR WEIGHTS OF THE ELEMENTS IN A SOLUTION, CALCULATE THE NUMBER OF MOLES PER UNIT WEIGHT AND THE MOLE PERCENT OF EACH OF THESE ELEMENTS.

PART 2 FLUX PHASE CALCULATIONS - GIVEN THE WEIGHT PERCENT OF THE METAL IN THE FLUX PHASE AND THE MOLECULAR WEIGHT OF THE METAL AND OF ITS SALT, CALCULATE THE WEIGHT PERCENT, THE NUMBER OF MOLES PER UNIT WEIGHT, AND THE MOLE PERCENTS OF BOTH SALTS.

PART 3 DISTRIBUTION CALCULATIONS - CALCULATE THE RATIO OF THE WEIGHT PERCENT OF THE METAL IN THE FLUX PHASE TO THAT IN THE METAL PHASE, AND THE RATIO OF THE MOLE PERCENT OF THE SALT IN THE FLUX PHASE TO THAT OF THE METAL IN THE METAL PHASE.

704F REFERENCES ON FILE Z

1805 AMD172 APACHE (CCR)

REQUESTOR M. BUTLER APPLIED MATHEMATICS

PROGRAMMER L. JUST

TO USE THE APACHE PROGRAM PREPARED BY CETIS, C.C.R., TO EVALUATE FUTURE USE OF THIS TYPE PROGRAM FOR OUR MACHINES. THE PROGRAM IS WRITTEN TO CARRY OUT PRELIMINARY OPERATIONS NECESSARY FOR THE STUDY OF A PROBLEM ON THE ANALOG COMPUTER.

790 REFERENCES ON FILE B Z

1806 AMD173 CHLOE CALIBRATION PROGRAM

REQUESTOR R. ROYSTON APPLIED MATHEMATICS

PROGRAMMER D. CARSON

IN USING THE CHLOE SYSTEM TO MEASURE PHOTOGRAPHS AUTOMATICALLY, IT IS COMMONLY NECESSARY TO MAKE AVAILABLE TO THE MEASURING PROGRAM THE SCANNER COORDINATES OF CERTAIN REGIONS OF THE PHOTOGRAPH WHEREIN PARTICULAR OBJECTS ARE LOCATED IN EVERY FRAME. IN ORDER TO OBTAIN THESE COORDINATES, IT IS NECESSARY TO DISPLAY A TYPICAL PHOTOGRAPH ON THE SCOPE ENLARGING A CERTAIN SUB-REGION OF IT IF NECESSARY, AND TO BE ABLE TO SUPERIMPOSE ON THE IMAGE A RECTANGULAR BOX WHOSE SIZE AND POSITION ARE CONTROLLED BY THE OPERATOR. WHEN THE BOX HAS BEEN BROUGHT TO THE REQUIRED POSITION, ITS COORDINATES (X-LOW, X-HIGH, Y-LOW, AND Y-HIGH) MUST BE PUNCHED OUT.

CHL REFERENCES ON FILE T1

1811 RPY143 AUTOCORRELATION AND POWER SPECTRUM ANALYSIS

REQUESTOR H. CRUTCHER RADIOLOGICAL PHYSICS

PROGRAMMER J. WENGER

SPECTRUM ANALYSIS OF TIME SERIES OF SOIL TEMPERATURE MEASUREMENTS. USE IS MADE OF CS TUKS-TUKEY SPECTRUM ESTIMATION, SHARE DIST. 574. A PRELIMINARY PROGRAM TO FILTER THE DATA FOR TUKS IS TO BE WRITTEN - TEMPERATURE MEASUREMENTS ARE REPLACED BY THEIR RESPECTIVE DEVIATIONS FROM THE MEAN FOR THEIR MONTHS.

704F REFERENCES ON FILE G2

1815 RPY144 COSMIC RAY STUDY

REQUESTOR H. MAY RADIOLOGICAL PHYSICS

CONSULTANTS J. COOK, J. VAN RYZIN PROGRAMMER R. HAMELINK

THE MEAN PATH LENGTH AND MOST PROBABLE PATH LENGTH TRAVELLED BY COSMIC RAYS THROUGH A 1M. CHAMBER WITH 2.5CM. THICK WALLS ARE TO BE DETERMINED. THE COSMIC RAYS STRIKE THE CHAMBER WITH INTENSITY DISTRIBUTED AS I(X)=I MULTIPLIED BY THE SQUARE OF THE COSINE OF X, WHERE X IS THE ANGLE MEASURING THE VERTICAL DISPLACEMENT. THIS IS PURELY A GEOMETRIC PROBLEM SINCE FOR COSMIC RAYS NO CHANGE IN INTENSITY OCCURS REGARDLESS OF THE CONSTRUCTION OF THE CHAMBER.

704F REFERENCES ON FILE RJ,G6

1819 RE301 FREE CONVECTION HEAT TRANSFER OF ELECTRICALLY CONDUCTING FLUIDS - EFFECTS OF NON-UNIFORM AND UNSTEADY MAGNETIC FIELDS AND WALL THERMAL CONDITIONS

REQUESTOR R. SINGER REACTOR ENGINEERING

PROGRAMMER N. JESSE

THE EFFECTS OF NON-UNIFORM AND UNSTEADY MAGNETIC FIELDS AND BOUNDARY THERMAL CONDITIONS ON THE FREE CONVECTION FLOW AND HEAT TRANSFER OF AN ELECTRICALLY CONDUCTING FLUID IS ANALYZED. SEVERAL GENERAL CLASSES OF MAGNETIC FIELDS AND THERMAL BOUNDARY CONDITIONS ARE INCLUDED.

704F REFERENCES ON FILE D2

1820 RE302 MHD FILM CONDENSATION - SOLUTION VALID FOR LARGE VALUES OF ZETA

REQUESTOR R. SINGER REACTOR ENGINEERING

PROGRAMMER N. JESSE

A PREVIOUS PROBLEM DESCRIBING THE EFFECT OF AN ELECTROMAGNETIC FIELD ON LAMINAR FILM CONDENSATION IS REFORMULATED IN ORDER TO INCLUDE LARGE VALUES OF THE PARAMETER ZETA (ESSENTIALLY PROPORTIONAL TO THE MAGNETIC FIELD INTENSITY).

704F REFERENCES 1795/RE300 ON FILE D2

1821 PHY285 TSALLY (ORNL)

REQUESTOR J. ERSKINE PHYSICS

PROGRAMMER M. BUTLER

THE CODE CALCULATES TRANSITION AMPLITUDES AND CROSS SECTIONS FOR DIRECT NUCLEAR REACTIONS USING THE DISTORTED-WAVE BORN APPROXIMATION. A DETAILED DISCUSSION OF THIS CODE IS GIVEN IN A REPORT BY R. H. BASSEL, R. M. DRISKO, AND G. R. SATCHLER, (THE DISTORTED-WAVE THEORY OF DIRECT NUCLEAR REACTIONS), ORNL-3240.

790 REFERENCES ON FILE Z

1822 PHY286 PAPER TAPE TO PUNCHED CARD CONVERSION

REQUESTOR E. SHERA PHYSICS

PROGRAMMER G. ROBINSON

CONVERSION OF PUNCHED PAPER TAPE FROM NUCLEAR DATA MULTICHANNEL ANALYZER USING GEORGE CHARACTER CODE SET 1.0 TO PUNCHED CARDS IN FORMAT 10F6.0. PRINTED OUTPUT IS PROVIDED FOR VISUAL EXAMINATION OF THE DATA.

160 REFERENCES ON FILE Z3

1823 CEN120 CALCULATION OF X-RAY POWDER DIFFRACTION PATTERNS (LRL-L)

REQUESTOR R. SCHABLASKE CHEMICAL ENGINEERING

PROGRAMMER F. CLARK

THIS PROGRAM USES THE LAUE SYMMETRY GROUP OF THE CRYSTAL AS A GUIDE AND GENERATES ALL NON-REDUNDANT MILLER INDICES. REFLECTIONS NOT ALLOWED BY THE SPACE GROUP ARE ELIMINATED AND THE D-SPACINGS FOR THE REMAINING REFLECTIONS ARE CALCULATED. THE INDICES ARE THEN ORDERED BY D-VALUES AND THE STRUCTURE FACTORS ARE CALCULATED. THESE FACTORS ARE CONVERTED TO POWDER INTENSITIES BY SQUARING AND APPLYING CORRECTIONS FOR THERMAL MOTION, MULTIPLICITY, LORENTZ-POLARIZATION EFFECTS, AND ABSORPTION.

790 REFERENCES UCRL-7196 ON FILE Z3

1824 PAD142 A STUDY OF THE EFFECT OF THE LIP FOR ZGS

REQUESTORS A. YOKOSAWA, S. SUWA PARTICLE ACCELERATOR

CONSULTANT W. COWELL PROGRAMMER J. MILLER

THIS PROGRAM IS TO SIMULATE THE PROCESS OF SPIRALLING THE BEAM IN ON TO THE TARGET, TAKING INTO ACCOUNT BOTH THE COULOMB ANGLE SCATTERING AND THE LANDAU ENERGY LOSS DISTRIBUTION OF THE PARTICLES IN THE LIP. PARTICLES ARE CHOSEN AT RANDOM AND THEIR PROGRESS TRACED TURN BY TURN.

704F REFERENCES ON FILE G6

1825 AMD174

REQUESTORS E. BAREISS, I. POLLACK — APPLIED MATHEMATICS CENTRAL SHOPS

PROGRAMMER B. GARBOW

CALCULATION OF CRITICALITY CONDITION FOR PERIODIC GEOMETRY OF THE BOLTZMANN EQUATION.

704F REFERENCES — ON FILE — D

1827 CHM CALCULATION OF RATE CONSTANTS IN PULSED RADIOLYSIS

REQUESTOR J. RABANI — CHEMISTRY

PROGRAMMERS L. JUST, W. SCOTT

GENERATE THE CONCENTRATION FUNCTIONS VS. TIME FOR IONS IN SOLUTION.

ANA REFERENCES — ON FILE

1828 PAD ANALOG SIMULATION OF A VOLTAGE DOUBLER

REQUESTOR H. VOGEL — PARTICLE ACCELERATOR

CONSULTANT N. MOREHOUSE — PROGRAMMER L. JUST

PROGRAM THE CIRCUIT EQUATIONS OF THE PROPOSED VOLTAGE DOUBLER FOR CHARGING THE 105 KILOJOULES HORN-OF-PLENTY CAPACITOR BANK. OBTAIN THE INTEGRAL (I**2)*DT OF THE CHARGING CURRENT. MAKE AN HARMONIC ANALYSIS OF THE TRANSFORMER CURRENT. PROVIDE THE TIME PLOTS OF THE CHARACTERISTIC CURRENTS AND THE BANK VOLTAGE FOR VARIOUS CIRCUIT PARAMETER SETTINGS.

ANA REFERENCES — ON FILE

1829 SSS136 DIATOMIC SCF

REQUESTOR T. GILBERT — SOLID STATE SCIENCE

PROGRAMMER C. CHAMOT

ANL-SSS-DIATOMIC-SCF PROGRAM WRITTEN BY CHRIS WAHL FOR THE IBM709 IS TO BE REPROGRAMMED FOR THE CDC3600, IN FORTRAN 63 WHEREVER POSSIBLE.

36CF REFERENCES — ON FILE — Z, F

1830 SSS137 ATOMIC SCF-6A

REQUESTOR T. GILBERT SOLID STATE SCIENCE

PROGRAMMER C. CHAMOT

ANL-SSS-ATOMIC SCF-6A PROGRAM WRITTEN BY PAUL BAGUS FOR THE IBM704 IS TO BE REPROGRAMMED FOR THE CDC3600, IN FORTRAN 63 WHEREVER POSSIBLE.

360F REFERENCES ON FILE Z0,F0

1832 AMD175 COGENT - A COMPILER AND GENERALIZED TRANSLATOR

REQUESTOR J. REYNOLDS APPLIED MATHEMATICS

COGENT IS A COMPILER WHICH WILL RUN ON THE 3600 AND PRODUCE OBJECT CODE FOR THE 3600. ITS INPUT LANGUAGE, CALLED THE COGENT METALANGUAGE, IS SPECIFICALLY ORIENTED TO DESCRIBING COMPILATION AND SYMBOL-MANIPULATING PROCESSES WHICH INVOLVE SYNTAX ANALYSIS AND LIST PROCESSING. MACHINE TIME IS REQUESTED FOR DEVELOPING AND DEBUGGING THE COGENT SYSTEM AND FOR USING IT TO COMPILE COMPILERS AND PROGRAMS FOR ALGEBRAIC MANIPULATION.

360 REFERENCES ON FILE Z0

1833 CEN121 NATURAL CONVECTION HEAT TRANSFER CALCULATIONS

REQUESTOR R. AKINS CHEMICAL ENGINEERING

PROGRAMMER A. STRECOK

GIVEN A SET OF INPUT VALUES, THIS PROGRAM COMPUTES A TABLE OF 5 FUNCTIONS.

704F REFERENCES ON FILE DM PSB Z0
GEO REFERENCES ON FILE Z0

1834 TPD101 KWIC TECHNICAL PUBLICATIONS REPORT

REQUESTOR M. FIELDHOUSE TECHNICAL PUBLICATIONS

PROGRAMMER R. MORRILL

A PROGRAM HAS BEEN PREPARED TO ACCEPT CARDS PREPARED FROM THE TECHNICAL PUBLICATIONS MONTHLY LISTINGS AND TO PROCESS THESE FOR PUBLICATION AS SEMIANNUAL OR ANNUAL COMPILATIONS IN THREE PARTS -

1) A DIVISION BY DIVISION LISTING OF THE BIBLIOGRAPHY ITEMS IN SEQUENTIAL NUMBER ORDER
2) AN ANL AUTHOR INDEX FOR EACH ITEM IN ALPHABETICAL ORDER
3) A KWIC INDEX OF EACH TITLE WITH EACH KEYWORD LISTED, IN ALPHABETICAL ORDER.

AN EXCLUSION LIST WILL BE USED.

| | | | |
|---|---|---|---|
| 160 | REFERENCES | ON FILE | M2 |
| 360 | REFERENCES | ON FILE | M2 |

1835 LDO DEMONSTRATION

REQUESTOR A. KRISCIUNAS LABORATORY DIRECTORS OFFICE

PROGRAMMER J. MCALLISTER

ANALOG DEMONSTRATION FOR FOUR GROUP TOURS.

| | | |
|---|---|---|
| ANA | REFERENCES | ON FILE |

1836 HEP139 SPATIAL AND KINEMATIC RECONSTRUCTION OF NEUTRINO FACILITY SPARK CHAMBER EVENTS

REQUESTOR T. NOVEY HIGH ENERGY PHYSICS

PROGRAMMER P. PENNOCK

1) RECONSTRUCT SPATIAL POINTS FROM MEASUREMENTS ON SCAMP.
2) DETERMINE DIRECTION COSINES OF TRACKS AT THE VERTICES AND MOMENTUM FROM TRACK CURVATURE.
3) KINEMATIC RECONSTRUCTION OF EVENTS.

| | | | |
|---|---|---|---|
| 704F | REFERENCES | ON FILE | E2 |

1837 PAD143 PLATE ANALYSIS - HORN OF PLENTY

REQUESTOR J. HEAP PARTICLE ACCELERATOR

PROGRAMMER W. NICO

SOME MATHEMATICAL ANALYSIS (DIFFERENTIAL EQUATIONS) AND NUMERICAL CALCULATIONS ARE TO BE CHECKED PREPARATORY TO THE PUBLISHING OF A RELATED PAPER.

704F REFERENCES ON FILE DO

1841 AMD176 CHECKER-PLAYING PROGRAM

REQUESTOR W. COWELL APPLIED MATHEMATICS

PROGRAMMER M. REED

A PROGRAM THAT PLAYS CHECKERS AND IMPROVES ITS PLAY THROUGH EXPERIENCE AND COACHING IS BEING WRITTEN IN IPL-V. MANY OF THE PRINCIPLES OF THE WELL-KNOWN CHECKER-PLAYING PROGRAM OF SAMUEL WILL BE EMBODIED, BUT MODIFICATIONS ARE ANTICIPATED FOR THE PURPOSE OF

1) EXPRESSING SUCH A PROGRAM IN MACHINE-INDEPENDENT, LIST PROCESSING TERMS, HOPEFULLY POINTING TOWARD MORE GENERAL LEARNING PROGRAMS,
2) INCREASING THE AMOUNT OF MAN-MACHINE INTERACTION IN THE LEARNING PROCESS.

SINCE THE 704 IS THE ONLY MACHINE NOW AT ARGONNE WITH AN IPL-V INTERPRETIVE SYSTEM, TIME IS REQUESTED FOR CHECKING OUT THE SYSTEM AND DEBUGGING THE CHECKER-PLAYING PROGRAM.

704 REFERENCES ON FILE ZO

1843 SSS138

REQUESTOR R. HUEBENER SOLID STATE SCIENCE

PROGRAMMER A. STRECOK

THIS PROGRAM EVALUATES AN ARCTAN OF A RATIO WHICH INVOLVES BESSEL FUNCTIONS.

704F REFERENCES ON FILE C3

1846 PHY287

REQUESTOR R. RINGO PHYSICS

PROGRAMMER R. ROSICH

THIS PROGRAM ACCEPTS MAGNETIC TAPE OUTPUT FROM 1845/PHY286 AND PUNCHES A PAPER TAPE IN SUITABLE FORMAT FOR INPUT TO 1312/PHY237.

GEO REFERENCES ON FILE Z

1847 MET154 PREPARATION OF SPECIAL INPUT TAPE FOR 1017/ME(CHM119)

REQUESTOR M. MUELLER METALLURGY

PROGRAMMER W. NICO

A CARD DECK CONTAINING ALL NECESSARY INFORMATION FOR PREPARING CHM119 INPUT DATA IS TO BE USED TO PREPARE A CHM119 INPUT TAPE.

7094F REFERENCES ON FILE M

1849 CHM177 ATOMIC ENERGY LEVEL CALCULATION (LRL)

REQUESTOR B. WYBOURNE CHEMISTRY

PROGRAMMER F. CLARK

THIS IS A 7090 PROGRAM (FORTRAN, FAP), WRITTEN AT LAWRENCE RADIATION LABORATORY, TO CONSTRUCT AND DIAGONALIZE ENERGY MATRICES TO YIELD ATOMIC ENERGY LEVELS.

7090 REFERENCES ON FILE F

1850 RE303 ITERATIVE SOLUTION OF THE MATRIX REPRESENTATION OF DETECTION SYSTEMS

REQUESTOR R. GOLD REACTOR ENGINEERING

PROGRAMMER N. JESSE

A FREDHOLM EQUATION USED FOR UNFOLDING THE OUTPUT DATA OF A DETECTION SYSTEM IS REPRESENTED IN MATRIX FORM AND SOLVED BY MEANS OF AN ITERATIVE METHOD.

7094F REFERENCES RED-EPM114 ON FILE D

1851 HEP140 MONTE CARLO CALCULATION OF THE EFFICIENCY WITH WHICH ETA DECAYS CAN BE OBSERVED

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

PROGRAMMER P. PENNOCK

THE PROGRAM IS TO FIND THE EFFICIENCY FOR DETECTING TWO GAMMA RAY DECAYS RESULTING FROM THE FOLLOWING REACTIONS -
PI-MINUS + PROTON GOES TO ETA-ZERO + NEUTRON. ETA-ZERO GOES TO 2 GAMMA RAYS.

704F REFERENCES ON FILE G6

1857 SSS139 BAND STRUCTURE OF ANTIMONY - THE COHEN MODEL

REQUESTOR Y. ECKSTEIN SOLID STATE SCIENCE

PROGRAMMER W. NICO

THIS CODE EVALUATES A, THE AREA OF THE CROSS SECTION OF A PLANE CUTTING A FERMI SURFACE AT ITS EXTREMUM, WHERE A IS EXPRESSED IN TERMS OF TRIGONOMETRIC FUNCTIONS AND ELLIPTIC INTEGRALS.

704F REFERENCES ON FILE Z0

1858 AMU103

REQUESTOR H. FAUSKE ASSOCIATED MIDWEST UNIVERSITIES

PROGRAMMER J. ZAPATKA

THIS CODE CALCULATES THE 2-PHASE CRITICAL FLOW FOR LIQUID METALS.

704F REFERENCES ON FILE Z0

1866 CHM178 CONVERSION COEFFICIENT INTERPOLATION

REQUESTOR P. DAY CHEMISTRY

PROGRAMMER A. STRECOK

THIS PROGRAM PERFORMS INTERPOLATIONS ON FOUR SETS OF INPUT TABLES AND PRODUCES A NEW TABLE WHICH CORRESPONDS TO A FUNCTION DETERMINED BY THE GIVEN SETS.

704F REFERENCES ON FILE E1

1867 SSS147 FOURIER COEFFICIENTS OF A CRYSTAL POTENTIAL

REQUESTOR J. WILKINS SOLID STATE SCIENCE

PROGRAMMER J. ANDERSON

A GENERAL PROGRAM FOR EVALUATION OF FOURIER COEFFICIENTS OF A CRYSTAL POTENTIAL.

7?4F REFERENCES ON FILE D1

1868 RE FAST REACTOR EXCURSION SIMULATION

REQUESTORS C. DICKERMAN, REACTOR ENGINEERING
D. GOPINATH REACTOR ENGINEERING

CONSULTANT N. MOREHOUSE PROGRAMMER L. BRYANT

OBTAIN THE DETAILED TEMPERATURE DISTRIBUTION IN AN AVERAGE FUEL ELEMENT DUE TO CHANGE IN ANY OF THE OPERATING CONDITIONS OF THE REACTOR.

CALCULATE THE CHANGE IN REACTIVITY OF THE SYSTEM.

CALCULATE THE POWER CHANGE DUE TO CHANGE IN REACTIVITY, TAKING INTO ACCOUNT THE FEEDBACK REACTIVITY AND THE EXTERNALLY INSERTED REACTIVITY.

ANA REFERENCES ON FILE

1871 CHM179 LEAST SQUARES FIT

REQUESTOR J. WEIL CHEMISTRY

PROGRAMMER A. STRECOK

THIS PROGRAM EMPLOYS AN-M-E208 TO OBTAIN A LEAST SQUARES FIT TO THE FUNCTION Y=SQUARE ROOT OF (B(1)+B(2)*SIN(X-B(3))) WHERE X IS THE INDEPENDENT VARIABLE (IN DEGREES).

7?4F REFERENCES ON FILE E2

1872 HEP141 AROMA CALIBRATION INFORMATION PREPARATION PROGRAM

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

PROGRAMMER R. RICE

THIS PROGRAM ACCEPTS DATA FROM THE ASI-210 ON-LINE TYPEWRITER AND FROM PUNCHED PAPER TAPES PREPARED BY THE GENERAL PURPOSE CALIBRATION PROGRAM 1806/AMD173 AND PUNCHES TAPES CONTAINING INFORMATION IN THE FORMAT REQUIRED FOR INPUT TO THE AROMA SPARK CHAMBER PHOTOGRAPH MEASURING PROGRAM 1772/HEP135.

CHL REFERENCES ON FILE M1

1873 HEP142 CONVERT

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

PROGRAMMER R. RICE

THIS PROGRAM IS TO TAKE THE SPARK CHAMBER MEASUREMENTS GENERATED BY AROMA (1772/HEP135) AND REMOVE THE OPTICAL DISTORTIONS INTRODUCED BY -

(A) THE CHLOE SCANNER.
(B) THE OPTICAL SYSTEM ASSOCIATED WITH THE ORIGINAL SPARK CHAMBER.

360F REFERENCES ON FILE R2

1874 CEN122 LAMINAR FREE CONVECTION HEAT TRANSFER OF A VERTICAL PLATE WITH UNIFORM SURFACE HEAT FLUX

REQUESTOR R. AKINS CHEMICAL ENGINEERING

PROGRAMMER W. NICO

THIS PROGRAM IS TO INVESTIGATE THE LAMINAR FREE CONVECTION HEAT TRANSFER OF A VERTICAL PLATE WITH UNIFORM SURFACE HEAT FLUX, TAKING INTO ACCOUNT THE EFFECT OF THE THERMAL BOUNDARY LAYER.

704F REFERENCES ON FILE D2

1877 CEN124 LEAST SQUARES DETERMINATION OF PARAMETERS COMMON TO TWO FUNCTIONAL FORMS

REQUESTOR M. FOSTER CHEMICAL ENGINEERING

PROGRAMMER N. WILLIAMSON

DETERMINE, BY A LEAST SQUARES PROCEDURE, THE PARAMETERS IN THE FOLLOWING EQUATION, WHERE, FOR EACH OBSERVED DATA POINT, ONE AND ONLY ONE OF THE TWO INDEPENDENT VARIABLES X(1) AND X(2) WILL HAVE A NON-ZERO VALUE, AND WHERE Q=1 IF X(1) IS NOT ZERO AND Q=0 IF X(1) IS ZERO.

```
F=A*((1-X(1))**2*Q+X(2)**2)+B*((1-X(1))**2*2*X(1)+X(2)**2*(2*X(2)-1))
  +G*((1-X(1))**2*3*X(1)**2+X(2)**2*(3*X(2)**2-2*X(2))).
```

704F REFERENCES ON FILE E2

1879 HEP143 TIME DISPERSIONS IN PHOTOMULTIPLIER PULSES

REQUESTOR L. HYMAN HIGH ENERGY PHYSICS

PROGRAMMER C. SMITH

TO CALCULATE CONVOLUTION INTEGRALS FOR THE STUDY OF THE EFFECTS OF TRANSIT TIME SPREAD IN THE PHOTOMULTIPLIER. THIS PROGRAM WILL BE USED AS A CHECK WITH THE COMPUTED VARIANCES OF TRIGGERING TIMES WITH TIME-JITTER IN THE PHOTOMULTIPLIER COMPUTED BY THE SCHWARTZ PROGRAM.

704F REFERENCES 1549/HEP120 ON FILE D1

1880 SSS141 ENERGY PROGRAM FOR SODIUM CHLORIDE

REQUESTOR G. BASSANI SOLID STATE SCIENCE

PROGRAMMER J. GVILDYS

0950/SSS105, ENERGY BAND PROGRAM FOR ZINC SULPHIDE, IS TO BE MODIFIED TO HANDLE THE SODIUM CHLORIDE CRYSTAL STRUCTURE.

704F REFERENCES ON FILE F0

1883 CEN125 EQUATIONS FOR ACTIVITY COEFFICIENTS IN TERNARY AND QUARTERNARY SYSTEMS

REQUESTOR G. BROWN CHEMICAL ENGINEERING

PROGRAMMER J. ANDERSON

EVALUATION OF ACTIVITY COEFFICIENTS IN BINARY, TERNARY, AND QUATERNARY SYSTEMS.

704F REFERENCES ON FILE Z0

# PROGRAMMING SYSTEMS AND LIBRARY ROUTINES

## Digital Systems Programming

Routines developed for the Argonne-built GUS digital computer complex, described more fully under COMPUTER ENGINEERING AND EQUIPMENT, include the following:

1. ARGUS

The FLIP assembly routine (FLARE) has been reorganized to serve as the basis for a larger programming system, ARGUS, which will facilitate the production of programs for the entire GUS system. To make programming for GUS as easy as possible, several new processors have joined FLARE as component parts of ARGUS:

(a) FORTRAN-type Input-Output Statement Translator.

(b) Micro-mnemonic Language Translator. Although FLIP has a very powerful and intricate instruction repertoire, the casual programmer finds useful a language that lets him concentrate on the micro-operations to be performed (such as ADD and MULTIPLY) rather than on how these can best be fitted into GEORGE or FLIP orders. A processor has been included in ARGUS to accept SAP-type mnemonics for these micro-operations and to pack them into reasonably efficient FLIP instructions.

(c) FLAT (FLIP Algebraic Translator). This processor accepts a problem formulation stated in an algebraic language similar to NELIAC and translates it into the micro-mnemonic language discussed above and ultimately into FLIP machine language. The algorithm is based upon a procedure due to Harry Huskey.

(d) GEORGE Code in ARGUS. This provision allows for GEORGE as well as for FLIP programming, and includes features which facilitate using the multi-bank core memory accessible to GEORGE.

Basic FLARE statements and any or all of the other four categories of source language statements described above may be intermixed. Furthermore, it is possible to refer to the same memory locations in GEORGE and FLIP code with the same symbolic labels even though the hardware-addressing schemes for the two machines are dissimilar.

ARGUS is a program that runs on GEORGE, but ultimately will utilize FLIP as well.

2. GUS Subroutine Library.

The present GUS library includes FLIP elementary functions, several GEORGE cathode-ray-tube subroutines, multi-precision integer I/O, and processors for the teletype messages sent to and from Argonne's Idaho Division. Elementary function subroutines will estimate a new index of precision from that of the given argument.

3. Operating System for GUS.

Work has begun on an automatic operating system for GUS. A rudimentary job-sequencing monitor for GEORGE currently processes GAR and ARGUS assemblies, and FLIP simulations. Among other components of this system are the following:

(a) Input-Output Package for FLIP. This program, which runs on GEORGE but is called by FLIP through the interrupt system, will provide for formatted input-output of the 704-FORTRAN type.

(b) Interrupt Control for GUS. Included are GEORGE and FLIP programs to handle, and if necessary stack, interrupts of either machine by the other and fault interrupts arising from program or machine errors.

(c) Request Stacking System for OMNI. This program will process requests made by GEORGE or FLIP programs for the OMNI unit to transfer data between core memory and the drum or the wide magnetic tape units.

(d) Dynamic Irregular Arrays. A program has been written to facilitate the use of arrays dynamically varying and of irregular shape. The method is patterned after a technique developed by Illiffe for the Rice computer.

4. Improvements and Modifications to the FLIP Simulator.

Several features have been modified or added in the GEORGE-program FLIP simulator. A limited interrupt capacity has been included; the square root operation and limited input-output capabilities have been added. In addition, several changes have been made to reflect changes in the system design of FLIP.

5. Modifications to GAR.

GAR III, the current version of the GEORGE assembly routine, has been modified to increase the flexibility of object program input and output and to enable GAR assemblies to be run under the GUS operating system without operator intervention.

Most IBM-704 programs are now processed under the Argonne monitor system OOPS, instituted late in 1962. Other 704 system routines, as well as those for the IBM-1401, are listed below by descriptive title.

In the CDC-160A area, contributions have been made to a comprehensive peripheral processing system, to OSAS-A assembly system binary loader and symbolic input routines, to a symbolic dump routine, to a card-punch subroutine, and to providing aids for ASI-210 programmers. Other routines developed include processors for Idaho teletype messages and for experimental paper tapes, and a card-reader test program.

## Abstracts of 704 Newsletters

The 704 Newsletter, published at irregular intervals, contains information of interest to users of the IBM-704 and its related equipment. This information includes abstracts of SHARE correspondence as well as titles and subject classification of routines distributed by the SHARE Distribution Agency.

704 Newsletter No. 20 11/7/62

Error discovered in compilation of some FORTRAN DO loops.

Recent SHARE correspondence and distributions.

704 Newsletter No. 21 12/31/62

Updated version of ANF203 (EIGEN) described.

Abstracts of SHARE programs published since Oct 1961.

Complete indexes of abstracts, listed by name and by installation.

Recent SHARE correspondence and distributions.

704 Newsletter No. 22 1/22/63

Recent SHARE correspondence and distributions.

## Abstracts of 3600 Newsletters

In anticipation of the arrival of a Control Data 3600 computer complex, the 3600 Newsletter was initiated. It is published at irregular intervals, and contains current information and news of interest to potential users of the 3600 and its related equipment.

3600 Newsletter No. 1 11/9/62

Compatibility of 704 FORTRAN II and 3600 FORTRAN 63 discussed, and differences noted.

CDC representative assigned to the Argonne account introduced.

3600 and 160A Reference Library established.

Appendix 1: Errata list for the CDC FORTRAN 63 General Information Manual (Publ. No. 514).

Appendix 2: Notes and Observations on Peculiarities of 3600 Computer Hardware (by John Reynolds).

3600 Newsletter No. 2 4/22/63

Errata list for 3600 Preliminary Reference Manual (Publ. No. 213a).

3600 Newsletter No. 3 5/27/63

Errata list for FORTRAN 63/Reference Manual (Vols. 1 and 2, Publ. No. 527 and 528).

## Abstracts of GEORGE Bulletins

The GEORGE Bulletin, published at irregular intervals, contains current information and news of interest to users of GEORGE and its related equipment. Following is a list of the topics discussed in Bulletins published during this period.

GEORGE Bulletin No. 16 9/19/62

Availability of the Cathode Ray Tube on GEORGE is announced. Description of the order structure for using the CRT attached.

Note that GEORGE shift orders do not clear the carry-overflow toggle.

Modification of 1401 GAR card-to-tape, called GEOFIN (GEOrge-Flip card-to-tape INput routine), to stack GAR and FLARE jobs on an input tape.

Provision added to GAR III to send object code to magnetic tape and suppress object code to paper tape. A modification of SCRIPT, called GEOFOUT, will punch the object program cards on the 1402 while printing the listing on the 1403.

GEORGE Bulletin No. 17 2/13/63

Detailed description of control card to be used with the FFG system for unattended handling of intermixed FLARE, FLIP Simulator, and GAR jobs.

## New Routines for the IBM-704

AN C103 - Polynomial Generator
Mary Anne Fisherkeller

AN E103 - Rational Interpolation Subroutine for 704, FORTRAN coded
William J. Cody

ANME209 - A General Program for Least Square Polynomial Fit (FORTRAN II)
Burton S. Garbow - Revised by Cynthia Chamot, January, 1963, for use on the Monitor.

AN F105 - Generalized Solution of Matrix Equations
Burton S. Garbow

AN M103 - N-tuple Restore after Lead Component Sort
Burton S. Garbow

AN M202 - Time Translating Subroutine
Norbert Purcell and Nancy Clark

AN N302 - Modify Fixed and Floating Divide Orders
Daniel Carson

AN P013 - TESTO (Two Enter Sixty Three Out). A diagnostic program which will flag 704 FORTRAN II Statements not compatible with 3600 FORTRAN 63.
Norbert Purcell.

## New IBM-1401 Routines

AN I120 - MONIN - Card-to-tape routine to make up an OOPS monitor input tape.
Nancy Clark.

AN I121 - MONOUT - Card-to-print and punch-to-process an OOPS monitor output tape.
Nancy Clark.

AN M001 - SHARE Abstract Sort, Update and Print
Nancy Clark and Ed Cline.

AN M102 - General Sort
Ronald Krupp.

AN M203 - PEST CONDENSING PROGRAM - DEW
Nancy Clark

AN Z016 - GAR-TO-FLARE CARD CONVERSION
Albert F. Joseph

AN Z017 - General Purpose Paper Tape Reader
Nancy Clark

## New GEORGE Subroutines

A-29-286 - Divide Test
Charles Harrison, Jr.

A-30-294 - Wide Tape Analysis Test
George Robinson, Jr.

B-22-268 - CRT Point Plot
Ronald F. Krupp

B-23-273 - CRT Axis Translation
Ronald F. Krupp

B-27-288 - Fixed Point Multiple Precision Integer Input
Albert Joseph

B-28-289 - Fixed Point Multiple Precision Integer Output
Albert Joseph

B-29-290 - Floating ALGOL General Input
Richard George

B-30-295 - CRT Character Plot
Ronald F. Krupp

B-31-297 - Decimal Format Output
Richard George

B-32-291 - Core Dump
M. A. Fisherkeller

B-33-301 - CRT Graph Plotter
Ronald F. Krupp

D-6-287 - Multiple Precision Integer Arithmetic
Albert Joseph

M-17-293 - Matrix Product
M. A. Fisherkeller

W-3-298 - GAR to FLIP Translator
Kenneth Hillstrom

X-31-282 - Compare M Blocks of Two Wide Magnetic Tapes
Charles Harrison, Jr.

X-32-285 - General Wide Tape Handler
Charles Harrison, Jr.

X-33-299 - Wide Magnetic Tape Display on the CRT and Dump
Ronald F. Krupp

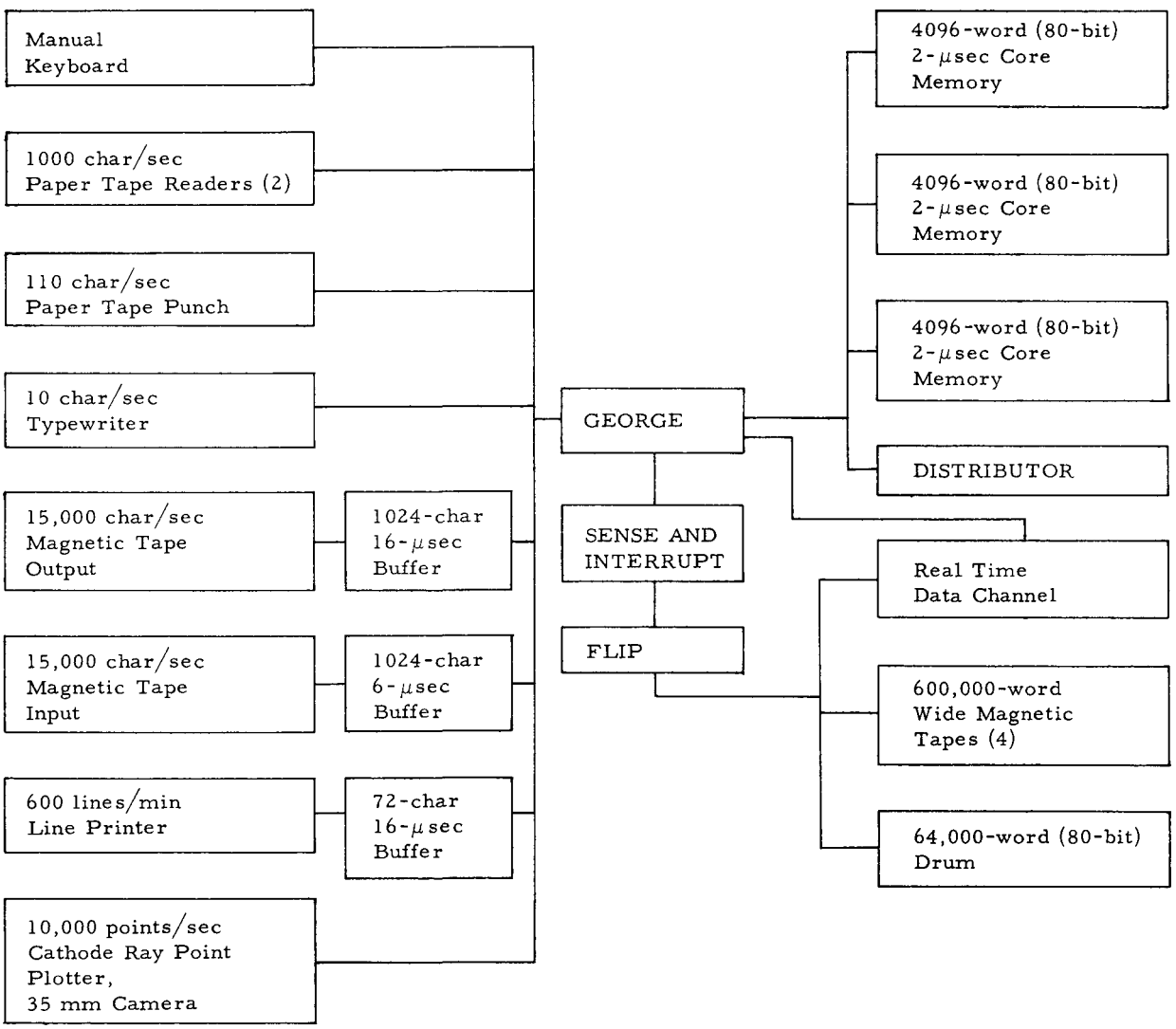
X-34-300 - GEORGE Memory Display on the CRT

# COMPUTER ENGINEERING AND EQUIPMENT

The present effort is directed toward (a) the completion of the GEORGE-FLIP Computer system and (b) the development of information-retrieval and pattern-recognition systems.

The GEORGE computer, which commenced full-time operation in November 1957, has been a contribution to computer technology as well as a useful tool for the Laboratory. GEORGE is a 40-binary-digit, parallel, asynchronous, modified two-address, fixed-point machine. A floating-point arithmetic unit (FLIP), which performs significance arithmetic, is under construction for operation with GEORGE. The complete GEORGE-FLIP (GUS) system, to be completed later in 1963, is outlined below.

## Planned GUS System



An automatic data-processing system, known as CHLOE, for analyzing spark-chamber photographs has been developed. It utilizes a fiber optics cathode-ray-tube scanner and an ASI-210 digital computer.

The computing equipment described below is currently available in the Applied Mathematics Division for carrying out computations. The first four (digital computers) have central processing units plus the listed features.

1) An IBM-704 digital computer including:

a 32768-word magnetic core memory,
an 8192-word magnetic drum memory,
a card reader (250 cards/min),
a card punch (100 cards/min),
a printer (150 lines/min), and
9 magnetic tape units.

2) An IBM-1401 System consisting of:

a 4000-char memory,
a card reader and punch (800 cards/min),
a printer (600 lines/min),
2 magnetic tape units, and
the following features:

multiply-divide
print storage
column binary
high-low-equal compare
advanced programming
buffered paper tape input
read-punch release
additional print control and print storage
10 sense switches
space suppress

3) The Laboratory-designed and -built digital computer GEORGE, currently operating as a computer separate from the GUS (GEORGE UNIFIED SYSTEM), equipped with

a 4096-word magnetic core memory,
paper tape input and output
4 wide magnetic tape units for internal storage,
an ANELEX buffered, 72 char/line, printer (600 lines/min),
a buffered (1024-char) narrow magnetic tape output unit,
a buffered (1024-char, max record: 512 char) narrow magnetic tape input unit, and
a cathode-ray tube output recorder and camera.

4) A CDC-160A System including:

an 8192-word magnetic core memory,
a printer (1000 lines/min),
a card reader (250 cards/min),
a card punch (100 cards/min),
a paper tape reader (350 frames/sec),
a paper tape punch (110 frames/sec),
a typewriter,
a point plotter, and
2 magnetic tape units.

5) A PACE analog computer, consisting of two computing consoles (which can be coupled) each complete with:

28 integrating amplifiers,
28 summing amplifiers,
10 servo-mechanisms,
5 electronic multipliers,
5 diode function generators, and
80 scale-factor potentiometers.

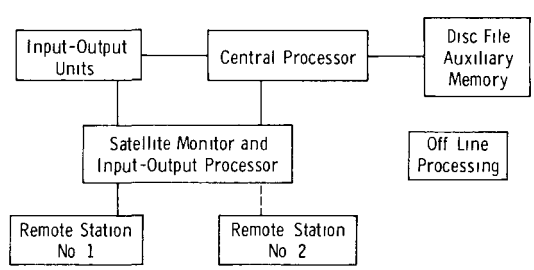
6) An Electronic Associates graph plotter operated from paper tape, punched card, or manual input.

7) A paper tape-to-punched card converter designed to make GEORGE output compatible with the 704 installation.

A CDC-3600 digital computer system is scheduled for Aug 1963 delivery to the Laboratory. Remote Station No. 1 will be located in the High Energy Physics Division Building; Remote Station No. 2 will be located in the Reactor Engineering Division Building.

The System will have a basic array of software, viz., an assembly routine called COMPASS, a compiler called FORTRAN 63, and a monitor routine called SCOPE. The FORTRAN 63 is upward compatible with FORTRAN IV, soon to be released by IBM.

A general block diagram follows:



# PUBLICATIONS AND PAPERS

## Publications

1) P. G. Burke(1) and Kenneth Smith. The Low-energy Scattering of Electrons and Positrons by Hydrogen Atoms, Revs. Mod. Phys., 34, 458-502 (July 1962).

2) Robert N. Buchal, The Approach to Steady State of Solution of Exterior Boundary Value Problems for the Wave Equation, J. Math. Mech., 12, (2) 225-234 (March 1963).

3) B. E. Rhoades, Total Comparison among Some Totally Regular Hausdorff Matrices - Addendum, Math. Zeitschr., 80, 1-3 (Nov 1962).

4) R. P. Anderson(2), L. T. Bryant, J. C. Carter(2), and J. F. Marchaterre(2), An Analog Simulation of the Transient Behavior of Two-phase Natural Circulation Systems, Heat Transfer, Houston, L. Bernath (ed.), Chem. Engr. Prog. Symp. Ser. No. 41, 59, 96-103 (1963).

5) B. E. Rhoades, Hausdorff Summability Methods - Addendum, Trans. Am. Math. Soc., 106, 254-258 (Feb 1963).

6) J. R. Bowers, Mercury Relay Pulse Generator, Electronic Design, Article No. 103 (Oct 25, 1962).

7) G. F. Bassani(3) and Megumu Yoshimine, Electronic-energy Bands of Group IV Elements and the III-V Compounds, Phys. Rev., 130, 20-33 (1963).

8) J. A. Robinson, Theorem-Proving on the Computer, Journal of the Association for Computing Machinery, 10, 163-174 (April 1963).

9) J. W. Butler, D. Hodges, and R. Royston, CHLOE - A System for the Automatic Handling of Spark Pictures Proceedings, M. Banot and B. Elliott (eds.) CERN 62-37, 73-80 (Dec 1962).

10) Philip G. Burke(1), Harry M. Schey(1), and Kenneth Smith, Collisions of Slow Electrons and Positrons with Atomic Hydrogen, Phys. Rev., 129, 1258-1272 (1963)

11) C. K. Sanathanan(2) and J. A. Koerner, Transfer Function Synthesis as a Ratio of Two Complex Polynomials, IEEE Trans. AC-8(1), 56-58 (Jan 1963)

12) Kenneth Smith and J. L. Uretsky(4), Pion-Pion Scattering from a Lagrangian Viewpoint, Abstract in Bull. Am. Phys. Soc., 8, 300 (April 1963).

13) L. R. Steele(5), D. F. Carson, and C. E. Dryden(6), Solution to the Fission Recoil Energy Deposition in a Slurry by a Monte Carlo Technique, Nuclear Sci. and Eng., 15, 451-457 (April 1963).

14) Edward M. Keberle and George L. Montet(3), Explicit Solutions of Partial Differential Equations and Random Paths on Plane Nets, Jour. of Math. Anal. and Appl., 6 (Feb 1963).

15) Raymond A. Kliphardt, Automation Comes to Descriptive Geometry, Graphic Science, 5, 13, 14, and 16 (May 1963).

16) John C. Reynolds and Robert Puff(7), Volume Properties of Ground State Nuclear Matter, Phys. Rev., 130, 1877-1890 (1963).

17) John C. Reynolds, Surface Properties of Ground State Nuclear Matter, Phys. Rev., 130, 1891-1901 (1963).

18) R. A. Kliphardt, DESCRIPTRAN - An Automated Descriptive Geometry, Communications of the ACM, 6, 336-339 (June 1963).

19) B. E. Rhoades, On Products of Power Series, Monatsh. Math. (in press).

20) C. Witzgall (H. Maehly) Methods for Fitting Rational Approximations, Journal of the Association for Computing Machinery (in press).

21) P. J. Persiani(2), J. J. Kaganove, and A. E. McArthy(2), Neutron Resonance Integral and Age Data, Reactor Physics Constants Center Newsletter No. 10 (April 1, 1963).

22) H. Greenspan and I. G. Baksys, Differential Scattering Cross Sections for Slow Neutrons in Natural $UO_2$, Reactor Physics Constants Center Newsletter No. 7 (July 1962).

23) H. Greenspan and I. G. Baksys, Addenda to Newsletters No. 3 and No. 4, Reactor Physics Constants Center Newsletter No. 9 (March 1963).

24) W. J. Cody, Joan Lawson(8), H. S. W. Massey(8), and Kenneth Smith, The Elastic Scattering of Positrons by Atomic Hydrogen, Proc. Phys. Soc. (in press).

25) W. F. Miller, The Role of Computers in Experimental Physics: A System for On-line Analyzers, Nuclear Science Abstracts, 17, 2189 (#16789) (May 31, 1963).

(1) Lawrence Radiation Laboratory, University of California, Berkeley, Calif.
(2) Reactor Engineering Division
(3) Solid State Science Division
(4) Physics Division
(5) Chemistry Division
(6) Ohio State University
(7) University of Washington
(8) University College London, London, England

## ANL Reports

1) ANL-6548, Studies of Metal-Water Reactions at High Temperature: III. Experimental and Theoretical Studies of Zirconium-Water Reaction, by L. Baker,* and L. Just.

2) ANL-6556, Mathematical Formulation, Analysis, and Description of the Fricke Kinetics Code, by Erwin H. Bareiss, Cynthia Chamot, and Hugo Fricke.**

3) ANL-6560, Results Obtained from the Fricke Diffusion Kinetics Code, by Erwin H. Bareiss, Cynthia Chamot, and Hugo Fricke.**

4) ANL-6592, Crystal Geometry Computer Program, by Lawrence P. Bush and Lowell T. Lloyd.†

5) Special ANL Report, Lectures on Theory of Approximation, by Michael Golomb.

6) ANL-6623, Surface and Volume Properties of Ground State Nuclear Matter in the Hartree-Fock and Puff-Martin Approximations, by John C. Reynolds.

7) ANL-6641, AMD Summary Report, July 1, 1961 through June 30, 1962, R. King, Editor.

8) ANL-6645, Analog Computation of Temperature Distribution in Solids with Electrical Heat-generation and Temperature-dependent Properties, by Darrel G. Harden†† and Lawrence T. Bryant.

9) ANL-6646, Effect of Long Decay Chains on the Counting Statistics in the Analysis of Radium-224 and Radon-222, by H. F. Lucas, Jr.§ and D. A. Woodward.

10) ANL-6653, Transient Analysis of Two-phase Natural-circulation Systems, by R. P. Anderson,†† L. T. Bryant, J. C. Carter,†† and J. F. Marchaterre.††

11) ANL-6662, Computer Program for Calculating the Relative Yields of Isomers Produced in Nuclear Reactions, by W. L. Hafner, Jr., J. R. Huizenga,** and R. Vandenbosch.**

*Chemical Engineering Division
**Chemistry Division
†Metallurgy Division
††Reactor Engineering Division
§Radiological Physics Division

12) ANL-6716, Transfer Function Synthesis as a Ratio of Two Complex Polynomials, by C. K. Sanathanan* and Judith Koerner.

13) ANL-6722, An Information-Theoretical Model Applied to Computer Programs, by W. R. Cowell.

*Reactor Engineering Division

## AMD Technical Memoranda

1) No. 33, A Proposal for a Generalized Compiler, by John C. Reynolds.

2) No. 34, An Asymptotic Expansion of an Integral Occurring in the Theory of Diffraction Gratings, by David Phillips.

3) No. 35, CHLOE, A System for the Automatic Handling of Spark Pictures, by J. W. Butler, D. Hodges, and R. Royston.

4) No. 37, OOPS Manual, by T. Barts and M. Butler.

5) No. 38, Computer Analysis of the Algebra of Relations, by William C. Davidon.

6) No. 39, ANL GEORGE Computer Anelex Line Printer Output System, by B. Kroupa, Jr.

7) No. 40, CHLOE, An Automatic Film Scanning Equipment - a Preliminary Description, by Donald Hodges.

8) No. 42, Some Theoretical Bases for Significance Arithmetic in FLIP, by George A. Robinson.

9) No. 44, Useful Applications of a Pair of Fourier Integrals, by Anthony Strecok.

10) No. 45, Performance of a Specific Algebraic Manipulation on a Digital Computer Using the LISP I System, by John C. Reynolds.

11) No. 46, Automation of Experimental Science, by J. W. Butler.

## Papers Presented at Meetings

A University Computation Center's Role in Computation Education and Research, by Robert T. Gregory, Summer Conference of the Northwest Computer Organization, Seattle, Wash., August 9-10, 1962.

CHLOE - A System for the Automatic Handling of Spark Pictures, by J. W. Butler, Informal Conference on Track Data Processing, CERN, Switzerland, July 19, 1962.

The Role of Computers in Experimental Physics: A System for On-line Analyzers, by W. F. Miller, Conference on Utilization of Multiparameter Analyzers, Grossinger, N.Y., November 12-15, 1962.

Automation of Physical Experiments, by J. W. Butler, annual meeting of the Illinois Academy of Science, Southern Illinois University, April 26-27, 1963.

The Contribution of Negative Energy Levels to Resonance Integrals, by P. J. Persiani,* J. J. Kaganove, and A. E. McArthy,* American Nuclear Society Ninth Annual Meeting, Salt Lake City, June 17-19, 1963.

On the Spectral Analysis of the Periodic Transport Operator, by E. H. Bareiss, International Congress of Mathematicians, Stockholm, Sweden, August 21, 1962.

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*Reactor Engineering Division

# SEMINARS, SYMPOSIA, AND LECTURES

## Applied Mathematics Division Seminars

July 5, 1962 — Recent Advances in Machine Theorem Proving, by Professor John Alan Robinson, Rice University, Houston, Texas.

July 12, 1962 — Programming with Significant Digit Arithmetic, by Professor Richard Miller, The Institute for Computer Research, The University of Chicago, Chicago, Illinois.

July 19, 1962 — Computer Constructed Time Tables, by Professor Calvin Gotlieb, Acting Director, Computation Center, University of Toronto, Toronto, Canada.

July 26, 1962 — Sufficient Condition for Total Monotonicity, by Professor B. E. Rhoades, Lafayette College, Easton, Pennsylvania.

September 14, 1962 — Stability, Convergence and Pseudo-stability of Finite Difference Equations for an Over-determined Problem, by Professor Seymour Parter, Department of Mathematics, Cornell University, Ithaca, New York.

September 19, 1962 — New Methods to Solve Differential Equations in Mathematics and Engineering, by Professor Ferdinand F. Cap, Institute of Theoretical Physics, Innsbruck, Austria and Science Adviser to the UNO Committee for Outer Space.

September 28, 1962 — Truncation Errors in Numerical Solutions of the Transport Equation, by Dr. John H. Bennet, Bettis Atomic Power Laboratory, Westinghouse Electric Corporation, Pittsburgh, Pennsylvania.

October 19, 1962 — Singular Perturbations of Ordinary Differential Equations, by Professor Bernard Friedman, Department of Mathematics, University of California, Berkeley, California.

October 23, 1962 — Optimal Scaling of Matrices, by Professor F. L. Bauer, Institut für Angewandte Mathematik, University of Mainz, West Germany.

November 1, 1962 — Pattern Recognition, by W. H. Highleyman, Vice President, Data Trends, Inc., Mountain Lakes, New Jersey.

November 5, 1962 — Combinatorial Analysis of Matrix Games and Linear Programs, by Professor A. W. Tucker, Chairman, Department of Mathematics, Princeton University, Princeton, New Jersey.

November 8, 1962 — Numerical Solution of Partial Differential Equations, by Professor Leslie Fox, University of Illinois, Urbana, Illinois (on leave from Oxford University).

November 15, 1962 — Two New Methods for the Approximate Solution of Integral Equations, by Dr. Philip Anselone, Mathematics Research Center, University of Wisconsin, Madison, Wisconsin.

November 29, 1962 — Adaptive Optimization of Continuous Processes, by Professor George E. P. Box, Chairman, Department of Statistics, University of Wisconsin, Madison, Wisconsin.

December 6, 1962 — The Compiler Compiler, by Dr. Ralph A. Brooker, Thomas J. Watson Research Center, IBM, Yorktown Heights, New York.

December 13, 1962 — Mathematical Methods of Linear Transport Theory, by Professor Kenneth M. Case, University of Michigan, Ann Arbor, Michigan.

January 8, 1963 — Alternating Direction Methods for Solving Elliptic Partial Differential Equations, by Professor David M. Young, Jr., Director, Computation Center, University of Texas, Austin, Texas.

January 25, 1963 — Kinetic Equations for Plasmas, by Professor Richard Osborn, Department of Reactor Engineering, University of Michigan, Ann Arbor, Michigan.

February 7, 1963 — On the Albedo Model of a Nuclear Reactor, by Dr. Marjan Ribarič, Argonne National Laboratory, and J. Stefan Institute, Ljubljana, Yugoslavia.

February 14, 1963 — Report on Lightning Project (Tunnel Diode and Snap-off Diode Circuitry) and a Report on Integrated Circuits, by Mr. Forrest Salter, Applied Mathematics Division, Argonne National Laboratory.

February 21, 1963 — Pattern Recognition Beast, by Professor B. H. McCormick, Digital Computer Laboratory, University of Illinois, Urbana, Illinois.

March 7, 1963 — On-line Computer System for Classical Analysis, by Dr. Glen J. Culler, University of California, Santa Barbara and Thompson-Ramo-Wooldridge, Inc., Van Nuys, California.

March 21, 1963 — Some Numerical Experiments on the Gauss Lattice Point Problem, by Professor Herbert B. Keller, Courant Institute of Mathematical Sciences, New York University, New York, New York.

April 18, 1963 — The Morse Theory of Ordinary Differential Equations, by Professor Robert Hermann, Northwestern University, Evanston, Illinois.

April 25, 1963 — Prediction Theory, by Professor Harry Furstenberg, University of Minnesota, Minneapolis, Minnesota.

April 26, 1963 — Generalized Predictor-Corrector Methods for the Numerical Solution of Ordinary Differential Equations, by Dr. Hans J. Stetter, Department of Mathematics, University of California, Los Angeles, California.

May 16, 1963 — A General-purpose Compatible Time-sharing System for the IBM 7090, by Professor F. J. Corbato, Massachusetts Institute of Technology, Cambridge, Massachusetts.

May 23, 1963 — Numerical Computation of Characteristic Values, by Dr. L. B. Rall, Mathematics Research Center, University of Wisconsin, Madison, Wisconsin.

June 6, 1963 — An Application of Discriminent Function Analysis, by Dr. Harold L. Crutcher, U. S. Weather Bureau, National Weather Records Center, Asheville, North Carolina.

June 26, 1963 — The QR-Algorithm for Eigenvalues, by Dr. J. H. Wilkinson, National Physical Laboratory, Teddington, England.

June 27, 1963 — The Wiener-Hopf Method, by Professor Ivar Stakgold, Northwestern University, Evanston, Illinois.

## Special Interest Seminars

July 6, 1962 — Informal Discussion of Schevinger's Action Principle, by Dr. John Reynolds, Applied Mathematics Division, Argonne National Laboratory.

July 19, 1962 — New Methods in Transport Theory, by Dr. T. W. Mullikin, The Rand Corporation, Santa Monica, California.

August 6, 1962 — Characteristics of a 10-times-"Stretch" Computer, by Mr. J. C. Chu, Minneapolis-Honeywell Regulator Company, Wellesley Hills, Massachusetts.

December 3, 1962 — Cogent - A Compiler and Generalized Translator, by Dr. John Reynolds, Applied Mathematics Division, Argonne National Laboratory.

December 20, 1962 — Library Services for the Applied Mathematics Division, by Mr. James C. Andrews, Director, Library Services Department.

## West Suburban College Seminar

October 16, 1962 — Mathematics Today - The Changing Pattern, by Wallace Givens.

November 13, 1962 — Analog Computers, by Louis C. Just.

December 4, 1962 — Topics in Digital Machine Programming, by Burton Garbow.

January 15, 1963 — Solution of Polynomial Equations, by Erwin Bareiss.

February 19, 1963 — A Mathematical Model of Communication, by Wayne Cowell.

March 19, 1963 — Von Neumann's Point-free Geometry, by Wallace Givens.

May 14, 1963 — Computer Languages, by William Miller.

## Conference on Numerical Solution of Partial Differential Equations
June 24-28, 1963

Five leaders in the field of numerical solution of partial differential equations and related algebraic problems gathered at Argonne to exchange views and to explore recent research developments. Discussions were also held with the Applied Mathematics Division staff on desirable features to have in future digital computers, insofar as partial differential equations are concerned. Participants were G. D. Birkhoff, S. V. Parter, R. S. Varga, J. H. Wilkinson, and D. M. Young.

## Symposium Presentations

Scattering Law Project Computations, by Harold Greenspan, Joint Argonne-European Nuclear Energy Agency Seminar on New Trends in the Use of Digital Computers in Atomic Energy Research and Development, (ENEA), at Argonne National Laboratory, September 17-21, 1962.

Organization and Objectives of Argonne's Applied Mathematics Division, by W. F. Miller, ENEA, at Argonne National Laboratory, September 17-21, 1962.

The Nuclear Codes Work of the American Nuclear Society, by Margaret Butler, ENEA, at Argonne National Laboratory, September 17-21, 1962.

A Data Handling System for Spark Pictures, by D. Hodges and J. Butler, ENEA, at Argonne National Laboratory, September 17-21, 1962.

A Computer Connected Multichannel Analyzer, by W. F. Miller, ENEA, at Argonne National Laboratory, September 17-21, 1962.

The Logic Orders on the GEORGE-FLIP System, by W. F. Miller, AEC Computer Information Meeting, at Brookhaven National Laboratory, October 25-26, 1962.

Theorem Proving by Computers, by J. A. Robinson, AEC Computer Information Meeting, at Argonne National Laboratory, May 2-3, 1963.

Programming for CHLOE, by R. Royston, AEC Computer Information Meeting, at Argonne National Laboratory, May 2-3, 1963.

Program Development for GUS, by W. F. Miller, AEC Computer Information Meeting, at Argonne National Laboratory, May 2-3, 1963.

Computer Organization and Design, by W. F. Miller, AEC Computer Information Meeting, at Argonne National Laboratory, May 2-3, 1963.

Panel on Future Development in Computers - J. W. Givens and J. A. Robinson, AEC Computer Information Meeting, at Argonne National Laboratory, May 2-3, 1963.

Reasoning Capabilities of Computers: Applications to Theorem Proving, by George A. Robinson, Jr., ANL Research Highlights Symposium, May 16-17, 1962.

"CHLOE" An Automatic Data Handling System for Spark Chamber Photographs, by Donald Hodges, Argonne Accelerator Users Group Meeting, at Argonne National Laboratory, November 9-10, 1962.

Computer Facilities at Argonne, by W. F. Miller, Argonne Accelerator Users Group Meeting, at Argonne National Laboratory, November 9-10, 1962.

Activities of AMD, by W. F. Miller, Chicago-Illinois-Argonne Computer Symposium, at Argonne National Laboratory, May 28, 1963.

The Associative Law; A. Problem of Wilf and Strauss, by J. Wallace Givens and N. Clark, Chicago-Illinois-Argonne Computer Symposium, at Argonne National Laboratory, May 28, 1963.

Disorientation, by J. M. Cook and A. Strecok, Chicago-Illinois-Argonne Computer Symposium, at Argonne National Laboratory, May 28, 1963.

Interrupt Processing for GUS, by G. A. Robinson, Jr., Chicago-Illinois-Argonne Computer Symposium, at Argonne National Laboratory, May 28, 1963.

## Lectures Presented at Universities

Malfunctions, Blunders, and Errors in Digital Computation, by Wallace Givens, The University of Kansas, Department of Mathematics, April 22, 1963.

Mathematics Today: A Discipline in Fission, by Wallace Givens, The University of Kansas, Department of Mathematics, April 22, 1963.

Scattering Theory and Functional Analysis, by J. M. Cook, State University of Iowa, Department of Physics, May 20, 1963.

Functional Analysis and the Mathematical Foundations of Quantum Mechanics, by J. M. Cook, Northwestern University, Department of Mathematics, May 29, 1963.

On the Spectral Analysis of the Period Transport Operator, by E. H. Bareiss, University of Michigan, Ann Arbor, Michigan, October 12, 1962.

Zeros of Polynomials, by E. H. Bareiss, Stevens Institute of Technology, Hoboken, N. J., March 8, 1963.

Numerical Solutions of the Boltzmann Equation, by E. H. Bareiss, Stevens Institute of Technology, Hoboken, N. J., March 9, 1963.

Numerical Methods for Solving the Boltzmann Transport Equation, by E. H. Bareiss, Radiation Transfer Seminar, Purdue University, Lafayette, Indiana, April 11, 1963.

Theorem Proving by Computer, by Richard Daly, The University of Notre Dame, Department of Electrical Engineering April 9, 1963.

## Lectures and Informal Talks

The Contribution of Engineering to Mathematics, by W. F. Miller, Western Society of Engineers, Hillside, Illinois, January 9, 1963.

Information Please, by W. R. Cowell, Aurora Chapter of Data Processing Management Association, November 8, 1962.

Information Please, by W. R. Cowell, Rockford Chapter of Data Processing Management Association, February 28, 1963.

Some Information-Theoretical Aspects of Computer Programs, by W. R. Cowell, Mid-Continent Computer Club, Chicago, Illinois, December 7, 1962.

Logic, Language, and the Computer, by George A. Robinson, Jr. Men's Mathematics Club of Chicago, January 18, 1963.

Spectral Analysis of the Transport Operator by E. H. Bareiss, Westinghouse Electric Corp., Bettis Atomic Power Laboratory, Pittsburgh, Pa., November 13, 1962.

Use of Computers. by David Jacobsohn, The University of Chicago Alumni Association (for undergraduate honor students), Chicago, Illinois, April 23, 1963.

What Is Programming? by Herbert Gray, First Science-Math Symposium and Fair, Joliet Township High School, Joliet Illinois, March, 1963.

The Consultant's Job in Applied Mathematics, by David Phillips, First Science-Math Symposium and Fair, Joliet Township High School, Joliet, Illinois, March, 1963.

Computer Engineering, by Richard Aschenbrenner, First Science-Math Symposium and Fair, Joliet Township High School, Joliet, Illinois, March, 1963.

Introduction to Computers and Programming, by Nancy Clark, Nazareth Academy Math Club, Nazareth Academy, LaGrange, Illinois, November 26, 1962.

Components and Circuits for Present and Future Computers, by Forrest O. Salter, Glen Ellyn Junior High Science Club, Glen Ellyn, Illinois, November 30, 1962.

The AIRWICK System of Programs for CHLOE, by R. K. Clark, Argonne National Laboratory, High Energy Physics Division, June 3, 1963.

Computers as a Direct Component in Experimental Science, by W. F. Miller, The University of Chicago, Chicago, Illinois, November 6, 1962.

Mathematics as a Career, by Richard F. King, at Lyons Township High School, LaGrange, Illinois, February 20, 1963.

## COURSES IN COMPUTER APPLICATIONS AND LOGICAL DESIGN

Applied Logic Design, by C. B. Shelman; a series of 12 lectures, March-May, 1963, AMD Computer Engineering Section.

CDC-3600 Programming Course - machine and assembler language, FORTRAN, and the 3600 operating system, November 5-9, and November 12-16, 1962.

Introduction to Analog Computers (a three-part lecture film), by L. C. Just, intended for classroom presentation.

Computer Applications to Nuclear Engineering, a lecture series at the AMU Faculty-Student Conference, by J. W. Butler, M. K. Butler, J. M. Cook, L. C. Just, W. F. Miller, and G. A. Robinson, Argonne National Laboratory, September 4-13, 1962.

A month-long series of lectures on the numerical solution of ordinary differential equations was presented March 25-April 19, 1963, at the Laboratory. Dr. E. T. Goodwin, Superintendent, Mathematics Division, National Physical Laboratory, reviewed classical methods of solution, introduced newer difference and extrapolation techniques, and emphasized the importance of stability analysis. Professor Leslie Fox, Director of the Oxford University Computing Laboratory, considered eigenvalue and boundary value problems, and solutions by Chebyshev approximation and by iterative improvement schemes.

## COMPUTER SERVICES COUNCIL

Established to advise the Applied Mathematics Division of the Laboratory's computing and mathematical needs, the Computer Services Council met twice during the report period.

Featured at the October 10, 1962, meeting was a discussion of both the hardware and the software (programming systems) for the Control Data 3600, a digital computer to be delivered to Argonne in Aug 1963. Plans for changeover to the new computer were outlined.

The CHLOE system for analyzing spark chamber photographs was described at the May 9, 1963 Council meeting. Latest developments in reprogramming and plans for programming courses for the CDC-3600 were mentioned. Current status of the Argonne-built GUS digital computer system was discussed.