METALLURGY

and

MATERIALS PROGRAMS

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FY 1969

UNITED STATES ATOMIC ENERGY COMMISSION
DIVISION of RESEARCH

METALLURGY

AND

MATERIALS

PROGRAMS

Fiscal Year 1969

September 1969

U. S. Atomic Energy Commission

Division of Research

FOREWARD

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 1969 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 1969 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

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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 1969.

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-
J. F. Smith - Phone: 294-1821

1. "Crystal Plasticity" $104,000 01-01
T. E. Scott
effect of H on deformation and fracture in V, Ta, Nb, deformation modes in Y, Yb, precipitation hardening in Cu-Co-Zn and bcc metals

2. "Metal Purification and Impurity Effects Studies" $ 75,000 01-01
O. N. Carlson, D. T. Peterson
purification of Ca, Mn, electromigration of C, O, N in Lu, electromigration of interstitials in Hf, Zr, Gd

3. "Ceramics Research" $ 75,000 01-01
O. Hunter
cation diffusion in Y_2O_3 and Er_2O_3, elastic properties of oxides of Tm, Yb, Lu, Y, Er, Dy and Ho, polymorphic transformation in HfO_2, thermal diffusivity to 1600°C

4. "Structure and Properties of Solids" $317,000 01-02
P. Chiotti, K. A. Gschneidner, F. X. Kayser, J. F. Smith, D. M. Bailey
thermodynamic properties, elastic constants, x-ray diffraction, magnetic susceptibility, Yb-Zn, Ga-Zn, Eu-Zn, U compounds, Mg alloys, Ce, In-Pb, In-Tl, Pb-Tl

5. "Diffusion and Transport Properties" $ 87,000 01-02
O. N. Carlson, D. T. Peterson, J. D. Verhoeven
constitutional supercooling, solid-liquid interface, effect of electric and magnetic fields on solidification, electrotransport in liquid metals, diffusion coefficients in Th-R.E. alloys, electromigration velocities of interstitials in Zr, Gd, Hf, Dy and U

6. "Properties of Surfaces" $ 38,000 01-02
R. K. Trivedi
surface energy and surface diffusion in V, growth and stability of interfaces, LEED study of epitaxial films

AMES LABORATORY
Metallurgy Division -01- (continued)

7. "Radiation Damage" $110,000 01-03
C. W. Chen
in-pile neutron damage studies down to 80°K, mechanical properties and internal friction studies of irradiated V, V-Ti alloys

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

8. "Materials Preparation and Characterization" $165,000 02-01
F. H. Spedding, G. Burnet
preparation and purification of rare earth metals compounds and alloys, high temperature heat content of fluorides, phase relations in binary rare earth systems

9. "Electronic Properties of Metals" $ 99,000 02-02
A. V. Gold, J. L. Stanford, L. Hodges, R. A. Phillips
theoretical study of electronic structure of transition and noble metals, Fe, Co, Cu, Ag, Au, experimental study of Fermi surface in Cr alloys, V, de Haas-van Alphen effect in W, Pb, Th, ReO_3, rf size effect in Mo, Ga, Tl, infrared reflectivity in Cr, Mo, V, Mn, magnetoplasma waves in Zn, Tl

10. "Electronic Structure of Crystalline Solids" $115,000 02-02
R. G. Barnes, D. R. Torgeson, L. V. Cherry
NMR, ESR, NGR techniques applied to metals and compounds, NGR in Er and Yb alloys, NMR in R.E.-Mn compounds, transition metal borides, ESR of impurities in semiconductors

11. "Superconductivity" $166,000 02-02
D. K. Finnemore, J. R. Clem, R. L. Cappelletti, W. J. Keeler
surface superconductivity in Nb, anisotropy of energy gap in Th, thermal conductivity in Th-Gd, susceptibility of La-R.E. alloys, specific heat of Gd, flux motion in superconductors, magnetic impurity states

12. "Thermodynamic Properties of Solids" $148,000 02-02
C. A. Swenson
low temperature thermal expansion of solid A, Cu, Ag, Au, equation of state of Cs and inert gases up to 20 Kb, low temperature thermometry

AMES LABORATORY
Physics Division -02- (continued)

13. "Transport Properties of Solids" $280,000 02-02
G. C. Danielson, J. J. Martin, K. Tanaka, P. H. Sidles, H. R. Shanks
electrical and thermal conduction in semiconductors and metals, superconductivity in tungsten bronzes, nuclear particle detectors, thermal conductivity of Th, Na WO_3, Mg_2Si, Mg_2Pb, thermal diffusivity of Pt to 1500°K using radial heat flow method

14. "Magnetic Materials: Rare Earth Metals and Rare Earth Compounds" $198,000 02-02
S. Legvold, S. H. Liu, J. L. Stanford, T. Wagner
magnetoelastic effects in rare earth metals, thermal conductivity of Gd, Tb, Ho, magnetoresistance of single crystals up to 100 Kg, theory of Fermi surface relation to magnetic ordering, ferromagnetic behavior of Gd-Th alloys

15. "Optical Properties of Solids" $198,000 02-02
D. W. Lynch, R. Fuchs, K. L. Kliewer, J. M. Keller
pure metals and alloys, experimental absorption studies down to 4°K in the visible and infrared region, optical properties and band structure of insulators, CsBr, CsCl, synchrotron radiation for vacuum ultraviolet studies on Cd, Zn, AgCl, defect studies of AgCl

16. "Neutron Scattering in Solids" $115,000 02-02
S. K. Sinha, R. A. Reese, R. P. Gupta, T. O. Brun
neutron triple axis spectrometer, lattice dynamics of solid He, Y, Sc, spin waves in Cr-Mn alloys, magnetic structure of Tm, nuclear polarization effects in solids at very low temperatures

17. "Optical and Magnetic Properties of Rare Earth Salts, Solutions, Metals and Alloys" $264,000 02-02
F. H. Spedding, R. H. Good
absorption spectra of Er and Ho ethylsulfates, Raman spectra of single crystals of rare earth compounds, heat capacity of Lu, Lu-Er and Lu-Tm alloys, magnetic susceptibility of polycrystalline and single crystal Sc, Y, La and Lu

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Metallurgy Division -01-
M. Nevitt - Phone: 739-2221
N. Peterson - Phone: 739-2222

18. "Physical Metallurgy" $397,000 01-01
M. B. Brodsky, A. J. Arko, L. M. Atlas,
J. J. Rechtien, W. J. Nellis
actinide metals, phase transformations, mechanical properties, electronic and magnetic structure, thermodynamics and statistical mechanics, preparation of high purity and single crystal Pu, deformation of Pu, transformations in Np, magnetoresistance, Hall coefficient, magnetic susceptibility Pu, Am, U, defect equilibria in oxides

19. "Metal Physics" $462,000 01-01
N. L. Peterson, W. K. Chen, E. S. Fisher,*
J. N. Mundy, S. J. Rothman, M. L. Volpe,
D. G. Westlake, D. A. Gerlich,
J. T. Robinson, D. O. Welch
diffusion in metals and ceramics, elastic modulus, plastic deformation, self diffusion Cu, Na, Ag, grain boundary diffusion in Ag, impurity diffusion Ge in Al, Fe in Ti, Fe in U, cation self diffusion and impurity diffusion in CoO, ZnO, NiO, property measurements on Nb and V with H, H supercharging in Zr, elastic moduli for Zr, Ti, Sc, U

20. "Mechanical Properties" $220,000 01-01
U. F. Kocks, C. Y. Cheng, R. O. Scattergood,
P. O. Kettunen, N. R. Risebrough
theoretical and experimental research on plastic deformation, flow stress, work hardening, recovery, fatigue hardening, Cu

21. "Kinetic Studies" $210,000 01-01
N. L. Peterson, R. K. Hart, J. W. Miller,
F. V. Nolfi, Jr., R. H. Spitzer, Jr.
transport processes during oxidation, Zr, gravimetric study of oxidation, growth or dissolution of bubbles and precipitates, He in Cu, Al and Cu alloys, electron microscopy of Al oxidation

ARGONNE NATIONAL LABORATORY
Metallurgy Division -01- (continued)

22. "Theory" $100,000 01-01
L. C. R. Alfred, F. M. Mueller,
I. R. Goroff, N. B. N. Achar
temperature dependence of elastic constants of Sc, impurity screening potential in noble metals, relation between defect cluster size and resistivity, interactions of line and point defects in anisotropic metals, electronic structure of metals

23. "Alloy Properties" $557,000 01-02
J. B. Darby, Jr., A. T. Aldred, D. I. Bardos,
F. Y. Fradin, L. L. Isaacs, D. J. Lam, new G. Knapp
S. K. Chan, J. Crangle, G. M. Goodman,
C. W. Kimball, J. W. Ross, R. A. Walker B. Veal
magnetization, neutron scattering, NMR and NGR on Pu, Np and U compounds, ferromagnetic alloys, Sc alloys, low temperature specific heat, optical properties, thermodynamics

24. "Magnetic Resonance and Positron Annihilation Research" $ 98,000 01-02
D. O. Van Ostenburg, G. A. Matzkanin,
J. J. Spokas
Knight shift, linewidth and nuclear spin lattice relaxation in dilute alloys of Pt and Pd, concentrated Nb-Al alloys, compounds of Th and U

25. "Scattering Studies" $352,000 01-02
M. H. Mueller, L. Heaton, M. Kuznietz,
G. H. Lander, R. C. Maglic
neutron scattering, U compounds, PuO_2, Np compounds, Fe-Cr, Sc-Gd, U, x-ray diffraction, neutron scattering by liquids

26. "Radiation Effects" $539,000 01-03
T. H. Blewitt, C. A. Arenberg, E. E. Gruber,
A. C. Klank, B. A. Loomis, K. L. Merkle,
G. Kostorz, H. P. Sigmund
neutron damage in BCC metals, Nb, flow stress, low temperature lattice parameter and resistivity on Cu, stored energy in Ag, Ni, irradiation hardening in Al, Au, Ag, transmission electron microscopy of irradiation induced defects, charged particle irradiation of films, theory of sputtering interaction of irradiation defects with flux in superconductors, Nb, Tc

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

27. "Material Preparation and Characterization" $ 86,000 02-01
S. Susman, D. Hinks
purification and crystal growth of KCl, KBr, KCN, KCN-KBr, transition metals, actinide compounds

28. "Neutron Scattering Studies" $666,000 02-02
D. W. Connor, G. Felcher, D. L. Price, J. M. Rowe, R. Kleb, R. Lechner, I. Pelah, K. Sköld, F. Smith
slow neutron inelastic scattering Sn, liquid A, neutron diffraction, NiS, Au_2Mn, neutron sources

29. "Defects in Nonmetallic Crystals" $205,000 02-02
P. Yuster, C. Delbecq, D. Schoemaker, S. Susman
alkali halides, visible, near-UV, ESR, irradiation induced defects

30. "Very-low-temperature Studies" $147,000 02-02
J. Ketterson, Y. Eckstein, M. Kuchnir, P. Roach
^3He-^4He refrigerator, sound attenuation, sound velocities, phase separation, specific heat

31. "Superconductivity and Low-Temperature Calorimetry" $135,000 02-02
H. Culbert, R. Huebener, V. Rowe
specific heats of metals and oxides, Pb-Tl, Pb-In, rare earth oxides, transport of magnetic flux in thin films of Pb, Sn, In, Nb, flux pinning

32. "Phase Transitions and Critical Phenomena" $256,000 02-02
L. Guttman, H. Kierstead, D. O'Reilly, R. Blinc, R. Lechner
thermodynamic properties of He at low temperatures, phase transition in Fe_3Al, small angle x-ray scattering, neutron scattering from Ni-Al, NMR on compounds

33. "Electronic and Magnetic Properties" $311,000 02-02
G. Kalvius, J. Ketterson, L. Windmiller, A. Boyle, B. Dunlap, G. Shenoy
NGR in Np, U, Am, Pu, Ir, Yb compounds, Fermi surface studies of Pt, Pd, dHvA effect

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

34. "Electron Spin Resonance and Kinetic Studies" $272,000 02-02
B. Smaller, S. Marshall, J. McMillan, T. Halpern, F. Waldner
hydrogen atom lifetime, defects in calcite ThO_2, recombination kinetics of radiation produced H in fluorite

35. "Solid State Theory" $401,000 02-02
T. Arai, S. Eckstein, T. Gilbert, R. Land, F. M. Mueller, A. Rahman, J. Robinson, M. Tosi, K. Singwi, D. Smith, A. Sjölander, B. Bosacchi, W. Kerr
insulator-to-metal transition, ferromagnetism, electron correlations, quantum liquids and solids, interatomic interactions, optical and electronic properties of insulators, atomic motions in liquids, electronic structure of metals, electron phonon effects, defects in solids, lattice dynamics

36. "Energetic Particle Interaction" $209,000 02-03
J. Jackson, W. Primak, G. Montet
energy release and resistivity of irradiated metals, D irradiation, Pt, Pt-Au, radiation behavior of vitreous silica, studies of graphite, MoS_2, $NbSe_2$

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Box 309
Canoga Park, California 91304
Phone: Area Code 213 341-1000

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

37. "Electronic Structure of Metals and Alloys" $201,000 02-02
H. J. Fink, A. G. Presson, L. J. Barnes, S. L. Wipf
theory related to surface superconductivity, superconducting point contacts, thermal properties of superconductors

38. "Radiation Damage in Crystalline Solids" $288,000 02-03
W. Bauer, H. H. Neely, D. W. Keefer, J. C. Robinson, K. Thommen, D. D. Vawter
annealing spectrum of electron irradiated Cu, Al, W, Zr, electron and alpha irradiation of Ti dislocation pinning in Cu, Ag, electron irradiation of GaSb, GaAs, proton and alpha irradiation of Ni at elevated temperatures

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

39. "Electronic and Structural Properties of Metals and Semiconductors in the Liquid State" $ 60,000 01-02
E. W. Collings, J. E. Enderby
Hall effect, magnetic susceptibility, thermoelectricity, Mg-Bi, Ca, Sr, Ba

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

40. "Superconductivity" (Stronger) $300,000 01-02
M. Garber, D. Schweitzer,
O. F. Kammerer, R. Thompson
fundamental properties of superconductors, irreversible properties, ultrathin films, transition metal films, low temperature spin ordering of solid He-3, high field-low loss superconductors, LEED, tunneling measurements

41. "Liquid Metals" $175,000 01-02
P. Adams, J. Dickey, S. Epstein
measurements of solubilities, densities, surface tension, electrical resistivities, thermoelectric power, mass transport, electromigration, neutron diffraction, theory, computer studies of atom motions

42. "Relationship Between Properties and Structure" $ -0- 01-02
J. Galligan, P. Soo, T. Oku, M. Suenaga
program to start in FY 70, radiation damage, plastic deformation, grain boundary behavior

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

43. "Spin Waves and Critical Scattering" $290,000 02-02
M. F. Collins, V. J. Minkiewicz,
R. Nathans, L. Passell, G. Shirane,
E. J. Samuelson, M. T. Hutchings
inelastic scattering of neutrons by Fe and Ni, energy dispersion relation for spin waves in antiferromagnetic Cr_2O_3

44. "Lattice Dynamics and Phase Transitions" $435,000 02-02
G. Shirane, Y. Yamada, V. J. Minkiewicz,
J. D. Axe, K. A. Muller, H. Meister,
J. Skalyo, Jr., B. C. Frazer
neutron scattering studies of phase transitions in $SrTiO_3$, $KMnF_3$, $LaAlO_3$

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

45. "Dynamical Scattering of Neutrons" $145,000 02-02
C. G. Shull
scattering of neutrons from perfect Si single crystals, atomic scattering amplitude of Si for neutrons, dimensions on neutron wave packet, single slit diffraction of slow neutrons

46. "Spin Density and Magnetic Structures" $145,000 02-02
B. C. Frazer, D. E. Cox, K. H. Beckurts
R. Nathans, R. E. Newnham, R. P. Santoro,
M. G. Miksic, M. D. Miller
polarized neutron beam scattering studies, solid O_2, magnetic structure in Cr_2BeO_4, Fe_2TiO_5

47. "Cold Neutron Moderator Program" $ 97,000 02-02
L. Passell
hydrogen moderator to be installed in H-9 beam port of HFBR

48. "Materials Synthesis and Crystal Growth" $145,000 02-02
D. E. Cox, J. Hurst, R. Graeser,
C. Klamut, F. F. Y. Wang, F. Merkert
Ge single crystals for neutron monochromators, specimen preparation, Pt-Fe, Au-V, $RbFeF_3$, magnetic measurement techniques

49. "Theory" $128,000 02-02
M. Blume, M. F. Thorpe, J. Sokoloff,
H. J. Lee, R. E. Watson, G. H. Vineyard,
A. J. Freeman, H. Ehrenreich
theory of the Mossbauer Effect, ferromagnetism, ferroelectricity, inelastic neutron scattering, granular superconductors, computer calculations for the classical Heisenberg ferromagnet, magnetic polarization of conduction bands by local moments, energy band theory of FCC transition metals

50. "Organic Crystals" $140,000 02-03
R. Arndt, W. Whitten, A. Damask, A. Korn
gamma-ray damage in anthracene, phenanthrene, napthalene, Hall mobility, dielectric measurements, neutron scattering

51. "Ionic Crystals" $175,000 02-03
P. W. Levy, W. Brandt, H. F. Waung,
P. Mattern, J. A. Rivas, P. D. Esser,
A. Lemos, P. J. Herley
alkali halides, positron annihilation, $NaBrO_3$, $NaClO_3$, optical absorption, luminescence, Tl doped KCl, ammonium perchlorate

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

52. "Diffraction Studies" $105,000 02-03
D. Keating, A. Goland, D. North
computer program for diffuse scattering and Bragg scattering from a HCP structure containing interstitial dislocation loops, clustering in liquid Cu-Ni using neutron scattering

53. "Alloy Studies" $ 70,000 02-03
G. J. Dienes, H. Herman, A. Damask
short range ordering in alpha brass during cyclic deformation, resistivity

54. "Superconductivity in Thin Films" $119,000 02-03
M. Strongin, J. Crow, O. Kammerer
critical temperatures of cryogenically deposited films of Al, Sn, In, Zn, Pd, critical fields of films, conductivity above T_c, quantization effects

55. "The Solid State Electron Accelerator" $210,000 02-03
A. Goland, A. Damask, H. Herman, M. Koczak, L. Snead, J. Kusmiss, R. DiNardo, P. W. Levy, P. Mattern
irradiation response of beta-brass, irradiation of Pt and positron annihilation studies, transition-radiation studies on thin films, internal friction and resistivity of irradiated W and Pt, simultaneous irradiation and optical and ESR measurements on alkali halides

56. "Theory" $ 86,000 02-03
G. J. Dienes, R. Hatcher, W. Wilson, R. Smoluchowski, P. Mattern, P. Kemmey, R. Bartram, C. R. Fischer, R. A. Johnson, D. Keating, A. Goland
defect calculations in ionic crystals, clustering and annealing of vacancies in metals, scattering of x-rays by crystal defects

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Idaho Falls, Idaho 83401
Phone: Area Code 208 526-2491

-02-

57. "High Pressure Neutron Diffraction" $155,000 02-02
R. M. Brugger, W. R. Myers, T. G. Worlton, R. E. Schmunk, R. B. Bennion, D. L. Decker, D. B. McWhan
neutron scattering studies of materials at pressures up to 100 Kb, time-of-flight technique, Bi, MnAs, Ce, EuS

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

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

58. "Mechanisms of Solid State Transformations" $ 35,000 01-02
C. J. Altstetter
phase transformations, Co-Ni, kinetics and morphology of nitride precipitation in Nb, solubilities and thermodynamics of N and O in V

59. "Electronic Structure of Transition Metal Alloys" $ 49,000 01-02
P. A. Beck
magnetic clustering in Ni-Cu, temperature dependence of resistivity in Cr-Al, magnetism in Au-V, Pt-Cr, Pd-Cr, ferromagnetic to paramagnetic transition in Re-Co, magnetic susceptibility, electron specific heat

60. "Point Defect-Dislocation Interactions" $ 72,000 01-02
H. K. Birnbaum
Nb, Mo, internal friction and microcreep at cryogenic temperatures, H diffusion in Nb, divacancy behavior in Au, diffusion along dislocations

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

61. "Mechanical and Surface Behavior of Crystals" $ 36,000 01-02
J. J. Gilman
not to be continued in FY 70

62. "First Order Phase Transformations in Solids" $ 44,000 01-02
D. S. Lieberman
orientation relationships in AuCu-I transformation, geometric relations and order of transformation in NbRu, RuTa, $NiCr_2O_4$ and $BaTiO_3$ ferroelectric transformation

63. "Dislocations and Surface Barriers" $ 64,000 01-02
M. Metzger
dislocation distributions under coated Cu crystals, coated Zn, microstrain and etch pit studies of deformed Cu, Cu with W fibers, mechanical properties

64. "Decomposition of Unstable Solid Solutions" $ 1,000 01-02
J. Morral
project to increase in FY 70, theoretical studies of precipitation and ordering in multicomponent solid solutions, decomposition of kinetics of unstable ternary solutions, spinodal decomposition

65. "Annealing of Cold-Worked Metals" $ 28,000 01-02
B. G. Ricketts
annealing texture in high purity Al as a function of rolling deformation, Al with intermetallic particles in system Cu-Al, Al with Fe impurities, nucleation of recrystallization

66. "Nuclear Magnetic Resonance Studies" $ 84,000 01-02
T. J. Rowland
V_3Si and V_3Ga under pressure, rate of solute diffusion and vacancy generation in Al alloys, precipitation in age hardening alloys of Cu and Be, Cu bombarded with alpha particles, Pt alloys

67. "Solid State Phase Transformations" $112,000 01-02
C. M. Wayman
martensite transformations, epitaxial growth of vacuum evaporated metals on various substrates, crystallography of martensite in beta phase Au-Cd, growth of Au films on graphite, Co films on NaCl, thermoelectric power of Au-Ni thin film thermocouples, superplastic deformation of Cd-Zn

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

68. "Study of the Nature of Solid Solutions of Metals" $ 53,000 01-02
C. A. Wert
Mossbauer study of martensite decomposition, chemistry and morphology of higher carbides of V, nitrides of Ta, Nb, internal friction, electron microprobe

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

69. "Use of Very High Pressure to Investigate the Structure of Matter" $116,000 02-02
H. G. Drickamer
Mossbauer resonance and optical absorption studies on Fe compounds to 200 Kb, irreversible processes in organic crystals at 350 Kb, nature of electron transfer processes

70. "Anharmonic Effects in Solids" $107,000 02-02
A. V. Granato
equation of state of solids, interatomic potentials, anharmonic effects, defect properties, second and third order elastic constants, alkali metals, LiF, BaF_2, CoO, Mg, CdS, NaCl, Al

71. "Defect and Electronic Properties of Solids" $122,000 02-02
D. Lazarus
effects of pressure on defect formation and motion in solids, thermal conductivity in solid He, ferromagnetism, Fermi surface, annealing of quenched vacancies in Au, ionic conductivity at high temperatures and pressures in alkali halides

72. "Properties of Noble Gas Crystals" $124,000 02-02
R. O. Simmons
theories of lattice dynamics and atomic interactions in condensed state, thermal properties of A, Kr, Xe, temperature dependence of thermal defect content of Ne, BCC ^{3}He, single crystal elastic constants of Kr, laser light scattering techniques

73. "Nuclear Magnetic Resonance in Solids" $148,000 02-02
C. P. Slichter
magnetic state of Fe in Cu, second order phase transitions, Gd, NH_4Cl, order-disorder transitions

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

74. "Physics of Refractory Materials" $106,000 02-02
W. S. Williams
low temperature thermal conductivity of UN and transition metal carbides, electromigration in TiC, resistivity and Hall coefficient of WC, piezoelectric properties of natural bone, dislocation velocities in doped Si, carbon fibers, plastic flow in glassy semiconductors

75. "Energetic Particle Interaction" $195,000 02-03
J. S. Koehler
anomalous x-ray transmission, electron microscopy, channeling, Ag, Cu, behavior of interstitials in Ge and Si, geometrical structure of interstitials in electron irradiated crystals, charge state of interstitials

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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

76. "Kinetics of Dislocation Dynamics" $110,000 01-01
J. E. Dorn
theory and experiment, strain rates from 10^{-7}/sec (creep) to 10^{5}/sec (high velocity impact), high temperature creep, Al, solute atom interactions with dislocations, low temperature behavior in BCC metals, Mo, Mo-Re, AgMg, effect of stacking fault energy on dynamic behavior in FCC metals

77. "Fundamental Aspects of Strength and Toughness" $100,000 01-01
E. R. Parker
fracture toughness, ferrous, non-ferrous, polymeric, composite materials, Ti-Al shock deformation, cleavage fracture of W single crystals, Al-Zn, acoustic emission, electron fractography, scanning electron microscopy

78. "Relation Between Microstructure and Properties of Alloys: Electron Microscopy" $180,000 01-01
G. Thomas
electron microscopy and field ion microscopy, 650 kV electron microscope, steels, spinodal transformations, ordering and embrittlement in refractory alloys, non-metallic alloys, application of velocity analysis to composition variations in alloys, Fe-Ni-Cu, Ta-C, Fe-Al, biological specimens

79. "Ceramic Microstructure, Glass and Ceramic Metal Systems" $125,000 01-01
J. A. Pask
diffusion, high temperature reactions, mechanical behavior, ceramic-metal interfaces, NiO-MgO, Al-Al_2O_3, MgO, control of microstructure, conductivity of glasses

LAWRENCE RADIATION LABORATORY
Inorganic Materials Research Division (continued)

80. "Crystal Imperfections" $110,000 01-01
J. Washburn
dislocation climb in Au, yielding in Cu, vacancy clustering in quenched Al, glide velocity of dislocations in Si, field ion microscopy, vacancy clustering in Ni, slip band formation and work hardening in Cu

81. "Relation of Microstructure to Properties of Ceramics" $115,000 01-01
R. M. Fulrath
sintering of lead zirconate titanate ferroelectric ceramics, dispersion strengthened glass, He and H permeation through fused silica, electrical and magnetic properties

650

82. "High Strength Materials" $190,000 01-01
V. F. Zackay
processing and alloy design, steels, Al alloys, Ti alloys, corrosion behavior, welding characteristics, TRIP steel behavior, H embrittlement, strain induced martensite in Fe-Cr-Ni-Mo alloys, low cycle fatigue, fatigue crack propagation, carbide precipitation on stacking faults, dislocation mobility in TRIP steel using acoustic emission

275

83. "High-Field Superconductivity" $145,000 01-02
L. Brewer, E. R. Parker, V. F. Zackay
high field, high current densities, new methods for fabrication, Nb-Zr, Nb_3Sn, NbC, Nb, $Nb_3(AlGe)$ with V and Ta, metastable materials prepared by condensation in vacuum

84. "High Temperature Reactions" $115,000 01-02
A. W. Searcy
kinetics of vaporization and solid-gas reactions, mass spectrometer, Cr, P, Zn, S, Se, Te

85. "Thermodynamics of Metal Systems" $115,000 01-02
R. Hultgren
heats of formation, liquid metal solution calorimeter, low temperature heat capacities, high temperature heat contents, chemical potentials from vapor pressure measurements, compilation and critical evaluation of thermodynamic data, In-Pb, Au, Cu, AuCu

LAWRENCE RADIATION LABORATORY
Inorganic Materials Research Division (continued)

86. "Superconductivity in Alloy Systems" $ 25,000 02-02
M. Merriam, R. Hammond
apply superconducting transition temperature measurements to understanding electronic structure of alloys, Pb-Tl, Pb-In

87. "Theoretical Solid State Physics" $ 90,000 02-02
M. L. Cohen
electronic structure of solids, empirical pseudopotential method, very low temperature experimental program, calculation of superconducting transition temperatures, Mg, Fermi surface of In, Sb

88. "Magnetic Properties of Solids" $ 35,000 02-02
A. M. Portis
EPR, NMR, localized magnetic moments, $KMnF_3$, antiferromagnetic resonance in $CsMnF_3$, $KMnF_3$, $RbMnF_3$, spin wave resonance in Ni and permalloy films, nuclear relaxation of Cu in Ni, electron resonance in Ni-Rh, nuclear spin diffusion in Co

89. "Far Infrared Properties of Solids" $115,000 02-02
P. Richards
far infrared radiation 2-500 cm^{-1} used to study solids, Josephson junction interactions with far infrared radiation, c.w. far infrared laser, tunable far infrared radiation source

90. "Experimental Solid State Physics and Quantum Electronics" $108,000 02-02
Y. R. Shen
optical properties of materials, Raman scattering, iodine complexes in solution, dynamics of self-focusing of a laser beam in liquids

91. "Research in Superconductivity" $ 90,000 02-02
G. I. Rochlin
ac and dc Josephson effects, zero bias anomaly, gapless superconductivity, properties of superconductor-metal-superconductor sandwiches, flux jumping in Type II superconductors, Pb-In, Pb-Cu-Pb sandwiches, tunneling in single crystal Cr, phase transition in CO_2

92. "Nuclear Spin Interaction" $ 20,000 02-02
E. L. Hahn
nuclear quadrupole moment interaction of nuclei with electric field gradients, nuclear magnetic moment interaction with applied magnetic field, KH_2PO_4, NMR studies of superconducting surface state in Al, electron cyclotron echoes in Cs vapor

LAWRENCE RADIATION LABORATORY
Inorganic Materials Research Division (continued)

93. "Research on Superconducting Junctions and Devices" $ -0- 02-02
J. Clarke
program to start in FY 70, weak-link and tunneling phenomena, Pb-Cu-Pb, nature of steps induced on the junction characteristic by the application of rf radiation, superconducting galvanometer, tunneling through semimetals, and semiconductors

MOUND LABORATORY
Monsanto Research Corporation
Miamisburg, Ohio 45342
L. J. Wittenberg - Phone: Area Code 513 866-7444 x3173

94. "Liquid Transuranium Metals Research" $100,000 01-01
L. J. Wittenberg, C. R. Hudgens, G. A. Vaughn
properties of liquid Pu and Np, thermal diffusivity of Pu up to 925°C, density, heats of transformation of Np, viscosity of liquid Np, x-ray diffraction of liquid Pu

NATIONAL BUREAU OF STANDARDS
Washington, D. C. 20234
Phone: 362-4040

95. "Constitution of Binary Alloys" $ 28,000 01-02

project funded through NSRDC of NBS and work done at IITRI, survey and compilation of all available data on binary systems

96. "High Temperature Crystal Growth Techniques" $ 63,000 02-01
W. S. Brower
growth of $KTaO_3$ from solution, zone melting of Cu_2O, zone refining of Mn ferrite, crystal characterization using X-ray topography

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
B. S. Borie - Phone: 483-6764
C. J. McHargue - Phone: 483-1278

97. "Fundamental Ceramics Research" $ 79,000 01-01
W. Fulkerson
support of a coordinated program on UN electronic band structure, thermal conductivity, electrical resistivity, Seebeck coefficient, self diffusion, creep, neutron diffraction, ESR, NMR, single crystal growth

98. "Physical Property Research" $182,000 01-01
D. L. McElroy, J. P. Moore,
R. K. Williams, T. G. Kollie
thermal conductivity, electrical resistivity, thermopower, specific heat, 77 to 2600 K, W, Cr, Mo, Ni_3Fe, UN, ThO_2, UO_2, Cu, ThN-UN, LiF

99. "Metallurgy of Superconducting Materials" $119,000 01-01
G. R. Love, C. C. Koch
Nb alloys, Tc alloys, effect of metallurgical structure on superconducting properties, critical current, ac and dc magnetization, phase diagrams, reaction kinetics and morphology, Gd and Y additions to Nb, flux pinning, precipitation kinetics of omega in Ti-Nb, performance of materials in high frequency cavity oscillator applications

100. "Direct Observation of Lattice Defects" $119,000 01-01
J. O. Stiegler, K. Farrell,
A. Wolfenden, B. T. M. Loh
observations and studies of defects in metals including voids, bubbles, and cavities using electron microscopy, gas bubble distributions in CVD tungsten, voids and neutron damage in Al, role of H and He on void formation

101. "Physical Ceramics Studies" $ 79,000 01-01
C. S. Morgan, C. S. Yust
plastic deformation of single crystal UO_2, sintering of ThO_2, diffusion of Th in ThO_2, measurement of electrostatic charge on dislocations in UO_2, creep of UN

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

102. "Deformation of Crystalline Solids" $119,000 01-01
R. O. Williams, R. W. Carpenter,
M. H. Yoo
development of texture, twinning, dislocation mechanics, precipitation, stored energy during deformation, structure of solid solutions, Re, Nb-Hf, Ta-Hf

103. "Deformation and Annealing Studies" $ 79,000 01-01
R. A. Vandermeer, J. C. Ogle,
P. V. Guthrie, W. J. Hulsey
annealing of defects, nature of nucleation sites for recrystallization, mobility of grain boundaries, Nb, Cu_3Au, Be, U alloys, Nb-V alloys, Al

104. "Reactions at Metal Surfaces" $158,000 01-01
J. V. Cathcart, R. E. Pawel
role of stress on oxidation, Nb, Ta, Auger and photoectron spectroscopy, electron bombardment induced desorption, LEED, oxidation of U-Nb, U-Zr, W diffusion, X-ray diffraction of thin oxide films

105. "Fundamental Research in X-Ray Diffraction" $119,000 01-02
H. L. Yakel, L. A. Harris,
C. J. Sparks, R. W. Hendricks
highly oriented graphite, small angle X-ray scattering, Ti-Nb, crystal structure, thermal diffuse X-ray scattering

106. "Theoretical Research" $135,000 01-02
J. S. Faulkner, H. W. Joy
numerical calculations of electronic band structures for pure metals and ordered compounds, magnetism, Cu, Au, UN, Ca, entropy of UO_2 and PuO_2

107. "Electronic Properties of Metals and Alloys" $120,000 01-02
J. O. Betterton, Jr., G. Czjzek
low temperature specific heat and galvanomagnetic properties, Zr, La, Re, not to be continued in FY 70

108. "Diffusion in Solids" $198,000 01-02
T. S. Lundy
Nb, Ta and W diffusion in W, cation diffusion in UO_2, UN, effects of high pressure and temperature gradients, Nb, concentration gradients in sintering process

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

109. "Spectroscopy of Ionic Media" $198,000 01-02
G. P. Smith, C. R. Boston, J. Brynestad
liquid and solid salts, optical spectroscopy, oxidation states of Te, quantitative optical spectroscopy of molten fluorides, coordination of Ni in binary melts, Ti-chloroaluminate crystals

110. "Mössbauer Studies" $ -0- 01-02
G. Czjzek
to begin in FY 1970, electronic structure of alloys and radiation damage, hyperfine fields and isomer shifts of Ni in Ni-Cu, Ni-Fe and Ni-Co alloys, neutron-capture Mössbauer experiments

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

111. "Research and Development on Pure Materials" $700,000 02-01
J. W. Cleland, C. T. Butler, G. W. Clark, R. E. Reed, R. D. Westbrook
growth of single crystals, purification and characterization of research materials, Research Materials Information Center, KCl, MgO, biological single crystal materials, Ge, Nb, V, Tb, Ho, UO_2, UO_2-ThO_2, UO_2-W, NpO_2, magnetic ferrites

112. "X-Ray Diffraction" $ 90,000 02-02
F. W. Young, Jr., T. O. Baldwin
investigation of defects in crystals by X-ray diffraction techniques, anomalous X-ray transmission topography and measurement of diffraction intensities, as grown, plastically deformed, irradiated single crystals, Si, Ge, Cu

113. "Superconductivity" $115,000 02-02
S. T. Sekula, R. H. Kernohan
flux pinning in Nb from neutron irradiation, ac properties of irradiated Nb, Nb-Zr, V, Nb-Mo, in-pile low temperature magnetic measurements

114. "Spin Resonance" $110,000 02-02
M. M. Abraham, J. L. Kolopus
ESR used to study impurities and radiation induced defects in crystals, BaS, MgO, MgF_2, $SrCl_2$, $ZrSiO_4$, $HfSiO_4$, $ThSiO_4$, ThO_2

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

115. "Neutron Spectrometry" $365,000 02-02
M. K. Wilkinson, H. G. Smith,
R. M. Nicklow, H. A. Mook
neutron scattering studies utilizing neutron beams at ORR and HFIR, 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, Ga, Tb, Gd, Ho, Li, In, alpha Sn, TiO_2, NH_4Cl, Ni

116. "Neutron Diffraction" $370,000 02-02
W. C. Koehler, J. W. Cable,
R. M. Moon, E. O. Wollan
neutron diffraction at ORR and HFIR, magnetic structure, paramagnetic scattering, form factor determinations, nuclear polarization, magnetic short range order, spin wave scattering, intra-rare earth alloys, USb, Ni-Cu, Ni-Pd, Co, Ce-Y, VF_2

117. "Defect Structures in Nonmetals" $322,000 02-02
W. A. Sibley, E. Sonder, Y. Chen
impurity and radiation effects on alkali halides, alkaline earth fluorides and oxides, optical absorption and luminescence, ESR, electrical measurements, stress-strain tests, MgO, MgF_2, ZnO, KCl, MnF_2, $KMnF_3$, ZnF_2

118. "Low Temperature Physics" $ 74,000 02-02
W. T. Berg, D. Walton
low temperature thermal conductivity, adiabatic calorimetry, investigation of crystalline defects, LiI, AgCl, $CuK_2Cl_4 \cdot 2H_2O$, KCl, $MnCl_2 \cdot 4H_2O$, YIG, Li ferrite, Cu

119. "Irradiation Effects in Thin Films and Foils" $118,000 02-03
T. S. Noggle, J. C. Crump
direct observation of irradiated thin foils and bulk samples by means of electron microscopy, defect clusters in Cu irradiated with neutrons at temperatures from liquid He to elevated, evaporated films of Au, Cd, Zn, in situ electron irradiation of graphite and Al

120. "Fundamental Studies of Elasticity and Anelasticity of Metals" $135,000 02-03
V. K. Pare
anelasticity measurements used to study radiation defect diffusion and annealing, dislocation pinning in irradiated Cu, third order elastic constants, sound velocity measurements

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

121. "Theory and Computations" $355,000 02-03
D. K. Holmes, R. F. Wood, M. T. Robinson
radiation damage, channeling, annealing of damage, electronic structure of solids, lattice dynamics, magnetism, spin waves in ferromagnets, numerical simulation of radiation damage cascades, shape of optical absorption bands due to point defects

122. "Surface Studies on Metals" $220,000 02-03
F. W. Young, Jr., L. H. Jenkins
effects of neutron irradiation on chemical reactivity of metal surfaces, growth and characterization of single crystals, dislocation generation, electrochemical techniques, Cu, computer simulated studies of crystal growth, electrodeposition on highly perfect substrates, LEED

123. "Ion Bombardment" $ 70,000 02-03
B. R. Appleton
channeling used to study radiation damage and ion-atom interactions, Au, ZnO

124. "Radiation Effects at Low Temperatures" $360,000 02-03
R. R. Coltman, Jr., C. E. Klabunde,
J. K. Redman, A. L. Southern
thermal neutron damage introduced at liquid He temperature, Cd, annealing studies, recovery of thermal and fast neutron damage at room temperature, Cu, Au, Ni, Pt, Re, Mo, U-235 in Al, effect of radiation on magnetoresistance and superconductivity

Sheely 3127

PACIFIC NORTHWEST LABORATORY
Box 999
Richland, Washington 99352
Phone: Area Code 509 942-1111 27279

125. "Transuranium Physical Metallurgy Research" $212,000 01-01
R. D. Nelson, S. D. Dahlgren, F. E. Bowman, D. Merz

Pu, phase transformation kinetics, deformation of Pu allotropes, properties of thin film sputter deposits superplastic behavior of beta Pu, recrystallization, fine-grained alpha Pu, crystallography of alpha-beta transformation, Np metallurgy

126. "Radiation Effects on Metals" $202,000 01-03
T. K. Bierlein, J. L. Brimhall, G. L. Kulcinski, H. E. Kissinger, B. Mastel WARD — HANFORD

neutron damage to metals irradiated at elevated temperatures, single and polycrystalline Mo, Re, Ni, effect of irradiation parameters on defect microstructure, void formation, effects of grain boundaries and doping of Mo with C and Fe, annealing of irradiated metals at high pressure, deformation studies

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

127. "Neutron Diffraction" $185,000 02-02
M. I. Kay, R. Kleinberg

magnetic structure of inorganic salts, $CoBr_2 \cdot 6H_2O$, $NiCl_2 \cdot 2D_2O$, alum sulfate, phenanthrene, NaH_3SeO_3, $NaNO_2$

128. "Study of Radiation Damage in Organic Crystals Using Electrical Conductivity and Optical Properties" $ 53,000 02-03
A. Cobas

anthracene, phenanthrene, ESR of gamma irradiated specimens, annealing studies

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

129. "Impurity Diffusion in Solids" $72,900 02-02
C. T. Tomizuka - Department of Physics
solid state diffusion at high pressures up to 10 Kb, self diffusion and impurity diffusion in metals, semimetals, ionic crystals and covalent crystals, self diffusion in Na by NMR, defects in ionic crystals by Mössbauer effect, Ag-Au, Ag, Cu, Au, Zn, AgCl

130. "High Temperature Anneals of Defects Quenched in Metals" $24,785 02-02
R. M. Emrick - Department of Physics
formation and motional energy of vacancies, quench-and-anneal studies, self diffusion, Mössbauer spectroscopy, Au, Al

BOSTON UNIVERSITY

131. "Coincidence - Mössbauer Studies of Solid State Phenomena" $34,321 02-02
G. R. Hoy - Department of Physics
coincidence-Mössbauer techniques used to study environment at the locations of decaying nuclei, ionic spin fluctuations, charge redistributions

BRANDEIS UNIVERSITY

132. "Experimental Studies of Critical Point Behavior in Magnetically Ordered Solids Using Nuclear Gamma-ray Spectroscopy and Related Experiments" $31,680 02-02
C. Hohenemser - Department of Physics
time dependent perturbed angular correlation studies in magnetically ordered systems, impurity atom magnetic coupling

133. "Low Temperature Properties of Solid Helium" $34,760 02-02
H. D. Cohen - Department of Physics
magnetic susceptibility of solid ^{3}He and ^{3}He-^{4}He mixtures, nuclear resonance and magnetometer techniques, specific heat measurements in vicinity of phase separation critical point

BRIGHAM YOUNG UNIVERSITY

134. "Thermodynamic Investigation of Alkali Metal Mixtures" $43,976 01-02
J. B. Ott and J. R. Goates - Dept. of Chemistry
thermodynamic properties of mixtures of Na, K, Rb and Cs, solid-liquid phase equilibria, heat of mixing calorimetry

BROOKLYN, POLYTECHNIC INSTITUTE OF

135. "Study of Binary Multiphase Diffusion in Metallic Systems" $23,933 01-02
L. S. Castleman - Department of Physical and Engineering Metallurgy
mechanism of non-planar phase interface growth, Al-Sb, In-Sb, nucleation and growth of intermetallic compounds, X-ray techniques

BROWN UNIVERSITY

136. "Radiation Damage Studies in Solids Using Magnetic Resonance Techniques" $31,879 02-03
P. J. Bray - Department of Physics
ESR and NMR of irradiated glasses and glasses doped with paramagnetic ions, alkali borate materials, niobate, titanate, and germanate glasses

137. "A Combined Macroscopic and Microscopic Approach to the Mechanical Properties of Metals" $106,972 01-01
J. Gurland - Division of Engineering
fracture strength and ductility transitions in carbon steels, embrittling parameters associated with the microstructure of multiphase alloys, strain and stress fields associated with a crack tip, interaction and coalescence of voids under triaxial stress

CALIFORNIA INSTITUTE OF TECHNOLOGY

138. "Studies of Alloy Structure and Properties" $235,020 01-02
P. Duwez - Department of Materials Science
structure and properties of metastable alloys obtained by rapid quenching from the liquid state, electrical and thermal conductivity, Hall coefficient, magnetoresistance, magnetic properties, superconductivity, thermoelectric power, Mössbauer spectroscopy, Pd-Si, Fe-P-C, Te alloys, amorphous-crystalline transformation kinetics

CALIFORNIA INSTITUTE OF TECHNOLOGY (continued)

139. "Dislocation Mobility and Density in Metallic Crystals" — $ 75,000 — 01-01
D. S. Wood and T. Vreeland, Jr. - Dept. of Materials Science
dislocation velocities, electron-dislocation interaction, effect of stress, temperature and crystal orientation, Fe, Cu, Zn, Mo, Nb

CALIFORNIA, UNIVERSITY OF

140. "The Effect of Controlled Variations of Particle Size Distributions on the Mechanical Properties of Precipitation-Hardened Nickel-Based γ/γ' Alloys" — $ 37,000 — 01-01
A. J. Ardell - Department of Engineering, Los Angeles
study of unimodal and bimodal particle size distributions on strength, Ni-Al alloys, dislocation structure, transmission electron microscopy, thermal stability of precipitation structures

141. "Electroabsorption Studies in Semiconductors" — $ 16,729 — 02-02
M. Chester - Dept. of Physics, Los Angeles
electric field effect on optical absorption in HgI_2

142. "Electric and Magnetic Properties of Transition Metals and Their Compounds" — $ 62,810 — 02-02
A. W. Lawson - Dept. of Physics, Riverside
line width and spin wave relaxation in EuS, antiferromagnetic resonance in EuTe, TbP, TbAs, TbSb, pressure dependence of the paramagnetic Curie temperature in Gd, electric and magnetic properties of EuS, EuSe, EuTe, EuO

143. "New Materials by Low Temperature Condensation" — $ 85,000 — 01-01
Huey-Lin Luo - Department of Applied Electrophysics, San Diego
sputtering method for depositing superconducting materials, Nb-Al-Ge, magnetic and electrical properties of sputtered materials

CALIFORNIA, UNIVERSITY OF (continued)

144. "Research on the Properties of Materials at Very Low Temperatures" $142,869 02-02
J. C. Wheatley - Dept. of Physics, San Diego
spin diffusion in pure liquid ^{3}He, flow properties of Fermi liquids, properties of solid and liquid ^{3}He at high pressure, techniques for producing, maintaining and measuring temperatures in the millidegree range, nuclear cooling, isentropic compression of ^{3}He, dilution refrigerator

CARNEGIE-MELLON UNIVERSITY

145. "Optical and Microwave Spectroscopy of Np and Co in Scheelites and Other Crystalline Environments" $ 30,000 02-02
J. O. Artman - Department of Physics and Electrical Engineering
optical absorption and fluorescence of doped crystals, EPR, calculation of energy level parameters

146. "Application of the Mössbauer Effect to the Study of Metallic Solid Solutions" $ 27,202 01-02
P. A. Flinn - Department of Physics and Metals Research Laboratory
phase transformations, diffusion, behavior of C and N in Fe, diffusion of Fe in BCC alloys, diffusion of Fe in Ti

CASE WESTERN RESERVE UNIVERSITY

147. "Motion of Ions in Solid Helium" $ 24,470 02-02
A. J. Dahm - Department of Physics
mechanism of motion of ions in solid He in an electric gradient, pulsed electron source, time of flight technique

148. "Dislocation-Solute Atom Interactions in Alloys" $ 37,000 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 alloys by dislocation damping, interstitial hardening and softening and the effect of solute partitioning on strengthening in high purity Nb, internal friction, electron microscopy

CASE WESTERN RESERVE UNIVERSITY (continued)

149. "Kinetics of Phase Transformations in Zirconium, Hafnium and Titanium Alloys" $ 25,100 01-01
R. F. Hehemann - Dept. of Metallurgy
omega transformation in Zr, Ti and Hf base alloys, transition state in TiNi, cold stage electron microscopy

150. "Solid State Physics" $ 76,901 02-02
R. W. Hoffman - Department of Physics
Mössbauer spectra of ultra thin ^{57}Co films, stress anisotropy in Ni films and in the Pt-Si epitaxial system, equation of state, lattice dynamics in alkali halides and alkaline earth halides, solid state theory of electron scattering in alloys

CHICAGO, UNIVERSITY OF

151. "Interactions on Metallic Surfaces" $ 30,917 02-02
R. Gomer - Department of Chemistry
adsorption on single crystal metal surfaces, field emission study of adsorption of inert gases, mass-spectrometric study of desorption of O and CO from W, field ion microscopy

CLARKSON COLLEGE OF TECHNOLOGY

152. "Transport and Magnetic Phenomena in Chromium and Iron Alloys" $ 24,751 02-02
S. Arajs - Department of Physics
electrical resistivity, thermoelectric power, magnetization, thermal conductivity, Cr alloys, Fe alloys

153. "The Oxidation of Copper Films" $ 21,000 02-02
A. W. Czanderna - Dept. of Physics
mechanism of Cu oxidation, optical constants of CuO, single crystal Cu film preparation on NaCl substrates

CLEMSON UNIVERSITY

154. "Radiation Effects in Crystalline Materials" $ 43,662 02-03
R. L. Chaplin - Department of Physics
electron irradiated metal crystals, damage production and thermal annealing, irradiations at liquid He temperature, Al, Mg, Ti

COLUMBIA UNIVERSITY

155. "A Study of the Feasibility of Obtaining Field Ion Microscope Images of Interstitial Solutes" $ 34,000 01-02
E. S. Machlin - Dept. of Metallurgy
behavior of solutes in refractory transition element base solid solutions, field ion microscopy, Ta, Hf, W, Re and Os solutes

156. "Defects in Crystals" $ 47,491 01-02
A. S. Nowick - Dept. of Engineering and Applied Science
dielectric and anelastic relaxation techniques, Cu_2O, $FeGe_2$, relaxation effects due to vacancies or substitutional atoms, piezoelectric relaxation

CORNELL UNIVERSITY

157. "Studies of the Lattice Properties of High Field Superconductors and Vanadium" $ 43,138 01-02
B. W. Batterman - Department of Materials Science and Engineering
low temperature structural transformation in V_3Si and Nb_3Sn, X-ray diffraction and optical microscopy, phonon properties by thermal diffuse X-ray scattering phonon dispersion and spectrum in V

158. "Defects in Metal Crystals" $178,151 01-03
R. W. Balluffi and D. N. Seidman - Dept. of Materials Science and Eng.
radiation damage produced by keV ion bombardment, annealing kinetics of vacancy defects in quenched Au, self diffusion along dislocations in Al, dechanneling of channeled ions at dislocations, structure of high angle boundaries, field ion microscopy of Au, W, Pt

159. "Electronic Properties of Defects in Ionic Crystals" $ 34,881 02-02
D. B. Fitchen - Department of Physics
optical investigation of the dynamic behavior of color centers in alkali halides, electron-phonon interaction, Jahn-Teller effect, excited state lifetimes

CORNELL UNIVERSITY (continued)

160. "Effect of Environment on Fracture Behavior" — $ 32,407 — 01-01
H. H. Johnson - Dept. of Materials Science and Engineering
role of hydrogen in environmental cracking of high strength steels, protective role of oxygen in hydrogen-bearing gas, Fe whiskers, diffusion of hydrogen ahead of cracks

161. "A Study of the Interaction Between Magnetic Fluxoids and Crystal Defects in Type II Superconductors" — $ 33,365 — 01-02
E. J. Kramer - Dept. of Materials Science and Engineering
quantitative determination of the effect of surface roughness on the surface critical current, Nb single crystals

162. "Theoretical Phonon Physics" — $ 74,496 — 02-02
J. A. Krumhansl and P. Carruthers - Laboratory of Atomic and Solid State Physics
phonons in highly anharmonic and quantum crystals, vibrations of disordered systems, transport involving phonons, soft modes and dynamics in phase changes

163. "Experimental Phonon Physics" — $141,310 — 02-02
J. A. Krumhansl, R. O. Pohl, A. J. Sievers - Laboratory of Atomic and Solid State Physics
lattice vibrations in pure dielectric solids and in solids containing controlled amounts of impurities, optical absorption in superconductors, interatomic forces in solids, far infrared and microwave absorption, low temperature heat conduction and specific heat

164. "Theory of Slow Neutron Inelastic Scattering by Liquids" — $ 39,380 — 02-02
M. Nelkin - Dept. of Applied Physics
density-density correlation function in liquids, nature of atomic motion in liquids, structure and forces in liquids and dense gases

CORNELL UNIVERSITY (continued)

165. "Elastic and Plastic Deformation of Solids" $122,700 01-01
A. L. Ruoff - Dept. of Materials Science and Engineering
elastic constants, pressure derivatives of elastic constants, shock-equation of state, Na, Li halides, Rb halides, Cu, Ag, Au, K, NMR used to study diffusion in Al, creep as a function of pressure

166. "A Study of Imperfections in Crystals" $ 64,685 02-02
H. S. Sack - Dept. of Applied Physics
study of impurities (Li^+, CN^-, F^-, NO_2^-) in alkali halides, dielectric and anelastic measurements at very low temperatures, internal friction in single crystals of Al

167. "Hard Superconducting Materials" $ 96,000 01-02
J. Silcox and W. W. Webb - Dept. of Applied Physics
critical current density, magnetic hysteresis, instabilities of hard superconductors in high magnetic fields, surface currents, flux creep, quantum effects associated with weak superconducting links

168. "Solid State Physics: Magnetic Phenomena" $127,000 02-02
R. H. Silsbee and R. Bowers - Department of Physics
influence of transition element ions and rare earth ions upon the conduction spin resonance in metals, electron spin resonance and paraelectric resonance of defects in crystals, electron transport properties of metals in magnetic fields, direct electromagnetic excitation of sound waves in metals, ac losses and flux motion in superconductors

169. "Radiation Damage Studies Using the Cornell 3.0 MeV Dynamitron Accelerator" $ 41,364 02-03
A. Taylor - Dept. of Materials Science and Engineering
annihilation kinetics of lattice and electronic defects in alkali halides, conductivity, thermoluminescence, optical absorption

DELAWARE, UNIVERSITY OF

170. "Radiation-Induced Defects in Alkali Halides, and Their Role in Recombination Processes" $ 35,315 02-03
R. B. Murray - Dept. of Physics
radiation induced point defects in alkali halides, KCl, LiF, NaI, NaCl

FLORIDA, UNIVERSITY OF

171. "Deformation Processes in Hexagonal Metals" $ 29,125 01-01
R. E. Reed-Hill - Dept. of Metallurgical and Materials Engineering
flow stress in HCP metals, Ti, Zr, dynamic strain aging, electron microscopy

FRANKLIN INSTITUTE

172. "Studies of Crystal Perfection--Tantalum Silicide and Beryllium" $ 66,150 01-01
J. D. Meakin, G. J. London and V. V. Damiano - Dept. of Materials Science and Engineering
field ion microscopy of TaC and Ta_2Si, growth of large Be crystals for use as neutron monochromators

GEORGETOWN UNIVERSITY

173. "The Study of Very Pure Metals at Low Temperatures" $ 50,758 02-02
W. D. Gregory - Dept. of Physics
effect of boundary scattering on properties of superconductors, superconducting tunneling properties of Ga, superconducting phase transition

GEORGIA INSTITUTE OF TECHNOLOGY

174. "A Study of the Structure and Mechanical Properties of Ordered Alloys" $ 35,000 01-01
B. G. LeFevre and E. A. Starke - Dept. of Chemical Engineering
order parameters in Ni-Si alloys, Ni_3Si, mechanical property studies, transmission electron microscopy

GEORGIA INSTITUTE OF TECHNOLOGY (continued)

175. "Surface Properties of Magnetic Materials" $ 57,570 02-02
E. J. Scheibner - Engineering Experiment Station
LEED scattering mechanisms, W, Cu, Ni, graphite, Si, Ge

176. "Magnetic Phenomena at Metal Surfaces" $ 45,000 01-02
S. Spooner - Dept. of Chemical Engineering
structure and magnetic phenomena at surfaces using neutron scattering, Co and Fe films, magnetic field effects

ILLINOIS INSTITUTE OF TECHNOLOGY

177. "Effects of Combined Stress on the Fracture and Fatigue of Brittle Ceramic Materials" $ 34,000 01-01
L. J. Broutman - Dept. of Mechanics
to determine the failure envelope for alumina, isotropic graphite and silicate glass when subjected to combined states of stress, cylindrical specimens subjected to various combinations of internal and external hydrostatic pressure

178. "Thermal Measurements on Solids Below 1°K" $ 49,000 02-02
H. Weinstock - Dept. of Physics
low temperature thermal conductivity and specific heat measurements to study localized defects produced by radiation, alkali halides, MgO

JOHNS HOPKINS UNIVERSITY

179. "Phonon Imprisonment Studies" $ 13,449 02-02
P. E. Wagner - Department of Electrical Engineering
study of phonon avalanche, detection of avalanche phonons by reabsorption in a second paramagnetic species, detection by Brillouin scattering

KANSAS, UNIVERSITY OF

180. "Experimental and Theoretical Studies of Magnetic Resonance and Relaxation" $ 31,150 02-02
P. M. Richards - Dept. of Physics and Astronomy
nuclear and electronic spin waves in $RbMnF_3$, measurement of spin lattice relaxation and line width in concentrated paramagnetic salts

KENTUCKY, UNIVERSITY OF

181. "Radiation Effects on Germanium" $ 32,570 02-03
B. R. Gossick - Dept. of Physics and Astronomy
charge carrier transport properties of n-type Ge bombarded with fast neutrons, charge carrier ambipolar mobility

LEHIGH UNIVERSITY

182. "Analysis of Flow and Fracture of Composite Materials During Gross Plastic Deformation" $ 35,000 01-01
B. Avitzur - Dept. of Metallurgy and Materials Science
deformation patterns of spherical inclusions in a matrix, void formation around inclusions, effects of geometry, strength ratio of inclusion to matrix and environmental pressure

183. "Strength and Structure in Cyclically Transformed Fe-Ni-C Alloys" $ 13,816 01-01
G. Krauss, Jr. - Dept. of Metallurgy and Materials Science
cyclic transformation in steels to produce different microstructures of carbide distribution, transmission electron microscopy, mechanical property measurements

LOUISIANA STATE UNIVERSITY

184. "Conductivity Tensors in Metals and Semiconductors" $ 75,476 02-02
J. M. Reynolds - Dept. of Physics and Astronomy
magnetoresistance, Hall effect, thermoelectric measurements, measurements made as a function of crystallographic orientation, electrical, thermal and thermoelectric tensors will be constructed, magneto-acoustic resonance, NMR, ESR, cyclotron resonance, Sb, Sn, Tl, Cd, Zn, Hg, Nb

MARQUETTE UNIVERSITY

185. "Defect Structures in Nonstoichiometric Oxides" $ 31,189 01-02
R. N. Blumenthal - Department of Mechanical Engineering
defect structure and transport properties in nonstoichiometric CeO_2, electrical conductivity, Hall mobility, ionic transference, thermogravimetric weight measurements, measurements up to 1500°C

MARYLAND, UNIVERSITY OF

186. "Conduction Electrons and Magnetism" $ 29,139 02-02
J. R. Anderson and S. M. Bhagat - Dept. of Physics and Astronomy
ferromagnetic resonance (FMR) in single crystals of Fe, Ni, Co and Gd, FMR measurements as a function of temperature and frequency to be correlated with dHvA effect measurements

187. "An Investigation of Irradiation Strengthening of B.C.C. Metals and Solid Solutions" $ 31,696 01-03
R. J. Arsenault - Dept. of Chemical Engineering
neutron damage to V and Ti-V BCC solid solutions, mechanical properties, activation parameters for flow stress, rate controlling mechanism for low temperature plastic deformation

188. "An Investigation of Solid Solution Hardening in Metallic Solid Solution Alloys" $ 26,610 01-01
R. M. Asimow - Dept. of Mechanical Engineering
strength of FCC solid solutions, critical resolved shear stress in Ag-Au, effect of single crystal growth rate on CRSS of Ag-3%In, quantitative theory of solid solution strengthening

189. "Atomic Strengthening Due to Atomic Order" $ 34,000 01-02
M. J. Marcinkowski - Dept. of Mechanical Engineering
study of work hardening, compressive stress-strain curves for single and polycrystalline alloys, effect of stacking fault energy and anti-phase boundary energies, transmission electron microscopy

MARYLAND, UNIVERSITY OF (continued)

190. "The Galvanomagnetic Properties of Graphite in the Temperature Range 4-300°K and Pressure Range 0-10,000 kg/cm^2" $ 29,908 01-01
I. L. Spain - Inst. for Molecular Physics
Hall coefficient and magnetoresistance of graphite crystals, variation of carrier density and mobility with pressure and temperature

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

191. "Mechanical Properties of Metals" $ 18,608 01-01
W. A. Backofen - Dept. of Metallurgy
shear fracture in polycrystalline Zr, oriented single crystals of Zr and polycrystalline textured Zircaloy-4, compressive flow stress

192. "Thermal Neutron Scattering Studies of Molecular Dynamics and Critical Phenomena in Liquids and Solids" $ 90,211 02-02
S. H. Chen and S. Yip - Dept. of Nuclear Engineering
inelastic thermal neutron scattering using a 3-axis spectrometer at MIT reactor

193. "Basic Research in Ceramics and Non-crystalline Systems" $282,820 01-01
W. D. Kingery and R. L. Coble - Dept. of Metallurgy
crystal growth by chemical vapor transport (FeO, ZnS, UO_2), freeze-dry preparation of mixed oxides, solid solubilities in MgO, high pressure sintering, oxygen diffusion in Al_2O_3, tunneling spectroscopy in amorphous Si, nonstoichiometry in fluorite-type structures (UO_2, ThO_2)

194. "Low Temperature Neutron Physics Studies" $ 93,347 02-02
C. G. Shull - Dept. of Physics
polarized neutron diffraction techniques used to investigate coherent paramagnetic scattering in pure V and in dilute Kondo-state alloys, reflectivity for the (222) forbidden reflection in Ge, dynamical diffraction of neutrons in perfect crystals

MASSACHUSETTS INSTITUTE OF TECHNOLOGY (continued)

195. "Microcracking in Welds of Nickel Base Alloys" $ 17,000 01-01
T. O. Ziebold - Depts. of Nuclear Eng. and Metallurgy and Materials Science
electron microprobe investigation of chemical elements in the vicinity of grain boundaries in Ni base alloys

MASSACHUSETTS, UNIVERSITY OF

196. "Ultrasonic Attenuation Studies of the Electronic Structure of Metals" $ 36,000 02-02
A. R. Hoffman - Dept. of Physics and Astronomy
diamagnetic domain formation in metals (Be, Ag), acoustic attenuation as a function of magnetic field, temperature and angular orientation in K, high frequency acoustic attenuation in pure Type I superconductors (Nb)

MICHIGAN STATE UNIVERSITY

197. "Studies of Electrical and Defect Properties of Thin Metallic Wires" $ 37,000 02-02
J. Bass - Dept. of Physics and Astronomy
point defects in Pt, Ta, W, Mo by the quenching technique, effects of specimen size and magnetic field on the thermopower of Al

198. "Study of Interactions between f-Shell Transition Ions in Non-metallic Crystals" $ 29,850 02-02
E. H. Carlson - Dept. of Physics
super exchange interactions and magnetic ordered states, NMR as a function of temperature, pressure, applied field and doping, $GdCl_3$, $PrCl_3$

199. "Properties of Rare-Gas Solids" $ 35,266 02-02
G. L. Pollack - Dept. of Physics and Astronomy
thermodynamic properties, surface physics, anharmonicity, defect structure, solid A, Kr, Xe, Ne

MICHIGAN TECHNOLOGICAL UNIVERSITY

200. "Structure and Properties of Solid Solutions" $ 43,093 01-01
A. A. Hendrickson - Department of Metallurgical Engineering
FCC and BCC solid solutions, flow stress and activation energy for deformation in Ag alloys, thermally activated glide in Nb-Mo single crystals

201. "Effect of Annealing on the Substructure of Cold Worked fcc Metals and Alloys" $ 25,286 01-02
D. E. Mikkola - Department of Metallurgical Engineering
X-ray diffraction and transmission electron microscopy of annealing studies, solid solutions of Ge in Cu, Cu_3Au, Pt_3Fe, kinetics of antiphase domain growth, configuration of antiphase domain boundary

MICHIGAN, UNIVERSITY OF

202. "Fission Fragment Induced Electrical Transients in Dielectric Materials" $ 11,870 01-03
D. R. Bach - Dept. of Nuclear Engineering
detection of fission fragments through observations of transient electrical pulse caused by passage of fission fragment through dielectric materials

203. "Thermodynamic Activities in Solid Alloys" $ 31,000 01-02
R. D. Pehlke - Dept. of Chemical and Metallurgical Engineering
thermodynamic properties of solid alloys using solid state electrochemical cells, Fe-Cr and Ni-Cr systems

MINNESOTA, UNIVERSITY OF

204. "'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 films deposited by inert gas ion sputtering, films deposited in situ in the electron microscope on both single crystal and amorphous substrates

MINNESOTA, UNIVERSITY OF (continued)

205. "Effect of Short-Range Order on the Mechanical Properties of Alloys" $ 19,000 01-01
M. E. Nicholson - Dept. of Mineral and Metallurgical Engineering
Bauschinger strain and overshooting in short range order alloys, Au-Pd alloys, single crystals pulled in tension

206. "A Study of Grain Boundary Segregation Using the Auger Electron Emission Technique" $ 26,072 01-01
D. F. Stein - School of Mineral and Metallurgical Engineering
analysis of fracture surfaces to determine chemical composition using Auger Electron Emission, Fe with additions of P, C, and O

207. "Diffusion Studies in Liquid Metals" $ 48,709 01-02
R. A. Swalin - Dept. of Mineral and Metallurgical Engineering
self diffusion under constant volume conditions, Na, Soret effect in liquid Ag, X-ray diffraction studies of alkali liquid metals

208. "Experimental and Theoretical Studies in Solid State and Low Temperature Physics" $179,300 02-02
W. Zimmerman, Jr., L. H. Nosanow, A. M. Goldman, and W. Weyhmann - School of Physics
superconductivity, theory of quantum crystals, theoretical and experimental studies of the magnetic properties of solid ^{3}He, theory of ^{3}He-^{4}He mixtures, magnetism in metals, superfluidity in He, millidegree temperature range techniques

MISSISSIPPI, UNIVERSITY OF

209. "The Effects of Neutron Irradiation on the Binary Alloys" $ 5,747 02-03
A. B. Lewis - Dept. of Physics and Astronomy
Cu alloys, neutrons from target reaction using dynamitron, resistivity, to be discontinued

MISSOURI, UNIVERSITY OF

210. "Ferroelectric Properties of Bismuth Ferrate and Related Materials" $ 21,482 02-02
R. Gerson and W. J. James - Department of Physics
growth of single crystals of $BiFeO_3$, dielectric measurements, x-ray and neutron diffraction, magnetic properties

211. "Nuclear Radiation Effects on Silicon P-N Junctions" $ 45,000 02-03
C. A. Goben - Dept. of Nuclear Engineering
voltage-current characteristics of neutron irradiated junctions, neutron fluence dependence of the quasi-Fermi potentials, recombination statistical model for the neutron-induced base current component, scanning electron microscopy to examine defect clusters

MURRAY STATE UNIVERSITY

212. "Interaction of Fission Fragments with Thin Films" $ 22,700 02-03
L. Bridwell - Dept. of Physics
interaction of fission fragments of ^{252}Cf with thin films, mechanism of heavy ion kinetic energy losses, time-of-flight system to determine the mass mode of the fission event

NEW YORK, STATE UNIVERSITY OF

213. "Theory of Reaction Kinetics" $ 49,000 02-03
J. W. Corbett - Dept. of Physics, Albany
role of spatial correlation in diffusion limited reaction kinetics, recovery in discrete lattices, simultaneous porduction and diffusion-limited recovery, radiation damage, void formation

214. "Study of Microplastic Behavior of Tungsten and Other Refractory Metals in Relation to the Brittle Fracture Problem" $ 17,729 01-01
J. C. Bilello - Dept. of Materials Science, Stony Brook
low temperature microstrain tests on W single crystals, etch pit and electron microscopy observations

NEW YORK, STATE UNIVERSITY OF (continued)

215. "Fatigue-Enhancement of Diffusion" $ 14,752 01-01
H. Herman - Department of Materials Science, Stony Brook
low amplitude cyclic straining of alpha brass, electrical resistivity, short range order effects

216. "Thermal Neutron Scattering on Magnetic Materials and Liquids" $ 49,000 02-02
R. Nathans - Department of Physics, Stony Brook
magnetic critical scattering in MnF_2 and $ZrZn_2$, magnetic spin density in alloy systems showing Kondo behavior, inelastic neutron scattering in liquid Ne, A, ^3He-^4He, neutrons from BNL HFBR reactor

NORTH CAROLINA STATE UNIVERSITY

217. "Behavior of Gases in Solids" $ 32,909 01-03
T. S. Elleman - Department of Nuclear Engineering
diffusion coefficients of ^{133}Xe in single crystals of KI and RbI, hydrogen bubble formation in metals irradiated with protons, tritium gradients in metals

218. "Grain Boundary Sliding in Alumina Bicrystals" $ 20,000 01-01
H. Palmour, III - Department of Engineering Research
high temperature deformation of synthesized bicrystals of Al_2O_3, orientation dependence of deformation mechanisms

219. "An Experimental Investigation of Boiling Bubbles" $ 25,996 01-01
R. F. Saxe - Department of Nuclear Engineering
establishment of parameters which control emission of sound from boiling bubbles, acoustic emission measurements on model systems

NORTH CAROLINA, UNIVERSITY OF

220. "Investigation of Defect Structures by Electric Polarization and Relaxation Methods" $ 34,031 02-02
J. H. Crawford, Jr. - Dept. of Physics
studies of dipolar defects and lattice imperfections, optical absorption, luminescence, EPR, ionic thermo-current method, KCl

221. "The Properties of Metals and Alloys" $ 66,000 02-02
L. D. Roberts - Dept. of Physics
measurement of screening charge distribution in alloys, Mössbauer effect, Au alloys, Fe-Cu, Kondo effect, pressure dependence of the characteristic temperature associated with screening

222. "Atomic Diffusion in Crystals" $ 31,208 02-02
L. Slifkin - Dept. of Physics
ion mobility in metals and ionic crystals, EPR in Mn doped AgCl, Ag in Al, isotope effect measurements of diffusion in Ag halides, cation diffusion in alkaline earth halides and oxides

223. "Pressure Variation of Single Crystal Elastic Constants" $ 19,907 02-02
C. S. Smith - Dept. of Physics
elastic constants of Rb halides, ultrasonic pulse echo method, pressure and temperature dependence

NORTH DAKOTA, UNIVERSITY OF

224. "Physical Phenomena in Crystals Consisting of a Finite and Countable Number of Atoms in One Direction" $ 35,000 02-02
H. H. Soonpaa - Dept. of Physics
study of size effect quantization using $Bi_8Te_7S_5$ crystals, thin crystals with atomically smooth surfaces, electrical conductivity, optical transmission, x-ray diffraction

NORTHEASTERN UNIVERSITY

225. "Structural, Thermal, and Electronic Properties of Metastable Binary Alloys of Thorium and Uranium Produced by Rapid Quenching" $ 32,662 01-01
B. C. Giessen - Dept. of Chemistry
metastable binary alloys containing actinide elements, splat cooling, Th and U alloys

NORTHEASTERN UNIVERSITY

226. "Calorimetric Studies of the Proximity Effect in Superconductors" $ 31,771 02-02
C. A. Shiffman - Dept. of Physics
excess superconductive ordering associated with proximity effect when superconducting and normal metals are brought into contact, measurements of specific heat of laminar eutectic alloy, Sn-Pb, Sn-Zn, Au-Tl, Cd-Tl

NORTHWESTERN UNIVERSITY

227. "Effect of Point Defects on Mechanical Properties of Metals" $ 43,049 01-03
M. Meshii - Dept. of Materials Science
effect of interstitials produced by electron irradiation on mechanical properties, quenched-in vacancies, dislocation-defect interactions

228. "Analytical Study on Dislocations in Thin Films" $ 34,180 01-02
T. Mura - Dept. of Civil Engineering
elastic stress and strain fields associated with dislocation distributions in thin films, dislocation interactions with impurities, dislocations, vacancy clusters and cavities

OHIO STATE UNIVERSITY

229. "An Investigation of Mixed Conduction in Solid Electrolytes" $ 31,015 01-02
R. A. Rapp - Dept. of Metallurgical Engineering
measurement and interpretation of solid state galvanic cell conduction, ThO_2-Y_2O_3, UO_2, ZrO_2, Dy_2O_3, Gd_2O_3, mixed conduction in molten salt electrolytes

230. "Liquid Metals Research--Electrotransport and Solidification Studies" $ 34,043 01-02
D. A. Rigney - Dept. of Metallurgical Engineering
electrotransport in dilute liquid alloys, supercooling of liquid metal droplets using coil and bridge technique

OKLAHOMA, UNIVERSITY OF

231. "The Effects of Surface Coatings on the Plastic Deformation of Metal Single Crystals" $ 28,176 01-01
R. J. Block - Dept. of Chemical Engineering and Materials Science
evaporated metal coatings, effect of residual stress on film strengthening effect, etch-pit and mechanical property tests, Cu crystals

232. "Thermoelectric Size Effect in Noble Metals" $ 26,604 02-02
R. R. Bourassa - Dept. of Physics
measurement of the electronic component of the thermoelectric power, Au, Cu, Ag, influence of specimen size on phonon drag component

OREGON STATE UNIVERSITY

233. "Natural Convection Heat Transfer in Liquid Metals" $ 20,843 01-01
J. R. Welty - Dept. of Mechanical, Industrial and Nuclear Engineering
natural convection of Hg between two vertical parallel plane walls, magnetic velocity probe to measure velocity

PENNSYLVANIA STATE UNIVERSITY

234. "Nonlinear Elastic and Thermoelastic Properties of Materials" $ 50,036 02-02
G. R. Barsch - Materials Research Lab.
nonlinearity of interatomic forces with respect to atomic displacements in U compounds and alkali halides RbCl, RbBr, RbI, CsI, third order elastic compounds, phonon dispersion relations

235. "Ceramic Research on Transformational Superplasticity and Ferroelectric Domain Boundaries" $ 26,000 01-01
R. C. Bradt and J. H. Hoke - Dept. of Materials Science
mechanical properties of bismuth oxide solid solutions, transmission electron microscopy of ferroelectric domain boundaries in $BaTiO_3$

PENNSYLVANIA STATE UNIVERSITY (continued)

236. "Thermodynamic Properties of Solid Solutions at High Temperatures" $ 29,309 01-02
A. Muan - Dept. of Geochemistry and Mineralogy
study of titanate solid solutions, $ZnO-CoO-TiO_2$, $ZnO-NiO-TiO_2$, activity-composition relations, $MgO-FeO-NiO-SiO_2$ quaternary system, stability of silicon oxynitride

237. "Transformations in AB_2 Intermetallic Compounds" $ 11,000 01-02
E. Ryba - Dept. of Metallurgy
search for phase transformations in compounds, $YbZn_2$, $SmZn_2$, x-ray diffraction, magnetic susceptibility of R.E. Zn_2 compounds, elastic constants of $HoZn_2$, phase diagrams for YCu_2-YZn_2, $YbZn_2-YbAl_2$

238. "Research on Graphite" $110,333 01-01
P. L. Walker, Jr. - Department of Materials Science
carbon formation and graphitization, gas-graphite interactions, dynamic mechanical properties of carbon and graphite, microscopy of defects in graphite, electronic transport properties of B doped graphite

PITTSBURGH, UNIVERSITY OF

239. "Precipitation From Supersaturated Copper-Titanium Solid Solutions: The Aging Process in Copper-Titanium Side-Band Alloys" $ 25,902 01-02
W. A. Soffa - Dept. of Metallurgical and Materials Engineering
study of very early stages of decomposition in supersaturated Cu-Ti solid solutions, kinetics and mechanism followed electrical resistivity and X-ray diffraction

240. "A Study of Radiation Induced Defects in Metals" $ 30,154 02-03
J. R. Townsend - Dept. of Physics
10 MeV proton irradiation of Cu and W crystals, anelastic measurements, computer calculations of defect configurations and their effect on the shear modulus, piezoresistance measurements

PITTSBURGH, UNIVERSITY OF (continued)

241. "Thermal, Structural and Magnetic Studies of Metals and Intermetallic Compounds" $ 97,972 02-02
W. E. Wallace and R. S. Craig - Dept. of Chemistry
crystal field spectra of lanthanide ions, constitution and magnetic behavior of ternary systems containing lanthanides, electronic specific heats of Mg-Cu-Zn alloys, electronic status of 3d transition elements in intermetallic compounds, magnetic coupling of lanthanides in ternary Laves, Haucke and 2:17 phases

PURDUE UNIVERSITY

242. "Diffusion and Precipitation of Inert Gases in Metals" $ 31,080 01-03
J. R. Cost - School of Materials Science and Metallurgical Engineering
helium atoms in Al, Nb, internal friction, lattice parameter, electron microscopy, low temperature calorimetry

243. "Transport and Thermodynamic Properties of Solids" $ 27,163 01-02
R. E. Grace - Dept. of Metallurgical Engineering
diffusion in Ag-Cd-Zn, Cu-Zn-Mn, and Cu-Zn-Ni, electron microprobe analysis, electrical conductivity and Seebeck coefficient used to determine identity and diffusivity of lattice defects in $CaTiO_3$ and $SrTiO_3$

244. "Basic Radiation Damage Studies" $ 81,000 02-03
J. W. MacKay - Dept. of Physics
radiation damage in Ge and Si, electron irradiation, impurity effects in n-type Ge, length changes in irradiated Ge, annealing, photo-effects in irradiated p-type Ge, radiation annealing in Si

245. "Mössbauer Studies of the Properties of Solids" $ 32,000 02-02
J. G. Mullen - Dept. of Physics
Mössbauer hyperfine patterns of ^{57}Fe in $CoCl_2$ and CoF_2, studies of NiO and CoO vacancy structure

RENSSELAER POLYTECHNIC INSTITUTE

246. "Theoretical Research on Electron Behavior in Crystals" $ 29,000 02-02
E. Brown - Dept. of Physics
determination of the frequencies of several phonon modes in Cu, method of calculating the energy of a solid as a function of the amplitude of the deformation corresponding to a mode of vibration

247. "Effect of Hydrostatic Pressure on Self-Diffusion Rates in Hexagonal Metals" $ 33,000 02-02
H. M. Gilder - Dept. of Physics
effect of pressure on the diffusion in Zn and Cd, anisotropy in activation volume for diffusion, diffusion of Ag in Zn, isotope effect in Cd

248. "Anisotropic Diffusion and Electro-migration" $ 55,200 02-02
H. B. Huntington - Dept. of Physics
electromigration, thermomigration, diffusion in non-cubic crystals, Zn, Mg, Cd, effect of absorbed gases on electromigration, thermo-migration in Ti, electromigration in liquid Na-K

249. "Research in Powder Metallurgy" $ 33,000 01-01
F. V. Lenel - Dept. of Materials Engineering
role of mechanical constraints due to multiple neck formation on sintering, Cu powder, electron microscopy of sintering of thin foils, electron microprobe study of inhomogeneity in alloys

250. "Precipitation and Dispersion Hardening in Hexagonal Alloys" $ 22,700 01-01
N. S. Stoloff - Dept. of Materials Engg.
slip and twin systems in Hf, influence of H on Hf strength and ductility, superplastic behavior in Mg-Th-Zr and Mg-Zr alloys, effect of heat treatment on strength, ductility, and fracture mechanisms

ROCHESTER, UNIVERSITY OF

251. "Electron Spin Resonance in Solids" $ 16,333 02-02
T. G. Castner - Dept. of Physics and Astronomy
stress dependence of spin-lattice relaxation for P and As in Si, ENDOR and spin lattice relaxation of O_2^- in alkali halides, transmission conduction electron resonance in Ga

SOUTHERN CALIFORNIA, UNIVERSITY OF

252. "Materials Research on High-Field Superconductors" $ 95,000 02-02
Y. B. Kim - Depts. of Physics and Electrical Engineering
effects of spin-orbit interactions on high field superconducting alloys, effect of metallurgical structure on loss characteristics, loss characteristics of Type II superconductors at microwave frequencies

253. "The Effects of Electric and Magnetic Fields on the Nucleation, Structure, and Residual Properties of Vapor Deposited Metal Films" $ 25,000 01-02
L. E. Murr - Dept. of Materials Science
effect of electric field and magnetic field on the residual structure and properties of vapor deposited films of Pd, In and Fe, transmission electron microscopy

STANFORD UNIVERSITY

254. "Structure Dependence of High Temperature Deformation of Metals" $ 44,000 01-01
C. R. Barrett and W. D. Nix - Dept. of Materials Science
structure dependence of high temperature deformation of metals, recovery in precipitation hardened Ni alloys, mechanism of creep and creep rupture in Ni-W alloys, viscous creep in Al, effects of shock deformation on creep

255. "Nitride Forming Reactions in Liquid Uranium Alloys" $ 37,636 01-01
N. A. Parlee - Dept. of Mineral Engineering
thermodynamics and kinetics of reactions of nitrogen with liquid U-Sn alloys, precipitation and resolution of UN

256. "Thermodynamic Properties and Defect Structure of Intermetallic Compounds" $ 30,000 01-02
D. A. Stevenson - Dept. of Materials Science
defect chemistry of compounds, self diffusion and impurity diffusion in ZnSe, precipitation studies in II-VI compounds, defect equilibria in CdTe

SYRACUSE UNIVERSITY

257. "In Situ Ultra High Vacuum High Energy Electron Diffraction Studies" $ 29,000 01-02
R. Vook - Dept. of Chemical Engineering and Metallurgy
nucleation and growth of epitaxial thin films, vapor deposited films on CaF_2, mica or NaCl substrates, HEED and transmission electron microscopy

TEMPLE UNIVERSITY

258. "A Study of the IB-IIB Beta Phase Alloys" $ 97,500 01-02
L. Muldawer and H. Amar - Department of Physics
optical constants of IB-IIB alloys and ordered and disordered Cu_3Au, Hall coefficients of CuZn-AuZn alloys, transport properties of metallic alloys in relation to their band structure, theory of long period superlattice based on the electronic structure of CuAu-I, studies of ordering using quantum statistical mechanics

TENNESSEE, UNIVERSITY OF

259. "Application of Adiabatic Calorimetry to Metal Systems" $ 23,180 01-01
E. E. Stansbury and C. R. Brooks - Dept. of Chemical and Metallurgical Engineering
heat capacity of Pt, Au, W, Cu, stainless steel, Al_2O_3, up to 1000°C, structure of Ni-base solid solutions, neutron irradiated Al

TEXAS, UNIVERSITY OF

260. "Elevated Temperature Morphological Stability of Metal Matrix Fiber Composites" $ 16,849 01-01
T. H. Courtney - Dept. of Mechanical Engg.
microstructure changes due to high temperature exposure in composite materials, elevated temperature mechanical properties, directionally solidified rod eutectic alloys

TUSKEGEE INSTITUTE

261. "Density Determinations Using a Gamma Radiation Attenuation Technique" $ 34,270 01-01
I. G. Dillon - School of Engineering
densities of coexisting vapor and liquid alkali metals by attenuation of gamma rays from Cs-137 source, measurements up to 2500 K

UTAH, UNIVERSITY OF

262. "Recrystallization and Sintering of Oxides" $ 14,634 01-01
I. B. Cutler - Dept. of Ceramic Engineering
measurement of shrinkage rates, characterization of powders, effects of impurities on diffusivity, Al_2O_3, MgO, CaO

263. "Impurity Effects on the Creep of Polycrystalline Magnesium and Aluminum Oxides at Elevated Temperatures" $ 19,513 01-01
R. S. Gordon - Dept. of Materials Science and Engineering
creep under four point loading conditions up to 1600°C, MgO doped with FeO, vacuum hot pressing of powders, grain size dependence of viscous creep

264. "Interstitial Diffusion in Non-Metallic Crystals" $ 21,500 01-02
O. W. Johnson - Dept. of Physics
interstitial diffusion, point defects and complexes in TiO_2, Li diffusion as a function of pressure, H and D diffusion

265. "A Magnetic Resonance Study of Defects in Solids" $ 14,421 02-02
W. D. Ohlsen - Dept. of Physics
NMR in mixed alkali halides, LiF and NaF

266. "The Fundamentals of Radiation Damage" $ 78,203 02-03
A. Sosin - Dept. of Physics
electron radiation damage to solids with electron energies up to 8 MeV, damage rate as a function of energy, annealing, role of displacement spikes

VANDERBILT UNIVERSITY

267. "Deformation Studies of Superlattice Structure" $ 29,693 01-02
J. J. Wert and R. J. Bayuzick - Dept. of Mechanical Engineering
X-ray diffraction study of deformed Cu_3Pt, degree of long range order, antiphase domain size, resistivity and thermoelectric measurements

VERMONT, UNIVERSITY OF

268. "Thermodynamic and Transport Properties of Interstitial Hydrogen Isotopes in Palladium" $ 22,836 02-02
J. S. Brown - Dept. of Physics
theory of the behavior of transition metal hydrides, analysis of data based on the pseudopotential and model potential techniques, transport and thermodynamic properties of PdH_x and PdD_x.

269. "Absorption of Hydrogen and Deuterium by Palladium-Rich Alloys" $ 29,456 01-02
T. B. Flanagan - Dept. of Chemistry
diffusion of H and D in a series of Pd alloys using an electrochemical relaxation technique, absorption studies on Cu-Pd, Ir-Pd and Pb-Pd alloys

VIRGINIA, UNIVERSITY OF

270. "Electronic Properties of Metals and Alloys" $ 76,692 02-02
R. V. Coleman - Dept. of Physics
magnetoresistance studies of ferromagnetic metals, effect of stress on magnetoresistance of Fe, tunneling and conduction phenomena in thin Fe-FeO-Fe sandwiches, Fermi surface topology in Cu, Ag and Pb, optical reflectivity measurements

271. "Investigations on the Behavior of Point Defects and Dislocations" $ 61,149 02-02
D. Kuhlmann-Wilsdorf - Dept. of Engineering Physics
investigation of Cu crystals of high perfection, theoretical investigations on the structure of monatomic liquids, theoretical research on the stresses due to various dislocation configurations, voids in metals

VIRGINIA, UNIVERSITY OF (continued)

272. "Dynamic Dislocation Phenomena in Single Crystals of Metals and Alloys" $ 37,516 02-02
J. W. Mitchell - Dept. of Physics
second and third order elastic constants, elastic and plastic behavior near the yield point, deformation band formation, dislocation velocities, accurately oriented alpha phase Cu-Al single crystal rods of high purity and perfection

WAKE FOREST UNIVERSITY

273. "A Study of Atomic Mobility in Crystalline Materials" $ 17,250 02-02
T. J. Turner and G. P. Williams - Dept. of Physics
atomic mobilities in metals and ionic crystals, internal friction, resistivity, optical absorption, dielectric relaxation, Ta, Ag-Au, RbCl, NH_4Cl, CaO, SrO

WASHINGTON, UNIVERSITY OF

274. "Mössbauer Studies at High Pressure" $ 34,750 02-02
R. L. Ingalls - Dept. of Physics
Mössbauer effect studies in solids up to 300 kb pressure, internal magnetic field and isomer shift of transition metals, alloys and compounds containing ^{57}Fe, Fe-Ni alloys

275. "A Study of Phase Transformations and Superconductivity" $ 33,086 01-01
D. H. Polonis - Dept. of Metallurgical Engineering
effects of thermal and mechanical history on the constitution and superconducting properties of alloys that exhibit diffusionless transformations and precipitation reactions, Ti alloys, flux pinning

WAYNE STATE UNIVERSITY

276. "Electron Paramagnetic Resonance Studies of Radiation Effects in Solids and Chemical Compounds" $ 50,000 02-03
Yeong-Wook Kim - Dept. of Physics
single crystals of alkali halides, single crystals of phosphors including $CaWO_4$ and $CsWO_4$, superconducting films and junctions

WAYNE STATE UNIVERSITY (continued)

277. "Investigation of the Atomic Structure and Nature of the Magnetism in Several Magnetic Glasses" $ 25,000 02-02
H. O. Hooper - Dept. of Physics
Mossbauer techniques, magnetic susceptibility and NMR measurements, magnetic ordering, bonding of B and Li atoms in iron alkali borate glasses

WISCONSIN, UNIVERSITY OF

278. "Creep Mechanisms in B.C.C. Alloy Crystals" $ 26,782 01-01
R. A. Dodd - Dept. of Minerals and Metals Engineering
creep properties of stoichiometric NiAl single crystals, single crystals of CoAl and GaZn

YALE UNIVERSITY

279. "X-Ray Study of the Structure of Liquid Metals and Alloys" $ 25,824 01-02
C. N. J. Wagner - Dept. of Engineering and Applied Science
structure and electronic transport properties of molten binary alloys, temperature dependence of the structure of liquid metals, Hg-Tl, Hg-In, Au-Sn, Ag-Sn, Cu-Sn, In, Tl, Cd, Zn, Sn

280. "Study of Ideal Magnetic Crystals" $115,000 02-02
W. P. Wolf - Depts. of Physics and Engineering and Applied Science
low temperature ESR and NMR, high and low field magnetization, magneto-thermal measurements, neutron scattering, rf relaxation methods, $CeCl_3$, $Dy_3Al_5O_{12}$, $Ce(C_2H_5SO_4)_3 \cdot 9H_2O$, rare earth hydroxides, nature of magnetic phase changes

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.

SUMMARY OF
FUNDING LEVELS

During the fiscal year ending June 30, 1969, the Metallurgy and Materials Programs total support level amounted to about $27.7 million in operating funds and $2.7 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 $27.7 million operating funds.

1. By Region of the Country:

	University Program (%)	Total Program (%)
(a) Northeast (N.Y., Mass., Vt., Conn., R.I., Penn., Md., Del., D.C.)	49.0	22.2
(b) South (Va., Ky., Tenn., N.C., S.C., Ga., Fla., Ala., Miss., La., Puerto Rico)	12.5	22.4
(c) Midwest (Ohio, Ind., Mich., Ill., Wisc., Minn., Iowa, Mo., Kansas, N.D.)	19.7	40.3
(d) West (Texas, Okla., Ariz., Calif., Utah, Idaho, Oregon, Wash.)	18.8	15.1

2. By Academic Department or Laboratory Division:

	University Program (%)		Total Program (%)	
(a) Metallurgy, Materials Science, Ceramics, Other Engineering (Office Budget Activity Numbers 01-)	47.6	50.4	42.2	43.3
(b) Physics, Solid State Science, Solid State Physics (Office Budget Activity Numbers 02-)	52.4	49.6	57.8	56.7

3. By AEC Laboratory and University:

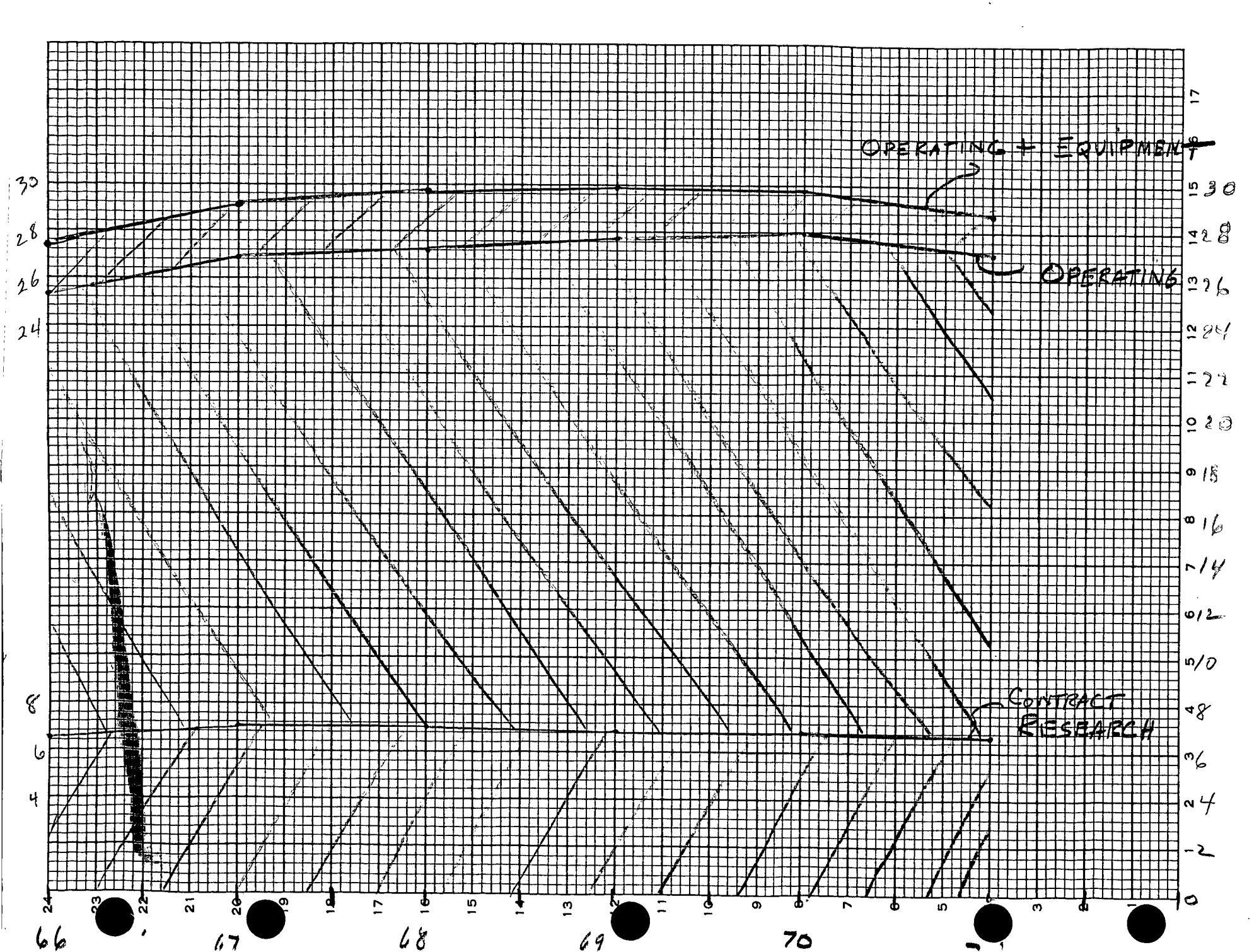
		Total Program (%)	
(a)	University Program (including those laboratories where graduate students are involved in research to a large extent -- e.g., Ames Laboratory and Lawrence Radiation Laboratory-Berkeley)	46.8	
(b)	AEC Laboratory Program (including laboratories where there is very little graduate student involvement -- e.g., Atomics International)	53.2	54.4

4. By Laboratory:

	Total Program (%)	
		170
Ames Laboratory	9.3	9.4
Argonne National Laboratory	20.4	20.5
Atomics International	1.8	.7
Brookhaven National Laboratory	10.0	10.6
Idaho Nuclear Corporation	0.6	.5
Illinois, University of (Materials Research Laboratory)	5.2	5.1
Lawrence Radiation Laboratory/Berkeley	6.5	6.5
Mound Laboratory	0.4	.4
Oak Ridge National Laboratory	18.6	18.8
Pacific Northwest Laboratory	1.5	1.8
Puerto Rico Nuclear Center	0.9	.9
		75.2

5. By Area of Research:

	Number of Projects (Total=280) (%)	Total Program $ (%)
(a) Materials		
Actinide Metals and Compounds	6.8	4.2
Ceramics	15.7	10.0
Rare Earth Metals and Compounds	7.5	5.4
Inert Gas Solids and Liquids	4.6	3.3
(b) Technique		
Neutron Scattering	6.1	13.1
Theory	8.6	6.6
(c) Phenomena		
Diffusion	12.2	4.0
Strength	17.5	10.0
Superconductivity	7.5	7.0
Surface Phenomena and Thin Films	10.7	6.5
(d) Environment		
High Pressure	7.9	4.1
Radiation	13.9	15.8


OPERATING + EQUIPMENT
OPERATING
CONTRACT RESEARCH
66
67
68
69
70

JCAE hearings FY 1971 March 2, 1970

HEP Syc. proj' in HEP lower - why?
storage ring -
Energy gap developing with budget crunch
U of Md. — Gravity waves — atomic & classical physics
— Disadvantaged Youths ↓ 200 BEV
— Business or open housing
AGS↓, SLAC↓, colliding beams (admission price, overseas)
PPA - White to find funds elsewhere eg. NSF $1-2 MILLION
Russia training HFP students - ?, Hosmer - priorities
ZGS -, Bevatron, GAO audit
MEP
Patent - Varian Assoc - LAMPF
Rosen - Radiotherapy - EPA
CTR -

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

5	25	104
11	27	106
18	33	125
19	94	145
23	97	225
24	103	234
		255

Ceramics

Carbides	Glass	Nitrides	Oxides				Other
74	36	74	3	79	117	229	44
83	79	97	18	96	156	235	46
172	136	101	19	98	177	245	81
	177	255	25	101	178	262	96
	277		31	108	185	263	145
			34	111	193	264	210
			43	114	218	273	236
							243
							276

Graphite

36
105
119
177
190
238

Intermetallic Compounds

28	66	174
32	103	189
36	116	201
57	135	241
62	149	256
		278

Ionic Crystals

Alkali Halides				Other	
15	55	150	220	73	129
27	56	159	223	88	180
29	70	165	234	92	217
34	71	166	251	109	222
35	111	169	265	114	
51	117	170	273	118	
		178	276	127	

Liquids

5	90	230
25	94	233
28	109	248
35	164	255
39	207	261
41	216	271
52	229	279

Metals

Alkali	BCC					Ferrous	
134	1	38	91	124	161	23	160
207	6	55	98	126	187	25	183
248	7	58	99	139	197	43	186
261	9	60	102	146	200	69	203
	11	68	103	148	214	78	206
	24	76	104	151	227	82	221
	26	77	108	155	240	137	253
	31	83	111	157	242	138	259
			113	158	259	152	274

Organics

50	140
74	10
78	10
128	53
	213

Rare Earth Metals and Compounds

1	8	16	33	116
3	10	17	57	142
4	11	19	111	198
5	14	23	115	237
				241

Semiconductors

10	80
13	93
38	112
45	181
75	211
	244

Solid and Liquid Inert Gases

Helium		Other
16	133	12
30	144	28
32	147	72
40	208	199
72		216

Elastic Constants

4	165		
19	223		
70	234		
72	237		
120	272		

Electrical Resistance

7	38	98	202
13	39	124	209
14	40	138	215
18	50	169	228
26	53	185	239
33	67	190	267
36	74	197	

Electron Microscopy

21	78	148	201
26	100	149	204
65	101	171	235
67	119	174	238
75	126	183	249
77	138	189	253
			257

Electron Scattering

6	150		
40	175		
78	206		
104	257		
122			

Electron Spin Resonance

10	88	159	
29	114	168	
34	128	220	
51	136	251	
55	145	280	

Field Ion Microscopy

78
80
151
155
158
172

High Temperature Heat Capacity

8
17
23
85
98
259

Infrared Spectroscopy

9
15
89
163

Internal Friction

7	156
55	166
60	187
68	242
120	273
148	

Laser Beam Scattering

72
89
90
179

Low Temperature Specific Heat

11	85	178
30	107	226
31	133	241
59	163	242

Magnetic Susceptibility

4	23	237
11	39	241
17	59	277
18	133	280

Mossbauer Effect

10	110	150
23	129	221
33	130	245
68	131	274
69	146	277

Neutron Scattering

16	45	164
25	47	172
28	52	176
32	57	192
43	115	194
44	127	216

Nuclear Magnetic Resonance

10	88	180
23	92	186
24	129	198
32	133	265
66	136	277
73	142	280

Optical Absorption

15	55	145
17	69	153
23	90	163
29	109	169
51	117	220
	141	273

Sputtering

26
125
143
204

Stress-Strain

1	101	191
7	137	205
19	177	218
20	187	227
26	188	231
53	189	272

Theory

9	49	121	228
20	56	162	240
22	64	164	246
26	76	188	258
35	87	208	268
37	106	213	271

Thermal Conductivity

3	71	118
11	74	152
13	94	163
14	98	178
		233

Thermodynamics

12	102
18	134
23	155
30	185
40	199
58	203
72	229
84	236
94	255
95	256

X-Ray Scattering

4	105	201
25	112	207
32	125	224
52	135	237
75	138	239
94	157	242
104	174	267
		279

Channeling

75
121
123
158

Crystal Structure, Atomic Distribution and Crystal Transformations

4	53	73	138	225
18	57	78	146	237
25	58	94	149	258
32	62	95	157	267
44	64	105	174	275
52	67	109	193	277
	68	125	201	279

Diffusion

2	68	135	207	247
3	71	146	215	248
5	74	147	217	256
19	79	158	222	262
41	108	160	230	264
60	129	165	242	268
66	130	193	243	269
				273

Electron Transport

5	67	107	181	229
13	71	138	184	232
26	74	142	185	238
39	79	143	190	243
41	81	152	193	258
50	97	168	197	270
	98	173	224	279

Electronic Structure

Fermi Surface

9	106
14	186
33	270
71	
87	

Other

10	35	69	131	198
15	37	86	145	221
18	39	87	159	241
22	49	97	168	245
23	59	110	184	246
24	66	121	186	258
			196	270

Ferromagnetism

Magnetic Structure

Materials Preparation and Characterization

Phonons

Point Defects

Precipitation

1	100	183
21	102	217
58	135	239
65	140	242
66	155	250
80	171	255

Sintering

81	193
101	249
108	262

Solidification

5
195
230
260

Strength

Fracture	Super-plasticity	Creep	Flow Stress			
1	67	76	7	76	174	200
77	125	101	18	79	177	205
82	235	125	19	80	182	214
137		165	20	101	183	218
160		254	26	102	187	227
195		263	60	139	188	228
206		278	61	140	189	231
250			63	148	191	250
			74	171	193	260
						272

Superconductivity

11	83	99	161	208
31	86	113	167	226
37	87	138	168	252
40	91	143	173	275
54	93	157	196	276

Surface Phenomena and Thin Films

6	61	104	153	224
21	63	119	161	228
26	67	122	175	231
40	79	125	176	253
54	84	150	204	257
55	91	151	212	276

Electric Field

2	141
5	147
41	230
74	248
	253

Gas

Oxidizing	Other	
21	1	160
104	19	238
153	81	268
	82	269
	151	

Magnetic Field

High Field		Low Field	
14	107	4	92
23	167	5	176
24	168	10	196
33	184	17	197
40	241	31	253
54	252		
83	270		
99	280		

Pressure

Above Atmospheric			Shock Loading
12	71	221	77
18	126	223	254
19	129	234	
57	142	247	
66	165	264	
69	190	274	
70	198		

Radiation

Electron	Ion		Neutron		Theory	Gamma
38	26	169	7	126	26	29
55	36	202	26	181	56	34
75	38	212	100	187	121	50
119	75	217	119	209	213	51
154	100	240	122	211	240	128
227	123	242	124			136
244	158					170
266						178
						276

Temperature Below Liquid Helium			High Temperature (about 1000°K or higher)	
11	40	144	3	185
12	54	166	13	236
30	87	167	84	254
31	118	173	85	259
32	133	208	98	260
			101	261
			108	263

Voids - 7 projects @ $416K

MEM

BOB Questions Oct. 15, 1969

- Cost effectiveness? RDT,

1) culled out weak programs? Labs. vs U.
2) How do you draw the line RDT&E
3) Is it clear?
4)

Support of Research Reactors (Neutrons Only)

		Est. FY 1970 K$
ANL	CP-5	414
BNL	HFBR	435 ← 523 → 616
ORNL	ORR	166 ↑ 31%
	BSR	180
Ames	ARR (TOTAL costs 800K) about ½ by MEM	70 (400)
PRNC		60
INC	MTR	20
MIT		106
Georgia Inst. Tech.		9
		1,460 1,860

Support of Research at Reactors (Including Cost of Neutrons)

	Est. FY 1970 K$
Neutron Scattering	3,900 4,300
Neutron Irradiation Damage	1,400
	5,300 (19% of operating funds) 5,700,000

DIVISION OF RESEARCH

NEW PROPOSALS - FISCAL YEAR 1969
($ in 1000's)

	On Hand 7/1/68		Received during FY 1969		Total	
	No.	Amount	No.	Amount	No.	Amount
gh Energy Physics	22	$ 2,098	56	$ 27,670[2]	78	$ 29,768[2]
ysics & Mathematics	44	31,461[1]	121	5,940	165	37,401[1]
emistry	40	1,381	106	4,038	146	5,419
tallurgy & Materials	42	1,264	134	4,688	176	5,952
ntrolled Thermonuclear	27	3,861	37	2,038	64	5,899
TOTAL	175	$ 40,065	454	$ 44,374	629	$ 84,439

ACTIONS TAKEN - NEW PROPOSALS - FY 1969
($ in 1000's)

	Approved[3]		Declined, etc.		On Hand 6/30/69	
	No.	Amount	No.	Amount	No.	Amount
gh Energy Physics	7	$ 302	35	$ 2,684	36	$ 26,782[2]
ysics & Mathematics	16	592	70	32,980[1]	79	3,829
emistry	22	639	70	3,008	54	1,772
tallurgy & Materials	31	1,049	95	3,093	50	1,810
ntrolled Thermonuclear	10	383	27	3,959	27	1,557
TOTAL	86	$ 2,965	297	$ 45,724	246	$ 35,750

[1] Includes a Cal. Tech. proposal for $9.5 million for a Cyclotron Facility and a $9.4 million request from UCLA-Nuclear Consortium for a $9.4 million Cyclotron Facility.

[2] Includes a proposal from Univ. of Michigan for $23.6 million for an Ultra High Cosmic Ray Physics Facility.

[3] Not including support for Conferences, National Academy of Sciences Committees, and miscellaneous items such as book translations, awards, etc.