WASH - 1158

METALLURGY *and* MATERIALS PROGRAMS

●

FY 1970

UNITED STATES ATOMIC ENERGY COMMISSION
DIVISION of RESEARCH

METALLURGY

AND

MATERIALS

PROGRAMS

Fiscal Year 1970

August 1970

U. S. Atomic Energy Commission

Division of Research

FOREWORD

The Metallurgy and Materials Program constitutes one portion of a wide range of research supported by the AEC Division of Research. Other programs are administered by the Division's Controlled Thermonuclear Research, Chemistry, High Energy Physics, and Physics and Mathematics Offices. Metallurgy and Materials research is supported primarily at AEC National Laboratories and Universities. The research covers a wide spectrum of scientific and engineering areas of interest to the Atomic Energy Commission and is conducted generally by personnel trained in the disciplines of Solid State Physics, Metallurgy, Ceramics, and Physical Chemistry.

This report contains a listing of all research underway in FY 1970 together with a convenient index to the program.

Donald K. Stevens
Assistant Director of Research for
Metallurgy and Materials Programs
Division of Research

INTRODUCTION

The purpose of this report is to provide a convenient compilation and index of the AEC's Metallurgy and Materials Programs. This compilation is intended for use by administrators, managers, and scientists to help coordinate research and aid in selecting new programs.

The report is divided into Sections A and B, listing all the projects, Section C, a summary of funding levels, and Section D, an index.

Each project carries a number (underlined) for reference purposes. The FY 1970 funding level, title, personnel, budget activity number (e.g. 01-02), and key words and phrases accompany the project number. The first two digits of the budget number refer to either Physical Metallurgy and Ceramics (01) or Solid State Physics (02). The budget numbers carry the following titles:

01-01 - Materials, Properties and Processes
01-02 - Structure of Materials
01-03 - Radiation Damage

02-01 - Materials Preparation and Characterization
02-02 - Crystal Physics
02-03 - Energetic Particle Interaction

Section C summarizes the total funding level in a number of selected categories. Obviously most projects can be classified under more than one category and, therefore, it should be remembered that the categories are not mutually exclusive.

In Section D the references are to the project numbers appearing in Sections A and B and are grouped by (1) investigators, (2) materials, (3) technique, (4) phenomena, and (5) environment.

It should be recognized that it is impossible to include in this report all the technical data available for such a large program. By the time it could be compiled it would be outdated. The approach taken here was to summarize each project with key words and phrases reflecting the activity under the project. The best method for obtaining more detailed information about a given research project is to contact directly the investigators listed.

Louis C. Ianniello
Metallurgy and Materials Programs
Division of Research

TABLE OF CONTENTS

SECTION A - Laboratories

SECTION B - Universities

SECTION C - Funding Levels

SECTION D - Index

SECTION A

Laboratories

The information was taken from current Laboratory program budget submissions. Most projects are of a continuing nature although specific problems and some projects were concluded in FY 1970.

AMES LABORATORY
U. S. Atomic Energy Commission
P. O. Box 1129, Station A
Ames, Iowa 50010
Phone: Area Code 515 284-4000

Metallurgy Division -01-
M. S. Wechsler - Phone: 294-1821

1. "Mechanical Behavior" $134,000 01-01
T. E. Scott
relationship between structure and mechanical properties, mechanical properties of Y Th Cu-Ni Yb Cu-Co Sm, effect of H on V Nb Ta, shock loading of stainless steel

2. "Metal Purification and Impurity Effect Studies" $70,000 01-01
O. N. Carlson, D. T. Peterson
electrotransport and reduced pressure sublimation techniques for purifying metals, properties include lattice parameter, electrical resistivity, yield point, strain aging, recrystallization temperature and hardness, Lu Zr V Mn Th Gd Hf Ca Ba Sr

3. "Ceramics Research" $45,000 01-01
O. Hunter, D. R. Wilder
atomic diffusion, elastic properties, thermal diffusivity by a flash method using a ruby laser source, Y_2O_3 ZrO_2 ThO_2-Y_2O_3 Nb_2O_5 HfO_2, TiB_2 ZrB_2 HfB_2

4. "Physicochemical Properties" $310,000 01-02
P. Chiotti, K. A. Gschneidner,
F. X. Kayser, J. F. Smith
thermodynamic, electronic, magnetic, elastic, and crystallographic properties, alloying behavior of Yb and Eu, binary Mg-lanthanide systems, Th-Co, Th-Fe, austenite-martensite transformation in Fe-Ni-C single crystals, Nd-Zn Pr-Zn, Ba Sr Ca

5. "Diffusion and Transport Properties" $140,000 01-02
J. D. Verhoeven, O. N. Carlson,
D. T. Peterson
electrotransport and atomic movements in solid and liquid metals, alloy solidification, C N O in Lu, C N O in Gd, diffusion in Th-rare earth alloys, C in Nb and Ta, effects of convection on controlled eutectic solidification in Pb-Sn

AMES LABORATORY
Metallurgy Division -01- (Continued)

6. "Properties of Surfaces" $41,000 01-02
R. K. Trivedi
theoretical and experimental studies of surface energy and structure, interface migration and surface diffusion, stability of surfaces and interfaces, epitaxial growth of thin films

7. "Radiation Damage" $120,000 01-03
C. W. Chen
neutron irradiation hardening in metals, tensile strength of irradiated V, Nb, Mo, magnetic studies of Ni-Pt alloys, radiation hardening in Th

Physics Division -02-
C. A. Swenson - Phone: 294-5288

8. "Materials Preparation and Characterization" $165,000 02-01
F. H. Spedding, G. Burnet
preparation of high purity rare earths, physical, electrical, magnetic, and thermodynamic properties, high purity rare earth fluorides, magnetic properties of intra-rare earth alloys, preparation of Er Ho Dy by Li reduction of the chloride

9. "Electronic Structure and Magnetic Properties of Metals" $68,000 02-02
J. L. Stanford, L. Hodges,
R. A. Phillips
theoretical and experimental research on the electronic structure of metals, Fermi surface studies, dHvA effect, rf size effect, transverse magnetoresistance, infrared absorption, Lu, Mo, Cr, V, ReO_2, Tl, calculations of electronic band structure by APW method

10. "Nuclear Resonance in Solids" $134,000 02-02
R. G. Barnes, D. R. Torgeson
ESR NMR and NGR applied to the study of metallic and magnetic solids, nuclear hyperfine interaction measurements, NMR of noncubic metals - Cd, As, Sb, Zn, Re, transition metal borides, hyperfine-enhanced NMR of Tm and Pr in alloys and compounds, NGR of Tm in Tm_2Al_2

AMES LABORATORY
Physics Division -02- (Continued)

11. "Superconductivity" $151,000 02-02
D. K. Finnemore, J. R. Clem,
W. J. Keeler, J. E. Ostenson
superconductivity in the presence of short-range magnetic order, critical field curves for gapless superconductors (La-Lu-Tb), surface superconductivity in V, effect of pressure on superconductivity (Pb-Bi), magnetic impurity states in superconductors (Th-Gd), theory of flux-flow noise voltage, flux pinning

12. "Low Temperature, High Pressure Studies" $185,000 02-02
C. A. Swenson
thermodynamic data (low temperature thermal expansion, heat capacity, P-V-T relations) for solid inert gases, alkali metals, alkaline earth metals, temperature scale from 1 to 20 K, low T thermal expansion of Cu Ag Au

13. "Transport Properties of Solids" $168,000 02-02
G. C. Danielson, P. H. Sidles,
H. R. Shanks, R. L. Anderson
electrical and thermal conduction in semiconductors, non-rare earth metals, and nonstoichiometric compounds, Mg_2X (X=Si, Ge, Sn or Pb), tungsten bronzes, thermal diffusivity of Th UO_2, electrical switching in amorphous materials As-(Ge,Si)-Te

14. "Electronic Structure and Magnetic Properties of Metals" $269,000 02-02
S. Legvold, S. H. Liu, J. L. Stanford,
T. Wagner, H. Gartner, R. Gupta
relationship between magnetic properties and electron band structure in rare earth metals, Gd-Th Gd-Mg, wavenumber dependent susceptibility function for paramagnetic Cr, Kondo effect, magnetoelastic effects in Tb, ferromagnetic resonance in $MnAu_2$ Tb-Y

15. "Optical Properties" $236,000 02-02
D. W. Lynch, R. Fuchs, K. L. Kliewer,
J. M. Keller, R. Rosei
optical properties of Cr and Cr alloys, infrared optical properties of an ionic crystal, nonlocal optical properties of an electron gas, electromagnetic fields resulting from optical excitation in metals, surface plasmons in metals, optical properties of Al Al-Mg alloys Cd and anisotropic K tungsten bronzes, infrared absorption of H and D ions in CsBr and CsI

AMES LABORATORY
Physics Division -02- (Continued)

16. "Neutron Scattering" $151,000 02-02
S. K. Sinha, R. A. Reese,
R. P. Gupta, T. O. Brun
phonon spectrum of HCP ^{4}He, magnon and paramagnon-type excitations in a Cr-Mn alloy, phonon spectrum of Sc, phonon spectrum of YZn, polarized neutron measurements of the magnetic moment distribution in Tm and Tb, phonon spectrum of Th

17. "Optical and Magnetic Properties of Rare Earth Salts, Solutions, Metals and Alloys" $252,000 02-02
F. H. Spedding, R. H. Good
high field Zeeman effect measurements, Er ethylsulfate, Raman spectra of aqueous rare earth perchlorate, nitrate and chloride solutions, magnetic properties of single crystals of Tb-Ho alloys, heat capacities of Lu-Er and Lu-Tm alloys

ARGONNE NATIONAL LABORATORY
9700 South Cass Avenue
Argonne, Illinois 60439
Phone: Area Code 312 739-7711

71 72
2985 3000

Materials Science Division -01-
P. G. Shewmon - Phone: 739-2221
N. L. Peterson - Phone: 739-2222

18. "Physical Metallurgy" $366,000 01-01
M. B. Brodsky, A. J. Arko, L. M. Atlas,
J. J. Rechtien, W. J. Nellis, J. S. Abell
research on actinide metals and alloys, preparation of high purity Pu and single crystal Pu, transformation studies of Np, electron transport and magnetic studies of Pu U, Kondo studies in Pd-U Pd-Np Pd-Pu, NGR in Am and Pu systems, Fermi surface of U, defect spacing in oxides, gas equilibria with PuO_2, thermodynamic properties of PuC

19. "Metal Physics" $450,000 01-01
N. L. Peterson, W. K. Chen, E. S. Fisher,
J. N. Mundy, S. J. Rothman, D. G. Westlake,
B. N. N. Achar, J. T. Robinson, W. M. Shyu
self diffusion in Na K Ag, impurity diffusion in Al U Zr Li Cu, diffusion in alloys of Cu-Zn and Nb-Mo, effect of irradiation on diffusion, cation diffusion in NiO ZnO CoO, surface diffusion in CoO, lattice dynamical diffusion theory, hydrogen effects in Zr V, elastic moduli in V and Ta alloys, pressure dependence of elastic moduli in U Zr Ti

20. "Mechanical Properties" $236,000 01-01
U. F. Kocks, C. Y. Cheng, R. O. Scattergood,
G. C. T. Liu, P. Neumann
dislocation theory, energies of screw and edge dislocations, statistical theory of slip, work hardening, stress relaxation in Cu, cyclic hardening in Cu, structure of deformed Al and Cu crystals

21. "Kinetic Studies" $192,000 01-01
C. A. Johnson, J. W. Miller,
F. V. Nolfi, Jr.
theory of solid state nucleation of voids and inert gas bubbles, kinetic studies of second phase growth in Cu-He Al-Cu, isotope diffusion in Pb, channeling to determine position of solute atoms

ARGONNE NATIONAL LABORATORY
Materials Science Division -01- (Continued)

22. "Alloy Properties" $662,000 01-02
J. B. Darby, Jr., A. T. Aldred,
D. I. Bardos, F. Y. Fradin, L. L. Isaacs,
G. S. Knapp, D. J. Lam, F. M. Mueller,
B. W. Veal, Jr., L. E. Drain, G. M. Goodman,
J. W. Garland, J. W. Ross
crystal structure and phase relationships of Am compounds, experimental and theoretical studies of crystal-field and exchange effects on actinide ions, NMR on U Pu Np compounds, NGR in Am compounds, magnetization of Fe-V-Al Fe-Cr-Al and Fe-Ni-Sn, weak band magnetism, NMR in transition metal alloys, low temperature specific heat on Gd-Sc, high temperature thermodynamics of alloys, optical properties of Pd Sc $ZrZn_2$ · U compounds, electronic structure of Sc alloys

23. "Scattering Studies" $442,000 01-02
M. H. Mueller, L. Heaton, G. H. Lander,
M. Kuznietz, R. C. Maglic
neutron magnetic scattering UP-US UAs-US, neutron diffraction of Np-U-C, ^{242}Pu, $^{242}PuO_2$, polarized neutron diffraction of Mn phosphide, study of magnetic electrons in Fe, diffraction studies of HoAlNi URhGe

24. "Radiation Effects" $391,000 01-03
T. H. Blewitt, E. E. Gruber, A. C. Klank,
B. A. Loomis, G. Kostorz
effect of neutron irradiation on Nb, radiation hardening in Cu, void formation in Al, saturation of electrical resistivity in BCC and HCP metals, low temperature x-ray diffraction, thermal migration of pores, interactions of irradiation defects in Tc with flux lines, flow stress in superconducting and normal Pb alloys of Cd Sn Tl and Bi

25. "Charged Particle Irradiation Studies" $89,000 01-03
K. L. Merkle, M. Rühle
studies of displacement cascade clusters by transmission electron microscopy, Xe and Kr on Au, dechanneling at twin boundaries, resistivity saturation effects with ion bombardment, effect of channeling on defect production

ARGONNE NATIONAL LABORATORY
Solid State Sciences Division -02-
O. C. Simpson - Phone: 739-3141

71 72
2.704 2.719

26. "Materials Purification and Crystal Growth" $149,000 02-01
D. Hinks, S. Susman
alkali halides, LiCl KCl, kilogram quantities of KCl with total impurity content of 10 micrograms/gm, KCN single crystals, preparation of Li Rb and Cs halides

27. "Neutron Scattering Studies" $523,000 02-02
G. Felcher, R. Kleb, D. Price, J. M. Rowe
slow neutron inelastic scattering, VH_x, liquid S, liquid argon, Cu-Ni, liquid Ne, H diffusion in metals, lattice dynamics of small gap semiconductors CdTe, KCN, light scattering, neutron diffraction to study magnetic density distribution in weakly ferromagnetic materials $ZrZn_2$

28. "Defects in Nonmetallic Crystals" $236,000 02-02
C. Delbecq, D. Schoemaker, S. Susman, P. Yuster
alkali halides, effect of gamma irradiation on KCl doped with KF, KBr, LiF, ESR and optical absorption, structure of hole and interstitial atom centers in doped and pure alkali halides, vacuum ultraviolet spectrophotometry

29. "Very Low Temperature Studies" $108,000 02-02
Y. Eckstein, J. Ketterson, M. Kuchnir
^3He-^4He dilution refrigerator, heat capacity of cerium magnesium nitrate, pressure dependence of sound velocity in liquid ^4He, ion mobilities in ^3He ^4He and ^3He-^4He mixtures

30. "Superconductivity and Low-Temperature Calorimetry" $211,000 02-02
H. Culbert, R. Huebener, G. Montet
specific heat of Pb-In and Pb-Tl, strong coupling effects, impurity effects, magnetic phenomena in Dy_2O_3 and Er_2O_3, transport properties and magnetic structure in superconductors, dynamic behavior of intermediate state structure in Pb and Nb in the presence of electrical fields, temperature gradient and oscillatory magnetic field

ARGONNE NATIONAL LABORATORY
Solid State Sciences Division -02- (Continued)

31. "Phase Transitions and Critical Phenomena" $236,000 02-02
L. Guttman, H. Kierstead, D. O'Reilly
thermodynamic properties of He at low temperatures, PVT measurements on ^3He-^4He mixtures, x-ray scattering from Fe_3Al, magnetic resonance in DS HBr HI solid ammonia, liquid crystals

32. "Electronic and Magnetic Properties" $363,000 02-02
B. Dunlap, G. M. Kalvius,
J. Ketterson, L. Windmiller
Mössbauer effect studies on actinides and rare earth compounds, electronic structure of transition metals Pt Pd Rh and Au, Fermi surface studies, dHvA effect in U

33. "Electron Spin Resonance and Kinetic Studies" $293,000 02-02
J. McMillan, S. Marshall, B. Smaller
detection and study of transient free radicals by ESR, DNA RNA nucleic acids, silver ion in single crystal SrF_2, defects in CaO ThO_2

34. "Solid State Theory" $403,000 02-02
T. Arai, D. Connor, S. Eckstein,
T. Gilbert, F. Mueller, A. Rahman,
J. Robinson, D. Smith, M. Tosi
electron correlations in narrow bands, temperature dependence of magnetic ordering in rare earth metals, electron correlation at metallic densities, theory of quantum liquids and solids, theoretical studies of interatomic forces, optical and electronic properties of insulators, atomic motions in liquids, molecular dynamics, neutron scattering measurements, lattice dynamics in anharmonic systems, electron-phonon interaction effects

35. "Energetic Particle Interaction" $205,000 02-03
J. Jackson, G. Montet, W. Primak
adiabatic calorimetry studies of vacancies in Pt, residual resistivity caused by plastic deformation in Pt, saturation damage studies, irradiation studies of silica and lithium niobate, studies of graphite and $NbSe_2$

ATOMICS INTERNATIONAL
(Division of North American Aviation, Inc.)
Box 309
Canoga Park, California 91304
Phone: Area Code 213 341-1000

Physics Technology -02-
R. G. Breckenridge - Phone: 341-1000 x1316

36. "Electronic Structure of Metals and Alloys"	$80,000	02-02
program not funded beyond FY 1970		
37. "Radiation Damage in Crystalline Solids"	$120,000	02-03
program not funded beyond FY 1970		

BATTELLE MEMORIAL INSTITUTE
505 King Avenue
Columbus, Ohio 43201
Phone: Area Code 614 299-3151

38. "Electronic and Structural Properties of Metals and Semiconductors in the Liquid State"	$30,000	01-02
program not funded beyond FY 1970		

BROOKHAVEN NATIONAL LABORATORY
Upton, Long Island, New York 11973
Phone: Area Code 516 924-6262

Materials Science Department -01-
D. H. Gurinsky - Phone: 924-6349

39. "Superconductivity" $350,000 01-02
M. Strongin, H. Farrell, O. Kammerer, J. Dickey, J. E. Crow, R. Thompson, A. Saxena, D. Schweitzer, M. Garber
cryogenically deposited thin and ultrathin films (Al, Sn, In, Zn, Pb, Nb, Mo, W), divergent fluctuations in superconducting films, surface and nucleation studies, LEED, Auger electron spectroscopy, hysteretic phenomena, multifilamentary wires for superconductivity, irradiation damage effects in superconductors

40. "Relationship Between Properties and Structures" $125,000 01-02
J. Galligan, M. Suenaga, P. Soo
mechanical properties of high purity W, stress relaxation studies in normal and superconducting states (Pb), magnetic flux lattices and defects, critical temperature-critical current studies in superconductors, grain boundary sliding in Cu bicrystals

Department of Physics -02-
G. J. Dienes - Phone: 924-6633

"Neutron Scattering Studies" $1,304,000 02-02

41. "Lattice Dynamics and Phase Transitions"
J. D. Axe, G. Shirane, J. Harada, J. Skalyo, Jr., B. C. Frazer, V. J. Minkiewicz
displacive phase transitions ($BaTiO_3$, $PbTiO_3$), determination of atomic displacements associated with phonon normal modes, anomalous acoustic dispersion in $KTaO_3$

42. "Two-Dimensional Antiferromagnets"
J. Skalyo, Jr., G. Shirane
magnetic scattering from the two-dimensional antiferromagnet K_2NiF_4, long-range two-dimensional magnetic correlations in $Mn(HCOO)_2 \cdot 2H_2O$

BROOKHAVEN NATIONAL LABORATORY
Department of Physics -02- (Continued)

43. "Spin Waves and Critical Scattering"
E. J. Samuelson, M. T. Hutchings, G. Shirane, A. C. Nunes
spin wave dispersion measurements on Cr_2O_3 Fe_2O_3 NiO, critical magnetic scattering in MnF_2

44. "Magnetic Structure and Spin Density"
D. E. Cox, E. J. Samuelson
magnetic order in $BaNiF_4$, magnetic scattering from solid oxygen, magnetic structure of Ca_2MnO_4

45. "Crystal Fields in Metals - Slow Chopper Experiments"
L. Passell, K. C. T. Turberfield
inelastic neutron scattering used to observe crystal field transitions in rare earth metallic alloys - PrBi PrTe, influence of conduction electrons on crystal fields

46. "Materials Preparation and Crystal Growth"
D. E. Cox
large crystals of $KTaO_3$ $KNbO_3$ for inelastic neutron scattering, mixed transition metal halides $CsNiCl_3$ $RbNiCl_3$ for studies in possible one-dimensional magnetic behavior, Fe-Ni-Si polarizing monochromator crystals

47. "Cold Neutron Moderator Project"
L. Passell, A. Kevey, B. C. Frazer, G. Shirane
designed to produce 3 cold neutron beams from a one-liter hydrogen target located at H-9 beam of HFBR, will be completed in FY 1972

48. "Theory" $160,000
M. Blume, M. F. Thorpe, R. Silberglitt, R. E. Watson
quantum mechanical calculations of magnetic properties and interactions, spin waves, phonon and magnon distributions, phase transitions, conduction and valence electron effects in alloys

BROOKHAVEN NATIONAL LABORATORY
Department of Physics -02- (Continued)

49. "Superconductivity" $130,00
M. Strongin, J. E. Crow
superconductivity in thin films, theoretical investigations of surfaces

"Energetic Particle Interactions" $905,000 02-03

50. "Organic Crystals"
W. Whitten, A. C. Damask, H. Ringel
Hall effect for holes and electrons in naphthalene, trapping of triplet excitons in high-purity anthracene by dislocations, annealing of defects produced in anthracene by gamma radiation, liquid crystals, pyrene, phenanthrene

51. "Ionic Crystals"
P. W. Levy, P. L. Mattern,
P. J. Herley
optical measurements in irradiated KCl, thermoluminescence by KCl doped with Tl, coloring in irradiated SiO_2-B_2O_3-Al_2O_3 glasses, radiation effects in solid ammonium perchlorate

52. "Metals and Alloys"
A. N. Goland, C. L. Snead,
A. C. Damask, D. E. Cox
positron-annihilation in electron damaged or plastically deformed samples of Fe Ni and Pt, internal friction of electron irradiated metals (Pt, Ni), electron irradiation damage in Th, visible and ultraviolet radiation emitted by electron bombarded thin metal films of Au Cu Ag C and K-C, defect production and annealing studies on beta brass, electron irradiation effects on superconducting Nb-Al-Ge

53. "Neutron-Diffraction Study of
Liquid Mg_3Bi_2"
D. T. Keating, D. M. North
alkaline earth semimetal alloys, diffraction from the liquid state

BROOKHAVEN NATIONAL LABORATORY
Department of Physics -02- (Continued)

54. "Theory"
G. J. Dienes, P. W. Levy, P. L. Mattern,
P. J. Kemmey, A. N. Goland, D. T. Keating,
D. M. North
defect calculations for ionic crystals, low temperature volume expansion in LiH:LiT, molecular ion calculations, lattice parameter and volume changes in crystals containing dislocation loops, scattering studies

IDAHO NUCLEAR CORPORATION
P. O. Box 1845
Idaho Falls, Idaho 83401
Phone: Area Code 208 526-2491

-02-

55. "High Pressure Neutron Diffraction" $130,000 02-02
not to be funded beyond FY 1970; program transferred to ANL

ILLINOIS, UNIVERSITY OF
Urbana, Illinois 61803
R. J. Maurer - Phone: Area Code 217 333-1370

Metallurgy Department -01-
C. A. Wert - Phone: 333-1440

56. "Mechanisms of Solid State Transformations" $41,000 01-02
C. J. Altstetter
BCC refractory metals, chemical potential of oxygen in Nb using solid state electrolytic cells, solid solution limits in the V-N system, martensitic transformation in V-N alloys, Nb-N system, electron microprobe technique

ILLINOIS, UNIVERSITY OF
Metallurgy Department -01- (Continued)

57. "Electronic Structure of Transition Metal Alloys" $67,000 01-02
P. A. Beck
low temperature specific heat, magnetization, Mossbauer technique, magnetic moments associated with 3d metal atoms in alloys, magnetic clusters in Cu-Co Mo-Fe and Au-Fe, Mossbauer spectroscopy of Fe in Au Mo Rh and Al alloys

58. "Point Defect-Dislocation Interactions" $108,000 01-02
H. K. Birnbaum
mechanical properties of BCC metals, low temperature microcreep, internal friction, Nb-H, Nb-N, Fe-H, diffusion and precipitation of H in Fe and Nb, behavior of point defects and solutes close to dislocations, nucleation and growth kinetics of dislocation loops and voids

59. "Phase Transformations in Crystalline Solids" $35,000 01-02
D. S. Lieberman
magnetic susceptibility measurements and X-ray structure studies in NbRu, reversible behavior and memory effects in AuCd

60. "Dislocations and Surface Barriers"
M. Metzger
low strain behavior of copper-tungsten fiber composites, microstrain measurements in coated and uncoated Cu crystals, X-ray study of nonbasal slip beneath coatings on Zn crystals

61. "Decomposition of Unstable Solid Solutions" $23,000 01-02
J. Morral
theoretical studies of precipitation and ordering in multicomponent solid solutions, spinodal decomposition, denuded zones near grain boundaries, zone formation

62. "Annealing of Cold-Worked Metals" $32,000 01-02
B. G. Ricketts
annealing textures, Al base alloys, effectiveness of solutes versus dispersed second phase in regulating the relative rates of recovery and recrystallization, TD-Ni

ILLINOIS, UNIVERSITY OF
Metallurgy Department -01- (Continued)

63. "Nuclear Magnetic Resonance Studies" $56,000 01-02
T. J. Rowland
energy of vacancy migration in Al by pulsed magnetic resonance method, charge density distribution in the immediate vicinity of solute atoms in Cu, electric field gradients at near neighbor sites in V alloys, diffusion of oxygen in transition metal refractory oxides

64. "Solid State Phase Transformations and Thin Films" $75,000 01-02
C. M. Wayman
nucleation and growth of FCC metals on hexagonal substrates in ultra-high vacuum, nucleation and growth of BCC metals on NaCl, relationship between the bainitic and martensitic transformation in Cu-Zn alloys, thermoelectric power of thin film combinations, nucleation of phase transformations in thin films

65. "The Study of the Nature of Solid Solutions of Metals" $63,000 01-02
C. A. Wert
interstitials C N H in V and Nb, diffusion rates, precipitation of metal-interstitial compounds and ordering of interstitials, internal friction, electron microscopy, Mossbauer study of martensite decomposition in Fe-C Fe-Cr-C and Fe-Ni-C steels

Physics Department -02-
R. J. Maurer - Phone: 333-1370

66. "Use of Very High Pressure to Investigate the Structure of Matter" $123,000 02-02
H. G. Drickamer
Mossbauer resonance studies of Fe compounds to 200 Kb, optical absorption and photochemical studies of both electronic and molecular excitations over the wavelength range 0.2 to 6.0 microns to 150 Kb, investigation of irreversible processes in aromatic compounds and complexes to 350 Kb

ILLINOIS, UNIVERSITY OF
Physics Department -02- (Continued)

67. "Anharmonic Effect in Solids" $67,000 02-02
A. V. Granato
equation of state of solids, interatomic potentials, determination of anharmonic effects, defect properties of crystals, measurement of second and third order elastic constants by determination of sound velocities under hydrostatic and uniaxial stress, Mg CdS NaCl Al MnF_2 $RbMnF_3$

68. "Defect and Electronic Properties of Solids" $149,000 02-02
D. Lazarus
theoretical analysis of the nature of the diffusional jump process, experimental studies of the effects of hydrostatic pressure on defect formation and motion in metals and ionic solids, effects of pressure on electronic and thermal transport properties of metals and alloys at low temperature, Fermi surface of K, ferromagnetic state in Pd, thermal conductivity in solid He

69. "Properties of Noble Gas Crystals" $109,000 02-02
R. O. Simmons
theories of lattice dynamics and the nature of atomic interactions as revealed by experiments on noble gas crystals, x-ray, ultrasonic and laser light-scattering methods, second order elastic constants of Kr, thermal vacancy concentrations in solid Ne, thermal excitation of structural defects in BCC ^3He

70. "Nuclear Magnetic Resonance in Solids" $140,000 02-02
C. P. Slichter
Knight shift and quadrupole coupling of atoms near magnetic impurities in metals, use of alternating electric fields to induce spin transitions of atoms not at centers of inversion symmetry, phase transitions in Gd and NH_4Cl, nuclear double resonance of Na atoms near Ag impurities in NaCl

71. "Physics of Refractory Materials" $109,000 02-02
W. S. Williams
thermal conductivity of transition metal carbides at low temperatures (NbC), chemical diffusion and electromigration in TiC, order-disorder transition in V-C system, dislocation velocities in carbides

ILLINOIS, UNIVERSITY OF
Physics Department -02- (Continued)

72. "Solid State Physics; Energetic Particle Interaction and Summary" $174,000 02-03
J. S. Koehler
anomalous x-ray transmission, electron microscopy and channeling, geometric structure of interstitials in electron irradiated crystals, Cu, Ge, Au, Ag

LAWRENCE RADIATION LABORATORY
University of California
Berkeley, California 94720
Phone: Area Code 415 843-2740

Inorganic Materials Research Division
L. Brewer - Phone: 642-5176
V. Zackay - Phone: 642-3812

73. "Kinetics of Dislocation Dynamics" $110,000 01-01
J. E. Dorn
theory and experiments related to dislocation mechanics, strain rates from 10^{-7}/sec to 10^{5}/sec, high temperature creep, solute atom interactions with dislocations, low temperature behavior of BCC metals (Mo), mechanical behavior of Cu_3Au

74. "Fundamental Aspects of Strength and Toughness" $120,000 01-01
E. R. Parker
electron fractography, scanning electron microscopy, analysis of crack growth in pearlitic steel as a function of crack path, effects of second phase particles on strength and toughness, analysis of dislocation configurations around arrested cracks in Si, impact velocity conditions on Ti-Al

75. "Relation Between Microstructure and Properties of Alloys: Electron Microscopy and Diffraction" $160,000 01-01
G. Thomas
650 kV high voltage electron microscope, electron microscopy, field ion microscopy, alloy steels, spinodal and ordering transformations, ordering and embrittlement in refractory alloys, semiconductors, biological materials

76. "Ceramic Microstructure, Glass and Ceramic-Metal Systems" $125,000 01-01
J. A. Pask
diffusion experiments to determine diffusivities and mechanism of mullite formation, kinetics of liquid phase sintering and grain growth in ceramics, stress-strain and creep in two-phase systems, creep in LiF, dissolution of oxides in $Na_2Si_2O_5$ glasses, glass-metal bonding mechanisms

LAWRENCE RADIATION LABORATORY
Inorganic Materials Research Division (Continued)

77. "Crystal Imperfections" $130,000 01-01
J. Washburn
etch pit studies of plastic deformation (Cu), field ion microscopy of radiation damage with 10 MeV protons on Ir, dislocation climb, collapse of tetrahedra and climb of triangular Frank loops

78. "Relation of Microstructure to Properties of Ceramics" $130,000 01-01
R. M. Fulrath
sintering of Pb zirconate titanate, monatomic gas solution in glass, fracture in composites, scanning electron microscopy

79. "Composite Materials and Their Electrical and Magnetic Properties" $25,000 01-01
R. H. Bragg
x-ray characterization of glassy carbon, low temperature transport properties, conductivity and Hall effect, small angle scattering

80. "High Strength Materials" $150,000 01-01
V. F. Zackay
strengthening role of chemistry, processing, stacking fault energy, austenite stability and the resulting morphology of strain induced martensite in TRIP steels, effect of C N H on the promotion of embrittlement, fatigue properties

81. "Superconductivity Effects-High Field Superconductivity" $142,000 01-02
L. Brewer, E. R. Parker,
V. F. Zackay, R. Hammond
electron beam evaporator system, Pb Sn Al Nb V Ta Mo, co-deposition with Xe, epitaxial thin films of A-15 compounds, amorphous transition metals and alloys

82. "High Temperature Reactions" $120,000 01-02
A. W. Searcy
effusion measurements, vaporization of Cd, mass spectrometry study of gaseous species in the Re-Re_2O_7 system, kinetics of vaporization of stannic oxide, study of SeS

LAWRENCE RADIATION LABORATORY
Inorganic Materials Research Division (Continued)

83. "Thermodynamics of Metal Systems" $120,000 01-02
R. Hultgren
low temperature heat capacities of ordered and disordered AuCu, critical evaluation of thermodynamic data for metallic systems

84. "Electrical Properties of Metallic Conductors and Superconductors" $20,000 02-02
M. Merriam
superconductivity for power transmission, critical current for composite Nb_3Sn in Pb matrix, non-precious metal electrodes for multilayer barium titanate capacitors, use of Ag in capacitor applications

85. "Theoretical Solid State Physics" $20,000 02-02
M. L. Cohen
empirical pseudopotential method for calculating band structures, Fermi surface calculations in In Sb, calculation of superconducting transition temperatures, In Mg, dilution refrigerator for low temperature measurements

86. "Magnetic Properties of Solids" $25,000 02-02
A. M. Portis
magnetic properties of Ni-Rh, nuclear relaxation in Co, nuclear relaxation in ferromagnetic alloys

87. "Far Infrared Properties of Solids" $100,000 02-02
P. Richards
tunable far infrared radiation generated from the difference frequency between two temperature tuned ruby lasers, absorptivity of Pb, Josephson effect radiation detectors, superfluid liquid He

88. "Experimental Solid-State Physics and Quantum Electronics" $125,000 02-02
Y. R. Shen
nonlinear optical effects, self focusing and self trapping of laser light in liquid, Raman scattering to investigate molecular vibrations and optical phonon modes, phase transitions in nematic liquid crystals

LAWRENCE RADIATION LABORATORY
Inorganic Materials Research Division (Continued)

89. "Research in Superconductivity" $90,000 02-02
G. Rochlin
tunneling experiments in superconducting systems, junctions fabricated with gapless superconductors (La-Ce), normal metal tunneling on Cr-Cr_2O_3-Cu-Cr alloys, rf coupling to supercurrents and quasi-particle currents

90. "Research on Superconducting Junctions and Devices" $85,000 02-02
J. Clarke
theory of current-voltage characteristics of weak-links, superconducting transformer, Josephson junctions, effect of magnetic impurities such as Fe Cr Mn in Cu on Pb-Cu-Pb junctions, resistance of superconductor-normal metal-superconductor sandwiches at ultralow temperatures

MOUND LABORATORY
Monsanto Research Corporation
Miamisburg, Ohio 45342
L. J. Wittenberg - Phone: Area Code 513 866-7444 x7286

91. "Liquid Actinide Metals Research" $100,000 01-01
L. J. Wittenberg, R. DeWitt
viscosity of liquid Pu and Np, thermal conductivity by thermal diffusivity technique for Pu phases, solid-liquid transformation in the actinides, density and electrical resistivity of liquid actinides

OAK RIDGE NATIONAL LABORATORY
P. O. Box X
Oak Ridge, Tennessee 37830
Phone: Area Code 615 483-8611

Metals and Ceramics Division -01-
J. H. Frye - Phone: 483-1554
C. J. McHargue - Phone: 483-1278

92. "Fundamental Ceramics Research" $102,000 01-01
W. Fulkerson
coordinated program on UN among several research groups, electronic band structure, low temperature specific heat, resistivity, self diffusion of U in UN, neutron diffraction, compressive creep

93. "Physical Property Research" $164,000 01-01
D. L. McElroy, T. G. Kollie,
J. P. Moore, S. C. Weaver,
R. K. Williams
thermal conductivity, electrical resistivity, thermopower, specific heat, temperature range from 4.2 to 2600K, Cr Ta Ni_3Fe UO_2 ThO_2 LiF Mo W Nb V UN ThN Ni Ni_3Mn

94. "Metallurgy of Superconducting Materials" $164,000 01-01
C. C. Koch, D. M. Kroeger
effect of structure, composition and metallurgical history on superconductivity, Nb and Tc base alloys, current carrying capacity as a function of temperature and applied field, Nb-Hf, Tc-Mo

95. "Physical Ceramic Studies" $82,000 01-01
C. S. Morgan, C. S. Yust
deformation of stoichiometric and hyperstoichiometric UO_2 single crystals, electron microscopy, topology, sintering of MgO, creep of UN, pyrolytic graphite, void topology in sintered ZnO

96. "Deformation of Crystalline Solids" $143,000 01-01
R. O. Williams, R. W. Carpenter,
M. H. Yoo
deformation and twinning, dislocation interactions, structures produced on alloying and precipitation, theoretical analysis of stress and dilatation fields around dislocations, Nb-Hf, Ta-Hf, Re, transmission electron microscopy, electron diffraction theory for dislocation contrast analysis, heats of mixing of binary liquid metals

OAK RIDGE NATIONAL LABORATORY
Metals and Ceramics Division -01- (Continued)

97. "Deformation, Annealing, and Interfaces in Metallurgical Phenomena" $143,000 01-01
R. A. Vandermeer, J. C. Ogle, P. V. Guthrie, W. A. Coghlan, B. T. M. Loh, J. O. Stiegler, A. Wolfenden
recrystallization, deformation texture, effect of V on cold rolling texture in Nb, Cu_3Au, velocity of dislocations, dynamical studies using HVEM, theoretical analysis of chemical vapor deposition, calculation of location and intensity of Auger spectra, crack nucleation and growth in the fracture process

98. "Surface Phenomena" $124,000 01-01
J. V. Cathcart, J. E. Epperson, R. E. Pawel, R. E. Clausing
oxidation of U and refractory metals, stresses arising from oxidation, Ta, Auger spectroscopy, electron beam induced desorption, studies of ultrathin layers, diffusion using anodic-film technique

99. "Fundamental Research in X-Ray Diffraction" $126,000 01-02
B. S. Borie, R. W. Hendricks, C. J. Sparks, H. L. Yakel
imperfections and vibrational properties of graphite, effect of strain in gamma-quenched U alloys, investigation of the structure of liquids by small angle x-ray scattering

100. "Theoretical Research" $168,000 01-02
J. S. Faulkner
calculations of electronic band structure, Al, Ca, Sr, KKR LCAO and CPA techniques, energy bands of SiC

101. "Diffusion in Solids" $168,000 01-02
T. S. Lundy
tracer diffusion in refractory metals Nb Ta W, diffusion of ^{233}U in UN by alpha degradation method, pipe diffusion in UO_2 crystals, cation self diffusion in oxides of Ti and U, effect of pressure and thermal gradients on diffusion

OAK RIDGE NATIONAL LABORATORY
Metals and Ceramics Division -01- (Continued)

102. "Spectroscopy of Ionic Media" $189,000 01-02
G. P. Smith
use of optical spectroscopy to study the behavior of solute ions in solid and liquid ionic materials at high temperatures, distribution of oxidation states and coordination geometries, interactions between solute ions and dislocations, molten-salts

103. "Radiation Damage" $100,000 01-03
J. O. Stiegler, K. Farrell, B.T.M. Loh,
H. L. Yakel, R. W. Hendricks, C. J. Sparks
high temperature radiation effects, void formation in neutron irradiated Al, Fe, Al alloys, effect of preinjected gases on void formation, in situ electron damage in Al, irradiated graphite, small angle x-ray scattering from neutron irradiated Al single crystals

Solid State Physics Division -02-
D. S. Billington - Phone: 483-6713

104. "Research and Development on Pure Materials" $700,000 02-01
J. W. Cleland, C. T. Butler,
G. W. Clark, T. F. Connolly,
H. S. Pomerance, R. E. Reed,
C. C. Robinson, B. J. Sturn,
R. D. Westbrook
research on purification, crystal growth and characterization of research-quality specimens, materials information center, Ge for detector purposes, V, Dy, MgO, tRNA crystals, Iodine crystals, Nb, Nb-Mo, MnGa ferrite for neutron polarization, UO_2-ThO_2, UO_2-W, graphite, $CaWO_4$, Mo

105. "X-Ray Diffraction" $75,000 02-02
B. C. Larson, F. A. Sherrill
studies of imperfections in nearly perfect crystals by x-ray transmission topography and measurements of diffracted intensities, Cu, Al, Li precipitation in Ge, generation and motion of dislocations, grown-in, radiation induced and strain induced defects

OAK RIDGE NATIONAL LABORATORY
Solid State Physics Division -02- (Continued)

106. "Superconductivity and Low Temperature Physics" $176,000 02-02
S. T. Sekula, G. S. Dixon, Jr., R. H. Kernohan
critical current and low frequency response of neutron irradiated Nb, low temperature thermal conductivity, KCl $MnCl_2 \cdot 4H_2O$, Cu KF

107. "Neutron Spectrometry" $370,000 02-02
M. K. Wilkinson, H. G. Smith, H. A. Mook, R. M. Nicklow, N. Wakabayashi, A. A. Z. Ahmad, J. C. G. Houmann
inelastic neutron scattering from magnetic and non-magnetic materials, critical scattering near chemical and magnetic phase transitions, polarized neutron scattering, small angle scattering with long wave length neutrons, lattice dynamics of heavy rare earths (Tb,Ho), phonon dispersion in In, lattice dynamics of graphite, superfluid state in ^4He, TiO_2, MnF_2, NH_4Cl, Y-Tb

108. "Spin Resonance" $110,000 02-02
M. M. Abraham, J. L. Kolopus
ESR used to study strength and nature of the local crystal field of a paramagnetic defect, irradiated MgO MgF_2 $KMgF_3$ ThO_2, Am and Cm in $SrCl_2$, $ZrSiO_4$

109. "Neutron Diffraction" $340,000 02-02
W. C. Koehler, E. O. Wollan, J. W. Cable, H. R. Child, R. M. Moon, Q. H. Khan
magnetic properties, polarized neutron spectrometry, form factor determinations, magnetic moment distribution, nuclear polarization, spin wave scattering, critical scattering, paramagnetic scattering, intra rare earth alloys (Ho-Dy, Er-Tb, Er-Dy, Er-Ho), Co alloys, Ni-Mn, ^{160}Gd, V_2O_3, Ce-Y, Ce-La, Ni_3Fe, Ho

110. "Defect Structures in Nonmetals" $320,000 02-02
E. Sonder, Y. Chen, B. Henderson, J. C. Pigg, O. E. Schow, L. C. Templeton, O. E. Facey
defects in MgO produced by doping and irradiation, optical absorption, alkali halides (RbI, RbBr, RbCl, KBr, KCl, KF, NaCl), MgF_2, low temperature electron induced damage in MgO and CaO, ESR in BeO and BaS, mixed crystals $KMgF_3$:$KMnF_3$

OAK RIDGE NATIONAL LABORATORY
Solid State Physics Division -02- (Continued)

111. "Irradiation Effects in Thin Films and Foils" $135,000 02-03
T. S. Noggle, S. M. Ohr, J. C. Crump, B. Nøst, H. F. Wenzl
electron microscopy studies of defects, neutron irradiated Cu, in situ electron irradiated graphite, Pt, heavy ion irradiated Au

112. "Theory and Computations" $448,000 02-03
D. K. Holmes, R. F. Wood, M. T. Robinson, G. Leibfried, W. E. Atkinson, J. H. Barrett, J. F. Cooke, H. L. Davis, B. N. Ganguly, M. E. Mostoller, O. S. Oen, W. Biem, P. H. Dederichs
radiation damage in metals, atomic and ionic interaction potentials at high energies, channeling of energetic particles, electronic structure of solids, lattice dynamics, magnetism, magnetoelastic effects in Ho, chemically bound neutron, Fermi surface of Cu, band structure calculations for actinide compounds, annealing of radiation damage

113. "Surface Study on Metals" $240,000 02-03
F. W. Young, Jr., L. H. Jenkins, U. Bertocci, M. F. Chung, K. J. Bachmann
LEED studies of clean, well-oriented Cu surfaces, characterization of defects formed by electrolytic deposition of Cu single crystals, Auger spectroscopy, kinetics of electrodeposition process

114. "Fundamental Studies of Elasticity and Anelasticity of Metals" $130,000 02-03
V. K. Pare, H. D. Guberman
dislocation anelasticity and diffusion of radiation defects in Cu, third order elastic constants, pinning point strengths

115. "Ion Bombardment" $85,000 02-03
B. R. Appleton
heavy ion bombarded ZnO, channeling and blocking studies, ion plantation, energy loss studies

116. "Radiation Effects at Low Temperatures" $350,000 02-03
R. R. Coltman, C. E. Klabunde, J. K. Redman, A. L. Southern
thermal neutron radiation effects down to 3.6°K, Cd Au Mo Re Co Pd, electrical resistance, recovery of defects

PACIFIC NORTHWEST LABORATORY
P. O. Box 999
Richland, Washington 99352
Phone: Area Code 509 942-1111

117. "Transuranium Physical Metallurgy Research" 27279 $212,000 01-01
R. D. Nelson, S. D. Dahlgren, M. D. Merz, R. P. Allen
phase transformations, crystallographic relationships, kinetics of phase transformations, plasticity of alpha-Pu and beta-Pu, recrystallization of alpha-Pu, superplasticity in alpha-Pu and beta-Pu, anisotropic properties, creep of Pu phases, properties of sputtered Pu and sputtered stainless steel

118. "Transuranium Ceramics Research" x3843 $50,000 01-02
T. D. Chikalla, R. Turcotte
oxygen decomposition measurements to evaluate stability of BkO_{2-x} and CmO_{2-x}, thermodynamic behavior of nonstoichiometric transuranium oxides, self radiation damage in oxides, high temperature x-ray diffraction

119. "Radiation Effects on Metals" 3124 $233,000 01-03
G. L. Kulcinski, J. L. Brimhall, H. E. Kissinger
neutron and heavy ion damage at high temperatures in metals, Mo, Re, Ni, Nb, influence of temperature, fluence and flux on void formation, transmission electron microscopy, x-ray diffraction, resistivity, high pressure effects, mechanical deformation of irradiated Re

PUERTO RICO NUCLEAR CENTER
Caparra Heights Station
San Juan, Puerto Rico 00935
Phone: Area Code 809 767-0350

120. "Neutron Diffraction" $185,000 02-02
M. I. Kay, R. Kleinberg
magnetic structures of inorganic salts, role of hydrogen in various compounds, NaH_3SeO_3, magnetic structure of $Fe_3(PO_4)_2 \cdot 8H_2O$, $NaNO_2$

PUERTO RICO NUCLEAR CENTER (Continued)

121. "Study of Radiation Damage in Organic Crystals Using Electrical Conductivity and Optical Properties" $54,000 02-03
A. Cobas
effects of radiation on electrical conductivity and optical properties of anthracene and phenanthrene crystals, annealing of gamma irradiated crystals

SECTION B

Universities

The information was taken from current 200-word summaries provided by the contractor. There is considerable (about 10%) turnover in the University program and some of the projects will not be continued beyond the current contract period.

ARIZONA, UNIVERSITY OF

200. "Impurity Diffusion in Solids" $89,706 02-02
C. T. Tomizuka - Department of Physics
diffusion in solids at high pressure up to 10 Kbar, self diffusion in Na by NMR, Kirkendall effect in Ag-Au, self diffusion in Cu and Zn at high pressure, AgCl, Bi

BOSTON UNIVERSITY

201. "Coincidence - Mössbauer Studies of Solid State Phenomena" $31,000 02-02
G. R. Hoy - Department of Physics
coincidence Mössbauer techniques used to study ionic spin fluctuations and charge redistribution, delayed-coincidence-Mössbauer techniques as a tool for improving spectral resolution

BRANDEIS UNIVERSITY

202. "Experimental Studies of Critical Point Behavior in Magnetically Ordered Solids Using Nuclear Gamma-Ray Spectroscopy, and Related Experiments" $31,429 02-02
C. Hohenemser - Department of Physics
time dependent perturbed angular correlation studies in magnetically ordered systems, impurity atom magnetic couplings in the ordered state

203. "Low Temperature Properties of Liquid and Solid Helium" $27,755 02-02
H. D. Cohen - Department of Physics
magnetic susceptibility measurements on pure solid ^{3}He, effect of small amounts of ^{4}He, specific heat measurements at critical point of solid ^{3}He - ^{4}He mixtures, light scattering on liquid ^{3}He

BRIGHAM YOUNG UNIVERSITY

204. "Thermodynamic Investigation of Alkali Metal Mixtures" $30,981 01-02
J. B. Ott and J. R. Goates - Department of Chemistry
solid-liquid phase diagrams for K-Rb, Rb-Cs, Na-K-Rb, Na-K-Cs, x-ray diffraction at high pressure, free energies of mixing

BROWN UNIVERSITY

205. "A Combined Macroscopic and Microscopic Approach to the Fracture of Metals" $70,500 01-01
J. Gurland - Division of Engineering
fracture initiation at particles and inclusions, influence of particle cracks on mechanical behavior, fracture mode transition as a function of steel microstructure, fracture mechanisms at the tip of a macroscopic crack, application of continuum plasticity to micromechanisms of ductile fracture

CALIFORNIA INSTITUTE OF TECHNOLOGY

206. "Studies of Alloy Structure and Properties" $240,000 01-02
P. Duwez - Department of Materials Science
study of structure and physical properties of nonequilibrium alloys obtained by rapid quenching from the liquid state, x-ray diffraction, electron microscopy and diffraction, resistivity, thermoelectric power, superconductivity, ferromagnetism, kinetics of amorphous to crystalline transformation

207. "Dislocation Mobility and Density in Metallic Crystals" $75,000 01-01
D. S. Wood and T. Vreeland, Jr. - Department of Materials Science
stress and temperature dependence of dislocation motion in BCC, FCC and HCP crystals, effect of C concentration on velocities in Fe, introduction of isolated dislocations near surfaces in Fe, Mo and Nb crystals, dislocation-electron interaction, Zn studies to determine influence of phonon drag and forest hardening

CALIFORNIA, UNIVERSITY OF

208. "Particle Size Distribution Effects in Precipitation Hardening" $46,000 01-01
A. J. Ardell - Department of Engineering, Los Angeles
effect of unimodal precipitates of different standard deviations and bimodal distributions with different average particle sizes, Ni base alloys, Ni-Al, transmission electron microscopy

CALIFORNIA, UNIVERSITY OF (Continued)

209. "Electric and Magnetic Properties of Transition Metals and Their Compounds" $64,352 02-02
A. W. Lawson - Dept. of Physics, Riverside
spin wave resonance in EuS, single domain magnetization and magnetic susceptibility versus stress in EuTe and EuSe, antiferromagnetic resonance in EuTe and compounds of Tb and Dy, line width and spin wave relaxation in EuS, magnetic anisotropy in EuS, EuTe and EuO vs temperature, magnetic anisotropy of TbN DyN HoN

210. "New Materials by Low Temperature Condensation" $94,000 01-01
Huey-Lin Luo - Department of Applied Electrophysics, San Diego
sputtering used to prepare homogeneous alloys, superconducting materials, Nb-Al-Ge, V_3Al, magnetic materials, Au-V, Al_3V

211. "Research on the Properties of Materials at Very Low Temperatures" $145,233 02-02
J. C. Wheatley - Dept. of Physics, San Diego
properties of liquid and solid ^3He, entropy, susceptibility, diffusion, bulk nuclear polarization, transport properties, spin diffusion and viscosity, osmotic pressure, studies of weakly magnetic properties of materials, static nuclear magnetism

CARNEGIE-MELLON UNIVERSITY

212. "Optical and Microwave Spectroscopy of Np and Co in Scheelites and Other Crystalline Environments" $27,403 02-02
J. O. Artman - Department of Electrical Engineering
optical and microwave spectra of ^{237}Np as a dopant in various single crystals, CaF_2, optical Zeeman effect studies, free-ion and crystal field parameter calculations, $LiYF_4$

213. "Application of the Mössbauer Effect to the Study of Metallic Solid Solutions" $34,000 01-02
P. A. Flinn - Department of Metallurgy and Materials Science
^{57}Fe resonance, diffusional broadening due to self-diffusion of Fe, anomalous diffusion of Fe in Ti, bainite formation in Fe-C and Fe-C-Ni alloys

CASE WESTERN RESERVE UNIVERSITY

214. "Motion of Ions in Solid Helium" $27,812 02-02
A. J. Dahm - Department of Physics
mobility of positive and negative charge carriers in solid He, lifetimes of ortho-positronium

215. "Dislocation-Solute Atom Interactions in Alloys" $38,000 01-01
R. Gibala - Department of Metallurgy
strain-aging and interstitial-defect interaction in austenitic steels by anelastic techniques, dislocation-solute atom interaction in Nb and Nb alloys by dislocation damping measurements, interstitial hardening and softening in Nb

216. "Kinetics of Phase Transformations in Zirconium, Hafnium and Titanium Alloys" $10,755 01-01
R. F. Hehemann - Dept. of Metallurgy
omega transformations in Ti, Zr and Hf alloys, transformations in the Ti-Ni system, x-ray diffraction and electron microscopy techniques

217. "Solid State Physics" $79,000 02-02
R. W. Hoffman - Department of Physics
magnetization of thin continuous Ni films, Mössbauer spectra of Fe films, residual stress and structure of Pt films, equation of state of solids, third order elastic constants of Al_2O_3, fourth pressure derivative of the dielectric constant of alkali halides, elastic constants of Pb Na, theory of electronic properties of solids

CHICAGO, UNIVERSITY OF

218. "Interaction on Metallic Surfaces" $49,030 02-02
R. Gomer - Department of Chemistry
study of adsorption on single crystal planes of tungsten and other metals by mass spectrometric study of ionic and neutral desorption products, work function measurements on single planes of tungsten, field ion microscopy of adsorption and surface rearrangement by means of Ar imaging

CINCINNATI, UNIVERSITY OF

219. "Radiation Effects on BCC Refractory Metals and Alloys" $37,000 01-03
J. Moteff - Dept. of Materials Science and Metallurgical Engineering
elevated temperature neutron irradiation in Nb Mo W Ta V, transmission electron microscopy, electrical resistivity, hardness

CLARKSON COLLEGE OF TECHNOLOGY

220. "Transport and Magnetic Phenomena in Chromium and Iron Alloys" $25,945 02-02
S. Arajs - Department of Physics
electrical resistivity, thermoelectric power, magnetization, thermal conductivity, Cr alloys with Fe Ru Os Ni Mn Ge Si Al, behavior of magnetization in the critical transition region

221. "The Oxidation of Copper Films" $25,000 02-02
A. W. Czanderna - Department of Physics
single crystal copper films, optical transmittance of oxidized films, mechanism of oxidation

CLEMSON UNIVERSITY

222. "Radiation Effects in Crystalline Materials" $40,986 02-03
R. L. Chaplin - Department of Physics
electron irradiation at liquid He temperature, Al Cu Mg Zn, production and annealing of point defects

COLUMBIA UNIVERSITY

223. "A Study of the Feasibility of Obtaining Field Ion Microscope Images of Interstitial Solutes" $33,954 01-02
E. S. Machlin - Dept. of Metallurgy
factors that govern interaction between solute atoms and between solute atoms and defects, W, Nb, oxygen interstitials

224. "Defects in Crystals" $76,470 01-02
A. S. Nowick - Dept. of Engineering and Applied Science
dielectric and anelastic relaxation techniques to study point defects, piezoelectric relaxation, Cu_2O, $FeGe_2$

CORNELL UNIVERSITY

225. "Defects in Metal Crystals" $180,000 01-03
R. W. Balluffi and D. N. Seidman - Dept. of Materials Science and Eng.
annealing kinetics of vacancy defects in quenched Au, electron microscopy of high and low angle boundaries in Au, in situ field ion microscopy of accelerator irradiated W Pt, FIM study of quenched Pt

CORNELL UNIVERSITY (Continued)

226. "Studies of Low Temperature Phase Transformations in High Field Superconductors and the Phonon Spectrum and Mechanical Properties of Vanadium" $34,962 01-02
B. W. Batterman - Dept. of Materials Science and Engineering
low temperature structural transformation in Nb_3Sn and V_3Si, thermal diffuse scattering of x-rays in the vicinity of the transformation, phonon spectrum of V with thermal diffuse scattering, precipitation of H in V

227. "An Electromigration Study of Void Kinetics in Metals" $41,978 01-03
P. W. Ho - Dept. of Materials Science and Engineering
determination of defect structure and measurement of mass transport in void migration and growth in thin metallic films by electron microscopy, studies of impurity effects by doping with specific gases or metals, Al, Au

228. "Effect of Environment on Fracture Behavior" $30,000 01-01
H. H. Johnson - Dept. of Materials Science and Engineering
role of H in fracture of steel, crack growth in H-O gas mixtures, diffusion of H in stress gradients, electrochemical permeation technique to study H motion and traps, H embrittlement of Fe whiskers

229. "A Study of the Interaction Between Magnetic Fluxoids and Crystal Defects in Type II Superconductors" $30,770 01-02
E. J. Kramer - Dept. of Materials Science and Engineering
stress relaxation in superconducting Pb alloy single crystals, surface pinning of fluxoids in Nb single crystals, dislocation motion in the fluxoid lattice

230. "Theoretical Phonon Physics" $64,000 02-02
J. A. Krumhansl - Dept. of Physics
studies of highly anharmonic condensed matter, quantum crystals, liquids, excitations in disordered systems, dynamics of defects in crystals, transport involving phonons, ferroelectricity in crystals with dipolar impurities, solid Ne, NaF, alkali halides

CORNELL UNIVERSITY (Continued)

231. "Experimental Phonon Physics" $144,000 02-02
J. A. Krumhansl, R. O. Pohl, A. J. Sievers - Department of Physics
lattice vibrations in pure dielectric solids, effect of defects on interatomic forces, second sound in NaF, far infrared and microwave absorption, low temperature heat conduction and specific heat, optical absorption in superconductors

232. "Elastic and Plastic Deformation of Solids" $123,000 01-01
A. L. Ruoff - Dept. of Materials Science and Engineering
elastic constants in Fe-Ni alloys, elastic constants of Be, pressure and temperature dependence of elastic constants of RbF, second and third order elastic constants of V_3Si, creep in Cu and Fe, equation of state

233. "A Study of Imperfections in Crystals" $64,850 02-02
H. S. Sack - Dept. of Applied Physics
dielectric study of paraelectric impurities in alkali halides, KCl, RbCl, zero-field resonance, field and orientation dependence, anelastic measurements on paraelastic impurities, CN^- impurities

234. "Hard Superconducting Materials" $90,000 01-02
J. Silcox and W. W.Webb - Dept. of Applied Physics
critical current densities, magnetic hysteresis, energy losses and instabilities, surface currents, surface magnetization, flux creep in the superconducting sheath, radiation sensitivity, quantum effects, effect of lattice defects and structural variables

235. "Solid State Physics: Magnetic Phenomena" $129,500 02-02
R. H. Silsbee and R. Bowers - Department of Physics
ESR of conduction electrons and measurement of spin flip scattering by impurities, studies of dynamics of molecular reorientation and tunneling of molecular impurities by ESR and paraelectric resonance, magnetoresistance in alkali metals, electron-electron interaction on resistivity and thermal conductivity in metals, excitation of sound waves in metals by electromagnetic means

DARTMOUTH COLLEGE

236. "Measurement of Electron Energy Band Structure in Conductors by Means of Magnetoplasma Waves and Electron Tunneling" — $26,867 — 02-02
J. R. Merrill - Department of Physics and Astronomy
energy gap anisotropy in superconductors, excess current peaks in Pb and Sn, plasmon waves in semiconductors and metals, molecular transitions in insulators, propagation of helicon-like waves in superconductors

FLORIDA, UNIVERSITY OF

237. "Deformation Processes in Hexagonal Metals" — $46,200 — 01-01
R. E. Reed-Hill - Dept. of Metallurgical and Materials Engineering
anomalous work hardening and dynamic recovery in Ti and Zr, dislocation reactions in hexagonal metals, effect of strain rate on work hardening, transmission electron microscopy

FRANKLIN INSTITUTE

238. "Studies of Crystal Perfection -- Tantalum Silicide and Beryllium" — $48,797 — 01-01
J. D. Meakin and G. J. London - Dept. of Materials Science and Engineering
growth and characterization of large Be single crystals for neutron monochromators

GEORGETOWN UNIVERSITY

239. "The Study of Very Pure Metals at Low Temperatures" — $39,000 — 02-02
W. D. Gregory - Dept. of Physics
effect of boundary scattering on the critical field and critical temperature of superconductors, superconducting tunneling properties of Ga, superconducting transition width in isotopically pure Ga

GEORGIA INSTITUTE OF TECHNOLOGY

240. "A Study of the Structure and Mechanical Properties of Ordered Alloys" $36,000 01-01
B. G. LeFevre and E. A. Starke, Jr. - Dept. of Chemical Engineering
short range and long range order parameters correlated with mechanical properties and deformation modes, Ni_4Mo, dislocation motion, x-ray, field ion microscopy and transmission electron microscopy techniques, yield strength and work hardening coefficients

241. "Magnetic Phenomena at Metal Surfaces" $39,460 01-02
S. Spooner - Dept. of Chemical Engineering
neutron scattering at metal surfaces, Co and Fe films, neutron mirror experiments with polarized neutrons, measurement of characteristic energy of the spin-flip process in $FeCo_3$

HAWAII, UNIVERSITY OF

242. "Photoelectric Emission from Thin Films in the Vacuum Ultraviolet Region" $24,512 02-02
W. Pong - Department of Physics and Astronomy
photoelectric properties of evaporated films of semiconductors, photon energy range of 7-23eV, spectral quantum yield, optical absorption, reflectance, energy distribution of emitted electrons vs thickness, PbS PbTe SnTe CdTe NiO, organic semiconductors

HOWARD UNIVERSITY

243. "Radiation Damage in Optically Transparent Materials (Zircons)" $20,000 02-03
A. N. Thorpe - Dept. of Physics
infrared absorption spectra and thermoluminescence of zircon, effects of neutron and x-ray irradiation, single crystal and powder zircon

ILLINOIS INSTITUTE OF TECHNOLOGY

244. "Effects of Combined Stress on the Fracture and Fatigue of Brittle Ceramic Materials" $35,000 01-01
L. J. Broutman - Dept. of Mechanics
fracture and fatigue strength of graphite, alumina, plexiglas, and silicate glass, static and cyclic fatigue under uniaxial stresses, combined stress tests using pressurized cylindrical specimens

ILLINOIS INSTITUTE OF TECHNOLOGY (Continued)

245. "Thermal Measurements on Solids Below $1^{o}K$" — $49,000 — 02-02
H. Weinstock - Dept. of Physics
low temperature thermal conductivity and specific heat measurements, gamma irradiation effects, KCl, graphite, MgO, magneto-acoustic interactions, heat capacity of ^{235}U enriched $UO_2Rb(NO_3)_3$

LEHIGH UNIVERSITY

246. "Analysis of Flow and Fracture of Composite Materials During Gross Plastic Deformation" — $35,430 — 01-01
B. Avitzur - Dept. of Metallurgy and Materials Science
deformation models for composite materials with spherical inclusions in a matrix and for void formation around the inclusions, extension to fiber and flake type inclusions, theoretical work on pure tension initially, experiments primarily by hydrostatic extrusion

247. "Strength and Structure in Cyclically Transformed Fe-Ni-C Alloys" — $18,021 — 01-01
G. Krauss, Jr. - Dept. of Metallurgy and Materials Science
cyclic martensite-austenite transformation on wire samples of Fe-Ni-C, effect of variation of heating rate on carbide distribution and resultant strength

LOUISIANA STATE UNIVERSITY

248. "Conductivity Tensors in Metals and Semiconductors" — $75,400 — 02-02
J. M. Reynolds - Dept. of Physics and Astronomy
electrical, thermal and thermoelectric tensors obtained from various conductivity measurements at low temperatures and in magnetic fields up to 50 kilogauss, transport measurements in Tl InSb Nb V Mo, Fermi surface measurements in Zn Zr Pb Cd Al, magnetic breakdown, electron-phonon scattering, magnetothermal effects

MARQUETTE UNIVERSITY

249. "Defect Structures in Nonstoichiometric Oxides" $32,693 01-02
R. N. Blumenthal - Department of Mechanical Engineering
defect structure and transport properties of CeO_2, electrical conductivity, Hall mobility, ionic transference, thermogravimetric weight measurements, effect of oxygen partial pressure, composition and temperature, solid state calcium stabilized zirconia electrolyte

MARYLAND, UNIVERSITY OF

250. "Conduction Electrons and Magnetism" $40,388 02-02
J. R. Anderson and S. M. Bhagat - Dept. of Physics and Astronomy
ferromagnetic metals, Fe Ni Ni-Cu Co Gd, ferromagnetic resonance and dHvA effect measurements, crystal growth of whiskers and high purity metals

251. "An Investigation of Irradiation Strengthening of bcc Metals and Solid Solutions" $33,109 01-03
R. J. Arsenault - Dept. of Chemical Engineering
neutron damage in bcc metals and solid solutions, V V-Ti, rate controlling mechanism of low temperature plastic deformation, effects of interstitial concentrations

252. "Atomic Strengthening Due to Atomic Order" $35,000 01-02
M. J. Marcinkowski - Dept. of Mechanical Engineering
compressive stress-strain studies, ordered and disordered FeCo, activation volumes and energies, work hardening theory, transmission electron microscopy

253. "The Galvanomagnetic Properties of Graphite in the Temperature Range 4-300°K and Pressure Range 0-10,000 kg/cm^2" $28,413 01-01
I. L. Spain - Department of Chemical Engineering
Hall coefficient and magnetoresistance of graphite crystals, synthetic and natural crystals, variation of carrier density and mobility with temperature and pressure

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

254. "Mechanical Properties of Metals" $23,420 01-01
W. A. Backofen - Dept. of Metallurgy
shear fracture in polycrystalline Zr and Zircalloy-4, tension testing and plane-strain compression of strip specimens, scanning electron microscopy

255. "Thermal Neutron Scattering Studies of Molecular Dynamics and Critical Phenomena in Liquids and Solids" $98,000 02-02
S. H. Chen and S. Yip - Dept. of Nuclear Engineering
design and construction of a double monochromator 3-axis spectrometer, inelastic neutron scattering using thermal neutrons from the MIT reactor, phonon energy spectra, self-diffusion in liquids, fluctuation phenomena

256. "Basic Research in Crystalline and Non-crystalline Ceramic Systems" $291,000 01-01
W. D. Kingery and R. L. Coble - Dept. of Metallurgy and Materials Science
diffusion in KCl ZnO Al_2O_3 Pb, crystallization in GeO_2 SiO_2 B_2O_3, sintering of $BaTiO_3$ $SrTiO_3$ $MgTiO_3$, crystal chemistry of $AsSbS_2$, cation distribution in nonstoichiometric spinels, grain boundaries, impurities and pores in Al_2O_3, dislocation behavior in alkaline earth fluorides, dislocation behavior in UO_2 ThO_2, thermal gradient effects in FeO, amorphous Si films, growth of ZnS crystals, growth of oxide crystals by vapor transport

257. "Low Temperature and Neutron Physics Studies" $119,828 02-02
C. G. Shull - Dept. of Physics
polarized neutron diffraction of Kondo effect in Cu-Fe alloys, Pendellosung fringe structure in Bragg reflections from perfect Si crystals, proton polarization in hydrogen-containing crystals, diamagnetic scattering in diamagnetic materials

MASSACHUSETTS, UNIVERSITY OF

258. "Ultrasonic Attenuation Studies of the Electronic Structure of Metals" $37,000 02-02
A. R. Hoffman - Dept. of Physics and Astronomy
behavior of ultrasonic attenuation in transition region between diamagnetic domain and non-domain states in metals Be Ag, acoustic attenuation in K, high frequency acoustic attenuation in pure type-II Nb

MICHIGAN STATE UNIVERSITY

259. "Studies of Electrical and Defect Properties of Thin Metallic Wires" $40,902 02-02
J. Bass - Dept. of Physics
quenching studies of wires in superfluid helium, W Mo Ta Pt, resistivity, effects of applied magnetic fields and sample size on thermopower, Al

260. "Study of Interactions between f-Shell Transition Ions in Non-metallic Crystals" $29,619 02-02
E. H. Carlson - Dept. of Physics
nuclear magnetic and quadrupole resonance, $GdCl_3$, $PrCl_3$, $ErCl_3$, susceptibility measurements

261. "Properties of Rare-Gas Solids" $38,792 02-02
G. L. Pollack - Dept. of Physics and Astronomy
thermodynamic properties of solid and liquid rare gases, sublimation pressure measurements on A Kr Xe, triple point determinations, flow rates of liquid He II, pressure wave sources in liquid He II

MICHIGAN TECHNOLOGICAL UNIVERSITY

262. "Structure and Properties of Solid Solutions" $43,525 01-01
A. A. Hendrickson - Dept. of Metallurgical Engineering
solid solution strengthening in FCC and BCC metal solutions, critical resolved shear stress, creep rate, dislocation velocities, Ag, Nb, Ta

263. "Effect of Annealing on the Substructure of Cold Worked fcc Metals and Alloys" $32,556 01-02
D. E. Mikkola - Dept. of Metallurgical Engineering
changes in structure in both random solid solutions and ordered alloys, x-ray diffraction and transmission electron microscopy, Cu-Ge, Cu_3Au, Ni_3Al, Pt_3Co, kinetics of antiphase domain growth

MICHIGAN, UNIVERSITY OF

264. "Fission Fragment Induced Electrical Transients in Dielectric Materials" $13,815 01-03
D. R. Bach - Dept. of Nuclear Engineering
feasibility of using dielectric materials as detectors for fission fragments, mylar, lexan, glass, mica

265. "Thermodynamic Properties of Solid Alloys" $29,525 01-02
R. D. Pehlke - Dept. of Chemical and Metallurgical Engineering
thermodynamic data employing solid oxide electrolytes, Fe-Cr Ni-Cr systems

MINNESOTA, UNIVERSITY OF

266. "Experimental and Theoretical Studies in Solid State and Low Temperature Physics" $169,723 02-02
A. M. Goldman, L. H. Nosanow, W. Zimmerman, Jr., and W. Weyhmann - School of Physics and Astronomy
thermal and intrinsic fluctuations in superconductors, magnetic susceptibility on crystalline ^{3}He below 30 $m^{o}K$, theory of quantum crystals, theory of liquid He, nuclear hyperfine interactions in transition metals, quantization of circulation and analogs of the Josephson effect in liquid He, specific heat and superfluid density in ^{3}He-^{4}He mixtures

267. "'In-Situ' Electron Microscope Investigation of the Nucleation and Growth of Sputtered Thin Films" $47,000 01-01
T. E. Hutchinson - School of Mineral and Metallurgical Engineering
mechanism of nucleation and growth of thin films formed by inert gas ion sputtering, Cu Au Nb on amorphous carbon and single crystal graphite, effect of atom energy on nucleation and growth parameters, data correlation with vacuum deposited films

268. "Effect of Short-Range Order on Mechanical Properties of Alloys" $20,000 01-01
M. E. Nicholson - School of Mineral and Metallurgical Engineering
study of slip bands in alloys exhibiting short range order, aging in alloys disordered by cold work, Au-Pd

MINNESOTA, UNIVERSITY OF (Continued)

269. "A Study of Grain Boundary Segregation Using the Auger Electron Emission Technique" $40,830 01-01
D. F. Stein - School of Mineral and Metallurgical Engineering
study of impurity segregation at fractured surfaces, low alloy steels, pure Fe, Mo, Cu, W, Al, stainless steels

270. "Diffusion Studies in Liquid Metals" $57,000 01-02
R. A. Swalin - School of Mineral and Metallurgical Engineering
self-diffusion measurements as a function of temperature at constant volume in liquid In and Hg, thermotransport measurements of Sb in liquid Ag, alkali metals, Ga, radial distribution function for K

MISSOURI, UNIVERSITY OF

271. "Nuclear Radiation Effects on Silicon P-N Junctions" $32,423 02-03
C. A. Goben - Space Sciences Research Center
surface degradation, effect of out-diffusion of the substrate or buried layer on device characteristics, radiation enhancement of high frequency forward gain for semiconductor transistors

MONTANA STATE UNIVERSITY

272. "High-Temperature Oxidation of Iridium" $21,888 01-01
R. T. Wimber - Dept. of Aerospace and Mechanical Engineering
oxidation rate of Ir in temperature range of 1600-2200^{o}C, rate equation for steady-state condition

NEW YORK, STATE UNIVERSITY OF

273. "Theory of Reaction Kinetics" $39,324 02-03
J. W. Corbett - Dept. of Physics, Albany
role of spatial correlation between reacting species on their reaction kinetics, role of correlation in diffusion-controlled reaction kinetics, relation of continuum treatments to the discrete results, applications to radiation damage and void formation, microscopic theory of nucleation

NEW YORK, STATE UNIV. OF (Continued)

274. "Slip Initiation and Microdynamics of Flow in Tungsten and Other Metals" $22,000 01-01
J. C. Bilello - Dept. of Materials Science, Stony Brook
thermally activated slip at low temperatures in W, correlation of micromechanical data with sample purity and dislocation characterization, microstrain damping behavior in Cu, high resolution strain measuring system

275. "Fatigue-Enhancement of Diffusion" $14,200 01-01
H. Herman - Dept. of Materials Science, Stony Brook
enhanced diffusion during low amplitude cyclic straining of disordered alpha-brass, electrical resistivity, effect of frequency and amplitude

276. "Thermal Neutron Scattering on Magnetic Materials and Liquids" $87,319 02-02
R. Nathans - Dept. of Physics, Stony Brook
critical scattering of neutrons from FeF_2, determination of dynamical structure factors in Te from neutron inelastic scattering intensity measurements, measurements of inelastic neutron scattering in ^3He-^4He mixtures as a function of liquid density

277. "Physical Theory of Brittle Fracture and Electron Interaction with Shock Waves In Metals" $25,000 01-01
R. M. Thomson - Dept. of Materials Science, Stony Brook
atomistic theory of fracture, electrical effects of shock waves in metals

NORTH CAROLINA STATE UNIVERSITY

278. "Diffusion of Gases in Solids" $28,908 01-03
T. S. Elleman - Dept. of Nuclear Engineering
rare gas diffusion in ionic crystals and tritium diffusion in metals, ^{133}Xe diffusion in CaF_2 and UO_2, effects of gas concentration and radiation damage, tritium diffusion in stainless steel and zircalloy

NORTH CAROLINA STATE UNIVERSITY (Continued)

279. "An Experimental Investigation of Boiling Bubbles" $22,779 01-01
R. F. Saxe - Dept. of Nuclear Engineering
effect of gaseous and liquid parameters on the emission of sound by boiling bubbles, quantitative correlation between bubble characteristics and sound emission, high speed photography, acoustic pulse height spectra from boiling bubbles

NORTH CAROLINA, UNIVERSITY OF

280. "Investigation of Defect Structures by Electric Polarization and Relaxation Methods" $34,030 02-02
J. H. Crawford, Jr. - Dept. of Physics
composite imperfections (cation-anion vacancy pairs, vacancy-impurity complexes) studied by means of dielectric behavior, polarized optical absorption, emission of polarized light, electron spin resonance, nuclear magnetic resonance, alkali halides, alkaline earth halides, divalent transition metal halides

281. "The Properties of Metals and Alloys" $40,000 02-02
L. D. Roberts - Dept. of Physics
Mössbauer effect, electrical resistance, magnetic measurements, x-ray diffraction, pressure dependence of the Kondo temperature, order-disorder effects in alloys, calculation of atomic wave functions, Mössbauer recoilless fraction for metallic Au as a function of temperature, isomer shift for Au in Cu-Au alloys

282. "Atomic Diffusion and Point Defects in Crystals" $32,773 02-02
L. Slifkin - Dept. of Physics
effect of transverse magnetic field on the diffusion of Ag in Al, EPR studies of Mn doped AgCl, studies of cation doping on impurity diffusion in Ag halides, internal friction study on vacancy formation and dislocation pinning in AgBr

283. "Pressure Variation of Single Crystal Elastic Constants" $44,852 02-02
C. S. Smith - Dept. of Physics
pressure variation of single crystal elastic constants of Li halides, temperature coefficients of the elastic constants at constant volume, pressure derivative of the isothermal bulk modulus

NORTH DAKOTA, UNIVERSITY OF

284. "Physical Phenomena in Crystals Consisting of a Finite and Countable Number of Atoms in One Direction" $36,000 02-02
H. H. Soonpaa - Dept. of Physics
optical and low temperature electrical and magnetic measurements on thin single crystal $Bi_8Te_7S_5$, ellipsometric studies to measure indices of refraction, thickness dependence of contact potentials, electrical conductivity and galvanomagnetic phenomena

NORTHEASTERN UNIVERSITY

285. "Structural, Thermal, and Electronic Properties of Metastable Binary Alloys of Thorium and Uranium Produced by Rapid Quenching" $32,655 01-01
B. C. Giessen - Dept. of Chemistry
splat cooling technique to prepare metastable alloys of U and Th, crystal chemistry, thermal stability, superconductivity

286. "Studies of the Proximity Effect in Superconductors" $33,388 02-02
C. A. Shiffman - Dept. of Physics
excess superconductive ordering associated with the proximity effect, specific heat measurements of laminar eutectic alloys, Pb-Sn

NORTHWESTERN UNIVERSITY

287. "Electronic Band Structure and Physical Properties of the Actinide Metals and Their Compounds" $34,362 02-02
A. J. Freeman - Dept. of Physics
theoretical study of electronic band structure of the actinide metals and compounds, symmetized relativistic augmented plane wave method, BCC uranium

288. "Effect of Point Defects on Mechanical Properties of Metals" $46,295 01-03
M. Meshii - Dept. of Materials Science
electron irradiation and rapid quenching to produce lattice vacancies, effects of point defects on mechanical behavior of metallic single crystals, interaction between dislocations and point defects, diffusion of point defects

NORTHWESTERN UNIVERSITY (Continued)

289. "Analytical Study on Dislocations in Thin Films" $28,013 01-02
T. Mura - Dept. of Civil Engineering
stress, deformation and displacement fields caused by dislocations in thin films, dislocation loops and vacancy clusters, screw or edge dislocations threading a foil obliquely, dislocation networks, interactions between dislocations, impurities and cavities

OHIO STATE UNIVERSITY

290. "An Investigation of Mixed Conduction in Solid Electrolytes" $35,000 01-02
R. A. Rapp - Dept. of Metallurgical Engineering
ThO_2-Y_2O_3 and ZrO_2-CaO electrolytes, interpretation of galvanic cell voltages at low oxygen pressures, determination of free energy change for UO_2, study of mixed conduction in NaCl-$TiCl_x$, role of metallic contacting electrodes in the oxidation and reduction reactions of gases at oxide electrolyte-electrode interfaces

291. "Liquid Metals Research--Electrotransport and Solidification Studies" $34,979 01-02
D. A. Rigney - Dept. of Metallurgical Engineering
electrotransport in liquid alloys based on Li Na K and Ag, supercooling and nucleation in liquids using coil and bridge technique

OKLAHOMA, UNIVERSITY OF

292. "The Effects of Surface Coatings on the Plastic Deformation of Metal Single Crystals" $29,666 01-01
R. J. Block - Dept. of Chemical Engineering and Materials Science
evaporated and electrodeposited coatings, Cu Al single crystals, dislocation etch pit density measurements and mechanical testing, fatigue behavior, role of film rupture in corrosion

293. "Thermoelectric Size Effect in Noble Metals" $27,500 02-02
R. R. Bourassa - Dept. of Physics and Astronomy
thermoelectric size effect on the phonon drag component of thermopower in noble metals, relaxation time for phonon scattering by the crystal surface

OREGON STATE UNIVERSITY

294. "Natural Convection Heat Transfer in Liquid Metals" $16,061 01-01
J. R. Welty - Dept. of Mechanical and Nuclear Engineering
heat transfer in liquid Hg under non-forced flow conditions, experimental and computer calculations, fluid velocity and temperature measurements

PENNSYLVANIA STATE UNIVERSITY

295. "Nonlinear Elastic and Thermoelastic Properties of Materials" $49,390 02-02
G. R. Barsch - Materials Research Lab.
third order elastic constants of UO_2 and alkali halides (RbCl, RbBr, RbI, NaI, KI, CsI), vitreous silica, strain dependence of the phonon dispersion relations

296. "Ceramic Research on Transformational Superplasticity and Ferroelectric Domain Boundaries" $20,405 01-01
R. C. Bradt and J. H. Hoke - Dept. of Materials Science
mechanical behavior of bismuth oxide solid solutions, transmission electron microscopy of 180° ferroelectric domain boundaries in single crystal $BaTiO_3$

297. "Thermodynamic Properties of Solid Solutions at High Temperatures" $29,000 01-02
A. Muan - Dept. of Geochemistry and Mineralogy
high-temperature equilibria in oxide, oxynitride, and nitride systems, $ZnO-CoO-TiO_2$, $ZnO-NiO-TiO_2$, $MgO-FeO-NiO-SiO_2$, stability of silicon oxynitride with simultaneous control of oxygen and nitrogen potentials

298. "Research on Graphite" $111,130 01-01
P. L. Walker, Jr. - Dept. of Materials Science
internal friction on neutron irradiated graphite, stress annealing of pyrolytic graphite, mechanical behavior of carbon composites, CO disproportionation over metal crystals, effect of B in graphite on transport and mechanical properties, diffusion in graphite, chemisorption of gases on carbon, graphitization of carbon

PENNSYLVANIA, UNIVERSITY OF

299. "Dislocation Mobilities in Ordered Alloys" $24,987 01-01
N. Brown and D. P. Pope - Dept. of Metallurgy and Materials Science
dislocation velocities in Cu_3Au and Ni_3Al using Berg-Barrett x-ray diffraction and etch pit techniques

PITTSBURGH, UNIVERSITY OF

300. "Precipitation From Supersaturated Copper-Titanium Solid Solutions: The Aging Process in Copper-Titanium Side-Band Alloys" $28,000 01-02
W. A. Soffa - Dept. of Metallurgical and Materials Engineering
precipitation process in Cu-Ti alloys, electrical resistivity and x-ray diffraction, correlation of mechanical properties in both the micro- and macrostrain region with structure

301. "A Study of Radiation Induced Defects in Metals" $30,367 02-03
J. R. Townsend - Dept. of Physics
effect of 10 MeV protons on dislocation pinning and point defect production in W and Cu, Young's modulus and internal friction, stress-induced ordering of O in Ta and C (or N) in Fe, calculations of the strain field contribution to electrical resistivity

302. "Thermal, Structural and Magnetic Studies of Metals and Intermetallic Compounds" $95,000 02-02
W. E. Wallace and R. S. Craig - Dept. of Chemistry
heat capacity of Ce-Y and Ce-La alloys (Kondo effect), crystal growth of lanthanide-Ni_5 single crystals, magnetic studies of lanthanide compounds of In, ^{161}Dy Mössbauer spectroscopy, electronic specific heat of $MgCu_{2-x}Zn_x$ alloys, pulse calorimetry at low temperatures, crystal field calculations of tripositive rare earth ions in cubic and hexagonal environments

PRINCETON UNIVERSITY

303. "Model Pseudopotentials and Atomic Properties in Simple Metals and Alloys" $28,757 02-02
D. O. Welch - Dept. of Aerospace and Mechanical Sciences
theoretical research using model pseudopotentials techniques in the calculation of atomic properties in simple metals and alloys, impurity diffusion (Na in ^{23}K, in Zn, in Al), residual resistivity of impurities, effect of alloying on elastic constants

PURDUE UNIVERSITY

304. "Diffusion and Precipitation of Inert Gases in Metals" $42,933 01-03
J. R. Cost - School of Materials Science and Metallurgical Engineering
alpha particle irradiation of Al and Nb, helium site occupancy and precipitation studied using internal friction, lattice parameter and residual resistivity, specific heat measurements near the lambda point of helium

305. "Transport and Thermodynamic Properties of Solids" $33,000 01-02
R. E. Grace - Dept. of Metallurgical Engineering
solid state diffusion in ternary alloy systems, Cu-Zn-Ni, Ag-Zn-Cd, diffusion of lattice defects in $CaWO_4$, formation of sulfide on FeO and MnO substrate

306. "Basic Radiation Damage Studies" $66,920 02-03
J. W. MacKay - Dept. of Physics
electron radiation damage in Ge and Si, irradiation energies of 0.1 - 5.0 MeV and temperatures from 4.2K - 250K, electrical conductivity, Hall coefficient, optical absorption, change in length, pulsed field conductivity and photoconductivity

307. "Mössbauer Studies of the Properties of Solids" $32,000 02-02
J. G. Mullen - Dept. of Physics
structure and nature of point defects in the transition metal oxides nickelous oxide, cobaltous oxide and ferrous oxide, studies of the magnetic hyperfine pattern, diffusion properties

RENSSELAER POLYTECHNIC INSTITUTE

308. "Effect of Hydrostatic Pressure on Self-Diffusion Rates in Hexagonal Metals" $35,000 02-02
H. M. Gilder - Dept. of Physics and Astronomy
activation volumes for diffusion in anisotropic materials, Zn, Cd, high pressure system with vessel submerged in stirred-Sn bath

309. "Anisotropic Diffusion and Electromigration" $55,700 02-02
H. B. Huntington - Dept. of Physics and Astronomy
electromigration as a function of crystal orientation in Cd and Mg, electromigration of impurities in single crystal Zn, electromigration of gaseous impurities in Ag, formation of voids and bubbles in Ag, impurity diffusion in Cd, Zn isotope diffusion in Cd, impurity diffusion in Sn

310. "Research in Powder Metallurgy" $33,000 01-01
F. V. Lenel - Dept. of Materials Engineering
role of slip in the early stages of sintering, Ag, Au, hot stage transmission electron micrography, role of diffusion in sintering using electron microprobe, fracture behavior of sintered iron base compacts

311. "Precipitation and Dispersion Hardening in Hexagonal Alloys" $24,900 01-01
N. S. Stoloff - Dept. of Materials Engineering
cleavage phenomena in solution annealed Hf at low temperatures, influence of H on strength and ductility of Hf, fracture mechanisms, ductility in Mg-Th-Zr alloys

SOUTHERN CALIFORNIA, UNIVERSITY OF

312. "Materials Research on High-Field Superconductors" $93,000 02-02
Y. B. Kim - Depts. of Physics and Electrical Engineering
effect of spin-orbit interactions on high-field superconducting alloys, effect of metallurgical structure on loss characteristics in high-field superconductors, loss characteristics of type II superconductors at microwave frequencies

SOUTHERN CALIFORNIA, UNIVERSITY OF (Continued)

313. "The Effects of Electric and Magnetic Fields on the Nucleation, Structure, and Residual Properties of Vapor Deposited Metal Films" $29,000 01-02
L. E. Murr - Depts. of Materials Science and Electrical Engineering
properties of vapor deposited Pd In Fe Co and Gd, effects of electric and magnetic fields, transmission electron microscopy, nucleation and epitaxy

STANFORD UNIVERSITY

314. "Structure Dependence of High Temperature Deformation of Metals" $47,504 01-01
C. R. Barrett and W. D. Nix - Dept. of Materials Science
structure dependence of high temperature-low stress creep in metals, effect of shock deformation on the subsequent high temperature creep behavior of metals and alloys, influence of He on the high temperature creep properties of Ni-W alloys, study of the rate controlling creep mechanism in superplastic Pb-Sn alloys

315. "Nitride Forming Reactions in Liquid Uranium Alloys" $39,341 01-01
N. A. Parlee - Dept. of Mineral Engineering
kinetics of UN and U_2N_3 forming reactions in liquid U-Sn alloys, Sieverts-type apparatus to measure the pressure and quantity of absorbed N, concentrations of U greater than 18% and temperatures of 1600°C and higher

SYRACUSE UNIVERSITY

316. "'In-Situ' Ultra High Vacuum High Energy Electron Diffraction Studies" $30,522 01-02
R. Vook - Dept. of Chemical Engineering and Metallurgy
thin film epitaxy, structure of crystal faces, surface reactions, ultra high vacuum HEED supplemented by transmission electron microscopy, CaF_2 on NaCl substrates, NaCl films on mica substrates

TEMPLE UNIVERSITY

317. "A Study of the IB-IIB Beta Phase Alloys" $90,000 01-02
L. Muldawer and H. Amar - Dept. of Physics
optical constants, high temperature resistivity, elastic constants of beta AuZn, transport properties of metals and alloys in relation to their band structure, calculation of the band structure of Cu-Au and Zn, statistical mechanics of disordered alloys

TENNESSEE, UNIVERSITY OF

318. "Study of a New Method for Preparing Ultra-Fine Grained Metal Alloys" $17,806 01-01
J. E. Spruiell - Dept. of Chemical and Metallurgical Engineering
optimization of a process to obtain fine grained structures in metals, mechanical properties, stainless steel, nickel base alloys

319. "Application of Adiabatic Calorimetry to Metal Systems" $22,434 01-01
E. E. Stansbury and C. R. Brooks - Dept. of Chemical and Metallurgical Engineering
heat capacity of W Pt stainless steel to establish standards, short range ordering in Ni-rich Ni-Cr alloys, effect of lattice defects on heat capacity in high purity Zn and Pb

TEXAS, UNIVERSITY OF

320. "Elevated Temperature Morphological Stability of Metal Matrix Fiber Composites" $16,714 01-01
T. H. Courtney - Dept. of Mechanical Engineering
eutectic fiber composites, changes in fiber rod density and morphology, quantitative metallography, elevated temperature mechanical testing

TUSKEGEE INSTITUTE

321. "Density Determinations Using a Gamma Radiation Attenuation Technique" $36,000 01-01
I. G. Dillon - Dept. of Mechanical Eng.
high temperature density measurements on alkali metals, Cs, Rb, gamma attenuation technique using Cs-137 source

UTAH, UNIVERSITY OF

322. "Impurity Effects on the Creep of Polycrystalline Magnesium and Aluminum Oxides at Elevated Temperatures" $21,428 01-01
R. S. Gordon - Dept. of Materials Science and Engineering
creep under four point loading at temperatures between 1200 and 1700°C, Al_2O_3 and MgO doped with Fe_2O_3 Cr_2O_3 NiO and Li_2O, role of impurities in governing the relative contributions of diffusional, grain boundary sliding and dislocation mechanisms of creep

323. "The Fundamentals of Radiation Damage" $87,600 02-03
A. Sosin - Dept. of Physics
damage rate as a function of energy--up to 8 MeV electrons, displacement processes, defect characteristics and interactions, recovery in Stage I, diffusional analysis, dislocation pinning

VERMONT, UNIVERSITY OF

324. "Thermodynamic and Transport Properties of Interstitial Hydrogen Isotopes in Palladium" $21,891 02-02
J. S. Brown - Dept. of Physics
theoretical study of hydrogen and deuterium in Pd, transport and thermodynamic properties of the hydrides, propagation of electrons in disordered interstitial alloys

VIRGINIA, UNIVERSITY OF

325. "Electronic Properties of Metals and Alloys" $75,939 02-02
R. V. Coleman - Dept. of Physics
electronic structure in ferromagnetic metals, magnetoresistance, Hall effect, thermal conductivity, optical reflectance, electronic switching in metal-metal oxide junctions, electron tunneling, Fermi surface topology in Cu Ag Pb, magnetoresistance in thin films of Ag Au Fe Ni, calculation of electron reflection at domain boundaries

VIRGINIA, UNIVERSITY OF (Continued)

326. "Investigations on the Behavior of Point Defects and Dislocations" $62,858 02-02
D. Kuhlmann-Wilsdorf - Depts. of Materials Science and Physics
stresses due to dislocation arrays, mechanical properties of crystalline materials, electron diffraction contrast of crystal defects, order-disorder phenomena in crystals, melting of small particles, epitaxy, elastic constant-interatomic potential relationships, annealing kinetics

327. "Dynamic Dislocation Phenomena in Single Crystals of Metals and Alloys" $75,000 02-02
J. W. Mitchell - Dept. of Physics
dislocation mechanisms in deformation of Cu-Al single crystals with emphasis on dislocation generation at surfaces, dislocation velocities, second and third order elastic constants

WAKE FOREST UNIVERSITY

328. "A Study of Atomic Mobilities in Crystalline Solids" $36,504 02-02
T. J. Turner and G. P. Williams, Jr. - Dept. of Physics
atomic mobilities in metals and ionic crystals, internal friction, resistivity, optical absorption, dielectric relaxation, MgO, Ag-Au, CaO, SrO, formation and thermal decay of centers produced by deformation in alkaline-earth oxides

WASHINGTON, UNIVERSITY OF

329. "Mössbauer Studies at High Pressure" $33,466 02-02
R. L. Ingalls - Dept. of Physics
measurement of the Mössbauer effect in solids under pressures to 300 Kb, internal magnetic field and isomer shift of transition metals, alloys and compounds containing Fe-57, internal magnetic field in Invar alloys, recoilless fraction of Fe-57 in Cu

WASHINGTON, UNIVERSITY OF (Continued)

330. "A Study of Phase Transformations and Superconductivity" $35,428 01-01
D. H. Polonis - Dept. of Mining, Metallurgical and Ceramic Engineering
effects of thermal treatments and plastic deformation on the structure and superconducting properties of alloys, Zr-Nb, Zr-Ta, electron microscopy, mechanisms of transformation

WAYNE STATE UNIVERSITY

331. "Electron Paramagnetic Resonance Studies of Radiation Effects in Solids and Chemical Compounds" $55,000 02-03
Yeong-Wook Kim - Dept. of Physics
nature and effects of defects introduced in solids by radiation and doping, alkali halides, phosphors, superconducting materials, microwave spectroscopy, optical spectroscopy, electron-nucleus double resonance, electrical resistivity, electron tunneling

WISCONSIN, UNIVERSITY OF

332. "Creep Mechanisms in BCC Alloy Crystals" $27,100 01-01
R. A. Dodd - Dept. of Minerals and Metals Engineering
slip and high temperature creep in CsCl-type compounds, NiAl, GaAl, CuZn, NiGa, FeAl, AuMg, AuZn, creep behavior of Al-rich NiAl, transmission electron microscopy, tension and compression creep

YALE UNIVERSITY

333. "X-Ray Study of the Structure of Liquid Metals and Alloys" $28,426 01-02
C.N.J. Wagner - Dept. of Engineering and Applied Science
evaluation of the concentration dependence of the atomic distributions in liquid binary alloys, measurements of the temperature dependence of the structure of liquid metals and alloys, Hg-Tl, Ag-Sn, Au-Sn, Cu-Sn, In, Tl, Cd, Zn, Sn, Cu-Sn

YALE UNIVERSITY (Continued)

334. "Study of Ideal Magnetic Crystals" $80,000 02-02
W. P. Wolf - Dept. of Engineering
and Applied Science
experimental and theoretical research on thermal and magnetic properties of magnetic materials, rare earth hydroxides, Ce and Nd chloride, $GdVO_4$, $DyPO_4$, $Dy_3Al_5O_{12}$, low temperature electron and nuclear spin resonance, low and high field static and dynamic magnetization, specific heat, magneto-thermal measurements, optical absorption, neutron scattering, ^3He-^4He dilution refrigerator

SECTION C

Summary of Funding Levels

The summary funding levels for various research categories were determined from the index listing in Section D and estimating the percentage from the project devoted to a particular subject. There is overlap in the figures. For instance, funding for a project on diffusion in oxides at high pressure would appear in all three categories of diffusion, oxides, and high pressure.

During the fiscal year ending June 30, ~~1970~~ 1971, the Metallurgy and Materials Programs total support level amounted to about ~~$27.9~~ $26.8 million in operating funds and ~~$1.8~~ $1.6 million in equipment funds. These separately identified equipment funds are expended primarily at AEC Laboratories and are not shown in this report. Equipment funds for the University projects are included in the total contract dollars, being part of the operating budget. The following analysis of costs is concerned only with the ~~$27.9~~ $26.8 million operating funds.

1. By Region of the Country:

	Contract Research (%)	Total Program (%)
(a) Northeast (Mass., R.I., Penn., N.Y., N.H., D.C., Md., [redacted], Vt., [redacted])	~~49.5~~ 45.9	~~23.0~~ 21.9
(b) South (S.C., Fla., Ga., La., N.C., Tenn., Ala., Va., Puerto Rico)	~~11.3~~ 9.8	~~22.5~~ 22.6
(c) Midwest (Ohio, Ill., Wisc., Mich., Minn., [redacted], N.D., Ind., Iowa)	~~20.6~~ 22.3	~~40.4~~ 41.6
(d) West (Ariz., Utah, Calif., Mont., Okla., Oregon, Texas, Wash., [redacted] Hawaii)	~~18.6~~ 22.0	~~14.1~~ 13.9

2. By Academic Department or Laboratory Division:

	Contract Research (%)		Total Program (%)	
(a) Metallurgy, Materials Science, Ceramics, Other Engineering (Office Budget Activity Numbers 01-)	50.4	~~71~~ 54.0	43.3	~~71~~ 45.2
(b) Physics, Solid State Science, Solid State Physics (Office Budget Activity Numbers 02-)	49.6	46.0	56.7	54.8

3. By AEC Laboratory and University:

	Total Program (%)	71
(a) University Program (including those laboratories where graduate students are involved in research to a large extent)--e.g., Ames Laboratory and Lawrence Radiation Laboratory/Berkeley)	46.6	45.3
(b) Laboratory Program (including laboratories where there is very little graduate student involvement --e.g., Atomics International)	53.4	54.1

4. By Laboratory:

	Total Program (%)	71
Ames Laboratory	9.4	9.9
Argonne National Laboratory	20.5	21.2
Atomics International	.7	
Brookhaven National Laboratory	10.6	11.1
Idaho Nuclear Corporation	.5	
Illinois, University of (Materials Research Laboratory)	5.1	5.0
Lawrence Radiation Laboratory/Berkeley	6.5	6.8
Mound Laboratory	.4	.4
Oak Ridge National Laboratory	18.8	19.5
Pacific Northwest Laboratory	1.8	1.9
Puerto Rico Nuclear Center	.9	.6
Contract Research		23.6
		100.0

5. By Selected Areas of Research:

	Number of Projects (Total=255) (%)	Total Program $ (%)
(a) Materials		
Actinide Metals and Compounds	11.8	7.3
Ceramics	17.6	7.4
Rare Earth Metals and Compounds ...	8.3	6.3
(b) Technique		
Neutron Scattering	7.8	14.4
Theory	12.2	8.0
(c) Phenomena		
Diffusion	13.7	5.8
Strength	20.4	10.7
Superconductivity	11.0	7.3
Surface Phenomena and Thin Films ..	11.4	7.5
Void Formation	3.9	1.5
(d) Environment		
High Pressure	8.3	4.6
Radiation	16.8	14.1

SECTION D

Index of Investigators, Materials, Phenomena, Technique and Environment

The index refers to project numbers in Sections A and B.

Actinide Metals and Compounds

1	91	117
2	92	118
5	93	212
7	95	256
13	98	285
18	99	287
22	101	290
23	104	295
32	108	315
33	112	

Ceramics

Carbides	Glass	Nitrides	Oxides			
18	51	56	3	43	110	256
65	76	92	9	63	115	290
71	78	93	13	76	118	296
100	244	95	18	82	212	297
	256	101	19	93	217	305
	264	315	23	95	224	307
	295		30	101	244	322
			33	104	245	328
			35	108	249	

Composites

60 - 10
78 - 30
79 - 25
84 - 10
246 - 35
298 - 20
320 - 17

Graphite and Carbon

35	111
79	244
95	245
99	253
103	298
107	

Intermetallic Compounds

4	73	224
13	81	226
22	83	240
23	84	242
27	93	252
31	109	263
35	209	299
59	210	302
		332

Ionic Crystals

Alkali Halides

15	230
26	231
28	232
51	233
67	280
104	283
106	295
110	331

Other

41	81	212	282
42	82	241	284
44	102	243	296
46	106	245	305
51	107	255	316
54	108	256	331
66	110	266	334
67	120	276	
70	200	278	

Liquids

27	102
31	206
38	255
50	270
53	276
88	291
91	294
96	315
99	333

Metals

Alkali	HCP		BCC		Ferrous	
2	2	216	1	104	1	220
4	10	222	5	108	4	228
12	19	232	7	116	22	232
19	24	237	9	119	23	241
68	60	238	11	207	65	246
200	74	241	15	215	74	247
204	82	254	19	218	75	250
217	94	278	24	219	80	265
235	96	308	40	220	103	269
258	116	309	56	223	205	278
291	119	311	58	225	207	318
321	200	330	63	229	213	319
	207		64	248	215	325
			65	251		
			73	258		
			81	259		
			93	262		
			94	269		
			96	274		
			97	288		
			98	301		
			101	319		

Organics

33	20	121	54
50	150	242	10
66	10	264	12
75	10		
104	20		

Rare Earth Metals and Compounds

1	14	104
2	16	107
3	17	109
4	22	209
5	32	260
8	45	302
9	89	334
10		

Semiconductors

13	242
72	248
74	256
75	257
104	271
105	306
236	

Solid and Liquid Inert Gases

Helium		Other
16	203	12
29	211	27
31	214	69
68	261	230
69	266	261
87	276	

Elastic Constants

Electrical Resistance

Electron Microscopy

Electron Scattering

Electron Spin Resonance

Field Ion Microscopy

75
77
218
223
225
240

High Temperature Heat Capacity

4 83
17 93
22 319
35

Infrared Spectroscopy

9
15
87
231
243

Internal Friction

52 282
65 298
71 301
114 304
215 323
224 328

Laser Beam Scattering

69
88

Low Temperature Specific Heat

12	83	266
22	92	286
29	203	302
30	231	304
57	245	

Magnetic Susceptibility

4	22	209
14	57	211
17	59	260
18	203	266

Mossbauer Effect

10	65	217
18	66	281
22	201	302
32	202	307
57	213	329

Neutron Scattering

16	43	55	241
23	44	107	255
27	45	109	257
41	47	120	276
42	53	238	334

Nuclear Magnetic Resonance

10	70	250
22	86	260
31	200	280
63	209	334

Optical Absorption

15	66	221	306
17	88	231	317
22	102	242	328
28	110	280	334
51	212	284	

Sputtering

117
210
267
269

Stress-Strain

1	58	117	232	254	292
2	60	205	237	256	300
7	71	207	240	262	311
19	73	208	244	268	318
20	74	215	246	274	320
24	76	219	251	275	322
40	80	228	252	288	332

Theory

6	34	100	281
9	48	112	287
11	54	212	289
18	61	217	303
19	68	230	317
20	73	266	324
21	85	273	326
22	97	277	

Thermal Conductivity

3	93	231
13	106	235
68	220	245
71	230	294
91		

Thermodynamics

4	91	297
8	118	302
12	204	315
18	249	319
56	261	321
67	265	324
82	272	
83	290	

X-Ray Scattering

2	103	226
24	105	238
31	118	263
69	119	270
72	204	300
79	206	304
99	216	333

Channeling

Crystal Structure, Atomic Distribution and Crystal Transformations

Diffusion

Dislocations

Electron Transport

9	30	90	220	264	306
13	68	93	235	284	324
14	79	209	248	290	325
18	89	217	253	293	

Electronic Structure

Fermi Surface		Other		
9	112	10	57	201
18	248	14	63	212
32	250	15	70	236
68	317	18	92	258
85	325	22	100	260
		34	109	287
		45	112	325

Magnetism

4	22	48	202	241
8	23	57	206	250
9	27	68	209	257
10	32	86	210	266
14	34	107	211	302
16	42	109	217	325
17	43	112	220	329
18	44	120	235	334

Materials Preparation and Characterization

2	104
8	113
18	238
26	250
46	256

Phonons

12	41	93	231
13	48	107	255
16	67	226	276
27	88	230	293
			295

Point Defects

7	35	63	110	200	243	301
19	40	67	111	222	245	306
21	50	68	112	223	249	307
24	51	69	114	224	259	319
25	52	72	116	225	280	323
28	54	77	119	232	282	326
33	58	108	121	233	288	331

Precipitation

1	65	304
4	94	311
21	96	313
58	208	315
61	213	318
62	300	

Recovery and Recrystallization

2	116	285
52	121	318
62	222	320
77	237	323
97	243	326
112	263	

Sintering

76
78
95
256
310

Solidification

5
91
291

Strength

Fracture		Super-plasticity	Creep	Flow Stress		
74	244	117	58	1	208	262
78	246	296	73	2	215	268
80	254	314	76	7	219	274
97	269		92	19	237	288
205	277		95	20	240	292
228	310		117	24	246	300
	311		232	40	247	318
			262	60	251	320
			314	80	252	327
			322	96	256	
			332			

Superconductivity

11	81	106	239
24	84	206	266
30	85	210	285
36	87	226	286
39	89	229	312
40	90	231	330
49	94	234	331

Surface Phenomena and Thin Films

6	52	111	236	284	313
11	60	113	241	289	316
19	64	217	242	292	325
39	81	218	259	293	331
49	98	221	267	298	

Void Formation

21	119
24	219
58	227
95	273
103	309

Electric Field

2	227	
5	291	
71	309	
214	313	

Gas

Oxidizing	Hydrogen	
98	1	226
118	15	228
221	19	311
272	58	324
	80	

Magnetic Field

4	18	57	233
9	22	63	234
10	30	70	239
11	32	79	248
13	33	81	259
14	36	86	282
16	39	94	313
17	44	109	334

Pressure

Above Atmospheric		Shock Loading
11	204	1
12	209	73
18	232	74
19	235	207
55	253	277
66	281	314
67	283	
68	295	
101	308	
119	329	
200		

Radiation

Electron	Ion		Neutron		Theory	Gamma
39	25	119	7	116	54	28
52	35	225	19	119	112	33
72	37	264	24	219	273	50
103	77	278	103	251	301	51
110	111	301	106	271		121
222	115	304	111	298		243
288	118		114			245
306						331
323						

Temperature

Below Liquid Helium (4.2°K)		High Temperature (about 1000°K or higher)	
11	85	2	272
12	87	3	297
14	90	5	314
22	203	13	315
29	211	22	321
30	231	82	322
31	239	93	332
68	266	102	
84	334		

FY1970

SUMMARY OF FUNDING LEVELS

By Area of Research

8/16/70

		Number of Projects (Total=255) 71 72		$ Level of Effort	
		#	%	K$	%
(a)	Materials				
	Actinide Metals and Compounds	30	11.8	2,032	7.3
	Ceramics	45	17.6	2,073	7.4
	Rare Earth Metals and Compounds	21	8.3	1,764	6.3
(b)	Technique				
	Neutron Scattering	20	7.8	4,016	14.4
	Theory	31	12.2	2,226	8.0
(c)	Phenomena				
	Diffusion	35	13.7	1,620	5.8
	Strength	52	20.4	3,005	10.7
	Superconductivity	28	11.0 1.9 1.7	2,044	7.3
	Surface Phenomena and Thin Films	29	11.4	2,084	7.5
	Void Formation	10	3.9	431	1.5
(d)	Environment				
	High Pressure	21	8.3	1,280	4.6
	Radiation	43	16.8	3,932	14.1

8/17/70

M&M SUPPORT AT RESEARCH REACTORS

A) Neutrons Only

		Est. FY 1971 K$	72
ANL	CP-5	$ 420	450
BNL	HFBR	549	700
ORNL	HFIR	0	0
	ORR	127	95
	BSR	160	180
Ames	ARR	400	400
PRNC		10	0
MIT		100	110
Georgia Inst. Tech.		10	10
		$1,776	1945

B) Research Total (Including Cost of Neutrons)

Neutron Scattering	$4,016	4000
Neutron Irradiation Damage	1,531	1500
	$5,547 (19.9% of operating funds)	5500

22%

5000

1310

2010

1510

MEM TOTAL	OP #
65	- 22 351
66	- 24 848
67	- 26 284
68	- 26 966
69	- 27 506
70	- 27 730
71	- 26779
72	-