ANL-6952

Argonne National Laboratory

APPLIED MATHEMATICS DIVISION SUMMARY REPORT

July 1, 1963 through June 30, 1964

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Mathematics and Computers
(TID-4500, 36th Ed.)
AEC Research and
Development Report

ARGONNE NATIONAL LABORATORY
9700 South Cass Avenue
Argonne, Illinois 60440

APPLIED MATHEMATICS DIVISION
SUMMARY REPORT

July 1, 1963 through June 30, 1964

William F. Miller, Division Director

Preceding Summary Reports

ANL-6768	July 1, 1962 through June 30, 1963
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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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 Research and Development Section to conduct research in new programming techniques, to develop needed subroutines and systems, and to provide training courses and instruction in programming techniques for the benefit of members of the Division, as well as for other members of the Laboratory. 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 functions of the Computer Engineering Section are (applied) computer engineering research, and the development and design of computers and information-processing systems having special application to the nuclear sciences.

APPLIED MATHEMATICS DIVISION

Organization of Personnel

July 1, 1963 through June 30, 1964

Director: W. F. Miller
Assoc. Director: J. W. Givens
Asst. Director: R. F. King
Asst. Director: A. S. Melmed (E)
Exec. Assistant: D. A. Davis
Admin. Assistant: R. E. King (E)

Secretarial: J. K. Bohne (T), E. J. Dreifuerst, D. I. Haight (E), M. H. Jedlicka, P. J. Johnson, G. M. Krause, S. L. Mentch (E), S. Meyer (E) (T), K. Perry (T) (E)

Consultation and Research

E. H. Bareiss
R. N. Buchal
J. W. Butler
W. J. Cody
J. M. Cook
W. R. Cowell
D. L. Phillips
J. C. Reynolds
K. Smith
J. Van Ryzin
D. L Woodward
L. T. Wos

Applied Programming

M. K. Butler, Section Head

B. S. Garbow, Asst. Section Head

H. Greenspan
S. A. Zawadzki

Clerical:
H. M. Glen
S. Katilavas
L. E. Meyer
E. L. Rudland
J. L. Zeman

Reactor Applications

D. C. Bingaman, Group Leader

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

Physics Applications

D. F. Jordan, (E) Group Leader

C. E. Burleson(T)
W. L. Hafner
R. C. Hamelink
F. R. Taraba
J. A. Wenger

Digital Operations

C. G. LeVee, Section Head
W. G. Greenhow, Asst. Section Head

D. R. Cyborski(E)
D. S. Davis(E) (T)
L. C. Douglas
E. A. Fearnow
J. Gajniak (E)
D. R. Greenwood (E)
D. P. Griffin (T)
G. D. Hatcher (T)
R. H. Ivan
C. J. Kilty
H. F. Krejci
P. A. Matousek (E)
L. T. Michel
R. L. Mueller
J. A. Nelson
L. J. Nelson
J. A. Ohde
R. S. Padilla (E)
S. A. Raso
V. M. Richards
C. M. Rogan
E. N. Singletary
D. M. Surdey
B. Tuan (E)
A. R. Turk
T. J. Unger
R. E. Van Buskirk
E. S. Wiener
P. L. Zaleski (T)
J. J. Zouganelis (E)

Chemical Applications

C. Chamot, Group Leader

F. L. Clark
A. H. Lent(E)
J. D. Varley

Numerical Methods

W. J. Cody, Group Leader

N. A. Clark
E. A. Thieleker

Programming Research and Development

G. A. Robinson, Section Head

L. I. Kassel, Asst. Section Head

Clerical:
J. Beumer

Systems Programming

M. A. Fisherkeller, Group Leader

D. M. Brooks
C. Harrison
K. E. Hillstrom
H. J. Ivey (E)
A. F. Joseph
R. F. Krupp
N. J. Purcell
A. Sandrin

Languages and Logic

W. R. Cowell, Group Leader

D. F. Carson
R. T. Daly (T)
L. P. Shalla

Analog Group

N. F. Morehouse, Group Leader

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

Biological and Metallurgical Applications

J. M. Heestand, Group Leader

J. L. Anderson
N. K. Clark
R. C. Fu (E)
J. Gvildys
A. J. Strecok

Computer Engineering

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

High Energy Physics Applications

R. J. Royston, Group Leader

H. D. Abramson (E)
M. Appelbaum (E)
R. K. Clark
J. A. Gregory
L. C. Just
K. A. Martin
P. R. Pennock
J. A. Scherer (E)
C. J. Smith

Management Applications

R. M. Morrill
W. J. Snow

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

ORGANIZATION OF PERSONNEL (Cont'd.)

TEMPORARY PROGRAM

SUMMER 1963

Resident Research Assoc.

J. H. McAllister
J. A. Robinson

Assistant Mathematician

P. R. Kosinski
C. L. Robinson

Resident Student Assoc.

F. D. Anger
J. M. Cooper
J. Eisenfeld
R. E. Greene
Y. Ikebe
H. Kanner
K. L. Modesitt
D. R. Nelson
W. R. Nico
R. K. Rice
R. K. Rosich
A. Scott
D. M. Shafer

Student Aide

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

LONGER TERM

Staff

G. K. Leaf (E)
G. J. Mitsis (T)
M. Ribaric
D. B. Taylor (E)

Non-paid Appointees

Y. Accad
M. C. Enfield

Co-op Technician

C. H. Conley
J. Potter
D. H. Laughlin

SUMMER 1964 (To June 30)

Resident Research Assoc.

D. Shale

Resident Student Assoc.

I. K. Abu-Shumays

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
B. Friedman, UICSM, Mathematics Project
M. Golomb, Purdue University
P. C. Hammer, University of Wisconsin
R. Hermann, Northwestern University
J. H. Holland, University of Michigan
K. A. Kastler, University of Illinois
R. Kliphardt, Northwestern University
B. H. McCormick, University of Illinois
H. P. Messinger, Illinois Inst. of Tech.
N. Metropolis, University of Chicago
R. W. Mitchell, Stanford University
W. Orvedahl, Rice University
N. S. Prywes, University of Pennsylvania
I. E. Segal, Massachusetts Inst. of Tech.
J. A. Robinson, Rice University
N. R. Scott, University of Michigan
J. N. Snyder, University of Illinois
A. H. Taub, University of California
P. M. Weichsel, University of Illinois
C. H. Wilcox, University of Wisconsin
H. S. Wilf, University of Pennsylvania
A. Wouk, Northwestern University

APPLIED 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: 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.

1293 SSS152 SPECIFIC HEAT DATA ANALY

REQUESTOR O. LOUNASMAA SOLID STATE SCIENCE

PROGRAMMER A. LENT

ANALYSIS OF DATA FROM SPECIFIC HEAT APPARATUS.

704 REFERENCES ANL 6497	ON FILE	E2,Z0
360F REFERENCES ANL 6497	ON FILE	E2,Z0

1387 RE270 RESONANCE INTEGRAL CALCULATION

REQUESTOR H. HUMMEL REACTOR ENGINEERING

PROGRAMMER A. RAGO

DETERMINATION OF RESONANCE INTEGRALS FOR DOPPLER COEFFICIENT CALCULATIONS. INITIALLY THE NARROW RESONANCE APPROXIMATION WILL BE USED AND THE INTERFERENCE BETWEEN RESONANCE AND POTENTIAL SCATTERING WILL BE NEGLECTED. THE CALCULATION OF THE J FUNCTION DEFINED AS THE INTEGRAL (PSI/(PSI+BETA)) IS ACCOMPLISHED BY A SIXTEEN POINT LEGENDRE-GAUSS QUADRATURE IN FOUR SEGMENTS. THE PSI FUNCTION DESCRIBING DOPPLER BROADENING OF SINGLE LEVEL CROSS SECTIONS IS EVALUATED BY A CONTINUED FRACTION EXPANSION OF THE POWER AND ASYMPTOTIC SERIES EXPANSIONS. FURTHER PROGRAMMING WORK MAY BE REQUIRED TO STUDY REFINEMENTS IN THE EVALUATION OF THE RESONANCE INTEGRALS.

704F REFERENCES	ON FILE	D0
360F REFERENCES	ON FILE	D0

1428 CHM150 DISTORTED WAVE IMPULSE APPROXIMATIONS FOR DIRECT NUCLEAR REACTIONS AT HIGH ENERGIES

REQUESTOR P. BENIOFF CHEMISTRY

PROGRAMMERS A. STRECOK, L. PERSON

THE PROGRAM REPRESENTS AN OPTICAL AND SHELL MODEL FOR DISTORTED INCIDENT AND EXIT PARTICLE PLANE WAVES CAUSED BY NUCLEAR OPTICAL POTENTIALS.

IN MATHEMATICAL TERMS, A SET OF QUADRUPLE INTEGRALS IS TO BE EVALUATED.

704F REFERENCES	ON FILE	D1
360F REFERENCES	ON FILE	D1

1449 SSS130 ENTROPY AND ENTHALPY OF SOME ALKALI HALIDE CRYSTALS

REQUESTOR F. FUMI SOLID STATE SCIENCE

PROGRAMMER J. HEESTAND

INTEGRALS FOR ENTROPY AND ENTHALPY ARE EVALUATED USING A GIVEN FUNCTIONAL FORM FOR THE FIRST N DATA POINTS AND THE SIMPSON QUADRATURE FORMULA FOR THE REMAINDER OF THE DATA.

704F REFERENCES ANME212 ON FILE DM APSB C D1

1450 MET142 LEAST SQUARES DETERMINATION OF CRYSTAL LATTICE CONSTANTS, GENERATION OF D-SPACINGS, AND LEAST SQUARES GENERATION OF CHI AND THETA

REQUESTORS L. HEATON,M. MUELLER METALLURGY

PROGRAMMER J. GVILDYS

PART I DETERMINE, BY THE LEAST SQUARE METHOD, THE LATTICE PARAMETERS FOR TRICLINIC CRYSTAL SYSTEMS, WITH ALL OTHER CRYSTAL SYSTEMS CONSIDERED AS SPECIAL CASES OF THE TRICLINIC.
PART II USING OUTPUT FROM PART I, OR CARD INPUT, GENERATE D-SPACINGS AND TRIGONOMETRIC FUNCTIONS FOR SETS OF H,K,L, UP TO A LIMIT AS DEFINED BY SPACE GROUP EXTINCTIONS FOR ANY CRYSTAL SYSTEM.
PARTS III AND IV GENERATE CHI AND THETA USING THE LEAST SQUARES METHOD ON OBSERVED CHI AND THETA, RESPECTIVELY.
PART V OUTPUT GENERATION.

360F REFERENCES 727/MET124, 1209/MET135 ON FILE E2,Z0

1480 CEN129 VOLATILIZATION REPROCESSING--MATHEMATICAL MODEL

REQUESTOR L. KOPPEL CHEMICAL ENGINEERING

PROGRAMMER J. ANDERSON

REPROCESSING OF SPENT FUELS BY VOLATILIZATION IN A FLUIDIZED BED MAY BE DESCRIBED BY SEVERAL POSSIBLE MODELS WHICH REDUCE TO SYSTEMS OF ORDINARY NON-LINEAR DIFFERENTIAL EQUATIONS.
THE EQUATIONS ARE INTEGRATED USING ASSUMED INITIAL VALUES OF THE PARAMETERS. (INTEGRATION USES STANDARD FOURTH-ORDER RUNGE KUTTA.) OBSERVABLE VARIABLES ARE CALCULATED FROM THESE RESULTS AND COMPARED WITH EXPERIMENTAL VALUES. THE PROGRAM SEEKS VALUES OF THE PARAMETERS WHICH MINIMIZE SUMS OF SQUARES OF DEVIATIONS OF EXPERIMENTAL AND CALCULATED VALUES.

704F REFERENCES ON FILE DM PSB D2
360F REFERENCES ON FILE D PS D2
794F REFERENCES ON FILE D2

1565 AMU101 GENERAL CALCULATIONS AMU

REQUESTORS J. ROBERSON, M. PETRICK — ASSOCIATED MIDWEST UNIVERSITIES REACTOR ENGINEERING

PROGRAMMER D. BINGAMAN

GENERAL NUMERICAL CALCULATIONS PREPARED AS A PART OF THE AMU HEAT TRANSFER PROGRAM.

704F REFERENCES — ON FILE — Z0

1641 BIM112 ANALYSIS OF BLOOD ELEMENT DATA FROM IRRADIATED RATS

REQUESTOR G. SACHER — BIOLOGICAL AND MEDICAL RESEARCH

PROGRAMMER F. CLARK

USING HEMATOLOGY DATA FROM BIM105 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 D PSB D E2
360F REFERENCES 1301/BIM105,1372/BIM106 ON FILE E2

1648 HEP124 GRIND (CERN)

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

CONSULTANT J. BUTLER PROGRAMMERS R. ROYSTON, K. MARTIN, J. SCHERER, M. APPELBAUM

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.

794 REFERENCES GRIND MANUAL	ON FILE	Z0
360F REFERENCES GRIND MANUAL	ON FILE	Z0

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 DM PSB	E2
360F REFERENCES	ON FILE DM PSB	E2

1814 HEP138 CIRCLE FITTING

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

CONSULTANT J. BUTLER PROGRAMMER P. PENNOCK

IN THE FITTING OF TRACKS IN TRAFIT (1242/HEP108) THERE ARE VARIOUS DIFFICULTIES. THIS PROGRAM WILL INVESTIGATE DIFFERENT METHODS OF FITTING CIRCLES TO DETERMINE WHICH ONE IS THE BEST, AND HOW ACCURATE IT IS.

704F REFERENCES	ON FILE	G2
360F REFERENCES	ON FILE	G2

1837 PAD143 PLATE ANALYSIS-HORN OF PL

REQUESTOR J. HEAP PARTICLE ACCELERATOR

PROGRAMMERS W. NICO, J. GVILDYS

SOME MATHEMATICAL ANALYSIS (DIFFERENTIAL EQUATIONS) IS TO BE CHECKED PREPARATORY TO THE PUBLISHING OF A RELATED PAPER, AND PROGRAMMED ON THE CDC-3600.

360F	REFERENCES	ON FILE DM PSB	DO

1841 AMD176 CHECKER-PLAYING PROGRAM

REQUESTOR W. COWELL APPLIED MATHEMATICS

PROGRAMMERS M. REED, L. SHALLA

RESEARCH IN LIST PROCESSING AND ITS APPLICATIONS IS BEING CARRIED OUT IN PARALLEL WITH THE DEVELOPMENT OF CERTAIN LIST PROCESSING SYSTEMS, NAMELY THE 3600 IPL-V INTERPRETER AND ENGINE NO. 2. THE MAJOR EFFORT IN THIS RESEARCH IS A GAME PLAYING PROGRAM WRITTEN IN IPL-V. THIS PROGRAM IS DESIGNED TO STUDY MAN-MACHINE INTERDEPENDENCE USING THE GAMES CHECKERS AND LASKER. IN ADDITION TO THIS PROGRAM, SHORTER PROGRAMS ARE BEING WRITTEN TO COMPARE LIST PROCESSING IN IPL-V WITH LIST PROCESSING AS ACCOMPLISHED BY USING A MACRO ASSEMBLER.

704	REFERENCES	ON FILE	ZO
360	REFERENCES	ON FILE	ZO

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.

704 PROGRAMS ARE TO BE WRITTEN TO DO THE FOLLOWING -

EXTEND SIZE OF MATRICES ON TAPE BY INCREASING RANK SIZE AND CHANGING ROW AND COLUMN DESIGNATIONS. INCREASE IN RANK IS TO BE THE SUM OF THE RANKS OF ANY TWO SIMULTANEOUS MATRICES. A RE-ORDERING OF THE MATRIX ELEMENTS IS ALSO DESIRED.

NEW MATRIX ELEMENTS TO BE USED AS A RESULT OF THE MATRIX DIMENSION INCREASE ARE TO BE CALCULATED.

PROGRAM WAS MADE AVAILABLE FOR 3600 WITH OUTPUT TO BE USED AS INPUT FOR CHM199.

704	REFERENCES	ON FILE	F1
360	REFERENCES	ON FILE	F1
794	REFERENCES	ON FILE	F1

1875 RPY145 LEAST SQUARES FITTING OF RADIOACTIVE DECAY DATA

REQUESTOR C. MILLER RADIOLOGICAL PHYSICS

PROGRAMMER W. SNOW

MINOR MODIFICATION OF PHYSICS 141 TO ADAPT THE INPUT FORMAT.

704F REFERENCES ON FILE E2

1876 CEN123 FISSION PRODUCT CONCENTRATIONS IN EBR II

REQUESTOR V. TRICE CHEMICAL ENGINEERING

PROGRAMMER J. HEESTAND

CALCULATE C(T), THE CURIES PER GRAM OF FUEL AT ANY TIME T FOR AN ISOTOPE, AND THE SUM OF C(T) OVER ALL ISOTOPES.

704F REFERENCES ON FILE DM PSB ZC

1884 RP309 RESONANCE SELF-SHIELDING

REQUESTOR R. DOERNER REACTOR ENGINEERING

PROGRAMMER J. ZAPATKA

THE RESONANCE SELF-SHIELDING IS CALCULATED BY EVALUATION OF THE FOLLOWING DOUBLE INTEGRAL USING THE TRAPEZOIDAL RULE.
DOUBLE INTEGRAL = (2/PI)*INTEGRAL(COS((PI*R/2A)*TAN(THETA))*COS (THETA)DTHETA)INTEGRAL((1-EXP(-TAU/COS(THETA)*COS(PHI)))*COS(PHI) DPHI) WHERE,
THETA HAS LIMITS 0 AND 88 DEGREES.
PHI HAS LIMITS 0 AND PI/2,
R/A = 1/28.636, AND
TAU IS A PARAMETER.

704F REFERENCES ON FILE D1

1887 HEP144 MONTE CARLO CALCULATIONS F[illegible]
DECAY EXPERIMENT

REQUESTOR G. BURLESON HIGH ENERGY PHYSICS

PROGRAMMER P. PENNOCK

THE PROGRAM IS A MONTE CARLO CALCULATION OF THE BACKGROUND TO THE REACTION -
PI-MINUS+PROTON GOES TO OMEGA-ZERO+NEUTRON,
WITH THE OMEGA-ZERO GOING TO PI-ZERO+ A GAMMA RAY, DUE TO THE REACTION PI-MINUS+PROTON GOING TO TWO PI-ZEROS+ A NEUTRON. THE INPUTS, OUTPUTS AND TECHNIQUES OF THE CALCULATION ARE SIMILAR TO THOSE DESCRIBED FOR PROGRAM 1690/HEP.

704F REFERENCES ON FILE G6

1888 RE305 MAGNETIC EFFECTS IN COMBINED FORCED AND FREE CONVECTION IN A BOUNDARY LAYER FLOW

REQUESTOR R. SINGER REACTOR ENGINEERING

PROGRAMMER C. BURLESON

THE EFFECT OF A TRANSVERSE MAGNETIC FIELD AND FREE CONVECTION UPON A BOUNDARY LAYER FORCED CONVECTION PROBLEM IS ANALYZED. THE FLUID IS ASSUMED TO BE NON-MAGNETIC, ELECTRICALLY CONDUCTING, AND SEMI-COMPRESSIBLE. NON-UNIFORM THERMAL BOUNDARY CONDITIONS ARE ALLOWED, AND THE PARAMETERS ARE THE RAYLEIGH NUMBER, HARTMANN NUMBER, AND THE PRANDTL NUMBER.

704F REFERENCES ON FILE DM PSB D2

1889 CEN126 SOLUTION OF TRANSCENDENTAL EQUATION

REQUESTOR M. FOSTER CHEMICAL ENGINEERING

PROGRAMMER A. STRECOK

GIVEN COEFFICIENTS FOR A POLYNOMIAL P(X) AND A NUMERICAL VALUE FOR F(X) AND C, THIS PROGRAM OBTAINS THE X VALUE FOR WHICH F(X)=P(X)+C*LN(X).

704F REFERENCES ON FILE DM APSB C5

1892 CEN127 THERMODYNAMIC PROPERTIES OF A BIMETALLIC SYSTEM

REQUESTOR M. FOSTER CHEMICAL ENGINEERING

PROGRAMMER K. CLARK

THE THERMODYNAMIC PROPERTIES OF A BIMETALLIC SYSTEM ARE STUDIED USING AN ELECTROCHEMICAL CELL. OBSERVED TEMPERATURE, CONCENTRATION, AND VOLTAGE ARE FIT TO ONE OF FIVE FUNCTIONS REPRESENTING AN ENERGY SURFACE OF A SPECIFIED GENERAL FORM.

704F REFERENCES		ON FILE	E2

1895 PHY288 LEGENDRE POLYNOMIAL FIT TO DATA FROM A MULTICHANNEL ANALYZER

REQUESTOR L. MEYER PHYSICS

PROGRAMMER R. ROSICH

BACKGROUND-CORRECTED COUNTS IN PEAK REGIONS ARE TO BE FIT WITH LEGENDRE POLYNOMIALS. THE PROGRAM IS PATTERNED AFTER A 1620 PREDECESSOR, 1254/PHY230, AND ACCEPTS FOR INPUT CARDS PREPARED BY PROGRAM 1745/PHY284.

704F REFERENCES	1254/PHY230,1745/PHY284	ON FILE DM APSB	E2
360F REFERENCES	1254/PHY230,1745/PHY284	ON FILE	E2

1896 AMD177 APPLIED PROGRAMMING LIBRARY

REQUESTOR M. BUTLER APPLIED MATHEMATICS

PROGRAMMER R. ROSICH

THIS PROGRAM WILL STORE ALL PRESENT CARDS AND PAPER TAPE PROGRAM LIBRARY MATERIAL ON LIBRARY TAPES WITH PROVISION TO REQUEST SOURCE OR SYMBOLIC LISTINGS, CARD DECKS OR PAPER TAPES ON DEMAND. ROUTINES TO UPDATE AND REVISE THE LIBRARY ARE INCLUDED.

160 REFERENCES		ON FILE	MO
360 REFERENCES		ON FILE	MO

1897 EL110 COMPLEX VARIABLE PROBLEMS

REQUESTOR J. HSU ELECTRONICS

PROGRAMMER R. WARD

A NUMBER OF PROBLEM SOLUTIONS ARE TO BE DETERMINED FOR GENERAL ELECTRONICS DIVISION APPLICATIONS.

REFERENCES		ON FILE	ZO

1899 RE306 ATMOSPHERIC TWO PHASE AIR W

REQUESTOR C. VOIGT REACTOR ENGINEERING

PROGRAMMER J. COOPER

PRESSURE DROP AND VOID FRACTION MEASUREMENTS MADE IN VERTICAL UPFLOW TEST SECTIONS OF THE AIR WATER LOOP WITH FLOW RESTRICTIONS ARE PROCESSED TO DETERMINE THE TWO-PHASE PRESSURE DROP AT THE ORIFICES.

704F REFERENCES ON FILE DM P B ZC

1903 RE307 ANALYSIS OF HEAT TRANSFER MECHANISMS IN CERAMIC FUEL ELEMENTS

REQUESTOR R. VISKANTA REACTOR ENGINEERING

PROGRAMMER J. COOPER

TEMPERATURE DISTRIBUTIONS AND LOCAL CONDUCTIVE AND RADIATIVE HEAT FLUXES IN CERAMIC FUEL ELEMENTS ARE DETERMINED.

704F REFERENCES ON FILE M APSB DC

1906 RE308 ELECTROMAGNETIC EFFECTS ON COMBINED FORCED AND FREE CONVECTION IN VERTICAL RECTANGULAR CHANNELS

REQUESTOR R. SINGER REACTOR ENGINEERING

PROGRAMMER M. SCHLAPKOHL

THE EFFECTS OF AN ELECTROMAGNETIC FIELD, INTERNAL ENERGY GENERATION, AND FREE CONVECTION UPON FULLY DEVELOPED, LAMINAR, FORCED CONVECTION HEAT TRANSFER OF AN ELECTRICALLY CONDUCTING FLUID ARE ANALYZED. THE CONSERVATION EQUATIONS ARE ANALYTICALLY SOLVED AND THE VELOCITY AND TEMPERATURE PROFILES, PRESSURE DROP PARAMETER, AND NUSSELT NUMBER ARE REPRESENTED IN TERMS OF INFINITE SERIES.

704F REFERENCES ON FILE DC

1907 MET155 EVALUATION OF AN EXPONENTIAL FUNCTION

REQUESTOR R. COTTERILL METALLURGY

PROGRAMMERS R. WARD, A. STRECOK

A FOUR-COMPONENT TEMPERATURE DEPENDENT EXPONENTIAL DECAY FUNCTION IS TABULATED.

704F REFERENCES ON FILE DM APSB ZC

1909 SSS142 ELECTRON SCATTERING AT VACANCIES IN METALS

REQUESTOR R. HUEBENER SOLID STATE SCIENCE

PROGRAMMER J. ANDERSON

AN ITERATIVE TECHNIQUE IS USED TO DETERMINE A SOLUTION TO A SYSTEM OF EQUATIONS INVOLVING BESSEL FUNCTIONS.

704F REFERENCES ON FILE DM APSB C3,C5

1911 RE POWER TO VOID TRANSFER FUNCTION

REQUESTORS M. PETRICK, K. JAIN REACTOR ENGINEERING

PROGRAMMER L. BRYANT

THIS PROGRAM IS TO INVESTIGATE THE FREQUENCY RESPONSE OF A BOILING CHANNEL.

ANA REFERENCES ON FILE

1912 CHM180 CALCULATION OF G-FACTORS FROM ZEEMANN DATA

REQUESTOR J. READER CHEMISTRY

PROGRAMMER W. NICO

THIS PROGRAM IS TO DETERMINE G-FACTORS, AND THEIR ERRORS, FROM ZEEMANN DATA, USING THE METHOD OF LEAST SQUARES.

704F REFERENCES ON FILE DM PSB E2

1916 AMD179 SUBROUTINES TO TEST BOOLEAN EXPRESSIONS FOR CONSISTENCY

REQUESTOR D. SHAFER APPLIED MATHEMATICS

THE PROGRAM INCLUDES-

1. A NUMBER OF SUBROUTINES TO TEST THE CONSISTENCY OF A BOOLEAN EXPRESSION IN CONJUNCTIVE NORMAL FORM,
2. A SUBROUTINE (PROBLM) THAT GENERATES SUCH EXPRESSIONS IN A RANDOM FASHION TO TEST THE SUBROUTINES (1),
3. A MAIN PROGRAM THAT CALLS (PROBLM) ONCE AND APPLIES THE SUBROUTINES (1) TO THE RESULTING EXPRESSION, PRINTING THE RESULTS AND THE TIMES.

THE OBJECTIVE IS TO DEVELOP A FAST PROCEDURE TO PERFORM THIS TEST FOR CONSISTENCY, WHICH IS NEEDED AS THE INNER LOOP FOR SOME THEOREM-PROVING PROGRAMS.

704F REFERENCES ON FILE Z0

1917 RE309 TRANSIENT THERMAL ANALYSIS

REQUESTOR R. SINGER REACTOR ENGINEERING

PROGRAMMER J. ZAPATKA

THE MAXIMUM TEMPERATURE REACHED IN A FUEL ELEMENT AND SPACER IS ANALYZED BASED ON A HYPOTHESIZED POWER EXCURSION. THE EFFECT OF HEAT TRANSFER BETWEEN THE FUEL AND THE SPACER WHICH ARE IN LOOSE CONTACT IS CONSIDERED.

704F REFERENCES ON FILE Z0

1920 PHY289

REQUESTOR A. ARIMA PHYSICS

PROGRAMMER J. WENGER

EIGENVALUES AND EIGENVECTORS OF REAL, SYMMETRIC MATRICES FORMED AS LINEAR COMBINATIONS OF COMPONENT MATRICES ARE COMPUTED.

704F REFERENCES ANF202 ON FILE DM PSB F2

1923 CEN128 LIQUID-LIQUID EXTRACTION PROBLEM

REQUESTOR T. JOHNSON CHEMICAL ENGINEERING

PROGRAMMER R. WARD

TABLES ARE TO BE CALCULATED TO ENABLE THE RAPID SELECTION OF OPERATING CONDITIONS FOR A WIDE VARIETY OF LIQUID METAL-LIQUID SALT EXTRACTION COLUMNS.

704F REFERENCES ON FILE DM PSB Z0

1931 BIM119 COLORADO BIRTH WEIGHTS, 1959-1962

REQUESTOR H. AUERBACH BIOLOGICAL AND MEDICAL RESEARCH

PROGRAMMER K. CLARK

AVERAGE BIRTH WEIGHTS AND VARIANCES ARE CALCULATED FOR INFANTS BORN IN COLORADO IN THE YEARS 1959-1962 (180,000 BIRTHS) GROUPED BY COUNTY OF RESIDENCE (ALTITUDE), SEX OF INFANT, AGE OF MOTHER AT BIRTH OF INFANT, AND LENGTH OF PREGNANCY. NUMBERS AND TYPES OF CONGENITAL MALFORMATIONS REPORTED AT BIRTH, BY THE ABOVE CATEGORIES, ARE ALSO TO BE ENUMERATED.

704F REFERENCES ON FILE G1,M3

1932 BIM120 NUMERICAL SOLUTION OF A CERTAIN VOLTERRA INTEGRAL EQUATION OF THE FIRST KIND

REQUESTOR E. TRUCCO BIOLOGICAL AND MEDICAL RESEARCH

CONSULTANT D. PHILLIPS PROGRAMMER J. VARLEY

SOLVE NUMERICALLY THE INTEGRAL EQUATION
G(T)=INTEGRAL FROM 0 TO T OF (1-KB(T-TAU))PSI(TAU)D(TAU)
WHERE G(T) AND B(T) ARE GIVEN AT A DISCRETE SET OF UNIFORMLY SPACED POINTS, AND K IS A CONSTANT.

704F REFERENCES ON FILE D1,E3

1935 PAD144 A MORPHOLOGY OF SOME SYSTEMS OF QUADRUPOLE LENSES USED FOR BEAM TRANSPORT

REQUESTOR C. TURNER PARTICLE ACCELERATOR

CONSULTANT W. COWELL PROGRAMMER J. ANDERSON

DETERMINE THE CHARACTERISTIC CURVE OR CURVES IN 7-DIMENSIONAL SPACE SUCH THAT ANY POINT ON THE CURVE SATISFIES TWO GIVEN MATRIX EQUATIONS (IN 7 UNKNOWNS) SIMULTANEOUSLY.

704F REFERENCES ON FILE F0
360F REFERENCES ON FILE F0

1942 MET156 SPECIAL POLYNOMIAL EVALUATION

REQUESTOR K. MYLES METALLURGY

PROGRAMMER K. CLARK

TABULATE T AND 1/T AS A FUNCTION OF (ER), WHERE (ER) IS GIVEN, AND
(ER)=A+B(EC)+C(EC)**2
(EC)=D+E(T)+F(T)**2.
POSITIVE ROOTS OF BOTH EQUATIONS ARE USED.

704F REFERENCES ON FILE DM PSB Z0

1944 CHM181 SPECTRUM OF INTERCHANGING A-B SPIN SYSTEM

REQUESTORS J. HEIDBERG, J. WEIL CHEMISTRY

PROGRAMMER K. CLARK

CALCULATION OF LINE SHAPES OF AN A-B NUCLEAR SPIN SYSTEM AS A FUNCTION OF THE LIFE-TIMES OF THE NUCLEI AT THE A-B SITES.

704F REFERENCES ON FILE DM PSB Z0

1946 MET157 VIBRATORY COMPACTION

REQUESTOR J. AYER METALLURGY

PROGRAMMER R. FU

GIVEN A SET OF EXPERIMENTAL OBSERVATIONS OF P AS A FUNCTION OF R, DETERMINE THE FUNCTIONAL FORM THAT BEST EXPRESSES, IN THE LEAST SQUARES SENSE, THE RELATIONSHIP BETWEEN R (THE RATIO OF THE DIAMETER OF A TUBE TO THE DIAMETER OF A SPHERE) AND P(THE PACKING FRACTION).

704F REFERENCES ANME208 ON FILE DM APSB E2

1947 CHM182 TABULATION OF Z(A)

REQUESTOR G. WING CHEMISTRY

PROGRAMMER R. FU

TABULATION OF Z(A) FOR EACH OF FOUR DIFFERENT ALGEBRAIC FUNCTIONS OF A.

704F REFERENCES ON FILE DM APSB ZO

1948 PHY290 ENERGY LEVEL FIT

REQUESTOR W. CHILDS PHYSICS

PROGRAMMER B. GARBOW

A BEST TWO-PARAMETER FIT FOR 4 ENERGY LEVELS.

704F REFERENCES ON FILE DM PSB E2

1950 HEP146 MONTE CARLO STUDY OF THE MOMENTUM RESOLUTION OBTAINABLE FROM SPARK CHAMBERS AND A BENDING MAGNET

REQUESTOR T. ROMANOWSKI HIGH ENERGY PHYSICS

PROGRAMMER C. SMITH

IN STUDYING THE KE(2) DECAY IT IS PROPOSED TO DETERMINE THE MOMENTUM OF THE ELECTRON BY ALLOWING IT TO PASS THROUGH A BENDING MAGNET AND RECORDING THE POSITION AND DIRECTION OF ITS PATH BEFORE AND AFTERWARDS IN SPARK CHAMBERS.

IN ORDER TO DISTINGUISH THIS DECAY FROM OTHERS IT IS NECESSARY TO ACHIEVE A MOMENTUM RESOLUTION OF ABOUT 2 PER CENT.

THE PURPOSE OF THIS PROGRAM IS TO SIMULATE BREMSSTRAHLUNG AND MULTIPLE SCATTERING IN THE PASSAGE OF ELECTRONS THROUGH THE SYSTEM. THE APPARENT ENERGY DISTRIBUTION OF THE ELECTRONS AS DEDUCED FROM THEIR PATHS THROUGH THE SPARK CHAMBERS IS THEN EXAMINED.

704F REFERENCES	ON FILE	G6
360F REFERENCES	ON FILE	G6

1951 PAD RESPONSE OF ZGS MAGNET POWER SUPPLY FILTER

REQUESTOR L. TENG PARTICLE ACCELERATOR

PROGRAMMER L. JUST

THE FILTER NETWORK USED TO FILTER OUT VOLTAGE RIPPLES IN THE POWER SUPPLY FOR THE ZGS RING MAGNET IS ANALYZED. THIS PROGRAM GIVES THE OUTPUT VOLTAGE WAVE FORMS FOR VARIOUS INPUT VOLTAGE WAVE FORMS AND PARAMETERS OF CIRCUIT ELEMENTS.

ANA REFERENCES	ON FILE	

1954 RP304 SOLUTIONS OF DETERMINANTS WITH POLYNOMIAL ELEMENTS (AEEW)

REQUESTOR G. SANATHANAN REACTOR PHYSICS

PROGRAMMER J. KOERNER

TRANSFER FUNCTIONS IN THE FORM OF A RATIO OF 2 POLYNOMIALS OF A COMPLEX VARIABLE ARE DERIVED FROM SETS OF LAPLACE TRANSFORMED SIMULTANEOUS DIFFERENTIAL EQUATIONS. THE SET OF ALGEBRAIC SIMULTANEOUS EQUATIONS IS SOLVED USING THE CRAMER RULE, GIVING RISE TO DETERMINANTS HAVING POLYNOMIAL ELEMENTS.

704F REFERENCES AEEW-R189	ON FILE	F3
360F REFERENCES AEEW-R189	ON FILE	F3

1955 RP305 AUTOMATED REPRODUCTIONS AND SECTION REQUEST

REQUESTOR A. SMITH REACTOR PHYSICS

PROGRAMMER R. MORRILL

TO PROVIDE A MEANS OF STORING AND RETRIEVING AEC CROSS SECTION REQUESTS ACCORDING TO VARIOUS CATEGORIES.

160 REFERENCES ON FILE APS MO

1956 MET158 ASSOCIATION OF ZN++ AND VACANCIES IN NACL

REQUESTOR S. ROTHMAN METALLURGY

PROGRAMMER R. FU

THE PROGRAM PROVIDES AN OPTION TO CHOOSE EITHER THE SIMPLE THEORY OR THE REFINED THEORY OR BOTH IN DETERMINING CV, THE CONCENTRATION OF ALL CAT-ION VACANCIES AND P, THE DEGREE OF ASSOCIATION.

704F REFERENCES ON FILE DM PSB C4

1957 MET159 CALCULATION OF DIFFUSION CONSTANT D

REQUESTOR S. ROTHMAN METALLURGY

PROGRAMMER R. FU

DETERMINATION OF LOG K AND D, THE DIFFUSION CONSTANT, BY A LEAST SQUARES PROCEDURE. SETS OF VD AND T OBTAINED ARE THEN FIT TO ANOTHER FUNCTION.

704F REFERENCES ON FILE DM PSB E2

1958 MET160 EVALUATION OF PS1 FOR A SERIES OF X, Y, Z VALUES

REQUESTOR R. COTTERILL METALLURGY

PROGRAMMER A. STRECOK

THIS PROGRAM OBTAINS A SET OF FUNCTIONS INVOLVING SIX RADICALS WHICH ARE DEPENDENT ON SPACE COORDINATES.

704F REFERENCES ON FILE DM APSB Z0

1960 CHM183 CRYSTAL FIELD CALCULATION

REQUESTOR J. WEIL CHEMISTRY

PROGRAMMER J. GVILDYS

THIS PROGRAM IS INTENDED TO CALCULATE MADELUNG SUMMATIONS FOR ELECTRIC CHARGES AND MULTIPOLES DISTRIBUTED IN A CRYSTAL ACCORDING TO THE OPERATIONS OF ANY SPACE GROUP.

360F REFERENCES ON FILE Z0

1961 IINSE ANALOG COMPUTER INSTRUCTIONS FOR AMU FACULTY-STUDENT CONFERENCE

REQUESTOR J. BAIRD INTERNATIONAL INSTITUTE OF NUCLEAR SCIENCE AND ENGINEERING

PROGRAMMERS L. JUST, J. MCALLISTER

PROVIDE INSTRUCTION IN ANALOG TECHNIQUES. ASSIST IN SOLUTION OF PROBLEMS OF INTEREST TO PARTICIPANTS.

ANA REFERENCES ON FILE

1962 CEN SIMULATION OF A DOG-CLUTCH

REQUESTOR J. GRAAE CHEMICAL ENGINEERING

CONSULTANT N. MOREHOUSE PROGRAMMER L. JUST

SOLVE EQUATIONS DESCRIBING THE TIME BEHAVIOR OF TWO SHAFTS CONNECTED BY A CLUTCH.

ANA REFERENCES ON FILE

1964 CEN130 NON-LINEAR LEAST SQUARES

REQUESTOR E. ZIEGLER CHEMICAL ENGINEERING

PROGRAMMER R. FU

GIVEN SETS OF A, B, AND C, DETERMINE, BY A LEAST SQUARES PROCEDURE, K, N, AND M IN FOUR DIFFERENT NON-LINEAR EQUATIONS.

704F REFERENCES ON FILE DM APSB E2

1966 RP306

REQUESTOR A. ULRICH REACTOR PHYSICS

PROGRAMMER N. JESSE

A BURST OF RELATIVISTIC PROTONS IN A NARROW BEAM IS SHOT UPWARD INTO THE ATMOSPHERE DURING A GIVEN TIME INTERVAL. CALCULATE FOR A GIVEN HEIGHT AND TIME THE FOLLOWING.

1. PROTON FLUX
2. IONIZATION RATE IN THE AIR
3. ELECTRON DENSITY IN THE AIR
4. DEGREE OF IONIZATION IN THE AIR
5. ELECTRICAL CONDUCTIVITY IN THE AIR
6. POTENTIAL AND ELECTRIC FIELD DUE TO RESULTING CHARGE DISTRIBUTION.

704F REFERENCES ON FILE Z0

1967 SSS143 THERMAL ELECTRIC POWER OF QUENCHED METALS

REQUESTOR R. HUEBENER SOLID STATE SCIENCE

PROGRAMMER A. STRECOK

GIVEN A TABLE OF X AND F(X), THIS PROGRAM APPROXIMATES THE VALUE FOR THE FIRST DERIVATIVE OF F(X).

704F REFERENCES ON FILE DM APSB E2

1969 RP307 PRESSURE CALCULATIONS IN NA LOOPS OF TREAT

REQUESTORS W. STEPHANY, C. DICKERMAN REACTOR PHYSICS

PROGRAMMER I. BAKSYS

IT IS DESIRED TO FIND THE BOILING COOLANT PRESSURE PULSE FOR A KNOWN POWER PULSE IN A REACTOR. AN ANALYTIC MODEL HAS BEEN DEVELOPED WHICH WILL BE APPLICABLE TO VARIOUS PHYSICAL SYSTEMS. OUR PRIMARY INTENTION IS TO USE THE MODEL FOR SAID PRESSURE CALCULATIONS IN THE INTERNAL AND LARGE NA LOOPS OF THE TREAT REACTOR.

MANIPULATION OF THE BASIC EQUATIONS OF THE ANALYTIC MODEL LEADS TO A SECOND ORDER NON-LINEAR DIFFERENTIAL EQUATION WHICH CAN BE SOLVED BY MACHINE METHODS.

704F REFERENCES ON FILE D2

1971 RP308 RIC (IITRI)

REQUESTOR B. TOPPEL REACTOR PHYSICS

PROGRAMMER G. JENSEN

THIS PROGRAM CALCULATES THE EFFECTIVE RESONANCE INTEGRAL ACCORDING TO THE METHOD OF NORDHEIM. IT IS SIMILAR TO THE METHOD USED IN GAM-I BUT IS MORE GENERAL AND USES LESS TABLE LOOK-UP.

704F REFERENCES ARF PROJECT A918	ON FILE	D1
360 REFERENCES ARF PROJECT A918	ON FILE	D1

1972 CHM184 CALCULATION OF TABLE OF RANDOM EXPONENTIAL DEVIATES AND CORRESPONDING TIME VALUES

REQUESTOR A. JAFFEY CHEMISTRY

PROGRAMMER J. HEESTAND

FOR INPUT VALUES OF T(J) AND C, DETERMINE T(I,J) TO 6 SIGNIFICANT DIGITS, WHERE T(I,J)=X(I)*T(J)/C. X(I)=ABSOLUTE VALUE OF LN(Y(I)), AND Y(I) IS A RANDOM NUMBER BETWEEN 0 AND 1.

704F REFERENCES	ON FILE DM	PSB	Z0

1974 RE310 MHD POWER GENERATOR STUDY

REQUESTOR R. SINGER REACTOR ENGINEERING

PROGRAMMER I. BAKSYS

THE EFFECTS OF COMBINED FORCED AND NATURAL CONVECTION HEAT TRANSFER, CHANNEL WALL ELECTRICAL CONDUCTIVITY, AND THE STRENGTH OF THE APPLIED MAGNETIC FIELD UPON THE CHARACTERISTICS OF MHD POWER GENERATOR ARE ANALYZED. THE PRESSURE DROP-FLOW RATE RELATIONSHIP AND THE HEAT TRANSFER RATE ARE FOUND TO DEPEND UPON FOUR PARAMETERS, THE HARTMANN NUMBER, M, THE RAYLEIGH NUMBER, RA, THE CONDUCTIVITY FACTOR PHI 2, AND THE ENERGY GENERATION FACTOR, F.

704F REFERENCES	ON FILE	Z0

1975 CEN131 ENTROPY ESTIMATION IN BINARY SYSTEMS

REQUESTOR E. VELECKIS CHEMICAL ENGINEERING

PROGRAMMER A. STRECOK

A LEAST SQUARES FIT TO A LOGARITHMIC FUNCTION IS OBTAINED.

704F REFERENCES ANME208	ON FILE DM	PSB	E2

1976 PHY292 PREPROCESSING ROUTINE A FOR PHY220

REQUESTOR G. PERLOW PHYSICS

PROGRAMMER J. WENGER

SEVERAL OPTIONS ARE PROVIDED FOR CONVERTING CHANNEL NUMBERS TO VELOCITY AND MODIFYING COUNTS BEFORE PUNCHING DATA DECKS IN SUITABLE FORMAT AS INPUT TO 1120/PHY220.

704F REFERENCES 1120/PHY220 ON FILE DM PSB Z0

1977 RPY146 COSMIC RAY NEUTRON BACKGROUND

REQUESTOR J. KASTNER RADIOLOGICAL PHYSICS

PROGRAMMER C. BURLESON

A. RECORDINGS ARE MADE WITH AN ORGANIC SCINTILLATOR OF PROTON RECOILS AS A FUNCTION OF THEIR ENERGY. THE FIRST PHASE OF THE PROGRAM PROCEEDS FROM THE EXPERIMENTAL CONTINUOUS DISTRIBUTION OF COUNTS VS. CHANNEL NUMBER TO DERIVE THE INCIDENT NEUTRON FLUX AND ENERGY DISTRIBUTION. CORRECTIONS FOR DETECTOR SIZE AND MULTIPLE SCATTERING ARE TO BE INCLUDED.

B. USING THE DERIVED AMBIENT NEUTRON DISTRIBUTION, A MONTE CARLO CALCULATION IS TO BE MADE TO DEVELOP A PROTON RECOIL PULSE HEIGHT SPECTRUM WHICH CAN BE EXPECTED TO COMPARE CLOSELY WITH THE EXPERIMENTAL SPECTRUM, PENDING WHICH FURTHER CORRECTIONS MAY BE NECESSARY.

360F REFERENCES ON FILE D PS G6

1978 AMD181 LYAPUNOV ALGORITHMS

REQUESTOR W. GIVENS APPLIED MATHEMATICS

CONSULTANT B. GARBOW PROGRAMMER S. CRICK, JR.

THE LYAPUNOV MAPPING G TO GA+(A-TRANSPOSE)G OF N BY N REAL SYMMETRIC MATRICES IS THE SUBJECT OF STUDY. IF THE INVERSE MAPPING COULD BE EFFECTIVELY CALCULATED, IT COULD PROVE A SIGNIFICANT TOOL IN DETERMINING THE STABILITY OF THE ASSOCIATED SYSTEM OF LINEAR DIFFERENTIAL EQUATIONS DX/DT=AX. THE TWO SPECIAL CASES UNDER INVESTIGATION ARE A IN HESSENBERG FORM, AND A THE COMPANION MATRIX OF A POLYNOMIAL. FOR THE LATTER, CODES IN 3600 FORTRAN ARE OPERATIONAL AND LIMITED NUMERICAL EXPERIMENTS ARE BEING CONTINUED. FOR PUBLICATION PURPOSES ALGOL CODES ARE UNDER DEVELOPMENT.

360F REFERENCES ON FILE C2,F4

1981 CEN132 NAPTHALENE MASS TRANSFER

REQUESTOR E. ZIEGLER CHEMICAL ENGINEERING

PROGRAMMER R. FU

CALCULATION OF VARIOUS QUANTITIES RELATED TO NAPTHALENE MASS TRANSFER AND LEAST SQUARES DETERMINATION OF PARAMETERS IN NON-LINEAR EQUATIONS.

704F REFERENCES	ON FILE	DM	PSB	E2

1982 PHY293 INPUT MODIFICATION OF PHYSICS 220

REQUESTOR J. HEBERLE PHYSICS

PROGRAMMER B. GARBOW

MODIFICATION OF INPUT FORMAT TO 1120/PHY220 TO ALLOW USE OF CARDS OBTAINED AS OUTPUT ELSEWHERE.

704F REFERENCES 1120/PHY220	ON FILE	DM	PSB	E2
360F REFERENCES 1120/PHY220	ON FILE	M	B	E2

1984 PHY294 NUCLEAR SHELL STRUCTURE CALCULATIONS

REQUESTORS S. COHEN, R. LAWSON, PHYSICS
M. MACFARLANE PHYSICS

PROGRAMMER D. JORDAN

CURRENT DEMANDS IN THE SHELL-MODEL PROJECT INCLUDE -

1) CREATION OF AN OPERATING SYSTEM TO CONTROL THE EXECUTION OF A LIBRARY OF PHYSICS PROGRAMS WRITTEN IN 3600 FORTRAN. THE CONTROL SYSTEM SHOULD INITIATE EXECUTION OF A PROGRAMMED SEQUENCE OF THE LIBRARY PROGRAMS AND COORDINATE DATA INTERCHANGE BETWEEN PROGRAMS.
2) A PROGRAM TO CONSTRUCT BASIC SET OF MANY-NUCLEON STATES.
3) A PROGRAM TO COMPUTE DOUBLE INTEGRALS WHICH OCCUR IN EVALUATING THE RADIAL PART OF THE TWO-BODY MATRIX ELEMENTS OF THE NUCLEON-NUCLEON INTERACTION.
4) A CHAIN OF PROGRAMS NEEDED IN STUDIES OF APPROXIMATE SOLUTIONS OF THE TRUNCATED SCHRODINGER EQUATION OF THE SHELL MODEL.
5) A STUDY TOWARDS SEEKING IMPROVEMENT OF AVAILABLE PROGRAMS FOR MINIMIZING FUNCTIONS OF MANY VARIABLES IN SITUATIONS WHERE ANALYTICAL EXPRESSIONS FOR DERIVATIVES ARE NOT AVAILABLE.

360 REFERENCES 1693/PHY280	ON FILE	D1,2,F0

1985 CHM185

REQUESTOR J. WING CHEMISTRY

PROGRAMMER J. VARLEY

1. GIVEN A SET OF ABOUT 150 DATA POINTS, FIND THE 18 PARAMETERS OF A FUNCTION WHICH IS A SUM OF QUOTIENTS OF POLYNOMIALS, USING A LEAST-SQUARES METHOD.
2. GIVEN ANOTHER SET OF 150 DATA POINTS, FIND THE 3 PARAMETERS OF A LINEAR FUNCTION, USING A LEAST-SQUARES METHOD.
3. GIVEN A SET OF 800 DATA POINTS, FIND 16 PARAMETERS OF A FUNCTION OF TWO VARIABLES, WHICH IS A SUM OF QUOTIENTS OF POLYNOMIALS, USING THE RESULTS OF (1) AND (2).

704F REFERENCES ANME208 ON FILE DM PSB E2
360F REFERENCES ON FILE E2

1986 CEN133 INTERACTION FOR 25 SOLUTE-SOLVENT PAIRS AT 500, 600, 700, AND 800 DEG K BY MCMILLAN AND JOHNSON-SHUTTLEWORTH EQUATIONS

REQUESTOR S. DHAR

PROGRAMMER A. STRECOK

THIS PROGRAM OBTAINS THE MCMILLAN AND JOHNSON-SHUTTLEWORTH INTERACTIONS FOR ALL COMBINATIONS OF THE GASES HE, NE, A, KR, AND XE WITH THE METALS LI, NA, K, RB, AND CS AT TEMPERATURES 500, 600, 700, AND 800K. THE MATHEMATICAL EXPRESSION INVOLVES A WEIGHTED EXPONENTIAL.

704F REFERENCES ON FILE DM PSB Z0

1987 MET161

REQUESTOR A. BERNDT METALLURGY

PROGRAMMER J. HEESTAND

GENERATE TABLES OF ALGEBRAIC AND TRIGONOMETRIC CRYSTALLOGRAPHIC FUNCTIONS.

704F REFERENCES ON FILE DM PSB Z0

1989 CHM186 SIEGER AND WAPSTRA SHELL EFFECTS

REQUESTOR J. WING CHEMISTRY

PROGRAMMER J. HEESTAND

TABULATE THE SIEGER AND WAPSTRA SHELL EFFECTS.

704F REFERENCES ON FILE DM PSB ZO

1990 CEN134 KEYWORD RETRIEVE AND SORT (KEYSORT)

REQUESTOR I. DILLON CHEMICAL ENGINEERING

PROGRAMMER R. MORRILL

TO LOCATE AND SORT INFORMATION PERTAINING TO GIVEN KEYWORDS FROM TECHNICAL PUBLICATION TITLES.

160 REFERENCES ON FILE D PS GO MO

1991 RP310 BILINEAR WEIGHTING

REQUESTOR D. SHAFTMAN REACTOR PHYSICS

CONSULTANT H. GREENSPAN PROGRAMMER A. RAGO

FEW GROUP CONSTANTS FOR USE IN DIFFUSION THEORY PROBLEMS ARE CALCULATED BY MEANS OF AN IMPORTANCE-WEIGHTING PROCEDURE. A FLUX-ADJOINT WEIGHTING INTEGRATED OVER THE REGION OF CONCERN IS USED. REGION DEFINITION, FLUX AND ADJOINT FLUX ARE OBTAINED FROM ASSOCIATED RE269 PROBLEMS.

704F REFERENCES MEMC-HG/DS,9/27/63 ON FILE M P ZO

1992 RP310 TWENTY GRAND (ORNL)

REQUESTOR C. KELBER REACTOR PHYSICS

PROGRAMMER N. JESSE

THIS CODE PROVIDES A REAL AND ADJOINT SOLUTION FOR THE NEUTRON DIFFUSION EQUATIONS OVER A RECTANGULAR REGION OF THE X, Y OR R, Z PLANE. ONE TO SIX LETHARGY GROUPS MAY BE SPECIFIED WITH UP AND DOWN-SCATTERING FROM ANY GROUP TO ANY OTHER GROUP, AND IN X, Y GEOMETRY A REGIONAL AND GROUP-WISE BUCKLING MAY BE GIVEN. BOTH DIFFUSION AND ROD REGIONS ARE ALLOWED AND AT THE EXTERNAL BOUNDARIES EITHER FLUX=0 OR DERIVATIVE=0 CONDITIONS MAY BE APPLIED. ALSO INCLUDED IN THE CODE ARE SINGLE DIAGONAL, DOUBLE DIAGONAL AND MIRROR DIAGONAL SYMMETRY OPTIONS AND AN OPTION TO NORMALIZE FLUXES TO ANY ARBITRARY POWER LEVEL. COMPLETE VARIATION OF THE MESH INTERVAL IS ALLOWED WITH UP TO 3000 MESH POINTS GIVEN. FOR THE REAL SOLUTION AS MANY AS 100 REGIONS MAY BE SPECIFIED, BUT FOR THE ADJOINT CASE NO MORE THAN 70 ARE ALLOWED.

360F REFERENCES ORNL-3200 ON FILE D0

1997 AMD182 MATRIX MULTIPLICATION TIMING TEST

REQUESTOR W. MILLER APPLIED MATHEMATICS

PROGRAMMER N. PURCELL

MATRIX MULTIPLY ROUTINE, INTENDED TO TIME 7094 OPERATIONS FOR COMPARISON WITH 3600 TIMES.

794 REFERENCES ON FILE

1999 HEP149 SR1 AND SR2 (ORNL)

REQUESTOR G. BURLESON HIGH ENERGY PHYSICS

PROGRAMMER R. ROYSTON

TO MAKE THESE FAP SUBROUTINES WHICH CALCULATE GAMMA RAY STRAGGLING AVAILABLE AS FORTRAN SUBROUTINES.

794 REFERENCES ORNL-3329 ON FILE D APSB G6

2000 HEP150 MULTI-CHANNEL ANALYZER OUTPUT MERGER

REQUESTOR R. LAMB HIGH ENERGY PHYSICS

PROGRAMMER R. ROYSTON

THE PAPER TAPES OUTPUT FROM A MULTI-CHANNEL ANALYZER WILL BE TRANSCRIBED ONTO MAGNETIC TAPE USING TRANSCRIBE (HEP123).
THIS PROGRAM WILL ADD TOGETHER THE DIFFERENT OUTPUTS, ADJUSTING THEM TO A COMMON GAIN AND ZERO SHIFT.

160F REFERENCES ON FILE M2

2002 CHM187

REQUESTOR J. WING CHEMISTRY

PROGRAMMER J. VARLEY

GIVEN A SET OF ABOUT 800 DATA POINTS, FIND 24 PARAMETERS OF A FUNCTION OF TWO VARIABLES WHICH IS A SUM OF QUOTIENTS OF POLYNOMIALS.

704F REFERENCES ON FILE E2
360F REFERENCES ANMZ013,1782/CHM176 ON FILE D APS E2

2003 CHM188 CALCULATION OF ISOTOPES CARBON-13 AND OXYGEN-18 CONCENTRATIONS

REQUESTOR J. STOESSEL CHEMISTRY

PROGRAMMER A. STRECOK

EIGHT VALUES REPRESENTING RATIOS OF INPUT VALUES ARE OBTAINED.

704F REFERENCES ON FILE DM PSB Z0

2004 CHM189 DOUBLE INTEGRATION OF MAGNETIC RESONANCE CURVES

REQUESTOR J. WEIL CHEMISTRY

PROGRAMMER C. CHAMOT

GIVEN A TABLE OF N VALUES OF Y AND FPRIME, USE TRAPEZOIDAL INTEGRATION TO OBTAIN VALUES OF F AT EACH Y, AND THEN USE SIMPSON QUADRATURE TO FIND THE INTEGRAL OF F(Y) FROM Y1 TO YN.
SCALE FACTORS MAY BE SPECIFIED FOR Y AND FPRIME.

704F REFERENCES ON FILE DM PSB D1

2006 CEN135

REQUESTOR E. VELECKIS CHEMICAL ENGINEERING

PROGRAMMER R. FU

P, R, AND OTHER FUNCTIONS OF P ARE CALCULATED FOR GIVEN VALUES OF T.

704F REFERENCES ON FILE DM PSB ZC

2007 BIM121 CALCULATION OF MOMENTS OF TREATMENT GROUPS

REQUESTOR G. SACHER BIOLOGICAL AND MEDICAL RESEARCH

PROGRAMMER R. FU

MOMENTS AND OTHER STATISTICAL DATA ARE TO BE CALCULATED FOR TREATMENT GROUPS SET UP IN CAGES OF THREE. THESE DATA WILL BE PLOTTED, AND INSPECTION OF THE PLOTS WILL DETERMINE FUNCTIONS TO BE USED IN A REGRESSION ANALYSIS.

704F REFERENCES ON FILE G1,2

2008 CHM190 COMPUTATION OF NORMALIZED INCOMPLETE BETA FUNCTIONS FOR LARGE ARGUMENTS

REQUESTOR A. JAFFEY CHEMISTRY

PROGRAMMER A. STRECOK

THIS METHOD IS RESTRICTED TO THOSE ARGUMENTS FOR WHICH THE PAULSON METHOD IS APPLICABLE.

704F REFERENCES ON FILE DM APSB C3

2010 BIM122 EVALUATION OF FUNCTIONS INVOLVING THE NORMALIZED INCOMPLETE GAMMA FUNCTION AND ITS ASSOCIATED POISSON TERM

REQUESTOR E. TRUCCO BIOLOGICAL AND MEDICAL RESEARCH

PROGRAMMER K. CLARK

EVALUATE THE THREE FUNCTIONS, PHI(A) (THE NORMALIZED INCOMPLETE GAMMA FUNCTION), DELTA(A) (A CONSTANT MULTIPLIED BY THE POISSON TERM), AND THETA(A) (DELTA(A)/PHI(A)).

704F REFERENCES ON FILE C3
360F REFERENCES ON FILE D PS C3

2011 RE312 A STUDY OF UNSTEADY, CONVECTIVE MAGNETOHYDRODYNAMIC CHANNEL FLOW

REQUESTOR R. SINGER REACTOR ENGINEERING

PROGRAMMER A. KENNEDY

THE HYDRODYNAMIC, THERMAL, AND ELECTROMAGNETIC PHENOMENA OCCURRING IN A MHD GENERATOR DURING START-UP ARE ANALYZED. THE AVERAGE VELOCITY AND TEMPERATURES ARE EVALUATED ALONG WITH THE HEAT TRANSFER RATE AS A FUNCTION OF TIME AND THE PARAMETERS RA (RALEIGH NUMBER), M (HARTMANN NUMBER), PR (PRANDTL NUMBER), AND F/G (HEAT GENERATION INDEX).

704F REFERENCES	ON FILE	ZO
360F REFERENCES	ON FILE	ZO

2014 CEN136 STEPWISE MULTIPLE REGRESSION (ER)

REQUESTOR D. RAMASWAMI CHEMICAL ENGINEERING

PROGRAMMER R. FU

TO PROVIDE THE CHEMICAL ENGINEERING DIVISION WITH THE USE OF A FORTRAN STEPWISE MULTIPLE LINEAR REGRESSION PROCEDURE.

704F REFERENCES ER MPR2	ON FILE	PSB C	G2

2016 HEP151 BUBBLE CHAMBER GEOMETRY PROGRAM (NIRNS)

REQUESTOR M. DERRICK HIGH ENERGY PHYSICS

PROGRAMMER S. ZAWADZKI

TO MAKE THE HARWELL GEOMETRY PROGRAM AVAILABLE FOR USE WITH INPUT FROM MEASUREMENTS MADE ON ARGONNE MEASURING TABLES AND OUTPUT TO GRIND. ALSO TO ADAPT IT FOR USE WITH THE OPTICAL SYSTEMS IN USE ON CHAMBERS AT THE ZGS AND LATER MODIFY IT FOR USE WITH HIGH FIELD CHAMBERS.

794F REFERENCES NIRL/R/14	ON FILE	RO
360F REFERENCES NIRL/R/14	ON FILE	RO

2018 MET163 THRESHOLD ENERGY DETERMINATION

REQUESTOR K. MERKLE METALLURGY

PROGRAMMER R. FU

GIVEN A SET OF EXPERIMENTAL DATA, DETERMINE, BY LEAST SQUARES METHODS, THE BEST ESTIMATES OF THE MEAN AND SIGMA OF THE WEIGHTING FUNCTION.

704F REFERENCES ON FILE

2019 SSS144

REQUESTOR G. MONTET SOLID STATE SCIENCE

PROGRAMMER A. LENT

EVALUATION OF TWO FINITE TRIGONOMETRIC SUMS.

704F REFERENCES ON FILE DM APSB ZO

2020 SSS145 CALCULATION OF THE DISTORTION AROUND IMPERFECTIONS IN A FACE-CENTERED CUBIC METAL

REQUESTORS M. DOYAMA SOLID STATE SCIENCE
R. COTTERILL METALLURGY

PROGRAMMER F. CLARK

A MINIMIZATION PROCEDURE IS USED TO DETERMINE THE POSITIONS OF ATOMS IN IMPERFECT METALS HAVING A FACE-CENTERED CUBIC CRYSTAL STRUCTURE.

704F REFERENCES ON FILE ZO
360F REFERENCES ON FILE ZO

2022 LDO103 ELECTRON GUN DESIGN

REQUESTOR A. CREWE LABORATORY DIRECTORS OFFICE

CONSULTANT J. BUTLER PROGRAMMER M. BUTLER

DESIGN OF FIELD EMISSION ELECTRON GUN FOR MINIMUM SPHERICAL ABERRATION.

704F REFERENCES ON FILE ZO

2023 IINSE INTRODUCTION TO ELECTRONIC ANALOG COMPUTING

REQUESTOR J. BAIRD INTERNATIONAL INSTITUTE

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

INTRODUCTION TO PROGRAMMING AND ANALYSIS ON AN ANALOG COMPUTER.

ANA REFERENCES ON FILE

2024 CEN137 LIMITING CURRENT DENSITY CALCULATIONS

REQUESTOR J. ELDER CHEMICAL ENGINEERING

PROGRAMMER J. HEESTAND

TABULATE THREE ALGEBRAIC FUNCTIONS FOR CURRENT DENSITY--NATURAL FLOW, FORCED FLOW, AND COMBINED FLOW.

704F REFERENCES ON FILE DM PSB Z0

2025 CEN138 LEAST SQUARES DETERMINATION OF PARAMETERS COMMON TO TWO FUNCTIONAL FORMS

REQUESTOR M. FOSTER CHEMICAL ENGINEERING

PROGRAMMER K. CLARK

DETERMINE, BY A LEAST SQUARES PROCEDURE, THE PARAMETERS IN THE FOLLOWING EQUATIONS, WHERE F(1) AND F(2) ARE NOT BOTH DEFINED AT X(1)=X(2).

```
F(1)=(1-X(1))**2*(A+B*(4*X(1)-1)+G*(12*X(1)**2-8*X(1)+1))
F(2)=X(2)**2*(A+B*(4*X(2)-3)+G*(12*X(2)**2-16*X(2)+5))
```

THAT IS, SETS OF F, X(1), AND X(2) WILL BE GIVEN AS INPUT. F IS FITTED TO F(1) IF X(2) EQUALS 0 AND X(1) DOES NOT EQUAL 0, AND F IS FITTED TO F(2) IF X(1) EQUALS 0 AND X(2) DOES NOT EQUAL 0.

704F REFERENCES ON FILE DM PSB E2

2026 CEN139 PROCESS CALCULATIONS FOR FLUID-BED URANIUM

REQUESTOR J. HOLMES CHEMICAL ENGINEERING

PROGRAMMER A. STRECOK

THE PURPOSE OF THIS PROGRAM IS TO OBTAIN THE MATERIAL AND HEAT BALANCE FOR THE HYDRO-CHLORINATION PROCESS.

704F REFERENCES ON FILE Z0,E2
360F REFERENCES ON FILE Z0,E2

2027 CHM191 CLASSIFICATION ARRAY

REQUESTOR M. FRED CHEMISTRY

PROGRAMMER C. CHAMOT

GIVEN TWO LISTS OF ENERGY LEVELS, TO AND T, WITH THEIR ASSOCIATED QUANTUM NUMBERS, JO AND J, GENERATE TABLES OF DIFFERENCES BETWEEN TO AND T FOR CERTAIN COMBINATIONS OF JO AND J. TABULATE THE SORTED DIFFERENCES WITH THEIR ASSOCIATED JO AND J.

360F REFERENCES 1384/CHM148 ON FILE D PSB O M1

2030 PHY295 SCATTERING OF DEUTERONS IN HELIUM

REQUESTOR D. GEMMELL PHYSICS

PROGRAMMER L. JUST

EVALUATION OF THE SCATTERING FORMULA FOR PARTICLES OF SPIN 1 IMPINGING ON A SPIN ZERO NUCLEUS - A ONE-LEVEL APPROXIMATION.

360F REFERENCES ON FILE DM PSB Z0

2031 PHY296 CURVE FITTING FOR VELOCITY SPECTRA OBTAINED WITH BASE-LINE INPUT

REQUESTOR J. HEBERLE PHYSICS

PROGRAMMER B. GARBOW

MODIFICATION OF PHY220 TO ALLOW 12 LINE SHAPES AND TO ACCEPT INPUT DATA IN A DIFFERENT FORMAT.

704F REFERENCES 1120/PHY220 ON FILE DM PSB E2
360F REFERENCES 1120/PHY220 ON FILE M B E2

2035 CHM192 RECOIL ANALYSIS

REQUESTOR L. WINSBERG CHEMISTRY

PROGRAMMER B. GARBOW

LEAST SQUARES SOLUTIONS OF NON-LINEAR EQUATIONS.

704F REFERENCES ANMZ013 ON FILE DM PSB E2

2036 SSS146 ZONE MELTING COMPUTATIONS

REQUESTOR S. SUSMAN SOLID STATE SCIENCE

PROGRAMMER R. HAMELINK

WE ARE GIVEN SEVERAL ANALYSES OF A BAR OF METAL AFTER N PASSES OF THE MOLTEN ZONE IN A ZONE MELTING PROCESS. THE PROBLEM IS TO FIND THE BEST DISTRIBUTION COEFFICIENT, K, FOR THE PROCESS. THIS IS DONE BY FITTING THE DATA TO THE CONCENTRATION FUNCTION. THIS FUNCTION IS DETERMINED FROM THE ZONE MELTING INTEGRAL EQUATIONS IN WHICH K IS A PARAMETER. IT EXPRESSES THE CONCENTRATION OF THE IMPURITY AS A FUNCTION OF THE DISTANCE FROM THE END OF THE BAR, THE NUMBER OF PASSES MADE BY THE MOLTEN ZONE, AND K.

360F REFERENCES ANL5294 ON FILE DM APSB D2,Z0

2038 CHM203

REQUESTOR S. WEXLER CHEMISTRY

PROGRAMMER W. HAFNER

THIS PROVIDES THE CHEMISTRY DIVISION WITH THE USE OF PHY240, WITH MODIFICATIONS TO BE MADE TO PARTS A AND B SO CALCULATIONS ARE BASED ON TIME INSTEAD OF PRESSURE.

704F REFERENCES 1323/PHY240 ON FILE DM PSB E0

2041 MET164 PREPARATION OF DATA CARDS FROM MET135 OUTPUT

REQUESTOR M. MUELLER METALLURGY

PROGRAMMER C. CHAMOT

MODIFICATION OF THE D-SPACE PROGRAM TO OBTAIN PUNCHED CARD OUTPUT OF H, K, L, 2THETA, PHI, AND CHI.

704F REFERENCES 1209/MET135 ON FILE DM PSB M0

2045 AMD184 FACTOR ANALYSIS

REQUESTOR W. GIVENS APPLIED MATHEMATICS

CONSULTANT J. VAN RYZIN PROGRAMMER R. FU

DEVELOPMENT OF A GENERAL FACTOR ANALYSIS PROGRAM FOR THE 3600 AS A CONTRIBUTION TO THE ARGONNE AND COOP STATISTICAL LIBRARY. THIS PROGRAM WAS CHOSEN TO UTILIZE ARGONNE EFFORTS IN DEVELOPMENT OF MATRIX EIGENVALUE-EIGENVECTOR ROUTINES.

360F REFERENCES ON FILE G2

2047 CHM193 EXTENSION OF PROGRAM 1518/CHM156

REQUESTORS H. GOODSPEED CHEMISTRY
J. MARSH CHEMISTRY

PROGRAMMER A. STRECOK

THIS PROGRAM CALCULATES A AND B FROM INPUT DATA AND PRODUCES A TABLE OF M*X*(A+B*X) FOR X IN THE RANGE 0(1)500. M IS AN INPUT PARAMETER.

704F REFERENCES 1518/CHM156 ON FILE CM PSB C1

2051 CHM194 FISSION FRAGMENT CORRELATIONS

REQUESTOR J. UNIK CHEMISTRY

PROGRAMMER F. CLARK

ANALYSIS OF MULTIPARAMETER CHANNEL ANALYZER DATA FROM MAGNETIC TAPE CONTAINING 512 30-BIT ITEMS PER RECORD.

360F REFERENCES ON FILE GO

2054 LIB101 AUTOMATED LIBRARY INDEXING

REQUESTOR J. ANDREWS LIBRARY SERVICES

PROGRAMMER R. MORRILL

A STUDY IS TO BE UNDERTAKEN WITH THE LIBRARY SERVICES DEPARTMENT TO DETERMINE THE FEASIBILITY OF PRODUCING FOR LABORATORY USE BOOK CATALOGS TO REPLACE THE EXISTING LIBRARY CARD CATALOGS. ATTEMPTS WILL BE MADE TO UTILIZE COMPUTING FACILITIES IN PREPARING AUTHOR, TITLE, AND SUBJECT INDEXES WHILE CONFORMING TO LIBRARY CONVENTIONS, AS POSSIBLE.

PROGRAMS ARE REQUIRED TO PRODUCE THE CATALOG LISTINGS AND TO UPDATE THESE LISTINGS.

401 REFERENCES ON FILE MO
360 REFERENCES ON FILE MO

2055 CHM195

REQUESTOR J. SULLIVAN CHEMISTRY

PROGRAMMER J. VARLEY

PART I FIND A, B AND C IN THE EQUATION T=A*LN(X/(CO6+X/3))+B/X+C
WHERE CO6 IS A CONSTANT.

PART II GIVEN A TABLE OF VALUES OF X AND Y, DETERMINE A AND B IN THE EQUATION A+BU=V USING WEIGHTS OF 1/(V*V), WHERE U=(XO-X)/X AND V=X(DY/DX)(CRO+X/3) WITH XO AND CRO GIVEN CONSTANTS, AND DY/DX A NUMERICAL DERIVATIVE CALCULATED AS IN SSS143.

704F REFERENCES ANME212, 1967/SSS143 ON FILE DM PSB E2,ZO

2056 SSS147 PROGRAM PROCESSOR

REQUESTOR J. GABRIEL SOLID STATES SCIENCE

PROGRAMMER J. VARLEY

MAKE UP A LIBRARY TAPE OF APPROXIMATELY 100 QUANTUM MECHANICS FORTRAN SUBROUTINES (TO BE PROVIDED) TOGETHER WITH A PROGRAM TO ADD, DELETE, OR REPLACE ROUTINES, AND TO PRINT OR PUNCH SPECIFIED ROUTINES UPON REQUEST. BOTH THE SOURCE AND OBJECT PROGRAM FOR EACH ROUTINE SHOULD BE ON THE LIBRARY TAPE.

THE POSSIBILITY OF USING THIS TAPE ON-LINE AS A SUBROUTINE LIBRARY TAPE (SUPPLEMENTARY TO THE SCOPE LIBRARY) FOR PRODUCTION RUNS WILL BE INVESTIGATED.

FORTRAN IS TO BE USED WHEN PRACTICAL.

THREE OF THE SUBROUTINES HAVE THE SAME NAME, THIS MUST BE TAKEN INTO CONSIDERATION IN ANY IDENTIFICATION SCHEME DEVELOPED.

160 REFERENCES ON FILE MO
360 REFERENCES ON FILE MO

2058 MET DIFFUSION OF ZINC AND SODIUM CHLORIDE

REQUESTOR S. ROTHMAN METALLURGY

CONSULTANT N. MOREHOUSE PROGRAMMER L. BRYANT

SOLVE THE NON-LINEAR DIFFUSION EQUATION FOR THE GIVEN CONDITIONS AND DETERMINE THE PARAMETERS BY FITTING THE CALCULATED CURVES TO THE EXPERIMENTAL DATA.

ANA REFERENCES ON FILE

2059 RP DETERMINE THE TEMPERATURE DISTRIBUTION FOR DOPPLER ELEMENT

REQUESTORS H. HUMMEL, D. MENELEY REACTOR PHYSICS

PROGRAMMER L. BRYANT

DETERMINE THE TEMPERATURE DISTRIBUTION FOR A DOPPLER ELEMENT WITH KNOWN MAXIMUM TEMPERATURE AND UNKNOWN SLOPE AND TEMPERATURE THROUGH THE VARIOUS REGIONS WITH THE GIVEN DATA. ASSUME EQUAL SLOPE AND TEMPERATURE AT THE BOUNDARIES OF THE ELEMENTS.

ANA REFERENCES ON FILE

2060 CHM196

REQUESTOR H. VONACH CHEMISTRY

PROGRAMMER A. LENT

STATISTICAL CORRELATION BETWEEN TWO SETS OF DATA.

704F REFERENCES ON FILE DM APSB ZO

2062 RE313

REQUESTOR R. STEIN REACTOR ENGINEERING

PROGRAMMER A. KENNEDY

THE MATHEMATICAL PROBLEM IS RELATED TO HEAT TRANSFER BETWEEN TWO FLUIDS IN LAMINAR CO-CURRENT FLOW THROUGH DOUBLE PIPE HEAT EXCHANGES. THE COMPUTATIONS REQUESTED GIVE FULLY DEVELOPED HEAT TRANSFER COEFFICIENTS AS A FUNCTION OF THE OPERATING CONDITIONS OF THE EXCHANGER, AND ILLUSTRATE THE USE OF AN APPROXIMATION TECHNIQUE NOT PREVIOUSLY THOUGHT APPLICABLE TO PROBLEMS OF THIS TYPE. THE COMPUTATIONS ALSO GIVE QUANTITIES THAT WILL BE USEFUL FOR FUTURE EXTENSIONS OF THE PROBLEM.

704F REFERENCES ON FILE DO

2063 PHY297 PUNCHED CARDS TO PAPER TAPE CONVERSION

REQUESTOR E. SHERA PHYSICS

PROGRAMMER R. MUELLER

CDC160A PROGRAM TO GO FROM PUNCHED CARDS WITH FORMAT OF 10I6 TO PAPER TAPE WITH ONE OF THE FOLLOWING FORMATS -
1. SIX DIGITS FOLLOWED BY AN E1,
2. TWO DELETES FOLLOWED BY 5 DIGITS FOLLOWED BY AN E1 (MOST SIGNIFICANT DIGIT FROM THE I6 CARD FIELD IS TO BE IGNORED).
OUTPUT FORMAT IS TO BE SELECTED BY A SENSE SWITCH. TAPE IS TO BE PUNCHED ACCORDING TO GEORGE STANDARD PAPER TAPE CODE.

160 REFERENCES ON FILE APS GO Z0

2064 CHM197 DETERMINATION OF COEFFICIENTS IN SUM OF EXPONENTIALS

REQUESTOR A. STEHNEY CHEMISTRY

PROGRAMMER J. HEESTAND

DETERMINE, BY LEAST SQUARES, THE C(J) IN THE FOLLOWING FUNCTION, WHERE THE LAMBDA(J) ARE GIVEN AS INPUT--
Y=C(1)EXPF(LAMBDA(1)*X)+C(2)EXPF(LAMBDA(2)*X)+...

704F REFERENCES ON FILE E2
360F REFERENCES ON FILE E2

2067 CEN140 KINETIC ANALYSIS OF THE HYDROLYSIS REACTION OF URANIUM HEXAFLUORIDE

REQUESTOR R. KESSIE CHEMICAL ENGINEERING

CONSULTANT D. WOODWARD PROGRAMMER A. STRECOK

THIS PROGRAM USES THE VARIABLE METRIC METHOD OF MINIMIZATION TO DETERMINE 17 PARAMETERS WHICH REPRESENT CONDITIONS IN A REACTOR SYSTEM. ALL PARAMETERS ARE DEFINED IMPLICITLY BY INTEGRAL EQUATIONS.

704F REFERENCES ANMZ013 ON FILE D1,E2
360F REFERENCES ON FILE D1,E2

2070 HEP152 AUTOMATIC MEASUREMENT OF KE2 PHOTOGRAPHS

REQUESTOR T. ROMANOWSKI HIGH ENERGY PHYSICS

CONSULTANT J. BUTLER PROGRAMMER R. CLARK

IN THE KE2 EXPERIMENT THE ENERGIES OF ELECTRONS ARE DETERMINED BY OBSERVING THE DEFLECTION IN THEIR PATHS ON PASSING THROUGH A BENDING MAGNET. THE ELECTRONS ARE OBSERVED IN SPARK CHAMBERS PLACED ALONG THEIR TRAJECTORY. THE CHAMBERS HAVE A SMALL NUMBER OF LARGE PLATES, AND ARE PHOTOGRAPHED IN NINETY DEGREE STEREO ON ONE FRAME.

THIS PROGRAM WILL MEASURE THE POSITIONS OF THE SPARKS AND FIDUCIALS AND PASS THEM ON TO A GEOMETRICAL RECONSTRUCTION PROGRAM.

IT IS ESTIMATED THAT 100,000 PHOTOGRAPHS WILL BE TAKEN.

704 REFERENCES	ON FILE	T1
360 REFERENCES	ON FILE	T1
CHL REFERENCES	ON FILE	T1

2071 SSS148 NUMERICAL INTEGRATION OF TRANSPORT INTEGRALS

REQUESTOR R. HUEBENER SOLID STATE SCIENCE

PROGRAMMER A. LENT

EVALUATION AS A FUNCTION OF T OF INDEFINITE INTEGRALS WITH INTEGRAND (X**2/(EXPF(X)-1.0)**2)*F(T,X) AND UPPER LIMIT A FUNCTION OF T. F IS A SLOWLY VARYING FUNCTION OF X.

360F REFERENCES	ON FILE DM APSB	D1,E2

2072 CHM198 SELF-CONSISTENT FIELD SEMI-EMPIRICAL MOLECULAR ORBITALS CALCULATION

REQUESTOR R. DOUGHERTY CHEMISTRY

PROGRAMMER C. CHAMOT

A NUMBER OF SUBPROGRAMS ARE REQUIRED FOR USE IN THESE CALCULATIONS. THE ROUTINES SHOULD TAKE ADVANTAGE OF VARIABLE DIMENSION FEATURES IN 3600 FORTRAN. ROUTINES REQUIRED INCLUDE THE MATRIX OPERATIONS - ADD, SUBTRACT, SCALAR MULTIPLY, MATRIX MULTIPLY, INVERT, TRANSPOSE, MOVE, SOLVE FOR TRACE AND DETERMINANT OF REAL MATRICES, AS WELL AS EIGENVALUE AND EIGENVECTOR DETERMINATION AND SCHMIDT ORTHOGONALIZATION.

360F REFERENCES	ON FILE D APSB	F0

2073 RE314 ON THE TRANSITION FROM POISEVILLE TO HARTMANN FLOW

REQUESTOR R. SINGER REACTOR ENGINEERING

PROGRAMMER A. KENNEDY

THE FLOW OF AN ELECTRICALLY CONDUCTING FLUID IN THE ENTRANCE REGION OF AN MHD GENERATOR IS DESCRIBED BY A SYSTEM OF PARTIAL DIFFERENTIAL EQUATIONS. FROM THE SOLUTION OF THE SYSTEM, INFORMATION ON THE OPERATING CHARACTERISTICS OF AN MHD GENERATOR CAN BE DETERMINED TAKING INTO ACCOUNT THE EFFECTS OF A NON-FULLY-DEVELOPED VELOCITY PROFILE. THE CONTROLLING PARAMETERS ARE THE REYNOLDS NUMBER, R, THE MAGNETIC-HYDRODYNAMIC INTERACTION PARAMETER, H, AND THE MAGNETIC REYNOLDS NUMBER, RM.

704F REFERENCES ON FILE D3

2079 EL111 SIGNAL TO NOISE CALCULATION

REQUESTOR D. DROBNIS ELECTRONICS

PROGRAMMER R. FU

THIS PROGRAM CALCULATES NORMALIZED BACKGROUND COUNTS AND SOURCE. IT ALSO DETERMINES THE MAXIMUM SIGNAL TO NOISE RATIO AND COMPUTES A TABLE OF SUCH RATIOS.

704F REFERENCES ON FILE DM PSB Z0

2082 PHY298 VAN DE GRAAFF REAL-TIME PROGRAMMING SYSTEM FOR PHYLIS

REQUESTOR J. SCHIFFER PHYSICS

CONSULTANT W. MILLER PROGRAMMER W. SNOW

VARIOUS PROGRAMS WILL BE WRITTEN TO ALLOW REAL-TIME COMPUTATION IN COORDINATION WITH EXPERIMENTS IN LOW ENERGY PHYSICS ON THE VAN DE GRAAFF. EXPERIMENTAL DATA IS ACCUMULATED IN THE ASI-2100 AND PASSED TO THE 3600 FOR SORTING, UPDATING AND OTHER PROCESSING AND RETURNED VIA THE 2100.

INITIAL PROGRAMS TO BE WRITTEN INCLUDE -

1) A CONTROL PROGRAM TO INITIATE COMPUTATION ON RECEIVED DATA, ARRANGING FOR TRANSFER TO APPROPRIATE COMPONENT LIBRARY PROGRAMS.
2) A SORTING AND ANALYSIS PROGRAM OPERATING ON THE RECEIVED TWO-PARAMETER MULTI-CHANNEL ANALYZER DATA, BUILDING UP A LARGE EVENT MATRIX.
3) A PROGRAM THAT WILL MAKE VARIOUS COMPUTATIONS ON THE MATRIX ELEMENTS AND ARRANGE FOR RETURN OF RESULTS TO THE EXPERIMENTER VIA THE 2100.

360F REFERENCES PHYLIS ON FILE

2084 RE315 APPROXIMATE HYDROGEN PROPERTIES FOR APPLICATION TO HEAT-TRANSFER AND FLUID-FLOW COMPUTATIONS (NASA)

REQUESTOR B. HOGLUND REACTOR ENGINEERING

PROGRAMMER N. JESSE

CALCULATION OF REAL FLUID STATE RELATIONS, THERMODYNAMIC PROPERTIES, AND TRANSPORT PROPERTIES OF MOLECULAR HYDROGEN IN ANY FIXED ORTHO-PARA COMBINATION, COVERING THE TEMPERATURE RANGE FROM MELTING TO DISSOCIATION FOR PRESSURES UP TO 340 ATMOSPHERES (5000 PSIA).

360F REFERENCES NASA TN D-1664	ON FILE	C3

2085 HEP154 MONTE CARLO GENERATION OF NEUTRAL DECAYS

REQUESTOR D. MC LEOD HIGH ENERGY PHYSICS

PROGRAMMER P. PENNOCK

THIS PROGRAM IS FOR THE GENERATION OF EVENTS LIKE THOSE OF 1786/HEP137, BUT INSTEAD OF CALCULATING DETECTION EFFICIENCIES THIS PROGRAM WILL BE AIMED AT DETERMINING THE BIAS INHERENT IN THE EXPERIMENTAL SET-UP USED. THIS WILL BE DONE BY RECORDING ALL THE EVENTS DETECTED AND SUBSEQUENTLY ANALYSING THEM TO YIELD PSEUDO-EXPERIMENTAL ESTIMATES OF THE PARAMETERS AND DISTRIBUTIONS, AND COMPARING THESE WITH THE KNOWN INPUT VALUES.

704F REFERENCES 1786/HEP137	ON FILE	G6
360F REFERENCES 1786/HEP137	ON FILE	G6

2086 HEP155 ETA DECAY WITH MONTE CARLO TREATMENT OF THE GAMMA RAY ELECTRON CASCADES

REQUESTOR G. BURLESON HIGH ENERGY PHYSICS

PROGRAMMER P. PENNOCK

MODIFY THE PRESENT MONTE CARLO PROGRAM 1851/HEP140 TO COMPUTE THE GAMMA RAY DETECTION PROBABILITY BY A MONTE CARLO METHOD, USING THE OAK RIDGE SR1 AND SR2 ROUTINES (1999/HEP149). ALSO TO OUTPUT HISTOGRAMS OF THE ETA-ZERO INVARIANT MASS AND OF THE NUMBERS OF ELECTRONS PRODUCED.

704F REFERENCES	ON FILE	G6
794F REFERENCES	ON FILE	G6

2089 HEP156 AUTOMATIC MEASUREMENT PROGRAM FOR 70-TON SPARK CHAMBER SYSTEM

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

CONSULTANT J. BUTLER PROGRAMMER R. CLARK

A NEW 70-TON SPARK CHAMBER SYSTEM IS BEING CONSTRUCTED. THIS PROGRAM IS CONCERNED WITH THE AUTOMATIC SCANNING AND MEASUREMENT OF PHOTOGRAPHS PRODUCED BY THIS SYSTEM. THE OUTPUT OF THIS PROGRAM WILL BE INFORMATION IN A FORM SUITABLE FOR INPUT TO A GEOMETRY PROGRAM. IT IS ESTIMATED THAT 2,000,000 PHOTOGRAPHS WILL BE TAKEN.

704	REFERENCES	ON FILE	T1
360	REFERENCES	ON FILE	T1
CHL	REFERENCES	ON FILE	T1

2090 IHS104 FRIDEN TAPE TO CARD FORM

REQUESTOR J. GERDES INDUSTRIAL HYGIENE AND SAFETY

PROGRAMMER R. MUELLER

CONVERT FRIDEN COMPUTYPER 8-CHANNEL PAPER TAPE INTO PUNCHED CARDS. TAPE IS TO BE EDITED FOR ZONE PUNCHES IN NUMERIC FIELDS, BLANK FIELDS, AND OMITTED CHARACTERS. TWO FIELDS WILL BE ADDED AND TOTAL PUNCHED. HEADING INFORMATION WILL BE REPRODUCED. CARDS ARE TO BE LISTED AS PRODUCED.

160 REFERENCES ON FILE

2091 CEN141 TEMPERATURE CORRECTION FOR BOMB CALORIMETRIC DATA

REQUESTOR W. HUBBARD CHEMICAL ENGINEERING

PROGRAMMER J. HEESTAND

THIS PROGRAM IS, WITH MINOR EXCEPTIONS, THE SAME AS 1796/CEN118, USING NEW CALORIMETER THERMOMETER CONSTANTS.

704F REFERENCES 1796/CEN118 ON FILE DM PSB

2093 RP312 CTS-3 A MULTI-GROUP TRANSPORT PROGRAM FOR INFINITE CYLINDERS (WAPD)

REQUESTOR E. PENNINGTON REACTOR PHYSICS

PROGRAMMER A. KENNEDY

SOLUTION OF THE MULTI-GROUP NEUTRON TRANSPORT EQUATION IN INFINITE CYLINDRICAL GEOMETRY.

704F REFERENCES WAPD-TM-396-CTS-3	ON FILE	ZO
360F REFERENCES WAPD-TM-396-CTS-3	ON FILE	ZO

2095 AMD185 SUPERSONIC FLOW

REQUESTOR D. TAYLOR APPLIED MATHEMATICS

THE ULTIMATE OBJECT OF THE PROJECT IS THE NUMERICAL SOLUTION OF THE NAVIER-STOKES FLUID FLOW EQUATIONS FOR SUPERSONIC FLOW IN A DUCT. THE FIRST PROGRAM TO BE DEVELOPED WILL FOLLOW THE LINES OF PROGRAMS ALREADY WRITTEN BY THE AUTHOR TO DEAL WITH SUPERSONIC POTENTIAL FLOW IN A DUCT. THE OBJECT OF THE EXERCISE IS THE SUCCESSFUL INTRODUCTION OF VISCOUS AND HEAT CONDUCTION TERMS. THE NUMERICAL METHOD OF HARTREE USING INTEGRATION OF COMPATIBILITY CONDITIONS HAS BEEN SUCCESSFULLY USED IN PROGRAMS ON A FERRANTI MERCURY COMPUTER AND THE AUTHOR INTENDS TO USE DEVELOPMENTS OF THIS TECHNIQUE.

360F REFERENCES	ON FILE	ZO

2096 CHM199 CALCULATION OF ELECTRON TRANSITION PROBABILITIES

REQUESTORS P. FIELDS, D. METTA, CHEMISTRY
W. CARNALL CHEMISTRY

PROGRAMMER F. CLARK

CALCULATE THEORETICAL PROBABILITIES FOR ELECTRON TRANSITIONS BETWEEN A GROUND STATE OF AN IONIZED ATOM IN SOLUTION AND A LARGE NUMBER OF ITS EXCITED STATES. THIS INVOLVES CALCULATING A LARGE NUMBER OF MATRIX ELEMENTS INVOLVING THE INTERACTION OF THESE STATES.

360F REFERENCES	ON FILE	CO

2098 RP INVESTIGATE THE RESPONSE OF PULSED REACTORS

REQUESTOR J. CARTER REACTOR PHYSICS

PROGRAMMER L. BRYANT

INVESTIGATE THE RESPONSE OF FAST REACTORS WHEN PULSED, AND DETERMINE THE KEX NECESSARY TO PULSE A REACTOR A PREDETERMINED AMOUNT.

ANA REFERENCES ON FILE

2099 BIM123 LEAST SQUARES FIT TO DATA ON MORTALITY OF CHICK EMBRYOS

REQUESTOR E. TRUCCO BIOLOGICAL AND MEDICAL RESEARCH

CONSULTANT D. WOODWARD PROGRAMMER A. STRECOK

GIVEN DATA SETS OF T AND D, THIS PROGRAM USES A LEAST SQUARES METHOD TO DETERMINE PARAMETERS K, A AND C WHICH BEST SATISFY THE APPROXIMATION KD=AT+LN(A/C(1-(A-C)T/KD)).

704F REFERENCES ANMZ013 ON FILE DM PSB E2

2100 HD1C1 ANALYSIS OF RADIOACTIVITY IN HUMANS, ANIMALS, AND OTHER SAMPLES

REQUESTOR C. MILLER HEALTH DIVISION

PROGRAMMER W. SNOW

TO FIND THE AMOUNT OF RADIOACTIVITY PRESENT IN SAMPLES BY STUDYING THEIR GAMMA-RAY SPECTRUM OUTPUT FROM A T.M.C. 400-CHANNEL ANALYZER. THIS CODE WILL DELETE AND MODIFY VARIOUS SECTIONS OF THE EXISTING RPY134 CODE AND PERFORM ADDITIONAL COMPUTATIONS.
THIS PROGRAM WILL REPLACE RPY134.

GUS REFERENCES 1470/RPY134 ON FILE ZO

2101 RE319 FOUR-RESTRAINT PIPE STRESS CODE (AI)

REQUESTOR T. BUMP REACTOR ENGINEERING

PROGRAMMER N. JESSE

FLEXIBILITY ANALYSIS OF PIPING SYSTEMS.

704F REFERENCES ON FILE DO

2102 BIM124

REQUESTOR W. NORRIS BIOLOGICAL AND MEDICAL RESEARCH

PROGRAMMER J. ANDERSON

CALCULATE THE RADIOACTIVITY IN SAMPLES MEASURED WITH A 400-CHANNEL GAMMA SPECTROMETER. THE RESULTS OF THE INITIAL COMPUTATION ARE USED TO DETERMINE THE EFFECTIVE- AND BIOLOGICAL-RETENTION.

225 REFERENCES ON FILE

2103 CHM200 INTEGRATION OF GAUSSIAN SPECTRAL DATA

REQUESTOR W. CARNALL CHEMISTRY

PROGRAMMER J. VARLEY

GIVEN X(I) AND Y(I), FIND C(J), B(J) AND S(J) IN THE EQUATION Y(I)=SUM FOR J=1(1)M OF C(J) * EXPF (-.5*((X(I)-B(J))/S(J))**2) USING A LEAST-SQUARES METHOD. ALSO, FIND THE INTEGRAL OF Y=F(X) USING THE NEWLY DETERMINED VALUES FOR C, B AND S.

360F REFERENCES 1120/PHY220,ANMZ013 ON FILE CM APSB D1E2,Z0

2104 CHM201 PREPARATION OF DATA FROM MET135 OUTPUT

REQUESTOR M. ATOJI CHEMISTRY

PROGRAMMER C. CHAMOT

MODIFICATION OF THE D-SPACE PROGRAM TO OBTAIN PUNCHED CARD OUTPUT OF H, K, L, AND MODIFIED VALUES OF THETA, PHI, AND CHI. THESE ARE CONVERTED TO THEIR BAUDOT REPRESENTATION ON A PAPER TAPE TO CONTROL THE ANGLE SETTINGS OF A NEUTRON DIFFRACTOMETER.

704F REFERENCES 1209/MET135,ANL 6519 ON FILE CM PSB MO
160 REFERENCES 1209/MET135,ANL 6519 ON FILE C S GO MO

2105 HEP157 PROGRAM FOR MERGING TRAFIT OUTPUT TAPES

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

PROGRAMMER J. GREGORY

TO MERGE THE OUTPUT FROM DIFFERENT TRAFIT (1242/HEP108) RUNS ON ONE TAPE.

704F REFERENCES 1242/HEP108 ON FILE C APSB C MO

2107 RE316 HEAT TRANSFER ANALYSIS OF THE AARR CORE

REQUESTOR R. ROHDE REACTOR ENGINEERING

PROGRAMMER I. BAKSYS

SOLVE 47 SIMULTANEOUS EQUATIONS WITH 7 VARIABLES IN ACCORDANCE WITH POLYNOMIAL APPROXIMATION METHOD OF REF. (1). OUTPUT WILL INCLUDE DEVIATIONS OF DATA FROM CURVE FIT.

704 REFERENCES NSE-17,CL LSQ2 ON FILE G2

2108 CEN142 MODIFICATION OF RE122 OUTPUT

REQUESTOR A. MADSON CHEMICAL ENGINEERING

PROGRAMMER J. ANDERSON

THE FLUX AND CROSS SECTION VALUES OBTAINED FROM RE122 ARE MULTIPLIED TOGETHER AND SUMMED.

704F REFERENCES ON FILE DM PSB Z0

2111 CEN143

REQUESTOR D. RAMASWAMI CHEMICAL ENGINEERING

PROGRAMMER R. FU

THIS PROGRAM IS AN ADAPTATION FOR THE IBM704 OF BIMD34, A FORTRAN AND FAP STEPWISE MULTIPLE LINEAR REGRESSION CODE, WRITTEN AT THE UCLA SCHOOL OF MEDICINE, DIVISON OF BIOSTATISTICS.

704F REFERENCES BIMD COMP.PROG.MANUAL ON FILE D PSB 0 G2

2113 IHS105 MODIFICATION OF PHY148

REQUESTOR L. ANDERSON INDUSTRIAL HYGIENE AND SAFETY

PROGRAMMER F. CLARK

ALTER PHY 148A TO PRINT OUT, FOR A GIVEN SENSITIVITY MATRIX, A SET OF INVERSE MATRICES CORRESPONDING TO A SET OF PER CENT ERROR ASSUMPTIONS COVERING THE RANGE OF COUNTING ACCURACY LIKELY TO BE ENCOUNTERED.

704F REFERENCES 650/PHY148 ON FILE D1
360F REFERENCES 650/PHY148 ON FILE D1

2114 HEP158 SUM-X (UCRL)

REQUESTOR T. FIELDS HIGH ENERGY PHYSICS

PROGRAMMER J. GREGORY

THIS IS A DATA SUMMARIZING PROGRAM. IT CONSTRUCTS DISPLAYS IN THE FORM OF LISTS, HISTOGRAMS, GRAPHS, ETC. FROM INFORMATION EXTRACTED FROM SETS OF RECORDS ON THE TAPE OUTPUT FROM 1648/HEP124.

704F REFERENCES 1648/HEP124	ON FILE	M2
360F REFERENCES 1648/HEP124	ON FILE	M2

2115 HEP159 SUM-X (UCRL)

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

PROGRAMMER J. GREGORY

THIS IS A VERSION OF 2114/HEP158 FOR USE WITH THE OUTPUT FROM 2085/HEP154.

704F REFERENCES	ON FILE	M2
360F REFERENCES	ON FILE	M2

2116 CHM202 DETERMINATION OF CARBON 11 RANGES IN ALUMINUM FROM THE BORON 11 (P,N) CARBON 11 REACTION

REQUESTOR L. WINSBERG CHEMISTRY

PROGRAMMER J. VARLEY

GIVEN THE THICKNESSES AND ACTIVITIES OF UP TO 10 ADJACENT FOILS, DETERMINE THE PARAMETERS OF THE GAUSSIAN DISTRIBUTIONS FOR UP TO 9 C11 ENERGY LEVELS WHERE ALL ENERGIES BUT THE LARGEST ARE GIVEN.

360F REFERENCES ANMZ013	ON FILE DM PSB	F4,Z0

2117 PAD146 PLATE ANALYSIS-HORN OF PLENTY

REQUESTOR J. HEAP PARTICLE ACCELERATOR

PROGRAMMER J. GVILDYS

THIS IS TO CONTINUE WORK STARTED UNDER 1837/PAD143. SOME OF THE DIFFERENTIAL EQUATIONS DEVELOPED AND CHECKED WILL BE PROGRAMMED ON THE 3600.

360F REFERENCES	ON FILE DM PSB	D0

2118 HEP160 LORENTZ INVARIANT MOMENTUM SPACE (BNL)

REQUESTOR M. DERRICK HIGH ENERGY PHYSICS

PROGRAMMER R. FU

IN THE TWO-BODY INELASTIC COLLISIONS GOING INTO N PARTICLES (N BETWEEN 4 AND 20), GIVEN THE MASS AND MOMENTUM OF THE INCOMING PARTICLE, THE MASS OF THE TARGET PARTICLE, AND THE MASSES OF THE SECONDARY PARTICLES, THE PROGRAM CALCULATES THE LORENTZ INVARIANT MOMENTUM SPACE, THE INVARIANT MASS DISTRIBUTIONS BETWEEN PARTICLES, THE ENERGY SPECTRUM OF THE NTH PARTICLE, AND THE ANGULAR CORRELATIONS BETWEEN N AND (N-1)ST PARTICLES.

360F REFERENCES ON FILE DM APSB D0

2120 AMD187 OPTIMUM RUNGE-KUTTA INTEGRATION PROCEDURES

REQUESTOR R. KING APPLIED MATHEMATICS

UNDER CERTAIN ASSUMPTIONS ABOUT DERIVATIVE BOUNDS, BEST RUNGE-KUTTA INTEGRATION SCHEMES OF THE THIRD AND FOURTH ORDERS ARE TO BE FOUND. THE VARIABLE METRIC MINIMIZATION PROGRAM ANMZ013 WILL BE USED TO DETERMINE OPTIMUM VALUES FOR THE PARAMETERS INVOLVED.

704F REFERENCES ON FILE D2

2122 PHY300

REQUESTOR A. MARINOV PHYSICS

PROGRAMMER J. WENGER

PHY226 IS MODIFIED TO ACCEPT AN INCREASED RANGE OF INPUT AND VALUES OF THE PENETRABILITY FUNCTION AS SPECIFIED IN PHY271.

704F REFERENCES 1201/PHY226,1615/PHY271 ON FILE C3,D1

2125 HEP161 ATHOS (UCRL)

REQUESTOR M. DERRICK HIGH ENERGY PHYSICS

PROGRAMMER R. FU

COMPUTES VARIOUS THREE PARTICLE DISTRIBUTIONS INCLUDING VARIOUS MOMENTUM, ANGULAR, AND EFFECTIVE MASS DISTRIBUTIONS FOR LORENTZ INVARIANT PHASE SPACE. RESONANCE BETWEEN A PAIR OF PARTICLES CAN BE INCLUDED. DALITZ PLOT TABLES CAN BE CALCULATED.

360F REFERENCES UCRL PHYSICS NOTES394 ON FILE DM APSB

2126 HEP162 POLARIZATION OF NEGATIVE MUONS

REQUESTOR J. DOEDE HIGH ENERGY PHYSICS

PROGRAMMER B. GARBOW

AN INVESTIGATION OF THE POLARIZATION OF NEGATIVE MUONS STOPPING IN LIQUID HYDROGEN AND LIQUID DEUTERIUM.

GEO REFERENCES 638HE(PHY146),1081HEP105 ON FILE P GO G1

2127 PHY301 STATISTICAL PROPERTIES OF RANDOM MATRICES

REQUESTOR N. ROSENZWEIG PHYSICS

PROGRAMMER R. HAMELINK

THIS IS A STUDY OF THE DISTRIBUTION OF EIGENVALUES OF LARGE SYMMETRIC MATRICES WHOSE ELEMENTS ARE SAMPLED FROM A NORMAL DISTRIBUTION. WE ORDER THE EIGENVALUES OF A PARTICULAR MATRIX, AND THEN COMPUTE THE SPACINGS BETWEEN NEIGHBORING EIGENVALUES. THESE SPACINGS ARE COLLECTED FROM SEVERAL MATRICES. THEN THE DISTRIBUTION AND FREQUENCY IS COMPUTED FOR THE SET OF SPACINGS. FOR EACH MATRIX WE TAKE AN ORDERED SUBSET OF NORMALIZED SPACINGS, AND COMPUTE AN INTEGRAL OVER THE INTERVAL BETWEEN SPACINGS. (ADJOIN 0 AS THE SMALLEST SPACING AND INFINITY AS THE LARGEST IN THIS SUBSET.) WE SUM THESE INTEGRALS FOR EACH MATRIX, AND COMPUTE THE VARIANCE OF THIS SET OF SUMS.

A SEPARATE PROGRAM IN THIS PACKAGE COMPUTES THIS SUM OF INTEGRALS FOR THE SPACINGS OF THE ENERGY LEVELS OF A MOLECULE, WHICH ARE USED AS INPUT DATA FOR THIS PROGRAM.

360F REFERENCES ON FILE DM PSB GO,F2

2128 PHY302 MULTI-CHANNEL ANALYZER DATA PROCESSING

REQUESTOR H. BOLOTIN PHYSICS

PROGRAMMER S. ZAWADZKI

SEVERAL PROGRAMS ARE TO BE PREPARED PROCEEDING FROM PUNCHED PAPER TAPES OBTAINED OFF A MULTI-CHANNEL ANALYZER.

OPERATIONS TO BE PERFORMED INCLUDE MULTIPLICATION OF CHANNELS BY CONSTANTS, SUMMING CUMULATIVELY OVER SEQUENTIAL CHANNELS, AND FORMING DIFFERENCES OF CHANNELS IN OPPOSITE HALVES OF THE TAPE.

GEO REFERENCES ON FILE ZO

2130 RE317 MHD CYCLE ANALYSIS

REQUESTOR K. LEE REACTOR ENGINEERING

PROGRAMMER N. JESSE

PERFORM A SERIES OF CALCULATIONS TO DESCRIBE A ONE-FLUID MHD CYCLE FOR A NUCLEAR-ELECTRIC POWER CONVERSION.
USING RESULTS OF THE CYCLE ANALYSIS, DESCRIBE MHD GENERATOR CHARACTERISTICS.

704F REFERENCES ON FILE ZO

2131 INSE NOISE ANALYSIS OF LAG NETWORK

REQUESTOR G. PAWLICKI INSTITUTE OF SCIENCE AND ENGINEERING

CONSULTANT L. BRYANT PROGRAMMER W. SCOTT

ANALYZE THE RESPONSE OF A SYSTEM LAG NETWORK TO VARIOUS RANDOM NOISE SIGNALS.

ANA REFERENCES ON FILE

2133 HEP163 VIDICON SYSTEM DATA ANALYSIS PROGRAM

REQUESTOR P. KALMUS HIGH ENERGY PHYSICS

PROGRAMMER L. JUST

DATA IN THE NEUTRON-PROTRON CHARGE EXCHANGE SCATTERING EXPERIMENT WILL BE RECORDED ON MAGNETIC TAPE BY A SERIES OF VIDICONS. THE MAIN PURPOSE OF THIS PROGRAM IS TO READ THE TAPE, UNPACK THE DATA AND ARRANGE IT IN A FORM SUITABLE FOR INPUT TO THE GEOMETRICAL RECONSTRUCTION PROGRAM BEING WRITTEN IN FORTRAN BY R. MCKEE (UC). IT WILL NOT PERFORM ANY TESTS OR RECONSTRUCT EVENTS.

360F REFERENCES ON FILE T1

2137 RE BOILING LIQUID METAL STUDIES

REQUESTOR R. HOLTZ REACTOR ENGINEERING

PROGRAMMERS L. BRYANT, F. MALETICH

INVESTIGATION OF LIQUID SUPER HEAT REQUIRED TO INITIATE NUCLEATE BOILING IN THE ALKALI METALS.

ANA REFERENCES ON FILE

2138 BIM125 STATISTICAL ANALYSIS OF HEM

REQUESTOR G. SACHER BIOLOGICAL AND MEDICAL RESEARCH

PROGRAMMER J. HEESTAND

PERFORM STATISTICAL ANALYSIS OF HEMATOLOGY DATA FROM GAMMA RAY TOXICITY PROGRAM, PRINT RESULTS IN PRESCRIBED FORMAT, AND PLOT GRAPHS. 1301/BIM105 IS TO BE USED, WITH APPROPRIATE MODIFICATIONS OF INPUT PROCESSING SECTION, ETC.

704F	REFERENCES 1301/BIM105	ON FILE	G1,G2

2139 SSS150 THE CLUSTERING OF POINT DEFECTS

REQUESTOR R. HUEBENER SOLID STATE SCIENCE

PROGRAMMERS C. HARRISON, L. BRYANT

DETERMINE THE CLUSTERING OF POINT DEFECTS FOR CORRELATION WITH EXPERIMENTAL RESULTS.

GEO	REFERENCES 1746/MET149	ON FILE	
ANA	REFERENCES 1668/MET	ON FILE	

2141 CHM204 FOUR-PARAMETER ANALYZER ANALYSIS

REQUESTOR H. DIAMOND CHEMISTRY

PROGRAMMER W. HAFNER

CONVERT 8-HOLE 1-INCH PAPER TAPE CONTAINING BINARY REPRESENTATIONS OF EXPERIMENTAL DATA FOR FOUR PARAMETERS, P(I) AND CONTROL PARAMETERS INTO A BINARY TAPE FOR USE WITH THE CDC 3600.

PROCESS THIS MAGNETIC TAPE ON THE CDC 3600 - FOR ANY SET OF PRESELECTED CONTROL PARAMETERS PRODUCE ANY COMBINATION OF THE FOLLOWING -

1. A PLOT OF FREQUENCY VS CHANNEL NUMBER FOR EACH OF THE P(I).
2. CARDS CONTAINING THE APPROPRIATE CONTROL PARAMETERS AND CHANNEL NUMBERS FOR EACH OF THE P(I).
3. CONVERT CHANNEL NUMBER TO ENERGY FOR EACH OF THE P(I).
4. PLOTS OF FREQUENCY VS ENERGY.

360F	REFERENCES	ON FILE	Z0
160	REFERENCES	ON FILE	

2143 RP313

REQUESTOR P. MOLDAUER REACTOR PHYSICS

PROGRAMMER A. KENNEDY

DIAGONALIZATION OF COMPLEX SYMMETRIC MATRICES WHOSE ELEMENTS ARE FUNCTIONS OF A NORMALLY DISTRIBUTED REAL RANDOM VARIABLE.

360F REFERENCES ON FILE F1

2144 CHM205 PROGRAM TO INDEX X-RAY POWDER FILMS (AMES)

REQUESTOR E. SHERRY CHEMISTRY

PROGRAMMER J. GVILDYS

A PROGRAM WRITTEN IN FORTRAN FOR THE IBM 7074 BY MCMASTERS AND LARSON OF AMES LABORATORY, IOWA, IS TO BE ADAPTED FOR USE ON THE CDC 3600. THE PROGRAM INDEXES X-RAY POWDER SAMPLES BY THE ITO METHOD, FINDS THE TRUE CELL, AND CHECKS THE VALIDITY OF THE PROPOSED CELL.

360F REFERENCES ON FILE Z0

2150 HEP164 TWO-BODY KINEMATICS TABLE FOR SINGLE PARTICLE DECAY

REQUESTOR M. DERRICK HIGH ENERGY PHYSICS

PROGRAMMER J. SCHERER

THIS PROGRAM CALCULATES A TABLE OF KINEMATICALLY POSSIBLE OUTCOMES TO A SINGLE PARTICLE DECAYING INTO TWO PARTICLES.

160F REFERENCES ON FILE D APSB 0 C0

2151 PHY303

REQUESTOR G. PERLOW PHYSICS

PROGRAMMER J. WENGER

THE PRE-PROCESSING OF PHY292 IS INCLUDED IN THE FRAMEWORK OF PHY220.
THE CALCOMP PLOTTER IS USED FOR PLOTTING RESULTS OF PHY220.

360F REFERENCES 1120/PHY220,1976/PHY292 ON FILE E2

2152 RP REACTOR KEX METER DESIGN

REQUESTOR W. KATO REACTOR PHYSICS

PROGRAMMER W. SCOTT

THE PROJECT IS TO DESIGN A WORKABLE KEX MEASURING DEVICE FOR USE WITH ZPR. THE WORK IS BEING DONE JOINTLY WITH THE ELECTRONICS DIVISION.

ANA REFERENCES ON FILE

2156 PER105 STUDY OF MARKET MOVEMENT FACTORS IN SALARY LEVELS OF SCIENTIFIC PERSONNEL

REQUESTOR H. PETERSON PERSONNEL

PROGRAMMER J. HEESTAND

GIVEN THE NUMBER OF EMPLOYEES AND THEIR AVERAGE SALARY FOR EACH OF 21 EXPERIENCE BRACKETS FOR EACH OF THE PAST 5 YEARS (1959-1963) FOR TOTAL PRIVATE INDUSTRY, AEC CONTRACTORS, AND ARGONNE.

1. USING A LINEAR PROJECTION, DETERMINE THE INCREASE IN SALARIES FOR 1964 DUE TO MARKET MOVEMENT FOR TOTAL PRIVATE INDUSTRY PLUS AEC CONTRACTORS MINUS ARGONNE, AND ARGONNE ALONE.
2. INVESTIGATE THE VALIDITY OF THE LINEAR FORM, COMPARED WITH OTHER POSSIBLE FORMS, FOR THE PROJECTION.

704F REFERENCES ON FILE G2

2157 AMD188 HOUSEHOLDER REDUCTION OF COMPLEX MATRICES TO UPPER HESSENBERG FORM

REQUESTOR W. GIVENS APPLIED MATHEMATICS

PROGRAMMER D. MUELLER

THIS IS A FORTRAN 3600 PROGRAM (WITH AN ALGOL COUNTERPART) THAT REDUCES A GENERAL SQUARE COMPLEX MATRIX TO AN UPPER HESSENBERG MATRIX WHOSE LOWER SUBDIAGONAL IS REAL. THE METHOD USED IS THAT OF HOUSE-HOLDER (CF., THE ALGEBRAIC EIGENVALUE PROBLEM, FORTHCOMING BOOK BY J. H. WILKINSON) PLUS A DIAGONAL UNITARY SIMILARITY. THE RESULTING MATRIX IS IN CORRECT FORM FOR THE COMPLEX Q-R ALGORITHM OF FRANCIS WHICH CALCULATES THE EIGENVALUES.

360F REFERENCES ON FILE F2

2158 HEP165 BAKE (CERN)

REQUESTOR J. DOEDE HIGH ENERGY PHYSICS

PROGRAMMER C. SMITH

THIS PROGRAM SCANS THE GRIND OUTPUT TAPE AND COMPUTES AND PRINTS QUANTITIES WHICH ARE USEFUL IN RESOLVING AMBIGUITIES WHICH ARISE WHEN GRIND MAKES SUCCESSFUL FITS TO MORE THAN ONE HYPOTHESIS.

360	REFERENCES 1648/HEP124	ON FILE	M2

2159 HEP166 BUBBLE CHAMBER TRACK MEASUREMENT

REQUESTOR L. VOYVODIC HIGH ENERGY PHYSICS

PROGRAMMER L. JUST

IT IS PROPROSED TO EXTRACT BUBBLE DENSITY DATA FROM THE FILM EXPOSED AT THE 30-INCH MURA CHAMBER. THIS PROGRAM WILL BE USED TO STUDY AUTOMATIC METHODS OF EXTRACTING THE INFORMATION ON CHLOE FROM ENLARGEMENTS OF SECTIONS OF THE TRACKS.

360	REFERENCES	ON FILE	T1
CHL	REFERENCES	ON FILE	T1

2161 AMD189 PROCEDURE FOR MINIMIZING BOOLEAN EXPRESSIONS BY REPRESENTATIONS IN TERMS OF TREE STRUCTURES

REQUESTOR H. MESSINGER APPLIED MATHEMATICS

CONSULTANT D. JACOBSOHN

A PROGRAM FOR THE ANALYSIS OF BOOLEAN EXPRESSIONS IN TERMS OF A PROCEDURE SUITABLE TO LIST PROCESSING LANGUAGE (AND ESPECIALLY TO THE IPL5) IS PRESENTLY BEING CONSTRUCTED. THE METHOD CONSISTS OF THE REPRESENTATION OF BOOLEAN EXPRESSIONS (GIVEN IN SUM OF PRODUCTS FORM) IN TERMS OF A TREE WHICH IS ANALOGOUS TO A LIST STRUCTURE. IN THE PROCESS OF REDUCTION OF THE BOOLEAN EXPRESSIONS THE BRANCHES OF THE TREE ARE INVESTIGATED IN TURN FOR SIMILARITY AND ARE THEN SUITABLY COMBINED WITH OTHER BRANCHES. AFTER ALL POSSIBLE USES OF A PARTICULAR BRANCH HAVE BEEN MADE, IT IS DROPPED. BY SUCCESSIVE APPLICATION OF THIS PROCEDURE THE TREE STRUCTURE WILL BE REDUCED IN COMPLEXITY, AND IN THE END A MINIMAL EXPRESSION IS EXPECTED TO RESULT.

704	REFERENCES	ON FILE	

2163 PHY299 GAMMA RAY UNPEELING (PHYL

REQUESTORS R. ALLAS, P. SINGH, PHYSICS
D. GEMMELL

PROGRAMMER F. TARABA

TO RESOLVE A GAMMA-RAY SPECTRUM INTO INDIVIDUAL CONTRIBUTING COMPONENTS. THIS INVOLVES ELIMINATION OF BACKGROUND AND FITTING THE COMPONENTS TO GIVEN SPECTRAL HISTOGRAMS. THERE EXISTS A 704 FORTRAN II PROGRAM FOR TREATING TWO COMPONENTS. THIS PROGRAM IS BEING MODIFIED FOR THE 3600 TO TREAT A LARGER NUMBER OF COMPONENTS. THE NUMBER OF INPUT PARAMETERS PER CASE AND THE NUMBER OF NEW PARAMETERS REQUIRED FROM CASE TO CASE IN AN ORDERLY EXPERIMENT IS MINIMAL TO FACILITATE REAL TIME OPERATION.

360F REFERENCES ON FILE

2164 BIM126 MODEL OF MAMMALIAN RECOVERY FROM RADIATION INJURY

REQUESTOR E. TRUCCO BIOLOGICAL AND MEDICAL RESEARCH

PROGRAMMER R. FU

CALCULATION OF THE CONTINUOUS EXPOSURE MODEL SOLUTION FOR A RANGE OF DOSE RATES AND OF THE SPLIT DOSE RATE MODEL OVER A RANGE OF LAPSE TIME BETWEEN THE TWO DOSES.

360F REFERENCES ON FILE ZO

2165 AMD190

REQUESTOR R. ASCHENBRENNER

TEST PROGRAMS FOR THE REAL-TIME COMMUNICATOR.

GEO REFERENCES ON FILE
360 REFERENCES ON FILE

2167 AMD191 EIGENSYSTEMS OF HERMITIAN MATRICES

REQUESTOR W. GIVENS APPLIED MATHEMATICS

PROGRAMMER D. MUELLER

THIS PROGRAM CALCULATES THE EIGENVALUES AND AN ORTHONORMAL SET OF EIGENVECTORS FOR A HERMITIAN MATRIX. AN EXTENDED HOUSEHOLDER REDUCTION TAKES THE HERMITIAN MATRIX INTO A REAL TRIDIAGONAL MATRIX OF THE SAME ORDER. SUBROUTINE EIGEN(ANLF202) OBTAINS THE EIGENSYSTEM OF THIS REAL MATRIX WHOSE EIGENVECTORS ARE THEN BACK-TRANSFORMED INTO THOSE OF THE HERMITIAN MATRIX. AN ALGOL COUNTERPART TO THIS FORTRAN 3600 PROGRAM USES ALGOL PROCEDURES OF WILKINSON (NUM. MATH. 4) FOR THE EIGENSYSTEM OF THE TRIDIAGONAL MATRIX.

360F REFERENCES ON FILE F2

2169 SSS151

REQUESTOR K. SINGWI SOLID STATE SCIENCE

PROGRAMMER A. LENT

SOLUTION OF A TRANSCENDENTAL EQUATION
0.5=1.0/(1+X**2)+X*X*ALPHA(K)*EXPF(-X/XZERO(K)),
FOR K = 1,2,...N AND N.LE.100.

360F REFERENCES ON FILE Z0

2170 CEN144 PREDICTION OF PROPERTIES OF GASES

REQUESTOR J. HOLMES CHEMICAL ENGINEERING

PROGRAMMER J. ANDERSON

GIVEN THE NECESSARY PARAMETERS AND CONSTANTS, COMPUTE THE PROPERTIES OF SEVERAL GASES AND MIXTURES OF THESE GASES BY EVALUATING STANDARD EQUATIONS.

360F REFERENCES ON FILE Z0

2171 CEN145 SUMMARY OF URANIUM USAGE

REQUESTOR J. HOLMES CHEMICAL ENGINEERING

PROGRAMMER A. STRECOK

FROM GIVEN INPUT PARAMETERS, THIS PROGRAM PRODUCES INFORMATION CONCERNING URANIUM USAGE IN A REACTOR.

704F REFERENCES ON FILE DM PSB Z0

2173 AMD192 RESPONSE SPECTRA FOR GAMMA-RAYS IN GERMANIUM CRYSTALS

REQUESTOR W. MILLER APPLIED MATHEMATICS

PROGRAMMER W. SNOW

TO CALCULATE THE ENERGY LOSS FOR GAMMA-RAYS INCIDENT ON GERMANIUM CRYSTALS BY THE MONTE CARLO METHOD. THE PHYSICAL PROCESSES SIMULATED AND THE GEOMETRICAL ARRANGEMENTS ARE THE SAME AS THOSE USED IN AMD105. THIS PROGRAM WILL BE MODIFIED BY REPLACING VARIOUS NUMERICAL CONSTANTS, SUCH AS BINDING ENERGIES, RADIATION LENGTHS, CROSS SECTIONS, ETC., FOR GERMANIUM.

GUS REFERENCES ON FILE G6

2175 CHM206 ATOMIC ENERGY LEVELS

REQUESTOR G. SMITH CHEMISTRY

PROGRAMMER J. VARLEY

THE PROGRAM REPRESENTS THE FIRST STAGE IN THE CALCULATION OF ATOMIC ENERGY LEVELS FOR CONFIGURATIONS OF A GIVEN TYPE. INITIALLY THE MATRICES FOR THE DIRECT ELECTROSTATIC INTERACTIONS WILL BE CALCULATED.

360F REFERENCES ON FILE DM PSB ZC

2177 PHY306 GAUSSIAN FIT AND UNPEELING OF COMPLEX GAMMA-RAY SPECTRA FROM VARIOUS ISOTOPES

REQUESTOR C. TRAIL PHYSICS

PROGRAMMER W. SNOW

GIVEN A COMPLEX GAMMA-RAY SPECTRUM, NON-LINEAR REGRESSION IS PERFORMED TO FIT A GAUSSIAN FUNCTION TO THE DATA. IN ADDITION TO THE FITTING PROCEDURE, REQUIREMENTS INCLUDE SPECIAL PURPOSE SUPPORT PROGRAMS -
160A PAPER TAPE CONVERSION PROGRAM, VISUAL DISPLAY ROUTINES, STANDARD SPECTRA PREPARATION PROGRAM.

160 REFERENCES 777/PHY172 ON FILE
360F REFERENCES 777/PHY172 ON FILE

2180 PHY307 LINE SHAPE FITTING BY VARIABLE METRIC MINIMIZATION

REQUESTOR A. MAGRUDER PHYSICS

PROGRAMMER D. JORDAN

THE PROBLEM IS TO FIT A GAMMA-RAY SPECTRUM USING THE VARIABLE METRIC MINIMIZATION TECHNIQUE.

360F REFERENCES 1537/PHY262,AMD MEMO 70 ON FILE DM PSB E2

2181 AEC101 AEC TELETYPE PROGRAM

REQUESTOR A. DIPASQUALE ATOMIC ENERGY COMMISSION

PROGRAMMER R. MORRILL

TRANSCRIBE CARD RECORDS ONTO 1-INCH PAPER TAPE IN AEC 5-CHANNEL TELETYPE CODE REPRESENTATION, EACH CARD PRECEDED BY THE THREE CHARACTERS, CR, CR, LF. EACH RECORD CONSISTS OF THE 80 CHARACTERS TOGETHER WITH APPROPRIATE SHIFT CHARACTERS.

APPROXIMATELY 500 CARDS/MONTH, A SINGLE RUN, WILL BE REQUIRED EXCEPT 2/28, 6/30, AND 11/30 WHEN APPROXIMATELY 2000 CARDS WILL BE PROCESSED FOR THAT MONTHS RUN.

160 REFERENCES ON FILE Z0

2183 RPY147 RESPONSE CORRECTION AND PLOTTING OF FLUORENCENCE EMISSION SPECTRA

REQUESTOR I. BERLMAN RADIOLOGICAL PHYSICS

PROGRAMMER W. HAFNER

THE PROBLEM CONSISTS OF CORRECTING SPECTRAL DATA FOR RESPONSE ERRORS IN THE RECORDING DEVICE AND PLOTTING THE RESULTS.

EACH SPECTRUM CONSISTS OF LESS THAN 400 EQUALLY SPACED POINTS WHOSE ORDINATES ARE TO BE MULTIPLIED BY A CORRECTION FUNCTION. THE CORRECTION FUNCTION IS TO BE COMPUTED FROM CALIBRATION DATA. THE RESULTS ARE TO BE NORMALIZED AND PLOTTED.

360F REFERENCES ON FILE DM PSB M3

2187 CHM207

REQUESTOR H. DIAMOND CHEMISTRY

PROGRAMMER J. VARLEY

GIVEN A TABLE OF VALUES OF SIGMA(E(I)) AND E(I), FIND B AND T USING A LEAST SQUARES PROCEDURE FOR SIGMA(E(I))=(E(I)-B)*EXPF (E(I)/T).

360F REFERENCES ANM2013 ON FILE DM PSB ZO

2188 PHY308

REQUESTOR C. TRAIL PHYSICS

PROGRAMMER S. ZAWADZKI

PHY50 WILL BE MODIFIED TO ADD TAPES IN SUCH A FASHION THAT EACH SPECTRUM TAPE MAY BE MULTIPLIED BY A NORMALIZING FACTOR AND ADDED (OR SUBTRACTED) TO OTHER TAPES. THE BEGINNING CHANNEL AND ENDING CHANNEL OF EACH TAPE IS TO BE SPECIFIED AS INPUT DATA.

GUS REFERENCES 303/PHY50 ON FILE ZO

2189 AMD193 CHLOE ASSEMBLER ON THE 3600

REQUESTOR CHLOE USERS GROUP APPLIED MATHEMATICS

PROGRAMMER H. GRAY

A ROUTINE FOR THE ASSEMBLY AND TRANSLATION OF THE CHLOE SOURCE LANGUAGE INTO ASI-210 MACHINE LANGUAGE USING THE CDC-3600 AND CDC-160A.

360 REFERENCES ON FILE

2190 BIM127 SIMULATION OF GRANULOCYTE MATURATION AND RELEASE INTO THE BLOOD

REQUESTORS M. MALONEY,E. TRUCCO BIOLOGICAL AND MEDICAL RESEARCH

CONSULTANT R. BUCHAL PROGRAMMER A. STRECOK

A BIOLOGICAL MODEL CONSISTING OF FOUR COMPARTMENTS IS TO BE STUDIED USING STATISTICAL AND MONTE CARLO TECHNIQUES. THE FIRST TWO COMPARTMENTS, DEALING WITH METAMYELOCYTES AND BANDS, FOLLOW FIRST-IN, FIRST-OUT KINETIC LAWS. CELLS FROM THE THIRD COMPARTMENT, DEALING WITH MATURE POLYS IN MARROW, GET ABSORBED INTO THE BLOOD. THE FOURTH COMPARTMENT, DEALING WITH MATURE POLYS IN BLOOD, HAS RANDOM EXIT WITH UNKNOWN AVERAGE SOJOURN TIME.

THE INPUT WILL DEAL WITH PARAMETERS OF THE LAST TWO COMPARTMENTS. THE AIM OF THIS PROGRAM WILL BE TO ADJUST THEM IN ORDER TO MATCH AS CLOSELY AS POSSIBLE THE CURVES OBTAINED BY EXPERIMENT FOR THE EMERGENCE OF LABELLED CELLS INTO THE BLOOD.

360F REFERENCES ON FILE D1,G3

2191 HEP167 DATA SORTING

REQUESTOR J. DOEDE HIGH ENERGY PHYSICS

PROGRAMMER J. SCHERER

ABOUT 150,000 MEASUREMENTS OF BUBBLE CHAMBER EVENTS HAVE BEEN MADE AT THE UNIVERSITY OF CHICAGO ON PAPER TAPE. MANY OF THEM ARE REPEATS, AND THEY ARE ALL IN RANDOM ORDER. THE PAPER TAPE WILL BE CONVERTED TO MAGNETIC TAPE. THE MEASUREMENTS MUST BE SORTED INTO NUMERICAL ORDER ACCORDING TO THE FRAME NUMBER OF EACH EVENT. THE BEST MEASUREMENT OF EACH EVENT MUST THEN BE SELECTED FOR PROCESSING BY HGEOM (HEP151).

360F REFERENCES ON FILE M1

2192 HEP151 HGEOM

REQUESTOR J. DOEDE HIGH ENERGY PHYSICS

PROGRAMMER S. ZAWADZKI

THIS IS TO PROVIDE USE OF THE HARWELL GEOMETRY PROGRAM UNDER THIS ACTIVITY CODE. THE PROGRAM WILL BE MODIFIED TO TAKE INTO ACCOUNT STOPPING TRACKS.

360F REFERENCES ON FILE R0

2194 RE320 REDUCTION OF AARR HEAT TRANSFER DATA

REQUESTOR R. ROHDE REACTOR ENGINEERING

PROGRAMMER I. BAKSYS

CONVERT RAW DATA FROM AARR TO TEMPERATURES, FLOW RATES, HEAT BALANCES AND PRESSURE DROPS AND COMPARE IT WITH ANALYTICAL CALCULATIONS. CURVE PLOTTING WILL BE REQUIRED FOR BOTH ANALYTICAL AND EXPERIMENTAL RESULTS.

360F REFERENCES ON FILE Z0

2195 RPY RADIATION OF ORGANIC SOLIDS

REQUESTOR R. BRAAMS RADIOLOGICAL PHYSICS

PROGRAMMER L. BRYANT

DETERMINE RADICAL PRODUCTION IN ORGANIC SOLIDS BY IONIZING RADIATION DESCRIBED WITH THE HYPOTHESIS THAT THE HYDROGEN ATOM IS THE PRIMARY REACTIVE SPECIES.

ANA REFERENCES ON FILE

2196 SSS153 SPECIFIC HEAT DATA ANALYSIS WITH GERMANIUM THERMOMETER

REQUESTOR O. LOUNASMAA SOLID STATE SCIENCE

PROGRAMMER A. LENT

ANALYSIS OF DATA FROM SPECIFIC HEAT APPARATUS.

360F REFERENCES 1293/SSS152 ON FILE E2,Z0

2198 SSS154 COMPLETE GAMMA FUNCTION CALCULATIONS

REQUESTOR F. DE WETTE SOLID STATE SCIENCE

PROGRAMMER C. CHAMOT

GENERATE TABLES OF THE INCOMPLETE GAMMA FUNCTIONS AND DIFFERENCES FOR INCREMENTED VALUES OF PI*Y.

704F REFERENCES ON FILE C3
360F REFERENCES ON FILE DM PSB C3

2200 CHM208

REQUESTORS A. ZIELEN, CHEMISTRY
J. SULLIVAN

PROGRAMMER J. VARLEY

GIVEN SETS OF DATA X(I), Y(I), AND W(I)(=ERROR IN Y(I)), DO A LEAST SQUARES FIT TO ONE OF TEN GIVEN FUNCTIONS.

360F REFERENCES ANLE208,CHM127,133,141 ON FILE DM APSB E2

2202 HEP168 SUM-X FOR STOPPING MUONS

REQUESTOR J. DOEDE HIGH ENERGY PHYSICS

PROGRAMMER J. SCHERER

A MODIFIED TAPE READING SUBROUTINE (TAPE) IS NEEDED IN SUM-X (2114/HEP158) TO READ THE OUTPUT OF 2126/HEP162.
IN ADDITION, A MONTE CARLO CALCULATION OF THE DECAY OF THE MUONS INTO ELECTRONS IS REQUIRED (BLOC 10).

360F REFERENCES ON FILE M2

2203 RE321 NUCLEAR ROCKET CYCLE ANALYSIS

REQUESTOR B. HOGLUND REACTOR ENGINEERING

PROGRAMMER N. JESSE

A GENERAL ANALYSIS PROGRAM TO EVALUATE STEADY STATE PROPELLANT TEMPERATURES AND PRESSURES THROUGHOUT THE ROCKET ENGINE SYSTEM AT ALL OPERATING CONDITIONS. THE CODE WILL BE WRITTEN AS A GROUP OF SUB-ROUTINES, EACH OF WHICH DESCRIBES A SYSTEM COMPONENT, THAT CAN BE RE-ARRANGED FOR REPRESENTATION OF A NUMBER OF DIFFERENT TURBOPUMP CYCLES, I. E., TOPPING CYCLE, COLD BLEED CYCLE, HEATED BLEED CYCLE, AND HOT BLEED CYCLE. THE SYSTEM COMPONENTS TO BE DESCRIBED ARE -

1. PUMP
2. TURBINE
3. PROPULSION NOZZLE
4. TUBE WITH HEAT ADDITION
5. MIXING CHAMBERS
6. PROPELLANT EXTRACTION POINTS
7. ROLL-CONTROL NOZZLES

360F REFERENCES ON FILE

2205 RP314 NREP3,4 (BAPL)

REQUESTOR C. KELBER REACTOR PHYSICS

PROGRAMMER A. KENNEDY

MONTE CARLO CALCULATION OF RESONANCE INTEGRALS.

704 REFERENCES WAPD-R(B)-93,150 ON FILE G6

2206 RP315 FORM (AI)

REQUESTOR C. KELBER REACTOR PHYSICS

PROGRAMMER J. KAGANOVE

A MODIFICATION OF MUFT-4, THE FOURIER TRANSFORM SLOWING-DOWN CODE. IN ADDITION TO THE OPTIONS PREVIOUSLY AVAILABLE, FORM ALLOWS THE CHANGING OF CROSS SECTIONS AT EXECUTION TIME AND THE CHOICE OF ARBITRARY FEW GROUP EDITS, BEING ABLE TO HANDLE UP TO 24 FEW-GROUP SCHEMES.

360F REFERENCES NAA-SR-MEMO-5766 ON FILE D0

2207 RP316 TEMPEST (AI)

REQUESTOR C. KELBER REACTOR PHYSICS

PROGRAMMER A. RAGO

A MODIFICATION OF SOFOCATE, THE 704 NEUTRON THERMALIZATION CODE. TEMPEST CALCULATES THERMAL CONSTANTS BASED ON THE WIGNER-WILKINS APPROXIMATION FOR LIGHT MODERATORS AND THE WILKINS APPROXIMATION FOR HEAVY MODERATORS.

360F REFERENCES NAA-TEMPEST II,AMTD-111 ON FILE D0

2208 RP317 AIM-6 (AI)

REQUESTOR C. KELBER REACTOR PHYSICS

PROGRAMMER G. JENSEN

A MODIFICATION OF AIM-5, A 704 ONE-DIMENSIONAL, MULTIGROUP DIFFUSION THEORY CODE. AIM-6 ALLOWS THE USE OF A MICROSCOPIC CROSS-SECTION LIBRARY.

360F REFERENCES NAA-AIM-6 CODE ON FILE D0

2209 RE322 THTB (GE-ANP)

REQUESTOR B. HOGLUND REACTOR ENGINEERING

PROGRAMMER N. JESSE

TO ANALYZE GENERAL THREE-DIMENSIONAL HEAT TRANSFER SYSTEMS USING A FINITE DIFFERENCE METHOD. A VARIETY OF MODES OF HEAT EXCHANGE MAY BE TREATED.

360F REFERENCES R60FPD647 ON FILE D0

2210 PHY309 PLASMA ADMITTANCE COMPUTATION

REQUESTORS A. HATCH, M. HASAN PHYSICS

PROGRAMMER R. HAMELINK

THE PURPOSE OF THE PROGRAM IS TO COMPUTE AND PLOT PLASMA ADMITTANCE FUNCTIONS.

360F REFERENCES ON FILE C3

2214 RE DOUBLE PIPE HX STURM-LIOUVILLE PROBLEM

REQUESTOR R. STEIN REACTOR ENGINEERING

PROGRAMMER L. BRYANT

THIS PROGRAM IS TO DETERMINE THE SOLUTION OF THE DOUBLE PIPE HX GRAETZ STURM-LIOUVILLE PROBLEM.

ANA REFERENCES ON FILE

2217 CEN146 CALCULATION OF PRESSURE AND THICKNESS OF A VAPOR FILM DURING A TRANSIENT

REQUESTOR R. IVINS CHEMICAL ENGINEERING

PROGRAMMER R. FU

SOLVE THREE SYSTEMS OF TWO DIFFERENTIAL EQUATIONS EACH TO DETERMINE THE PRESSURE AND THICKNESS OF A VAPOR FILM DURING A TRANSIENT.

360F REFERENCES ON FILE D2

2225 PHY310 POLARIS

REQUESTORS R. LANE, C. GEMMELL PHYSICS

CONSULTANT W. MILLER PROGRAMMER W. HAFNER

POLARIZATION AND ANGULAR DISTRIBUTION DATA ARE REDUCED TO CROSS SECTIONS, LEGENDRE POLYNOMIAL COEFFICIENTS AND POLARIZATION RESULTS. THIS IS A FORTRAN II PROGRAM WHICH IS TO BE PREPARED FOR USE ON PHYLIS.

360 REFERENCES ON FILE MC

2226 PHY311 SIGPU

REQUESTORS R. LANE, C. GEMMELL PHYSICS

CONSULTANT W. MILLER PROGRAMMER W. HAFNER

FOR NUCLEI OF ANY SPIN, LEVEL PARAMETERS OR PHASE SHIFTS OR SCATTERING MATRIX ELEMENTS ARE ASSUMED AND DIFFERENTIAL CROSS SECTIONS AND POLARIZATIONS FOR NEUTRONS ARE CALCULATED. THIS IS PRESENTLY A 3600 FORTRAN PROGRAM AND IS TO BE PREPARED FOR PHYLIS USE.

360 REFERENCES ON FILE ZC

2227 PHY312 COMBC

REQUESTORS R. LANE, C. GEMMELL PHYSICS

CONSULTANT W. MILLER PROGRAMMER W. HAFNER

FOR ZERO-SPIN NUCLEI, PARAMETERS OF R-FUNCTIONS ARE ASSUMED AND FROM THESE THE DIFFERENTIAL CROSS SECTIONS AND POLARIZATIONS FOR NEUTRONS ARE CALCULATED. THIS IS A COMBINED VERSION OF PHY155 AND 169, WITH MODIFICATION, WHICH IS TO BE PREPARED FOR USE WITH THE PHYLIS SYSTEM.

360 REFERENCES ON FILE ZC

2228 PHY313 LEGENDREVILLE

REQUESTORS R. LANE, C. GEMMELL PHYSICS

CONSULTANT W. MILLER PROGRAMMER W. HAFNER

THIS IS THE RE256 PROGRAM FOR FITTING DATA WITH LEGENDRE AND ASSOCIATED LEGENDRE POLYNOMIALS. THE ORIGINAL CODE WAS PROGRAMMED BY G. DUFFY FOR THE 704 IN FORTRAN II AND IS TO BE PREPARED FOR USE ON PHYLIS.

360 REFERENCES ON FILE C3,E2

2230 RE323

REQUESTOR M. PETRICK REACTOR ENGINEERING

PROGRAMMER I. BAKSYS

TO INVESTIGATE THE BEHAVIOR OF NATURAL CIRCULATION SYSTEMS AND THE HEAT TRANSFER RATES IN THE THERMODYNAMIC SUPER CRITICAL REGION OF WATER.

360F REFERENCES	ON FILE	DO

2232 RE324 OPTIONAL GEOMETRY FLUID FLOW AND HEAT TRANSFER PROGRAM

REQUESTOR L. GORDON REACTOR ENGINEERING

PROGRAMMER N. JESSE

A UTILITY PACKAGE FOR CALCULATION OF PRESSURE DROP, HEAT TRANSFER RATES, AND TEMPERATURES IN SYSTEMS WHERE ONE DIMENSIONAL FLOW ASSUMPTIONS ARE APPLICABLE. ANY LINEAR FLOW PATH CONSISTING OF COMBINATIONS OF GEOMETRICAL UNITS MAY BE DESCRIBED. THERE ARE PROVISIONS FOR STORAGE OF A LIBRARY OF FLUID THERMODYNAMIC AND TRANSPORT PROPERTIES AS WELL AS WALL MATERIAL THERMAL PROPERTIES.

704 REFERENCES	ON FILE	DO
360F REFERENCES	ON FILE	DO

2233 HEP169 CALIBRATION OF CHLOE

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

PROGRAMMERS R. ROYSTON, P. PENNOCK

A PHOTOGRAPH OF A CALIBRATION GRID WILL BE MEASURED BOTH ON CHLOE AND ON A HERMES MEASURING MACHINE.

A LEAST SQUARES FIT OF THE CHLOE MEASUREMENTS TO THE HERMES MEASUREMENTS WILL THEN BE MADE TO DETERMINE THE DISTORTIONS IN CHLOE SO AS TO PROVIDE A MAPPING OF CHLOE COORDINATES INTO TRUE SPACE COORDINATES.

360F REFERENCES	ON FILE	T1
CHL REFERENCES 1787/BIM117	ON FILE	T1

2234 HEP170 MOMENTUM DETERMINATION IN STRONGLY NON-UNIFORM MAGNETIC FIELDS

REQUESTOR A. ROBERTS HIGH ENERGY PHYSICS

PROGRAMMER P. PENNOCK

IN ORDER TO DETERMINE THE MOMENTA OF PARTICLES FROM THEIR TRAJECTORIES IN NON-UNIFORM MAGNETIC FIELDS IT IS NECESSARY TO APPROXIMATE THE TRAJECTORIES BY CURVES MORE COMPLEX THAN CIRCULAR HELICES.
THIS PROGRAM WILL BE USED TO DEVELOP AND TEST THE VARIOUS METHODS AVAILABLE AND TO DETERMINE THEIR ACCURACY AND SPEED SO THAT SUITABLE ONES CAN BE SELECTED FOR USE IN 2016/HEP151 AND 2089/HEP156.

360F REFERENCES ON FILE G2

2235 PHY314 PATTERN RECOGNITION TEST

REQUESTOR R. RINGO PHYSICS

CONSULTANT D. JACOBSCHN PROGRAMMER C. HARRISON

TEST RUNS OF A PATTERN RECOGNITION TECHNIQUE USING DAPHNIS. THE PROGRAM PRODUCES A LEARNING SET OF ASSOCIATORS AND TESTS THE ABILITY OF THIS SET TO DISCRIMINATE.

GUS REFERENCES ON FILE R1

2246 PHY315 REDUCTION OF GAMMA RAY STATISTICS

REQUESTOR C. TRAIL PHYSICS

PROGRAMMER J. WENGER

COMPOSITE STATISTICS ARE COMPUTED FROM STATISTICAL DATA ARISING FROM THE FITTING OF GAMMA RAY SPECTRA.

360F REFERENCES ON FILE Z0

2248 CEN147

REQUESTOR T. TAMURA CHEMICAL ENGINEERING

PROGRAMMER R. FU

THIS PROGRAM COMPUTES CHANGE IN RATE OF PARTICLE FORMATION IN A URANIUM DIOXIDE OXIDATION AND REDUCTION EXPERIMENT.

360F REFERENCES ON FILE Z0

PROGRAMMING RESEARCH AND DEVELOPMENT

Control Data 3600 System

Programming work done in connection with the Control Data 3600 digital computer system delivered to Argonne in September of 1963 included the following.

1. Acceptance Testing of Control Data 3600

The Control Data 3600 delivered to Argonne was the second such system to be accepted by a user. Therefore it was necessary that the Argonne system be very thoroughly checked before being accepted. CDC-written diagnostic routines constituted the bulk of the acceptance tests used, but a large number of the tests were prepared and programmed by Argonne. In particular, Argonne Acceptance Tests on the 3600 included timing tests to verify standard operation and memory times and a test of the simultaneous operation of several peripheral devices.

On the 3600/160-A satellited system, tests were written to check: the core-to-core transfer and interrupt communication between the two machines; the simultaneous operation of several peripheral devices on the 3600 and the satellited 160-A viewed as a peripheral device of the 3600; and the peripheral equipment reservation features. During the period preceding the delivery of the machine, a number of machine errors were detected as a result of the acceptance test work. In particular, a good number of problems were uncovered in the satellite features of the system, since the machine had never been employed in a configuration utilizing the satellite, even in the manufacturer's testing.

2. Pre-field Test Work with CDC 3600 Software

In order to expedite the availability of 3600 programming systems to Argonne users, considerable effort was invested in working with the SCOPE monitor system, the COMPASS assembler, and the FORTRAN compiler before these were released by the Control Data Corporation into a field test status. Various modifications were also made to fit the systems to local needs. In particular, accounting procedures were changed and tape assignment was modified to make more tapes available to the user. Some of the major modifications made dealt with the PHYLIS system (described below) to allow it to communicate with the 3600 on an interrupt basis.

3. Peripheral Support for SCOPE

Since no peripheral processing programs for the CDC 160-A to support the operation of SCOPE on the 3600 were available at delivery time, programs to perform this function were written at Argonne. Effort in this direction continues, due to changes in the peripheral equipment configuration.

4. 3600 Library Subroutines.

At the time of delivery of the Control Data 3600, no library subroutines were available. Consequently, it was necessary to write the following minimal set of function subroutines and related codes:

(a) FORTRAN-like formatted input-output processor
(b) Sine-cosine
(c) Arctangent
(d) Arcsine
(e) Square root
(f) Double-precision (84-bit) square root
(g) Cube root
(h) Double-precision cube root
(i) Exponential
(j) Logarithm
(k) Error function
(l) Random number generator

When the CDC FORTRAN library tape was delivered a few months later, it was discovered that a number of the Argonne subroutines surpassed the standard library subroutines in speed, accuracy, or both.

PHYLIS

Considerable work has been done to allow the PHYLIS on-line multi-parameter analyzer data system to process data both on the ASI 2100 alone and on the combined ASI 2100 and CDC 3600 on a real-time interrupt basis. For a description of PHYLIS itself, see the account in COMPUTER ENGINEERING AND COMPUTER SYSTEMS.

In order to aid the physicists in the use of this system, it was necessary to augment, considerably, programming systems provided by the computer manufacturers. Several improvements were made in the programming systems for the ASI-2100 computer in PHYLIS. Additional input-output instructions were added to the assembler. Peripheral processing programs were written for the input-output devices at the local and remote stations. Provisions have been made for transferring data from the Multi-parameter Analyzer and for communication with the 3600 computer. An Executive system to supervise the above operations has also been prepared.

To handle real-time interrupts from the ASI 2100, the 3600 monitor SCOPE was extensively altered. A signal from PHYLIS causes the job running on the 3600 to be interrupted and all current input-output activity to be completed. All of the magnetic core memory, all the registers, and all unanswered interrupts are saved on a tape. Then a new version of SCOPE — specially modified for the PHYLIS job — is read into the memory. The PHYLIS job requested is loaded from the PHYLIS library tape and run. Upon normal termination, the interrupted job and the monitor are reloaded, registers, etc., restored, and the job resumed. In the case of abnormal termination, a definitive message

is typed on the console typewriter, an appropriate status pattern is sent to the ASI 2100, and the interrupted job is resumed as in normal termination. The maximum 3600 time per interrupt has been set at two minutes, and the minimum interval between interrupts at fifteen minutes.

All input-output between the ASI-2100 and CDC 3600 is handled, on the 3600 end, by a special driver program which was added to SCOPE and which performs packing, unpacking, and conversion tasks on the 2100 data, so that the user may treat the data as that received from or sent to magnetic tapes.

GUS

Programming research and development work done in connection with the Argonne-built digital computer GUS (GEORGE Unified System) include the following.

1. Micro-mnemonics for GEORGE.

Previous successful experience with a micro-mnemonic (single-address) language for FLIP led to the incorporation of such a feature into the programming language for GEORGE. The necessary modifications to the assembly system have been accomplished.

2. FORTRAN for GUS.

As a result of a study made of possible means of implementing FORTRAN on FLIP, it was decided to investigate the possibility of modifying the 3600 FORTRAN compiler to produce GUS code. This work is currently in progress.

3. Improvements to FLAT (FLIP Algebraic Translator).

Provisions for integer arithmetic and automatic handling of subscripted (indexed) variables have been successfully incorporated into FLAT.

4. Subroutines and Tests.

Completed subroutines include a GUS version of the variable metric minimization scheme and an elliptic integral routine. Test programs for the memory, the drum, the FLIP divide order, and the GEORGE changes have been written.

Numerical Methods

Since its formation late last year, the numerical methods group has concentrated on the function library for the 3600. A continuing program to test all of the function subroutines provided by the Control Data Corporation was undertaken. Partially to correct deficiencies detected by this testing program, subroutines have been written for the arcsin, single and double precision square root, and single and double precision cube root. All of these routines are currently standard on the Argonne system tape, and the last four are also distributed as standard by CDC. Routines for the gamma function, the

incomplete gamma function and Bessel functions plus a package of statistical testing routines (being used to evaluate various proposals for random number generators) have been written.

Research efforts have been directed primarily towards the approximation of functions. Two versions of Remez' second algorithm for Chebyshev approximation by rational functions are currently working on the 3600. These codes have been used to generate the approximations for the square root, cube root, and arcsin which are the basis of the subroutines mentioned above. In addition, new approximations for the Complete Elliptic Integrals have been computed.

Some preliminary tests on the accuracy of the Index of precision on GUS have been carried out. Much work lies ahead on this project, but the basic codes necessary for the use of the 3600 to check GUS calculations have been completed.

Logic and Languages

1. ALGOL Activity.

A. An ALGOL translator which can handle recursively defined procedures is nearing completion.

B. CDC 3600 ALGOL has been obtained, tested, put on the systems tape, and will be maintained.

2. Theorem Proving.

The emphasis has been placed on a consideration of the strategies of search involved in avoiding the examination of many of the possible inferences not germane to the theorem under consideration rather than on discovering computer-oriented rules of inference and corresponding methods for a rapid but exhaustive examination of the inferences resulting therein. One search strategy together with some subsidiary strategies has been employed by a CDC 3600 program to prove some elementary theorems in algebra.

3. List Processing and Applications

A. The 3600 IPL-V Interpreter written at the University of Texas has been modified for the Control Data 3600.

B. A program to play checkers and Lasker against a human opponent has been written in IPL-V. Its list structure organization permits easy modification of its strategy. The program carries on an on-line dialogue with its opponent and cooperates with a human colleague in the analysis of positions. Experiments will soon be underway to make use of its man-machine communication capability to improve its game-playing performance. The program is serving as a benchmark in testing the IPL-VC System (see COMPUTER ENGINEERING AND COMPUTER SYSTEMS) and the 3600 IPL-V Interpreter.

New Library Routines

Control Data 3600

ANL B150 ASINF	W. Cody	3600 FORTRAN Systems Routine for Arcsine, Arccosine
ANL B450	L. Shalla	(Elementary Functions, Roots and Powers)
ANL B451	L. Shalla	(Elementary Functions, Roots and Powers)
ANL B452 CUBERTF	A. Joseph, L. Shalla (writeup by W. Cody)	3600 FORTRAN Systems Routine for the Cube Root
ANL B453 DCUBRT	A. Joseph, L. Shalla (writeup by W. Cody)	3600 FORTRAN Systems Routine for the Double Precision Cube Root
ANL C350 GAMMA(X)	E. Thieleker	Gamma Function
DABSF	W. Cody	FORTRAN Function Subroutine to Find the Absolute Value of a Double Precision Number

Control Data 160-A

E5.60	R. Krupp	Point Symbol and Line Plot Routine for the CDC 165 (CAL-COMP 565)

IBM-704

AN F204	B. Garbow	Generalized Eigenvalue Program for Symmetric Matrices
AN J902	W. Cody	Double Precision Output for FORTRAN
AN Q304	D. Carson	Modified "Save and Restore" Function

GEORGE

X-35-302	K. Modesitt	Narrow Magnetic Tape Compare Routine
A-31-303	C. Harrison	Shift Test
X-36-304	D. Brooks	Flip Dump

Abstracts of Newsletters

3600 NEWSLETTER

The 3600 NEWSLETTER, published at irregular intervals, contains current information and news of interest to users of the CDC 3600 and its related equipment.

3600 NEWSLETTER No. 4 7/19/63

CDC Applications Analyst, Ronald Petersen, assigned to Argonne for one year, introduced.

Miscellaneous programming information, regarding 3600 I/O instructions, use of satellited 160-A, and the satellite adapter 3681, presented.

Two 3600 FORTRAN 63 classes to be given at Argonne, announced.

3600 NEWSLETTER No. 5 9/16/63

Announcement of arrival of CDC 3600 system.

Information on use of FORTRAN 60 provided.
Appendix 1: FORTRAN-60 for 3600
Appendix 2: IBM 704 FORTRAN II to CDC 3600 FORTRAN 60

3600 NEWSLETTER No. 6 11/4/63

Substitution types performed by 3600 FORTRAN library subroutine Q8QRESID described.

3600 NEWSLETTER No. 7 11/5/63

SCOPE control card to call FORTRAN 63 described.

Other notes on use of FORTRAN 63 given.

3600 NEWSLETTER No. 8 12/12/63

SCOPE Abnormal Termination Diagnostics listed.

SCOPE Loader Diagnostics listed.

3600 NEWSLETTER No. 9 12/16/63

Current status of COMPASS, FORTRAN 63, and SCOPE given.

Information on SCOPE Library Routines available and their use given.

Argonne-coded subroutines for 3600 listed and their availability described.

3600 NEWSLETTER No. 10 1/3/64

Corrections to COMPASS Reference Manual, CDC Publication 525a, listed.

FORTRAN execution time error messages listed and described.

SNAP/TRACE diagnostics listed and described.

3600 NEWSLETTER No. 11 3/10/64

Additions and corrections to the 3600 Reference Manual, Publication 600 213 00 listed.

3600 NEWSLETTER No. 12 5/15/64

Changes in Q2Q07XXX and POWERF Routines described.

Overlay facility availability announced.

Addition of complex arithmetic subroutines to SCOPE library announced.

Modifications in the SCOPE loader and in IOH described.

Difficulties in use of BYPASS described.

Possible 3600 FORTRAN Compiler errors listed.

3600 FORTRAN Execution errors listed.

3600 NEWSLETTER No. 13 5/27/64

3600 FORTRAN parameter substitution timing described.

FORTRAN IV names added to FORTRAN 63 are listed. These names cannot be variable names within a FORTRAN program.

Conjugate subroutine in FORTRAN 63 should be called CØNJ, not CCØNJ.

Subroutines which destroy contents of D register listed.

Suggestions on use of MACRO feature in COMPASS given.

704 NEWSLETTER

The 704 NEWSLETTER, published at irregular intervals, contains information of interest to users of the IBM-704 and its related equipment. Due to the decrease of programming activity on the 704 after the arrival of the CDC 3600, only one 704 NEWSLETTER was published during this period.

704 NEWSLETTER No. 23 9/10/63

Errors still existent in FORTRAN II and its related subroutines described.

Recent SHARE correspondence and distributions.

GEORGE BULLETIN

No GEORGE BULLETINS were published during this period.

COMPUTER ENGINEERING AND COMPUTER SYSTEMS

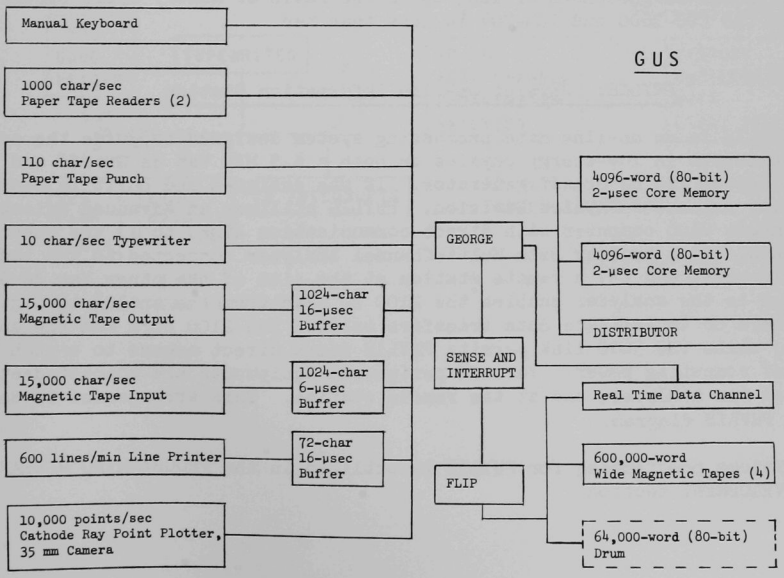
Daphnis: A Digital Perceptron Simulator

Preliminary computational experiments by J. A. Gregory and G. R. Ringo in pattern recognition by Perceptron simulation (see ANL-6767) indicated the need for a much, much faster computing device to conclude the experiments. Daphnis is a special-purpose computer designed to meet this need. Operation of Daphnis, by way of the GUS distributor, is controlled by FLIP. GEORGE meanwhile is used to generate random numbers to be utilized in the discrimination process. Daphnis produces an operational speed gain of a factor greater than 500, by: (1) generating Hamming weights of logical products directly; (2) operating on multi-word data sets without program intervention; and (3) functioning simultaneously with FLIP and GEORGE.

GUS: GEORGE Unified System

The current status of GUS, a multi-processor computer, is shown in the accompanying figure. The past year has seen the addition of FLIP (FLoating Indexed Point), a fast arithmetic processor; 8192 words of 80-bit magnetic core memory; Daphnis, a (temporary) wire-programmed processor; RTC, a real-time communications link between GUS and the Division's PACE analog computer (to permit experiments in hybrid computing); and Omni, a buffer-controller. The additions were made with minimum interference to GEORGE production.

Supporting software completed this past year is discussed under PROGRAMMING RESEARCH AND DEVELOPMENT.



IPL-VC: A Computer System Having the IPL-V Instruction Set

IPL-V is a list-processing language which, to the present time, has always had to be interpreted on other computers rather than being hardware-implemented. Now, thanks to the modular organization of the Control Data 3600, it has been possible to design a second processor, called Engine No. 2, which together with an associated programming system converts the 3600 into an IPL-VC system.

The advantages of such an approach to obtaining an IPL-V system over designing and fabricating a complete hardware computer are: (1) availability, on the CDC-3600, of a large, fast memory; (2) availability of a fast arithmetic unit, and a wealth of input/output equipment; (3) near-availability of an IPL-V simulator program for the Control Data 3600, with its excellent tracing, dumping, and snapshot procedures so necessary for program debugging, and not available in the actual IPL-VC system; and (4) economic advantage of having to build only a fairly simple list processor in place of a complete computer.

Engine No. 2 was designed with certain basic IPL-V "J" processes as its instruction set, while the remaining list operations are built up as subroutines of these "J" processes. This second 3600 processor has direct access to the CDC-3600 memory for its data and instructions. All of the arithmetic and input/output processes are performed by the CDC-3600, with the list processor taking care of any necessary list bookkeeping. Transfer of control is accomplished by an interrupt system.

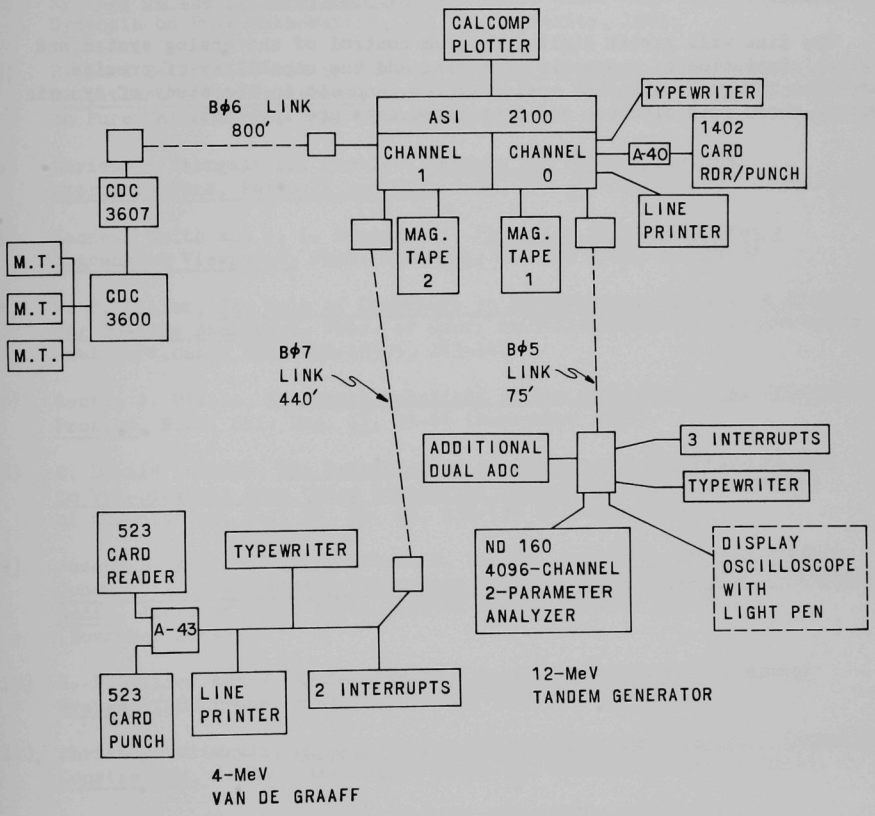
The system, which utilizes the same printed circuit boards as the Control Data 3600, is estimated to have a speed advantage over an IBM-704 interpretive system in the neighborhood of 100, while the ratio of memory cycle speeds between the CDC-3600 and IBM-704 is less than ten.

PHYLIS: Physics On-line Information Station

PHYLIS is an on-line data processing system designed to guide the conduct of experiments in low-energy physics on both a 4.5 MEV Van de Graaff and a 12 MEV tandem Van de Graaff generator. It was designed and built in cooperation with Argonne's Physics Division. PHYLIS utilizes an Advanced Scientific Instruments 2100 computer with direct communication links to 1) the Control Data 3600, 2) a Nuclear Data Multi-Channel Analyzer connected to the tandem Van de Graaff, and (3) a remote station at the site of the other Van de Graaff. The link to the analyzer enables the 2100 to read from the analog-to-digital converters or to initiate data transfers between the 2100 core and the analyzer memory, while the 3600 link permits PHYLIS users direct access to a much higher level of computing power. Various peripheral equipments are connected at the 2100, at the analyzer, and at the remote station. This arrangement is depicted in the PHYLIS diagram.

Systems programming for PHYLIS is outlined in the PROGRAMMING RESEARCH AND DEVELOPMENT section.

PHYLIS


CALCOMP PLOTTER
TYPEWRITER
Bϕ6 LINK 800′
ASI 2100
CHANNEL 1
CHANNEL 0
A-40
1402 CARD RDR/PUNCH
LINE PRINTER
CDC 3607
MAG. TAPE 2
MAG. TAPE 1
M.T.
M.T.
M.T.
CDC 3600
Bϕ7 LINK 440′
Bϕ5 LINK 75′
ADDITIONAL DUAL ADC
3 INTERRUPTS
TYPEWRITER
523 CARD READER
TYPEWRITER
ND 160 4096-CHANNEL 2-PARAMETER ANALYZER
DISPLAY OSCILLOSCOPE WITH LIGHT PEN
A-43
523 CARD PUNCH
LINE PRINTER
2 INTERRUPTS
12-MeV TANDEM GENERATOR
4-MeV VAN DE GRAAFF

RTC (Real-time Communicator): Link for a Hybrid Computer System

The Real-time Communicator is a link between GUS and the Applied Mathematics analog computing equipment, and adds hybrid computing capacity to the Division's repertoire. Consisting essentially of (1) a digital control unit, and (2) an analog control unit with accompanying data converters, the RTC uses integrated circuitry and conventional circuit modules (required at the interface).

The link will permit digital program control of the analog system and digital simulation of a dynamic variable, add the capability of precise numerical integration to the analog system, and aid in the study of dynamic systems where both discrete and continuous data are involved.

PUBLICATIONS AND PAPERS

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1) B. E. Rhoades, On Products of Power Series, Monatsh. Math. 67 (2), 125-128 (April 1963).

2) Ky Fan, On the Krein-Milman Theorem, Amer. Math. Soc. Proceedings of Symposia on Pure Mathematics, Vol. 7: Convexity, 1963.

3) Richard Bellman(1) and Ky Fan, On Systems of Linear Inequalities in Hermitian Matrix Variables, Amer. Math. Soc. Proceedings of Symposia on Pure Mathematics, Vol. 7: Convexity, 1963.

4) Christoph Witzgall (H. Maehly), Methods for Fitting Rational Approximations, Parts II and III, Jour. ACM 10 (3), 257-277 (July 1963).

5) Kenneth Smith and J. L. Uretsky(2), Pion-Pion Scattering from a Lagrangian Viewpoint, Phys. Rev. 131, 861-867 (July 15, 1963).

6) W. F. Miller, The Role of Computers in Experimental Physics: A System for On-Line Analyzers, Proc. of Conf. on Utilization of Multiparameter Analyzers,USAEC Rpt. NYO-10595, 143-147.

7) George J. Mitsis, Transport Solutions to the One-Dimensional Critical Problem, Nucl. Sci. Eng. 17, 55-64 (September 1963).

8) C. Donald LaBudde, The Reduction of an Arbitrary Real Square Matrix to Tri-Diagonal Form Using Similarity Transformations, Mathematics of Computation, Vol. 17, No. 84, 433-436 (October 1963).

9) Joseph B. Keller(3), and Robert N. Buchal, Impedance Between Perfect Conductors in a Finitely Conducting Medium with Application to Composite Media, Jour. of Appl. Phys., Letter to the Editor, 34, 3414 (November 1963).

10) W. F. Miller and R. Aschenbrenner, The GUS Multi-Purpose Computer System, IEEE Trans. EC-12(5) 671-676 (December 1963).

11) Christoph Witzgall, An All-Integer Programming Algorithm with Parabolic Constraints, J. Soc. Ind. Appl. Math. 11, 855-871 (December 1963).

12) W. J. Cody, Joan Lawson(4), H. S. W. Massey(4), and K. Smith, The Elastic Scattering of Slow Positrons by Hydrogen Atoms, Proc. of the Royal Society, A 278, 479-489 (1964).

13) H. F. Lucas, Jr.(5) and D. A. Woodward, Effect of Long Decay Chains on the Counting Statistics in the Analysis of Radium-224 and Radon-222, J. Appl. Phys. 35, 452-456 (February 1964).

14) M. Ribaric, On the Asymptotic and Average Behavior of the Unsteady Reflection Properties of a Compound Body in an Infinite Time Interval, Arch. Rational Mech. Anal. 15(1), 54-68 (1964).

15) Forrest Salter, A Ternary Memory Element Using a Tunnel Diode, IEEE Trans. on Electronic Computers (Correspondence), Vol. EC-13 #2, 155-156 (April 1964).

16) G. Calabrese(6) and E. Hovorka, Magnet Excitation for a Proton Accelerator, IEEE Trans. Vol. 83, No. 72, 302-309 (May 1964).

17) M. T. Janicke(7) and L. C. Just, A Simulation of a Generalized Thermal Radiating Fin, SIMULATION, 2, 19-22 (May 1964).

18) Herbert S. Wilf, On Dirichlet Series and Toeplitz Forms, Jour. for Math. Anal. and Appl., 8, 45-51 (June 1964).

19) B. E. Rhoades, Some Hausdorff Matrices Not of Type M, Proc. Amer. Math. Soc. 15(3), 361-365 (June 1964).

20) David Jacobsohn, A Self-Organizing Drum, IEEE Trans. on Electronic Computers, Letter to the Editor, Vol. EC-13, #3, 302 (June 1964).

21) Louis C. Just and Nye F. Morehouse, Jr., The Simulation of Large Transients in Neutron Reactors, SIMULATION, 3, #1, 11-14 (July 1964).

22) J. W. Butler, Margaret K. Butler, and Agnes Stroud(8), Automatic Classification of Chromosomes, 1963 Rochester Conf. on Data Acquisition and Processing in Biology and Medicine, Data Acquisition Volume 3 (in press).

23) Calvin H. Wilcox, The Asymptotic Behavior of Wave Packets in Relativistic Scattering Theory, Jour. Math. Anal. & Appl. (in press).

24) M. Ribaric, The Relation Between the Reflection Properties of the Body and the Reflection Properties of Its Parts II, Arch. for Rational Mechanics and Analysis (in press).

25) George J. Mitsis, On the Transport Equation in Plane Geometry, Nucl. Sci. Eng., Letter to the Editor (in press).

26) D. Woodward, Continuous Transformations and Stochastic Differential Equations, Bulletin of the AMS (in press).

27) W. J. Cody, Double Precision Square Root for the CDC-3600, Comm. ACM (in press).

28) Robert K. Clark, LINK and PAIR, CDC-3600 Programs for the Association of Spark Images into Tracks, Proc. of Informal Meeting on Film-less Spark Chamber Techniques and Associated Computer Use, CERN Report (in press).

29) Richard J. Royston, The Resolution Function of a Two-Rotor Neutron Velocity Selector, Nuclear Instruments and Methods (in press).

(1)RAND Corporation, Santa Monica, Calif.
(2)Physics Division
(3)Courant Inst. Math.Sci., New York Univ., N.Y.
(4)University College London, England
(5)Radiological Physics Div.
(6)Particle Accelerator Div.
(7)Reactor Engineering Div.
(8)Biol. & Med. Research Div.

ANL Reports

1) ANL-5800, 2nd Edition, Reactor Physics Constants, Section 10, Digital Computer Codes, by M. K. Butler and H. Greenspan.

2) ANL-6654, A Method of Calculating Transient Temperatures in a Multi-Region Axisymmetric, Cylindrical Configuration (The ARGUS Program 1089/RE248, Written in FORTRAN II), by D. F. Schoeberle*, J. Heestand, and L. B. Miller*.

3) ANL-6730, The Morse Index Theorem and Geometrical Optics, by Robert Hermann.

4) ANL-6768, Applied Mathematics Division Summary Report July 1, 1962 through June 30, 1963, R. F. King, Editor.

5) ANL-6787, Transport Solutions to the Monoenergetic Critical Problems, by George Mitsis.

6) ANL-6798, A Fast Reactor Excursion Simulator, by Lawrence T. Bryant and D. V. Gopinath**.

7) ANL-6805, ELMOE: An IBM-704 Program Treating Elastic Scattering Resonances in Fast Reactors, by A. L. Rago and H. H. Hummel**.

8) ANL-6820, Asymptotic Solutions to Compound Decision Problems, by John Van Ryzin.

9) ANL-6886, Calculated Values of Wing-Fong's Nuclidic Mass Equation, by James Wing*** and Judith D. Varley.

10) ANL-6888, IPL-VC, A Computer System Having the IPL-V Instruction Set, by Donald Hodges.

*Reactor Engineering Division

**Reactor Physics Division

***Chemistry Division

AMD Technical Memoranda

1) No. 25, IBM-704 FORTRAN II to CDC-3600 FORTRAN 63, by Norbert J. Purcell.

2) No. 36, Circuitry of the GUS System, by James Potter and Forrest O. Salter.

3) No. 41, ARGUS - A Programming System for GUS, by M. A. Fisherkeller, K. E. Hillstrom, L. I. Kassel, and G. A. Robinson.

4) No. 43, Zero Gradient Synchrotron Power Supply Grounding Study, by R. A. Bare, L. C. Just, and N. F. Morehouse.

5) No. 47, Notes on the Use of the ASI-210 Including Compilation and Assembly, by Charles J. Smith.

6) No. 48, A Summary of Problem Results Obtained from the Three S_n Codes - DSN, DTK, and W-DSN, by M. Butler, G. Duffy, H. Greenspan, and E. Mueller.

7) No. 49, Magnetic Drum Memory System for GUS, by C. B. Shelman.

8) No. 50, Organization of the Real-Time Communicator for GUS, by Richard Aschenbrenner and John Byram.

9) No. 51, ASI-210 - CDC-3600 Communication Link, by Robert Clark and Donald Hodges.

10) No. 52, Preliminary Discussion of Floating Point GEORGE, by David H. Jacobsohn.

11) No. 55, Double-Precision Square Root for the CDC-3600, by W. J. Cody.

12) No. 56, Computation of Boolean Matrices for Syntax Analysis Using the LISP I Programming System, by Robert E. Greene.

13) No. 57, A Checker-Playing Program in IPL-V, by W. R. Cowell and M. C. Reed.

14) No. 58, Programming for the ASI-210/CDC-3600 Communication Link, by Robert Clark.

15) No. 59, GEORGE Changes for the GUS System, by L. Amiot and D. Jacobsohn.

16) No. 60, Automatic Classification of Chromosomes, by J. W. Butler, Margaret Butler, and Agnes Stroud*.

17) No. 61, CHLOE, Automatic Film Scanning Equipment Hardware Reference Manual, by Donald Hodges.

18) No. 62, A System for the On-Line Control of Manually Positioned Measuring Tables, by Donald Hodges.

19) No. 63, ASI-210/CDC-3600 Communication Link, by Robert Clark and Donald Hodges.

20) No. 64, AROMA-AIRWICK: A CHLOE/CDC-3600 System for the Automatic Identification of Spark Images and Their Association into Tracks, by Robert K. Clark.

21) No. 65, Integrated Circuits, by James Potter and Forrest Salter.

22) No. 66, IPL-VC, A Proposal for a Computer System Having the IPL-V Instruction Set, by Donald Hodges.

23) No. 67, On-Line CRT Plotting Techniques and Subroutines with the CDC-3600 Computer System, by George A. Robinson.

24) No. 68, GUS Programming Manual - Part I, The GEORGE Computer, by G. A. Robinson.

25) No. 69, A Proposal for a Micro-Programmed List Processor, by John C. Reynolds.

26) No. 70, Off Line Plotting Techniques Using CALCOMP Magnetic Tape Plotting System #580, by C. LeVee and J. Ohde.

27) No. 72, Some Theorem-Proving Strategies and Their Implementation, by George A. Robinson, Lawrence T. Wos, and Daniel F. Carson.

*Biological and Medical Research Division.

Papers Presented at Meetings

Automatic Classification of Chromosomes, by J. W. Butler, Margaret K. Butler, and Agnes Stroud*, 1963 Rochester Conference on Data Acquisition and Processing in Biology and Medicine, Rochester, N.Y., July 15, 1963.

LINK and PAIR, CDC-3600 Programs for the Association of Spark Images into Tracks, by Robert K. Clark, Informal Meeting on Film-less Spark Chamber Techniques and Associated Computer Use, CERN, Geneva, Switzerland, March 4, 1964.

*Biological and Medical Research Division

SEMINARS, SYMPOSIA, AND LECTURES

Applied Mathematics Division Seminars

July 18, 1963 — A Syntax-Structured Compiler for ALGOL-60, Professor Herbert Kanner, Institute for Computer Research, The University of Chicago, Chicago, Illinois.

August 1, 1963 — Asymptotic Solution for Compound Decision Problems, Dr. John Van Ryzin, Applied Mathematics Division, Argonne National Laboratory.

August 7, 1963 — The Bell Laboratory 7090 Compiler for the Composition in Generation of Music, Dr. Arthur Roberts, High Energy Physics Division, Argonne National Laboratory.

August 8, 1963 — Syntax-Directed Compilers, Dr. Stephen Warshall, Computer Associates, Woburn, Massachusetts.

August 22, 1963 — A Machine-Oriented Logic, Professor John Alan Robinson, Rice University and Argonne National Laboratory.

September 12, 1963 — Non-Linear Hyperbolic Equations in the Large, Professor Irving E. Segal, Department of Mathematics, Massachusetts Institute of Technology, Cambridge, Massachusetts.

September 16, 1963 — A Programming Language, Professor L. H. Thomas, Thomas Watson Laboratory, Columbia University, New York, New York.

October 10, 1963 — States of the Clifford Algebra, Professor W. F. Steinspring, Department of Mathematics, University of Chicago, Chicago, Illinois.

October 17, 1963 — A Working Seminar on Matrix Codes and Discussion of Computing Techniques, Professor George E. Forsythe, Computation Center, Stanford University, Stanford, California.

October 17, 1963 — A Working Seminar on Matrix Codes and Discussion of Computing Techniques, Professor Gene H. Golub, Computation Center, Stanford University, Stanford, California.

October 17, 1963 — A Working Seminar on Matrix Codes and Discussion of Computing Techniques, Professor Richard S. Varga, Case Institute of Technology, Cleveland, Ohio.

October 17, 1963 — Relative Self-Adjoint Operations in Hilbert Space, Professor Magnus R. Hestenes, Department of Mathematics, University of California, Los Angeles, California.

October 24, 1963 — Nanosecond Circuits for High Energy Physics Experiments, Mr. Stanley Rudnick, Electronics Division, Argonne National Laboratory.

October 29, 1963 — On Some Recent Developments in the Theory and Applications of Continued Fractions, Professor Peter Wynn, Mathematisch Centrum, Amsterdam, Netherlands.

November 7, 1963 — The Application of Relaxation Methods to the Solution of Engineering Problems, Dr. Clyde Hyde, Chairman, Department of Electrical Engineering, University of Nebraska, Lincoln, Nebraska.

November 21, 1963 — Computer Based Automatic Teaching Systems, Professor Peter G. Braunfeld, Coordinated Science Laboratory, University of Illinois, Urbana, Illinois.

December 5, 1963 — Critical Problems in Transport Theory, Dr. George Mitsis, Applied Mathematics Division, Argonne National Laboratory.

December 12, 1963 — Positive Real Resolvents and Linear Passive Hilbert Systems (the Continuation Problem Associated with Virtual States, Resonances and Complex Eigenvalues, Professor C. L. Dolph, University of Michigan, Ann Arbor, Michigan.

January 23, 1964 — Proving Algorithms Equivalent, Professor John McCarthy, Computation Center, Stanford University, Stanford, California.

January 23, 1964 — Applications of Magnetic Thin Films for Use in Digital Computers, Professor Arthur V. Pohm, Department of Electrical Engineering, Iowa State University, Ames, Iowa.

January 30, 1964 — Problem-Solving with the Solomon Computer, Dr. D. Slotnick Westinghouse Electric Corp., Baltimore, Maryland.

February 6, 1964 — Diffraction by a Dielectric Wedge, Professor James Radlow, Department of Mathematics, Purdue University, Lafayette, Indiana.

February 13, 1964 — The Origin of Some Non-Linear Problems in Differential and Integrodifferential Equations, Professor John A. Nohel, Department of Mathematics, University of Wisconsin, Madison, Wisconsin.

February 20, 1964 — A New Numerical Solution for a Form of the Neumann Problem, with Applications to Electrocardiography, Dr. J. C. Swihart, Thomas J. Watson Research Center, IBM Corp., Yorktown Heights, New York.

February 27, 1964 — Oscillations and Stability of Rotating Liquid Masses, Professor Norman Lebovitz, Department of Mathematics, The University of Chicago, Chicago, Illinois.

March 19, 1964 — Uniform Asymptotic Estimates for Wave Packets in the Quantum Theory of Scattering, Professor Calvin H. Wilcox, Department of Mathematics, University of Wisconsin, Madison, Wisconsin.

April 16, 1964 — IBM System/360, Mr. Robert Struzenberg, Data Processing Representative, IBM Corporation.

May 7, 1964 — Algebraic Computation of Feynman Graphs Using a Digital Computer, Professor A. C. Hearn, Department of Physics, Stanford University, Stanford, California.

May 14, 1964 — The CDC-6600 Computer, Mr. Ray Allard, Control Data Corp., Minneapolis, Minnesota.

May 28, 1964 — Multiprogramming and the G.E. 635, Dr. John Weil, Computer Department, General Electric Company, Phoenix, Arizona.

June 4, 1964 — A Simplification of the Method of Singular Eigenfunctions in Transport Theory, Professor Ivan Kuscer, Department of Nuclear Engineering, University of Michigan, Ann Arbor, Michigan.

June 5, 1964 — Characteristic Roots of Sums of Matrices, Dr. Olga Taussky Todd, Department of Mathematics, California Institute of Technology, Pasadena, California.

June 22-26, 1964 — Lectures on ALGOL, Professor Albert Grau, Northwestern University, Evanston, Illinois.

June 25, 1964 — Constructional Solution of Functional and Differential Equations, Professor W. V. Petryshyn, Department of Mathematics, The University of Chicago, Chicago, Illinois.

Seminar on the QR-algorithm, and Application of Lyapunov Theory to Polynomials, October 17, 1963

Several of the leading workers in the area of matrix calculations met at Argonne to discuss the QR algorithm for finding eigenvalues of general real matrices, and application of the classical Lyapunov stability theory to solution of polynomial equations. Non-Argonne contributers were G. E. Forsythe, M. R. Hestenes, R. S. Varga, Virginia Klema, and Fawzi Imad. Argonne was represented by W. Givens, Burton Garbow, and G. J. Duffy.

Special Interest Seminars

November 4, 1963 — Organization of the Atlas Computer, Dr. Frank Sumner, University of Manchester, Manchester, England, and The University of Chicago.

December 20, 1963 — Logical Organization for Computing Design, Dr. Frank Sumner, University of Manchester, Manchester, England, and The University of Chicago.

February 7, 1964 — A Heuristic Computer Program for Recognition of Grammatical String, Mr. M. Ralph London, Computing Center, Carnegie Institute of Technology, Pittsburgh, Pennsylvania.

May 7, 1964 — A Method of Solving Linear Equations, Professor Shmuel Kaniel of the Department of Mathematics and the College, The University of Chicago, Chicago, Illinois.

June 12, 1964 — Engine No. 2, Mr. Donald Hodges, Applied Mathematics Division, Argonne National Laboratory.

June 25, 1964 — Strategy Algorithms in the Game of Checkers, Mr. Leo Levitt, Atomics International, Canoga Park, California

Special Interest Engineering Seminars

May 8, 1964 — Organization of a Multi-Processor, R. A. Aschenbrenner.

May 15, 1964 — Fingerprint Identification and Classification, C. B. Shelman.

June 12, 1964 — Introduction to Engine No.2, D. Hodges.

West Suburban College Seminar

October 15, 1963 — Calculation of the Square Root on a Computer, by W. J. Cody.

November 12, 1963 — Disorientation, or the Case of the Confused Bean, by Joseph Cook.

December 3, 1963 — CHLOE, by Richard Royston.

February 18, 1964 — Theorem Proving and the Computer, by L. T. Wos.

March 17, 1964 — Solving a Differential Equation Numerically, by Richard King.

Symposium Presentations

Research in the Applied Mathematics Division of Argonne National Laboratory, by E. H. Bareiss, at IBM Product Development Laboratory, Endicott, New York, December 11, 1963.

An Un-Perturbation Theory, by J. M. Cook, at Physics Colloquium, Argonne National Laboratory, December 27, 1963.

AIRWICK, a CDC-3600 Spark Chamber Data Processing System, by R. K. Clark, at High Energy Physics Division Research Seminar, Argonne National Laboratory, February 24, 1964.

Kinematic Fitting, by R. J. Royston, at High Energy Physics Division Research Seminars, Argonne National Laboratory, March 10 and 24, 1964.

Automation of High Energy Physics Experiments: A Report on the CERN Conference on Film-less Spark Chambers and Associated Computer Use at Geneva (March 3-6, 1964), by R. K. Clark, at High Energy Physics Division Colloquium, Argonne National Laboratory, March 25, 1964.

Lyapunov, Hessenberg and Companion, by Wallace Givens, at Symposium on Matrix Computations, Gatlinburg, Tennessee, April 14, 1964.

Biological Behavior in Compensated Fields: Beginning Studies, by S. A. Gordon* and J. M. Cook, at Biological and Medical Research Division Colloquium, Argonne National Laboratory, June 4, 1964.

Numerical Integration on Compact Groups, by J. M. Cook, at Colloquium, Mathematics Research Center, Madison, Wisconsin, June 23, 1964.

University Lectures

An Evaluation of Integrated Circuits in Systems, by Forrest Salter, University of Illinois, Urbana, Illinois, October 21, 1963.

The Computer's Role in Experimental Sciences, by W. F. Miller, The University of Chicago, October 21-22, 1963.

Introduction to Transport Theory, by E. H. Bareiss, Concordia College, Moorhead, Minnesota, December 16, 1963.

Argonne National Laboratory and Its Applied Mathematics Division, by E. H. Bareiss, Concordia College, Moorhead, Minnesota, December 16, 1963.

How to Solve a Polynomial Equation, by E. H. Bareiss, Concordia College, Moorhead, Minnesota, December 17, 1963.

*Biological and Medical Research Division.

Decomposition of a Linear Transport Operator, by E. H. Bareiss, Harvard University, Cambridge, Massachusetts, March 4, 1964.

Argonne Data Analysis Systems, PHYLIS and CHLOE, by W. F. Miller, Stanford University, Stanford, California, March 6, 1964.

Argonne High-Speed Data Analysis Systems: Talk I - The PHYLIS System for Real-time Data Analysis; Talk II - The CHLOE System and Its Film Scanning Programs, by W. F. Miller, University of Texas, Austin, Texas, April, 1964.

Introduction to Transport Theory, by E. H. Bareiss, Trenton State College, Trenton, New Jersey, April 10, 1964.

Research in the Applied Mathematics Division of Argonne National Laboratory, by E. H. Bareiss, Trenton State College, Trenton, New Jersey, April 10, 1964.

The Geneology of GUS, by W. J. Cody, Elmhurst College, Elmhurst, Illinois, April 27, 1964.

Functional Analysis and Quantum Mechanical Scattering Theory, by J. M. Cook, Purdue University, Lafayette, Indiana, April 28, 1964.

COMPUTER SERVICES COUNCIL

The Computer Services Council was established to advise the Applied Mathematics Division of the Laboratory's mathematical and computing needs and to help disseminate information on the Division's activity to other parts of the Laboratory.

Current status of Control Data 3600 programming systems and the projected disk file opened the meeting of January 31, 1964. Engineering checkout of Argonne's GUS system was also discussed. Reference was made to the related DAPHNIS pattern extractor and the Real-time Communicator link with the PACE analog computer.

Tentative plans for arrival and acceptance testing of the Control Data 3600 were outlined.

COMPUTING FACILITIES

The computing equipment described below is currently available in the Applied Mathematics Division for carrying out computations. Numerous peripheral devices, such as keypunches and paper tape reproducers, are also available. Scheduling and operation are handled by the Division's Operations Section.

1) A Control Data Corporation 3600 system including:

a compute module with real-time clock,
a 65,536-word magnetic core memory,
4 printers (1,000 lines/minute),
2 card readers (1,200 cards/minute),
20 magnetic tape units,
2 auxiliary Control Data 160-A computers, one of which as a satellite shares the compute module with the 3600; it also shares the line printers with the other 160-A; the other 160-A controls four tape units and a card reader and punch;
2 card punches (100 cards/minute),
3 input/output typewriters,
a data display unit with camera plus console unit for viewing,
2 paper tape readers (on the 160-A computers),
a microwave transmission unit and digital data terminal linking to the High Energy Physics Building,
an incremental plotter on-line with the non-satellited 160-A, and
a real-time channel for access from other systems such as PHYLIS.

2) A Control Data 160-A system (located in the Reactor Physics and Engineering Building) including:

a central computer,
an 8192-word magnetic core memory,
a printer (1,000 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, and
2 magnetic tape units.

3) A Control Data 160-A system (located in the High Energy Physics Building) including:

the same configuration as that in item 2) above, plus a microwave transmission unit and digital data terminal linking the system to the Mathematics and Computer Facility.

4) An IBM-704 computer including:

a central processing unit,
a 32,768-word magnetic core memory
an 8,192-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.

5) An IBM-1401 system consisting of:

a processing unit with a 4,000-character magnetic core memory,
a card reader and punch (800 cards/min),
a printer (600 lines/min),
2 magnetic tape units, and
the following features:

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

6) The Argonne-built GUS system, described above in COMPUTER ENGINEERING AND COMPUTER SYSTEMS.

7) 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.

8) CHLOE, an automatic data-processing system for analyzing spark-chamber and other photographs, including:

a fiber optics cathode-ray-tube scanner, and
an Advanced Scientific Instruments 210 digital computer with paper tape reader and punch, one magnetic tape, and a typewriter for input/output.

9) A California Computer Products incremental plotter.