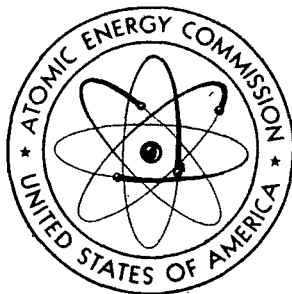


UNITED STATES
ATOMIC ENERGY COMMISSION

RESEARCH CONTRACTS
in the
PHYSICAL SCIENCES



JULY 1, 1969

DIVISION OF RESEARCH

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I N T R O D U C T I O N

The Physical Research Program is chiefly concerned with basic research investigations undertaken to discover new scientific knowledge and also includes some applied research investigations relevant to certain aspects of the practical utilization of nuclear energy. Research is conducted in the fields of high, medium, and low energy physics, mathematics and computers, chemistry, metallurgy and materials, and controlled thermonuclear reactions.

Approximately three-fourths of the costs are associated with support of research conducted in AEC-owned, contractor-operated, Federally Funded Research and Development Centers (FFRDC's). A little less than one-fourth of the costs are associated with the contract support of research conducted in other laboratories ("off-site"). The major portion of the research at sites other than at FFRDC's is conducted at educational institutions, and is based almost entirely on unsolicited proposals.

Federally Funded Research and Development Centers

There is no clear line of demarcation between Federally Funded Research and Development Centers and other laboratories. The AEC investment in facilities ranges from zero for some contractors to tens of millions of dollars for others, and the annual level of AEC support ranges from a few thousand dollars for some contractors, to tens of millions of dollars for others -- the spectrum is broad with no significant peaks or breaks.

Some of the FFRDC's research and development activities other than basic physical research include programs in production, weapons, biology and medicine, reactor development, isotopes development, and peaceful nuclear explosives. The Physical Research Program at FFRDC laboratories provides, in varying degrees, the basic investigations underlying the applied and development activities of such laboratories. FFRDC's also include laboratories that are engaged in research in a single, well defined area. All FFRDC's have the following common characteristics:

1. They are treated as national facilities.
2. They represent large investments (several millions of dollars) in AEC-owned capital facilities.
3. They have large annual levels (several millions of dollars) of AEC support.
4. It is implicit that they have continuing AEC support.
5. The guidance of smaller scientific efforts within each laboratory is usually vested in the laboratory management with only major overall research guidance supplied by the AEC.

Washington-Designated Contract-Research Program

In addition to the research conducted at the FFRDC's, AEC supports, by means of the Washington-designated ("off-site") contract-research program, research investigations at educational and other non-profit institutions, and at industrial laboratories. Under this program AEC Headquarters is responsible for the approval of AEC support and for the review of the technical progress of the research projects, while AEC's field offices negotiate and administer the non-technical aspects of the contracts.

The objective of the off-site basic research program is to search for and discover new knowledge within the mission-oriented framework of AEC. It is from this expanding reservoir of knowledge that developmental accomplishments are ultimately achieved. Thus the off-site programs aids in the advancement of science in those disciplines that are fundamental to AEC's programs.

The contract-research program has a number of distinct benefits:

1. When the amount provided by AEC is added to other funds available to the contractor, the effectiveness of the contractor's program, as well as the basic research effort of AEC, is increased.
2. AEC receives the services, in basic research activities fundamental to AEC's future capabilities, of highly qualified scientists who prefer employment at outside laboratories or who prefer to teach and to do research at educational institutions.
3. The contract-research program, by providing for the conduct of research at educational institutions, contributes to the training of scientists in fields relevant to AEC's programs.

In conducting this program, AEC generally uses a special research support agreement with educational institutions. In consideration for the institution's performance of research activities described in the contract and in accordance with the provisions of the contract, the AEC will pay up to a specified amount, referred to as the "support ceiling." Adjustment of this amount will be made if total costs turn out to be less than expected. The total project cost estimate is reflected in a budget, submitted by the prospective contractor, that includes such items as salaries, materials and supplies, equipment, travel, communication, publication, and indirect expenses.

In most cases, the contractor proposes to share in the cost of the work conducted under the contract. In order to support the maximum number of important and worthwhile projects within the limits of available funds and to have tangible evidence of a university's interest in the proposed research, it is AEC policy to encourage cost-sharing by the universities. Although sharing by the institution in the cost of the project is desirable, such sharing is not a prerequisite for AEC support, which, in the final analysis, is determined by the prospective quality of the proposed research, the relative interest of AEC and the institution in the research, and availability of funds. Thus, AEC will pay up to the full cost of a research project.

When the special research support agreement is used for not-for-profit organizations other than educational institutions, AEC's commercial cost principles will be used in determining actual cost, or the contract provisions may be revised to provide for a lump-sum payment to the contractor in consideration for its commitment to perform particular research at a specified level of effort.

For larger projects, a cost-reimbursement contract generally is used. This provides for the reimbursement, to the extent prescribed in the agreement, of defined allowable costs incurred in the performance of the contract. This type of contract as a rule is used for projects with an annual AEC contribution exceeding \$250,000 and/or for projects that do not lend themselves to accurate cost estimates. The total costs of the research may be shared by the contractor and AEC.

Occasionally, no-fund contracts are used in the contract-research program when AEC loans property to an outside organization as AEC's support to the research project or when the organization wishes to enter into a study contract in a certain area of research before it actually undertakes the research. Also, contracts are frequently extended without additional funds being added when the research project is being completed or terminated and additional time is required to bring the project to an orderly close.

Most research contracts are written for terms of one year, renewable for additional annual terms. Sometimes contract terms may run somewhat more or less than one year (e.g. 9 or 15 months), usually for the purpose of establishing a different renewal date. There may also be cases where the contract may be written for several (usually three) years, but with the legal commitment for funding remaining on an annual basis. Occasionally, multi-year contracts with full funding are executed, generally where procurement of a major piece of equipment is involved, or where the nature of the research project is such that a clearly defined, longer fixed term can be established.

In practice, contracts tend to run for several years, some of them for as much as ten years or more. Most research projects are not of the type that can be completed in one year, or in any specified longer time period that can be estimated in advance with reasonable accuracy. This is informally recognized by the parties concerned, whenever a new research project is approved for support and the customary one year contract written.

Proposals for research contracts are usually initiated by the scientist interested in doing the work and are submitted through administrative channels of his institution to the appropriate division at the Headquarters, U. S. Atomic Energy Commission, Washington, D. C., 20545, depending on the scientific area of the proposed research project:

Division of Research:

Physical Sciences, covering Chemistry, Metallurgy, Ceramics, Solid State Physics, Elementary Particle Physics, Nuclear Structure Physics, Atomic Physics, Plasma Physics as related to controlled thermonuclear processes, Mathematics and Computer research, and Basic Nuclear Engineering.

Division of Biology and Medicine:

Life Sciences, including Medicine, Biology, Ecology and Marine Sciences; Atmospheric Radioactivity and Fallout Studies; Radiation Instrumentation; and Radiological and Health Physics.

Division of Reactor Development and Technology:

Nuclear Reactor Technology, Nuclear Power Plant Development, and Terrestrial and Marine Isotopic Power Systems Development.

Division of Isotopes Development:

Environmental and Ocean Sciences Involving Isotopic Applications, Radiation Analysis and Control, Process Radiation, Radiation Preservation of Foods, Radioisotope Production and Materials, Radiation Engineering, and Thermal Applications.

Those interested in receiving contracts for research under this program may obtain a copy of a "Guide for the Submission of Research Proposals" from AEC Headquarters, Washington, D. C. 20545 or from an AEC field office.

The contract-research program is not to be confused with AEC's program for Nuclear Educational Assistance, including equipment grants, nuclear materials loans, fellowships, institutes, etc. Requests for information and brochures concerning educational assistance should be directed to the Division of Nuclear Education and Training at AEC Headquarters.

Reporting Results of Research

Scientific reports on basic research investigations are usually published in the open literature. Special reporting of results in detail before they are ready for publication generally is not required of the contractors. AEC recognizes open publication and wide dissemination as the normal and most desirable means for reporting the findings of fundamental research.

AEC annually publishes a special survey of selected significant developments during the previous year in the more basic areas of AEC's research and development activities. This annual report entitled "Fundamental Nuclear Energy Research--A Supplemental Report to the Annual Report to Congress of the U. S. Atomic Energy Commission," may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

Contract Listing

Contract-research projects supported by the AEC Headquarters Division of Research are listed on pp. 13-43, including the name and address of the contractor, the name(s) of the principal investigator(s), a short descriptive title of the research, and the level of AEC support during the most recent funding period. The amounts listed are for one year unless otherwise indicated.

FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS

For purposes of this report, the following may be considered FFRDC's* operated for AEC (including only those supported in whole or in part under the Physical Research Program):

<u>Name of Laboratory and Contractor and Contract Number</u>	<u>Level of Physical Research Program Support - FY 1969 (in thousands)</u>	
	<u>Operations</u>	<u>Equipment</u>
<u>Ames Laboratory, Ames, Iowa</u> Iowa State University, W-7405-ENG-82	\$ 7,054	\$ 783
<u>Argonne National Laboratory, Argonne, Illinois</u> Argonne Universities Association and University of Chicago, W-31-109-ENG-38	37,033	6,022
<u>Brookhaven National Laboratory, Upton, L. I., New York</u> Associated Universities, Inc., AT(30-2)-GEN-16	34,285	5,901
<u>Cambridge Electron Accelerator, Cambridge, Massachusetts</u> Harvard University, AT(30-1)-2076, AT(30-1)-2752 Massachusetts Institute of Technology, AT(30-1)-2098	8,054	1,689
<u>Lawrence Radiation Laboratory, Berkeley and Livermore, California</u> University of California, W-7405-ENG-48	40,021	4,400
<u>Los Alamos Scientific Laboratory, Los Alamos, New Mexico</u> University of California, W-7405-ENG-36	6,878	920
<u>Mound Laboratory, Miamisburg, Ohio</u> Monsanto Chemical Company, AT(33-1)-GEN-53	633	149
<u>National Accelerator Laboratory, Batavia, Illinois</u> Universities Research Association, Inc., AT(49-8)-3000	3,459	898
<u>National Reactor Testing Station, Idaho Falls, Idaho</u> Idaho Nuclear Corporation, AT(10-1)-1230	155	21
<u>Oak Ridge National Laboratory, Oak Ridge, Tennessee</u> Union Carbide Nuclear Company, W-7405-ENG-26	32,043	2,678
<u>Pacific Northwest Laboratory, Richland, Washington</u> Battelle Memorial Institute, AT(45-1)-1830	736	88
<u>Princeton-Pennsylvania Proton Accelerator, Princeton, New Jersey</u> Princeton University, AT(30-1)-2137 University of Pennsylvania, AT(30-1)-2171	7,939	1,332
<u>Princeton Plasma Physics Laboratory, Princeton, New Jersey</u> Princeton University, AT(30-1)-1238	7,405	221
<u>Stanford Linear Accelerator Center, Stanford, California</u> Stanford University, AT(04-3)-515	23,465	5,779
	<hr/>	<hr/>
	\$ 209,160	\$ 30,881
	<hr/>	<hr/>

*The listing is consistent with Federally Funded Research and Development Centers as defined by the National Science Foundation and the Office of Science and Technology as of August 18, 1969.

SUMMARY OF OFF-SITE CONTRACTS

The following summarizes the number and level of Washington-designated off-site contracts in effect on July 1, 1969 and supported under the Physical Research Program:

<u>Type of Organization</u>	<u>No. of Institutions</u>	<u>No. of Contracts</u>	<u>FY 1969 Funding (in 1000's)</u>
Educational Institutions	141	565	\$ 62,924
Not-for-Profit Institutes	6	10	428
Industrial Organizations	<u>5</u>	<u>9</u>	<u>1,753</u>
Total	152	584	\$ 65,105

(Under "No. of Institutions," the separate campuses of the University of California, University of Miami, the City and State Universities of New York, and the University of Wisconsin are counted as separate institutions)

<u>AEC Budget Category</u>	<u>No. of Contracts</u>	<u>FY 1969 Funding (in 1000's)</u>
High Energy Physics	41	\$ 18,268
Medium Energy Physics	15	4,314
Low Energy Physics	69	15,401
Mathematics and Computer Research	25	3,301
Chemistry	217	10,871
Metallurgy and Materials	172	9,178
Controlled Thermonuclear Research	<u>45</u>	<u>3,772</u>
Total	584	\$ 65,105

Under AEC's annual review and renewal system, the yearly turnover rate, i.e. numbers of new projects approved and existing contracts terminated, in recent years has been in the 10-15% range, with an average of some 70 new contracts written and approximately 55 old contracts terminating each year. In FY 1969, 86 new projects were started, while 62 contracts terminated. While the total number of contracts has tended to increase only slightly, the total dollar level increased from \$32.4 million in 1960 to \$65.1 million in 1969.

Note:

The above summary does not include the portion of the Physical Research Program supported through reimbursable agreements with other Federal agencies. In FY 1969 this amounted to \$0.9 million.

SUMMARY OF NEW PROPOSALS RECEIVED AND ACTIONS TAKEN

During Fiscal Year 1969 the Division of Research received 454 formal proposals for new research, representing requests for a total of \$44.4 million. On hand at the beginning of FY 1969 pending completion of reviews were 175 new proposals requesting \$40.0 million, for a total of 629 proposals representing requests for \$84.4 million.

Approved during FY 1969 were 86 new proposals for \$3.0 million, while 297 representing \$45.7 million, were declined, tabled, or withdrawn.

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

	<u>On Hand 7/1/68</u>		<u>Received during FY 1969</u>		<u>Total</u>	
	<u>No.</u>	<u>Amount</u>	<u>No.</u>	<u>Amount</u>	<u>No.</u>	<u>Amount</u>
High Energy Physics	22	\$ 2,098	56	\$ 27,670**	78	\$ 29,768**
Physics & Mathematics	44	31,461*	121	5,940	165	37,401*
Chemistry	40	1,381	106	4,038	146	5,419
Metallurgy & Materials	42	1,264	134	4,688	176	5,952
Controlled 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)

	<u>Approved</u>		<u>Declined, etc.</u>		<u>On Hand 6/30/69</u>	
	<u>No.</u>	<u>Amount</u>	<u>No.</u>	<u>Amount</u>	<u>No.</u>	<u>Amount</u>
High Energy Physics	7	\$ 302	35	\$ 2,684	36	\$ 26,782**
Physics & Mathematics	16	592	70	32,980*	79	3,829
Chemistry	22	639	70	3,008	54	1,772
Metallurgy & Materials	31	1,049	95	3,093	50	1,810
Controlled Thermonuclear	10	383	27	3,959	27	1,557
TOTAL	86	\$ 2,965	297	\$ 45,724	246	\$ 35,750

Submissions to the Division of Research of new proposals have increased significantly in recent years, from an annual rate of some 200 in the late 1950's, and about 300 in the early 1960's to 454 in FY 1969. Approval rates have averaged about 70 annually for the past ten years. Approval dollars have decreased from about 33% of requested amounts in the early 1960's to about 7% during the 1967-68-69 period. Competition for available funds for new research projects thus has become increasingly severe in recent years and many proposals for excellent research must be turned down solely because of lack of funds.

*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 Cyclotron Facility.

**Includes a proposal from University of Michigan for \$23.6 million for an Ultra High Cosmic Ray Physics Facility. This proposal was declined in November 1969.

SUMMARY OF CONTRACTS BY STATE

(not including contracts listed on p. 5)

<u>State and Contractor</u>	<u>Number of Contracts</u>	<u>FY 1969 Funding (in 1000's)</u>
<u>Alabama</u>	<u>2</u>	<u>65</u>
Auburn University, Auburn	1	\$ 32
Tuskegee Institute, Tuskegee	1	33
<u>Alaska</u>	<u>3</u>	<u>60</u>
Alaska, University of, College	3	60
<u>Arizona</u>	<u>9</u>	<u>385</u>
Arizona State University, Tempe	1	73
Arizona, University of, Tucson	8	312
<u>Arkansas</u>	<u>2</u>	<u>111</u>
Arkansas, University of, Fayetteville	2	111
<u>California</u>	<u>74</u>	<u>10,567</u>
Atomics International, Canoga Park	4	701
California Institute of Technology, Pasadena	9	2,502
California, University of, Berkeley	4	220
California, University of, Davis	4	842
California, University of, Irvine	4	735
California, University of, Los Angeles	13	1,785
California, University of, Riverside	3	323
California, University of, San Diego	8	1,628
California, University of, Santa Barbara	2	210
Gulf General Atomic, Inc., San Diego	2	633
Harvey Mudd College, Claremont	1	0
Navy, Bureau of Ships, San Francisco	1	98
Southern California, University of, Los Angeles	6	245
Stanford Research Institute, Menlo Park	2	104
Stanford University, Stanford	11	541
<u>Colorado</u>	<u>4</u>	<u>991</u>
Colorado State University, Ft. Collins	1	13
Colorado, University of, Boulder	2	938
Environmental Science Services Administration, Boulder	1	40
<u>Connecticut</u>	<u>13</u>	<u>3,720</u>
Connecticut, University of, Storrs	1	0
New England Institute for Medical Research, Ridgefield	1	48
United Aircraft, East Hartford	1	120
Yale University, New Haven	10	3,552
<u>Delaware</u>	<u>1</u>	<u>35</u>
Delaware, University of, Newark	1	35
<u>District of Columbia</u>	<u>10</u>	<u>878</u>
Catholic University of America	2	71
Georgetown University	2	0
George Washington University	1	22
National Academy of Science	3	30
National Bureau of Standards	2	755

<u>State and Contractor</u>	<u>Number of Contracts</u>	<u>FY 1969 Funding (in 1000's)</u>
<u>Florida</u>	<u>13</u>	<u>523</u>
Florida State University, Tallahassee	6	298
Florida, University of, Gainesville	4	132
Miami, University of, Coral Gables	2	69
Miami, University of, Miami	1	24
<u>Georgia</u>	<u>9</u>	<u>349</u>
Georgia Institute of Technology, Atlanta	7	337
Georgia, University of, Athens	2	12
<u>Hawaii</u>	<u>1</u>	<u>390</u>
Hawaii, University of, Honolulu	1	390
<u>Idaho</u>	<u>1</u>	<u>10</u>
Idaho State University, Pocatello	1	10
<u>Illinois</u>	<u>28</u>	<u>5,919</u>
Chicago, University of, Chicago	8	1,347
Illinois Institute of Technology, Chicago	5	151
Illinois, University of, Urbana	7	4,203
Northwestern University, Evanston	8	218
<u>Indiana</u>	<u>18</u>	<u>3,217</u>
Indiana University, Bloomington	3	141
Notre Dame, University of, Notre Dame	3	1,398
Purdue University, Lafayette	12	1,678
<u>Iowa</u>	<u>4</u>	<u>88</u>
Dordt College, Sioux Center	1	8
Iowa, University of, Iowa City	3	80
<u>Kansas</u>	<u>9</u>	<u>640</u>
Kansas State University, Manhattan	4	271
Kansas, University of, Lawrence	5	369
<u>Kentucky</u>	<u>5</u>	<u>110</u>
Kentucky, University of, Lexington	4	87
Murray State University, Murray	1	23
<u>Louisiana</u>	<u>1</u>	<u>75</u>
Louisiana State University, Baton Rouge	1	75
<u>Maryland</u>	<u>24</u>	<u>2,927</u>
Johns Hopkins University, Baltimore	6	397
Maryland, University of, College Park	18	2,530

<u>State and Contractor</u>	<u>Number of Contracts</u>	<u>FY 1969 Funding (in 1000's)</u>
<u>Massachusetts</u>	<u>35</u>	<u>\$ 4,687</u>
Avco-Everett Research Laboratory, Everett	1	199
Boston University, Boston	1	34
Brandeis University, Waltham	5	274
Clark University, Worcester	1	25
Harvard University, Cambridge	4	180
Massachusetts Institute of Technology, Cambridge	13	3,223
Massachusetts, University of, Amherst	2	206
Northeastern University, Boston	2	64
Southeastern Massachusetts Technological Institute, North Dartmouth	1	100
Tufts University, Medford	4	357
Worcester Polytechnic Institute, Worcester	1	25
<u>Michigan</u>	<u>26</u>	<u>2,611</u>
Michigan State University, East Lansing	11	424
Michigan Technological University, Houghton	3	44
Michigan, University of, Ann Arbor	9	2,049
Wayne State University, Detroit	3	94
<u>Minnesota</u>	<u>10</u>	<u>1,544</u>
Minnesota, University of, Minneapolis	9	1,544
St. Mary's College, Winona	1	0
<u>Mississippi</u>	<u>1</u>	<u>7</u>
Mississippi, University of, University	1	7
<u>Missouri</u>	<u>9</u>	<u>391</u>
Midwest Research Institute, Kansas City	1	30
Missouri, University of, Rolla	2	66
Washington University, St. Louis	6	295
<u>Montana</u>	<u>2</u>	<u>45</u>
Montana State University, Bozeman	2	45
<u>Nebraska</u>	<u>2</u>	<u>21</u>
Nebraska, University of, Lincoln	2	21
<u>Nevada</u>	<u>1</u>	<u>0</u>
Nevada, University of, Reno	1	0
<u>New Hampshire</u>	<u>1</u>	<u>12</u>
New Hampshire, University of, Durham	1	12
<u>New Jersey</u>	<u>11</u>	<u>1,619</u>
Institute for Advanced Study, Princeton	1	61
Princeton University, Princeton	5	1,238
Rutgers University, New Brunswick	2	65
Stevens Institute of Technology, Hoboken	3	255
<u>New Mexico</u>	<u>1</u>	<u>10</u>
New Mexico Highlands University, Las Vegas	1	10

<u>State and Contractor</u>	<u>Number of Contracts</u>	<u>FY 1969 Funding (in 1000's)</u>
<u>New York</u>	<u>87</u>	<u>\$ 9,568</u>
Army, Department of, U.S. Military Academy, West Point	1	16
Brooklyn, Polytechnic Institute of, Brooklyn	3	91
Clarkson College of Technology, Potsdam	4	100
Columbia University, New York	12	3,628
Cornell University, Ithaca	20	1,339
Fordham University, New York	1	25
Long Island University, Greenvale	1	0
New York, City University of, Brooklyn College	1	25
New York, City University of, Hunter College	1	32
New York, City University of, Queens College	1	27
New York, State University of, Albany	1	49
New York, State University of, Buffalo	4	213
New York, State University of, Stony Brook	8	664
New York University, New York	3	1,213
Rensselaer Polytechnic Institute, Troy	9	285
Rochester, University of, Rochester	9	1,534
Syracuse University, Syracuse	3	192
Yeshiva University, New York	5	135
<u>North Carolina</u>	<u>17</u>	<u>1,302</u>
Duke University, Durham	4	675
North Carolina State University, Raleigh	5	189
North Carolina, University of, Chapel Hill	7	421
Wake Forest University, Winston-Salem	1	17
<u>North Dakota</u>	<u>1</u>	<u>35</u>
North Dakota, University of, Grand Forks	1	35
<u>Ohio</u>	<u>21</u>	<u>1,150</u>
Battelle Memorial Institute, Columbus	1	60
Case Western Reserve University, Cleveland	9	570
Ohio State University, Columbus	7	478
Ohio University, Athens	2	8
Toledo, University of, Toledo	2	34
<u>Oklahoma</u>	<u>3</u>	<u>55</u>
Oklahoma State University, Stillwater	1	0
Oklahoma, University of, Norman	2	55
<u>Oregon</u>	<u>8</u>	<u>392</u>
Oregon State University, Corvallis	5	183
Oregon, University of, Eugene	3	209
<u>Pennsylvania</u>	<u>34</u>	<u>2,893</u>
Carnegie-Mellon University, Pittsburgh	10	1,860
Duquesne University, Pittsburgh	1	16
Franklin Institute, Philadelphia	2	156
Lehigh University, Bethlehem	4	69
Pennsylvania State University, University Park	7	314
Pennsylvania, University of, Philadelphia	3	80
Pittsburgh, University of, Pittsburgh	5	266
Temple University, Philadelphia	2	132

<u>State and Contractor</u>	<u>Number of Contracts</u>	<u>FY 1969 Funding (in 1000's)</u>
<u>Puerto Rico</u>	<u>3</u>	<u>\$ 299</u>
Puerto Rico, University of, Mayaguez and Rio Piedras	3	299
<u>Rhode Island</u>	<u>6</u>	<u>501</u>
Brown University, Providence	5	501
Rhode Island, University of, Kingston	1	0
<u>South Carolina</u>	<u>3</u>	<u>89</u>
Clemson University, Clemson	1	44
South Carolina, University of, Columbia	2	45
<u>Tennessee</u>	<u>8</u>	<u>215</u>
Tennessee, University of, Knoxville	5	136
Vanderbilt University, Nashville	3	79
<u>Texas</u>	<u>28</u>	<u>2,784</u>
Baylor University, Waco	1	25
Houston, University of, Houston	4	125
Rice University, Houston	5	927
Texas A & M University, College Station	10	982
Texas Christian University, Ft. Worth	1	0
Texas Nuclear Corporation, Austin	1	100
Texas Technological College, Lubbock	1	23
Texas, University of, Austin	5	602
<u>Utah</u>	<u>8</u>	<u>183</u>
Brigham Young University, Provo	3	20
Utah, University of, Salt Lake City	5	163
<u>Vermont</u>	<u>2</u>	<u>52</u>
Vermont, University of, Burlington	2	52
<u>Virginia</u>	<u>7</u>	<u>241</u>
Roanoke College, Salem	1	16
Virginia Polytechnic Institute, Blacksburg	2	53
Virginia, University of, Charlottesville	4	172
<u>Washington</u>	<u>9</u>	<u>1,329</u>
Washington State University, Pullman	3	149
Washington, University of, Seattle	5	1,170
Western Washington State College, Bellingham	1	10
<u>Wisconsin</u>	<u>11</u>	<u>2,878</u>
Marquette University, Milwaukee	1	31
Wisconsin, University of, Madison	9	2,834
Wisconsin, University of, Milwaukee	1	13
<u>Wyoming</u>	<u>1</u>	<u>41</u>
Wyoming, University of, Laramie	1	41

HIGH ENERGY PHYSICS

- Army, Department of the, (U.S. Military Academy), West Point, New York. William B. Streett, Experimental Measurements of Density in Liquid Mixtures of Neon and Hydrogen. \$15,985 (2 years).
- Brandeis University, Waltham, Massachusetts. Lawrence E. Kirsch and Howard J. Schnitzer, Experimental and Theoretical Elementary Particle Physics. \$130,000.
- Brown University, Providence, Rhode Island. David Feldman and Anatole M. Shapiro, Experimental and Theoretical High Energy Physics. \$320,000.
- California Institute of Technology, Pasadena, California. Robert L. Walker, Operation and Research with 1.5 BeV Electron Synchrotron; Users Group. \$1,491,000.
- California, University of, Irvine, California. Frederick Reines, Studies of Neutrino and Cosmic Ray Interactions. \$480,000.
- California, University of, Irvine, California. Jonas Schultz, Study of New Heavy Bosons in Proton-Anti-Proton Interactions. \$130,000.
- California, University of, Los Angeles, California. Harold K. Ticho and Donald H. Stork, Research in High Energy Physics. \$319,000.
- California, University of, Riverside, California. Peter E. Kaus and Anne Kernan, High Energy Physics. \$230,000.
- California, University of, San Diego, California. Oreste Piccioni, Norman Kroll and George Masek, Experimental and Theoretical Particle Physics. \$1,055,000.
- California, University of, Santa Barbara, California. David O. Caldwell, High Energy Physics Users. \$140,000.
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Roger B. Sutton, High Energy Physics Users; Theoretical Research. \$881,000.
- Case Western Reserve University, Cleveland, Ohio. Thomas L. Jenkins, High Energy Accelerator Physics and Low Level Counting Elementary Particle Physics. \$70,000.
- Chicago, University of, Chicago, Illinois. Y. Nambu, Theoretical Research in Elementary Particle Physics. \$315,000.
- Chicago, University of, Chicago, Illinois. Roland Winston, Experimental Study of Weak Interactions. \$128,000.
- Colorado, University of, Boulder, Colorado. Leona Marshall Libby and Alan Franklin, High Energy Physics. \$289,000.
- Columbia University, New York, New York. Leon Lederman and Robert Serber, High Energy Physics Users; Theoretical Research. \$1,936,000.
- Cornell University, Ithaca, New York. Kenneth Greisen, Detection of Large Cosmic Ray Showers By Atmospheric Fluorescence. \$72,000.
- Duke University, Durham, North Carolina. Earle C. Fowler, Research in High Energy Physics. \$195,000.
- Florida State University, Tallahassee, Florida. Joseph E. Lannutti, Elementary Particle Physics. \$135,000.
- Harvard University, Cambridge, Massachusetts. Tai Tsun Wu, High Energy Collision Processes. \$25,000.
- Hawaii, University of, Honolulu, Hawaii. Vincent Z. Peterson and San Fu Tuan, Research in High Energy Nuclear Physics. \$390,000.
- Illinois, University of, Urbana, Illinois. A. Wattenberg and R. D. Sard, High Energy Physics Users; Theoretical Research. \$1,576,000.

HIGH ENERGY PHYSICS

- Indiana University, Bloomington, Indiana. Richard M. Heinz and Homer A. Neal, Spark Chamber and Counter High Energy Physics Research Program. \$85,000.
- Johns Hopkins University, Baltimore, Maryland. Gabor Domokos, Algebraic Methods in Regge Pole Theory. \$31,000.
- Maryland, University of, College Park, Maryland. George A. Snow, Properties of Elementary Particles. \$640,000.
- Massachusetts Institute of Technology, (National Magnet Laboratory), Cambridge, Massachusetts. Benjamin Lax, Search for Ferromagnetically Trapped Dirac Monopoles of Cosmic Ray Origin. \$38,000 (2 years).
- Massachusetts, University of, Amherst, Massachusetts, S. Steven Yamamoto and Janice B. Shafer, High Energy Physics. \$170,000.
- Michigan State University, East Lansing, Michigan. J. H. Hetherington, Theoretical Investigations of Scattering Problems and Nucleon-Nucleon Interactions. \$16,000.
- Michigan, University of, Ann Arbor, Michigan. H. R. Crane, High Energy Physics Users; Theoretical Research. \$790,000.
- Minnesota, University of, Minneapolis, Minnesota. Stephen Gasiorowicz and Hans W. J. Courant, Theoretical and High Energy Physics Research. \$250,000.
- National Bureau of Standards, Boulder, Colorado. Heat Transfer and Associated Fluid Property Studies with Liquid Helium. \$128,758.
- New York, State University of, Stony Brook, New York. Juliet Lee-Franzini, C. N. Yang and Myron L. Good, Experimental and Theoretical Subnuclear Physics. \$422,000.
- Ohio State University, Columbus, Ohio. Thomas A. Romanowski, K. Tanaka and W. W. Wada, High Energy Physics. \$290,000.
- Oregon, University of, Eugene, Oregon. Michael J. Moravcsik, Theory of Elementary Particles. \$77,000.
- Pittsburgh, University of, Pittsburgh, Pennsylvania. Richard H. Pratt, Studies in Quantum Electrodynamics and the Theory of Elementary Particles. \$75,000.
- Purdue University, Lafayette, Indiana. Frank J. Loeffler and Masao Sugawara, Fundamental Particle Physics. \$905,296.
- Rochester, University of, Rochester, New York. Morton F. Kaplon, High Energy Physics Users; Theoretical Research. \$925,000.
- Southeastern Massachusetts Technological Institute, North Dartmouth, Massachusetts. Zvi Bar-Yam, Photoproduction of Single Pions from Hydrogen and Deuterium. \$100,000 (2 years).
- Syracuse University, Syracuse, New York. K. C. Wali, Research Program in Elementary Particle Theory. \$145,000 (7 months).
- Tennessee, University of, Knoxville, Tennessee. William M. Bugg, Study of Elementary Particle Processes using Bubble Chamber Techniques. \$35,000.
- Tufts University, Medford, Massachusetts. Allan M. Cormack, Experimental and Theoretical High Energy Physics Research. \$340,000.
- Wisconsin, University of, Madison, Wisconsin. Ugo Camerini and Marvin E. Ebel, High Energy Physics Users; Theoretical Research. \$1,560,000.
- Yale University, New Haven, Connecticut. Robert K. Adair, High Energy Physics Users; Theoretical Research. \$1,105,000.

MEDIUM ENERGY PHYSICS

California, University of, Davis, California. John A. Jungerman and William W. True, Nuclear Physics Research. \$773,000.

California, University of, Los Angeles, California. Roy P. Haddock, Particle Physics. \$180,000.

Carnegie-Mellon University, Pittsburgh, Pennsylvania. R. B. Sutton, 440 MeV Synchrocyclotron and Associated Research. \$375,000.

Columbia University, New York, New York. W. W. Havens and C. S. Wu, Medium Energy Physics. \$121,000.

Houston, University of, Houston, Texas. John C. Allred and Clark Goodman, Pion Interactions at Medium Energies. \$25,345 (11 months).

Maryland, University of, College Park, Maryland. Harry D. Holmgren, Variable Energy Cyclotron Facility. \$3,000,000 (authorized FY 1965).

Maryland, University of, College Park, Maryland. Harry D. Holmgren, Experimental Study of the Structure of Nuclei and the Interactions of Intermediate Energy Particles. \$600,032.

Maryland, University of, College Park, Maryland. William M. MacDonald, Theoretical Studies in Nuclear Reactions and Nuclear Structure. \$172,461.

Massachusetts Institute of Technology, Cambridge, Massachusetts. P. T. Demos, Medium Energy Physics. \$597,000.

Minnesota, University of, Minneapolis, Minnesota. J. Morris Blair, George Greenlees and Norton Hintz, Experimental Nuclear Physics. \$36,917.

Rice University, Houston, Texas. Gerald C. Phillips, Nuclear and Extra-Nuclear Physics. \$70,000.

Rochester, University of, Rochester, New York. Adrian C. Melissinos and J. Bruce French, Synchrocyclotron Operation and Associated Research. \$175,000.

Texas A & M University, College Station, Texas. A. D. Suttle, Jr., Variable Energy Cyclotron Facility. \$3,000,000 (authorized FY 1964).

Texas A & M University, College Station, Texas. J. A. McIntyre and A. D. Suttle, Jr., TAMVEC Research Program. \$670,000.

Yale University, New Haven, Connecticut. Vernon W. Hughes, Medium Energy Physics. \$84,000.

LOW ENERGY PHYSICS

- Alaska, University of, College, Alaska. Eduard Berg, Earth Tilts in Connection with Crustal Failure: A Study in Alaska. \$39,268.
- Alaska, University of, College, Alaska. Syun-Ichi Akasofu, A Study of Magnetospheric Substorms in Conjunction with the Vela Satellite Data. \$20,558.
- Alaska, University of, College, Alaska. David B. Stone, Paleomagnetic Studies on Amchitka Island. No Funds (2 years).
- Arizona, University of, Tucson, Arizona. Douglas J. Donahue, Research in Nuclear Physics. \$107,000.
- Arizona, University of, Tucson, Arizona. C. Y. Fan, To Measure Lamb Shift in Hydrogen-Like Atoms of Nuclear Charge $Z \geq 3$. \$60,000 (2 years).
- Brigham Young University, Provo, Utah. Dwight R. Dixon, Max W. Hill and Gary L. Jensen, Transfer of 4 MeV Van de Graaff Accelerator. No Funds (4 years).
- Brown University, Providence, Rhode Island. Russell A. Peck, Jr., Reaction Studies with Fast Neutrons and Theory of Direct Reactions and Nuclear Excitations. \$95,000.
- California Institute of Technology, Pasadena, California. Felix Boehm, Nuclear Spectroscopy and X-ray Program. \$330,000.
- California, University of, Berkeley, California. Carson D. Jeffries, Dynamic Nuclear Polarization and Solid State Physics. \$81,700.
- California, University of, Berkeley, California. John H. Reynolds, Mass Spectroscopy Research. \$70,000.
- California, University of, Los Angeles, California. J. Reginald Richardson and Byron T. Wright, Nuclear Structure Research. \$538,400.
- California, University of, Los Angeles, California. Leon Knopoff, Space-Time Correlation of Seismic Events. \$42,670.
- California, University of, Los Angeles, California. George C. Kennedy, Compressibility Measurements. \$62,084.
- California, University of, San Diego, California. Keith A. Brueckner, Problems in the Theory of Many-Body Systems. \$130,000.
- California, University of, Santa Barbara, California. Paul H. Barrett and Robert M. Eisberg, Nuclear Structure Research. \$70,000.
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Peter D. Barnes, Experimental Nuclear Physics. \$49,693.
- Case Western Reserve University, Cleveland, Ohio. Erwin F. Shrader and R. M. Thaler, Nuclear Physics Research. \$270,000.
- Catholic University of America, Washington, D. C. Robert W. Deutsch, Experimental and Theoretical Investigations of Nuclear Fission Induced by Low-Energy Nuclear Particles. \$47,347.
- Colorado, University of, Boulder, Colorado. W. R. Smythe and Ernest S. Rost, Study of Fundamental Nuclear Interactions. \$453,325.
- Columbia University, New York, New York. W. W. Havens, Jr., C. S. Wu, L. J. Rainwater, L. J. Lidofsky, and H. N. Goldstein, Nuclear Physics Research. \$1,214,000.
- Cornell University, Ithaca, New York. David D. Clark, Experimental Study of Nuclear Isomers. \$40,000.
- Duke University, Durham, North Carolina. Henry W. Newson, Studies of Nuclear Structure using Neutrons and Charged Particles. \$480,000.

LOW ENERGY PHYSICS

- Duke University, Durham, North Carolina. Henry W. Newson, Regional Nuclear Physics Laboratory. \$2,500,000 (authorized FY 1966).
- Franklin Institute, Philadelphia, Pennsylvania. Franz R. Metzger, Electromagnetic Properties of Excited States of Nuclei. \$90,000.
- Gulf General Atomic Incorporated, San Diego, California. W. M. Lopez and M. P. Fricke, Neutron Capture Cross-Section Measurements. \$99,833.
- Illinois, University of, Urbana, Illinois. George H. Miley and Joseph T. Verdeyen. Advanced Methods for Nuclear Reactor-Gas Laser Coupling. \$53,000.
- Johns Hopkins University, Baltimore, Maryland. Henry M. Crosswhite, Jr. and Brian R. Judd, Theoretical Spectroscopy and Spectra of Rare Earth Ions and Hydrogen Molecules. \$75,000.
- Johns Hopkins University, Baltimore, Maryland. George E. Owen and Leon Madansky, Studies of Nuclear Reactions with Light Nuclei and Studies of Radioactive Transitions. \$251,000.
- Kansas State University, Manhattan, Kansas. Robert B. Leachman, Nuclear Physics Accelerator Facility. \$440,461 (authorized FY 1966).
- Kansas State University, Manhattan, Kansas. Robert B. Leachman, Atomic and Nuclear Research with Accelerators. \$204,579.
- Kansas State University, Manhattan, Kansas. Walter Meyer and John O. Mingle, Fast Neutron Transmission Measurements for Reactor Core and Shielding Materials. \$47,800.
- Kansas, University of, Lawrence, Kansas. Ralph W. Krone, Nuclear Structure Studies of the Light and Medium-Light Nuclei. \$181,500.
- Maryland, University of, College Park, Maryland. William F. Hornyak, The Structure of Light Nuclei. \$210,000.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. P. T. Demos, Nuclear Physics Research. \$1,223,000.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. Keiiti Aki, Measurement of Stress in Place. \$44,000.
- Michigan State University, East Lansing, Michigan. Hugh McManus, Scattering Problems Including the Scattering of Particles by Nuclei. \$85,000.
- Michigan State University, East Lansing, Michigan. Peter S. Signell, Elementary Particle Basis of Nuclear Forces. \$68,000.
- Michigan, University of, Ann Arbor, Michigan. H. R. Crane, Low Energy Physics Research. \$976,000.
- Michigan, University of, Ann Arbor, Michigan. Glenn Knoll, Absolute Fission Cross Section Measurements. \$44,355.
- Minnesota, University of, Minneapolis, Minnesota. J. Morris Blair, George Greenlees, and Norton Hintz, Experimental Nuclear Physics. \$863,711.
- National Academy of Sciences, Washington, D. C. Konrad Krauskopf, Committee on the Alaska Earthquake. \$5,000.
- National Academy of Sciences, Washington, D. C. William R. Judd, U.S. National Committee on Rock Mechanics. \$5,000.
- National Academy of Sciences, Washington, D. C. C. K. Reed, Committee on Nuclear Science. \$19,700.
- New York, State University of, Buffalo, New York. Gregory Breit, The Theories of Nucleon-Nucleon Interactions, Nuclear Reactions and Atomic Hyperfine Structure. \$124,968 (14 months).

LOW ENERGY PHYSICS

- New York, State University of, Stony Brook, New York. G. E. Brown and Arnold M. Feingold, Research in Theoretical Nuclear Physics. \$100,000.
- North Carolina State University, Raleigh, North Carolina. L. W. Seagondollar, Nuclear Structure Research at the Regional Nuclear Laboratory. \$81,000.
- North Carolina, University of, Chapel Hill, North Carolina. Eugen Merzbacher, Studies of Nuclear Processes. \$79,822.
- Notre Dame, University of, Notre Dame, Indiana. Charles J. Mullin, Interactions of Photons and Particles with Nuclei. \$84,449.
- Notre Dame, University of, Notre Dame, Indiana. John W. Mihelich, Nuclear Spectroscopy. \$99,015.
- Ohio University, Athens, Ohio. Raymond O. Lane, 8 MeV Tandem Accelerator Facility. \$1,000,000 (authorized FY 1967).
- Oregon State University, Corvallis, Oregon. Harry T. Easterday, Low Energy Nuclear Research. \$80,000.
- Oregon, University of, Eugene, Oregon. Bernd Crasemann and Amit Goswami, Nuclear Physics Research. \$100,000 (5 months).
- Pennsylvania, University of, Philadelphia, Pennsylvania. Henry Faul, Applications of Spontaneous Fission of ^{238}U in the Study of Natural Crystals and Glasses. \$19,340.
- Princeton University, Princeton, New Jersey. Rubby Sherr, Nuclear Physics Research. \$680,000.
- Purdue University, Lafayette, Indiana. Rolf M. Steffen, Research in Nuclear Physics. \$300,000.
- Rice University, Houston, Texas. G. C. Phillips and G. K. Walters, Nuclear and Extra-Nuclear Physics. \$585,000.
- Rochester, University of, Rochester, New York. J. B. French and Adrian C. Melissinos, Nuclear Physics Research. \$130,000.
- South Carolina, University of, Columbia, South Carolina. Frank T. Avignone, III, Antineutrino Absorption Cross Section Measurement. \$24,915 (16½ months).
- Southern California, University of, Los Angeles, California. H. H. Forster, Nuclear Physics Research. \$23,484.
- Texas Nuclear Corporation, Austin, Texas. William E. Tucker, Experimental and Theoretical Studies of Neutron Produced Gamma Ray Cross Sections. \$100,000.
- Texas, University of, Austin, Texas. Ira L. Morgan, Research in Nuclear Physics. \$400,000.
- Washington, University of, Seattle, Washington. Robert Vandenbosch and Robert Puff, Experimental and Theoretical Nuclear Physics. \$1,044,280.
- Washington, University of, Seattle, Washington. Gene L. Woodruff, The Measurement of Delayed Neutron Energy Spectra. \$27,498.
- Wisconsin, University of, Madison, Wisconsin. C. H. Blanchard and H. H. Barschall, Nuclear Research. \$558,065.
- Wisconsin, University of, Madison, Wisconsin. J. R. Dillinger, Low Temperature Physics. \$60,000.
- Wyoming, University of, Laramie, Wyoming. William G. Simon and Hudson B. Eldridge, Neutron Emission from Compound Nuclei. \$41,000.
- Yale University, New Haven, Connecticut. Vernon W. Hughes and Howard L. Schultz, Studies in Nuclear Physics. \$655,000.

LOW ENERGY PHYSICS

Yale University, New Haven, Connecticut. D. A. Bromley, Emperor Tandem Van de Graaff Research Program. \$875,000.

Yeshiva University, New York, New York. A. G. W. Cameron, Research in Nuclear Physics and Nucleosynthesis. \$40,662.

MATHEMATICS AND COMPUTER RESEARCH

- California, University of, Berkeley, California. A. H. Taub, Analytical and Numerical Studies in General Relativity. \$93,371 (2 years).
- California, University of, Los Angeles, California. Gerald Estrin, Research Program for the UCLA Variable Structure Computer System. \$249,996.
- California, University of, San Diego, California. Kenneth Bowles, Computing Facility at UCSD. No Funds.
- Case Western Reserve University, Cleveland, Ohio. Richard S. Varga, Use of Variational and Projectional Methods in Numerical Analysis. \$47,935.
- Chicago, University of, Chicago, Illinois. Victor H. Yngve, Computer Research and Development. \$410,000.
- Duke University, Durham, North Carolina. John L. Artley and Herbert Hacker, Jr., Superconducting Circuitry. \$99,404 (2 years).
- Harvard University, Cambridge, Massachusetts. Garrett Birkhoff, Research on Reactor Mathematics. \$37,460 (15 months).
- Illinois, University of, Urbana, Illinois. Bruce H. McCormick, Pattern Recognition Computer. \$380,000.
- Illinois, University of, Urbana, Illinois. C. W. Gear and W. J. Poppelbaum, Computer Systems Research. \$600,000.
- Maryland, University of, College Park, Maryland. Bertie E. Hubbard, Studies of the Numerical Solution of Elliptic and Parabolic Boundary Value Problems. \$85,552 (2 years).
- Maryland, University of, College Park, Maryland, Azriel Rosenfeld, Development of a Generalized Picture-Processing Programming System. \$91,205 (2 years).
- Midwest Research Institute, Kansas City, Missouri. Yudell L. Luke, Research in Finite Perturbation Methods. \$30,462.
- New York, City University of/Queens College, Flushing, New York. Arthur Sard, Optimal Approximation and Differentiable Maps. \$26,966.
- New York, State University of, Stony Brook, New York. Martin A. Leibowitz and Daniel Dicker, Research in Applied Mathematics. \$58,860 (2 years).
- New York University, New York, New York. Peter Lax, Courant Institute of Mathematical Sciences. \$949,000.
- New York University, University Heights, Bronx, New York. Raphael Aronson, Investigation of Transfer Matrix Method. \$30,000.
- North Carolina, University of, Chapel Hill, North Carolina. Frederick P. Brooks, Jr., An Investigation of a System for Displaying Computer Outputs to the Kinesthetic Sense. \$112,231.
- Oregon State University, Corvallis, Oregon. Arvid T. Lonseth, Research in Applied Analysis. \$48,029.
- Rice University, Houston, Texas. Walter Orvedahl and Zevi W. Salsburg, Computer Research. \$121,466.
- Southern California, University of, Los Angeles, California. Richard Bellman, New Methods in the Theory of Partial Differential Equations. \$58,200 (2 years).
- Stanford University, Stanford, California. George B. Dantzig, Robert B. Wilson and Richard W. Cottle, Stochastic Mathematical Programs. \$39,900.

MATHEMATICS AND COMPUTER RESEARCH

Stanford University, Stanford, California. Stefan Bergman, The Kernel Function and the Method of Particular Solutions. \$30,715.

Stanford University, Stanford, California. William F. Miller, Programming Models and the Control of Parallel Computing Systems. \$58,281 (15½ months).

Stanford University, Stanford, California. Gene Golub, Numerical Analysis with Emphasis on Least Square Problems. \$30,262.

Washington University, St. Louis, Missouri. Leon Cooper, Research in Methods of Nonlinear and Combinatorial Programming. \$49,335.

CHEMISTRY

- Arizona State University, Tempe, Arizona. LeRoy Eyring, Solid State Chemistry of Rare Earth Oxides. \$73,000.
- Arizona, University of, Tucson, Arizona. Henry Freiser, Development and Testing of Organic Reagents for Use in Inorganic Analysis. \$37,000.
- Arizona, University of, Tucson, Arizona. Paul E. Damon, Correlation and Chronology of Ore Deposits and Volcanic Rocks. \$38,000.
- Arizona, University of, Tucson, Arizona. Leslie S. Forster, The Luminescence of Metal Complexes. \$20,000.
- Arizona, University of, Tucson, Arizona. Quintus Fernando, An Investigation of Steric and Synergic Effects in Metal Chelates. \$15,000.
- Arkansas, University of, Fayetteville, Arkansas. Arthur Fry, Tracer and Isotope Effect Studies in Organic Chemistry. \$38,900.
- Arkansas, University of, Fayetteville, Arkansas. Paul K. Kuroda, Nuclear and Cosmochemistry. \$72,000.
- Atomics International, Canoga Park, California. S. J. Yosim, High Temperature Chemistry. \$138,000.
- Atomics International, Canoga Park, California. R. B. Ingalls, Radiation Chemistry. \$72,000.
- Auburn University, Auburn, Alabama. William C. Askew and C. H. Ward, Synthesis, Identification and Purification of C₆ and C₇ Fluorocarbons from Radiolysis. \$32,000.
- Avco-Everett Research Laboratory, Everett, Massachusetts. Richard H. Levy, Study of a Heavy Ion Plasma Accelerator \$198,971 (10 months).
- Baylor University, Waco, Texas. W. O. Milligan, Crystal Structure and Morphology of Hydrrous Oxides and Hydroxides in the Lanthanide and Actinide Series. \$25,000.
- Brandeis University, Waltham, Massachusetts. Henry Linschitz, Photochemical Reactions of Complex Molecules in Condensed Phase. \$54,128.
- Brandeis University, Waltham, Massachusetts. Saul G. Cohen, Effects of Mercaptans and Disulfides on Photochemical and High Energy Radiation Induced Reactions. \$23,400.
- Brigham Young University, Provo, Utah. Reed M. Izatt and James J. Christensen, Jr., Thermodynamics of Metal-Ligand Interaction in Aqueous Solution. \$20,000.
- Brown University, Providence, Rhode Island. E. F. Greene, Experimental Chemical Kinetics: A Study of Chemical Reactions by Means of Molecular Beam and Shock Wave Techniques. \$54,000.
- California Institute of Technology, Pasadena, California. Frederick H. Shair, Diffusion of Molecular Species at Low Concentrations in Glow Discharge. \$19,128.
- California Institute of Technology, Pasadena, California. Aron Kuppermann, Studies in Chemical Dynamics and Radiation Chemistry: \$120,000.
- California Institute of Technology, Pasadena, California. Robert P. Sharp, Geochemical Studies with Stable and Radioactive Isotopes. \$160,000.
- California Institute of Technology, Pasadena, California. Jesse L. Beauchamp, The Application of Ion Cyclotron Resonance to the Study of Ion-Molecule Interactions. \$29,948.
- California, University of, Davis, California. John W. Root, Recoil Studies in Chemical Dynamics. \$43,482.
- California, University of, Davis, California. Peter A. Rock, The Thermodynamic Properties of Lithium Isotopes. \$10,538.

CHEMISTRY

- California, University of, Irvine, California. Frank S. Rowland, Radiochemistry Research. \$125,000.
- California, University of, Los Angeles, California. W. G. McMillan, E. R. Hardwick and M. F. Nicol, Intra- and Intermolecular Energy Transfer Studies. \$105,000 (18 months).
- California, University of, Los Angeles, California. M. A. El-Sayed, The Vacuum Ultraviolet Spectra and Photochemistry of Polyatomic Molecules. \$48,000.
- California, University of, Los Angeles, California. Clifford S. Garner, Complex Ion Chemistry. \$45,000.
- California, University of, Riverside, California. Donald T. Sawyer, Study of Metal Chelates. \$30,000.
- California, University of, San Diego, California. Harold C. Urey, The Distribution and Origin of the Elements and Their Isotopes in Nature. \$90,000.
- California, University of, San Diego, California. Joseph E. Mayer, Interacting Atoms. \$34,380.
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Truman P. Kohman, Nuclear Chemistry and Geochemistry Research. \$69,601.
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Robert H. Schuler, Radiation Chemistry. \$350,000.
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Albert A. Caretto, Jr., High Energy Nuclear Reactions. \$60,130.
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Joe V. Michael, Reactions of Hydrogen Atoms. \$26,000.
- Case Western Reserve University, Cleveland, Ohio. Edwin W. Abrahamson, Primary Processes in Radiation Chemistry. \$20,000.
- Case Western Reserve University, Cleveland Ohio. Robert E. Sparks, Velocity Profile Control in Large Scale Chromatographic Columns. \$37,000 (3 years).
- Catholic University of America, Washington, D. C. Theodore A. Litovitz, Ultrasonic Spectroscopy in Liquids at High Temperatures. \$23,853.
- Chicago, University of, Chicago, Illinois. Clyde A. Hutchison, Jr., Paramagnetic Resonance Absorption. \$150,000.
- Chicago, University of, Chicago, Illinois. Edward Anders, Radiochemical and Geochemical Studies. \$51,917.
- Chicago, University of, Chicago, Illinois. Nathan Sugarman and Anthony Turkevich, Nuclear Chemistry Research. \$200,000.
- Chicago, University of, Chicago, Illinois. Ugo Fano, Basic Studies of Atomic Dynamics. \$51,349.
- Clark University, Worcester, Massachusetts. Daeg S. Brenner, Nuclear Chemistry and Radiochemistry. \$25,000.
- Clarkson College of Technology, Potsdam, New York. Milton Kerker, Studies on Colloidal Particles: Scavenging of Aerosol Particles by a Falling Macroscopic Particle. \$27,500.
- Clarkson College of Technology, Potsdam, New York. Richard J. Nunge and Fadel F. Erian, An Investigation of Pulsating Turbulent Flow. \$24,999 (9 months).
- Colorado State University, Fort Collins, Colorado. John D. Vaughan, Chemical Effects of the Nuclear Reaction $N^{14}(n,p)C^{14}$ in Various Nitrogenous Compounds. \$12,800.

CHEMISTRY

- Columbia University, New York, New York. T. I. Taylor, Separation of Isotopes. \$46,386.
- Columbia University, New York, New York. J. M. Miller, Nuclear Chemistry at Medium and High Energy. \$70,000.
- Columbia University, New York, New York. Paul F. Kerr, Alteration and Mineralization of Primary Uranium Deposits. \$33,000.
- Columbia University, New York, New York. Charles F. Bonilla, High Temperature Transport Properties and Processes of Gases and Alkali Metals. \$31,200.
- Columbia University, College of Pharmaceutical Sciences, New York, New York. Alfred V. Willi, Isotope Effects in Nucleophilic Substitution Reactions of Alkyl Halides. \$16,000.
- Cornell University, Ithaca, New York. Franklin A. Long, Mechanisms of Acid-Base Catalysis and Studies in Deuterium Oxide as Solvent. \$37,500.
- Dordt College, Sioux Center, Iowa. Russell Maatman, Interactions of Aqueous and Nonaqueous Ions with Oxide Surfaces. \$8,000.
- Florida State University, Tallahassee, Florida. Gregory R. Choppin, Chemistry of the Actinide and Lanthanide Elements and Nuclear Chemistry. \$102,000 (2 years).
- Florida State University, Tallahassee, Florida. Russell H. Johnsen, Radiation Induced Effects in Organic Systems. \$40,338.
- Florida State University, Tallahassee, Florida. Raymond K. Sheline, An Experimental Study of Nuclear Models. \$90,000.
- Florida State University, Tallahassee, Florida. James V. Quagliano, Structural Studies of Metal Coordination Compounds. \$15,000.
- Florida State University, Tallahassee, Florida. Ronald J. Clark, Physical-Inorganic Studies on Phosphorus Trifluoride-Metal Complexes. \$18,000.
- Florida, University of, Gainesville, Florida. M. Luis Muga, Ternary Fission and the Interaction of Fission Fragments with Matter. \$49,000.
- Florida, University of, Gainesville, Florida. Robert J. Hanrahan, Radiation Chemistry of Hydrocarbon and Alkyl Halide Systems. \$54,000 (18 months).
- Florida, University of, Gainesville, Florida. William H. Ellis, Chemical Structural Studies by Nuclear Techniques. \$32,500 (19 months).
- Fordham University, New York, New York. Michael Cefola, Kinetics and Structural Studies of Chelates. \$25,000.
- Georgetown University, Washington, D. C. Joseph E. Earley, Substitution in Oxyions. \$9,000 (17 months).
- George Washington University, Washington, D. C. Nicolae Filipescu, Lanthanide Ions as Sensitive Probes in Intermolecular Energy Transfer and Organic Photochemistry. \$22,000.
- Georgia Institute of Technology, Atlanta, Georgia. Richard W. Fink, Nuclear Spectroscopy and Fast Neutron Reactions. \$85,000.
- Georgia Institute of Technology, Atlanta, Georgia. James A. Knight, Jr., Radiation Chemistry of Monosubstituted Aromatic Compounds. \$21,000.
- Georgia, University of, Athens, Georgia. Francis J. Johnston, Studies in Colloid Kinetics and Radiation Chemistry. \$12,000.
- Georgia, University of, Athens, Georgia. Charles E. Melton, Radiolysis of Water in a Wide Range Radiolysis Source. \$37,138 (2 years).

CHEMISTRY

- Harvard University, Cambridge, Massachusetts. William A. Klemperer, Molecular Spectroscopy of Substances Existing at High Temperatures. \$60,000.
- Harvard University, Cambridge, Massachusetts. Martin Karplus, Theoretical Studies in Chemical Kinetics. \$95,000.
- Harvey Mudd College, Claremont, California. J. Arthur Campbell, Energy Levels of Polyatomic Inorganic Ions. \$17,260 (27 months).
- Houston, University of, Houston, Texas. Gerhard G. Meisels, Principal Processes in the Radiolysis of Gases by High Energy Electrons and Fission Fragments. \$46,000.
- Houston, University of, Houston, Texas. L. C. Witte, The Vapor Explosion - Heat Transfer and Fragmentation. \$35,000.
- Idaho State University, Pocatello, Idaho. Joseph L. Thompson, Consequences of Radioactive Decay: Charge and Kinetic Energy of the Daughter Atom. \$10,383.
- Illinois Institute of Technology, Chicago, Illinois. Phillip G. Wahlbeck, High Temperature Chemistry-Fundamentals of Effusion and Thermodynamics of Materials. \$33,000.
- Illinois Institute of Technology, Chicago, Illinois. Theodore J. Neubert, Color Centers and Related Phenomena in Alkali Halide Type Crystals. \$35,000.
- Illinois, University of, Urbana, Illinois. Robert F. Nystrom, Preparation of Carbon-14 and Tritium Labeled Compounds by Hydroboration and Tritioboration Procedures. \$18,029.
- Illinois, University of, Urbana, Illinois. Peter E. Yankwich, Isotope Effects and Chemical Kinetics. \$28,000.
- Indiana University, Bloomington, Indiana. W. B. Schaap and F. C. Schmidt, Electrochemical Research in Amine Solvents. \$34,000.
- Indiana University, Bloomington, Indiana. V. J. Shiner, Jr., Deuterium Effects on the Rates of Organic Reactions. \$22,000.
- Iowa, University of, Iowa City, Iowa. E. David Cater, High Temperature Physical Chemistry. \$23,000.
- Iowa, University of, Iowa City, Iowa. Gilbert Gordon, Stable Isotope Tracer Studies. \$26,000.
- Johns Hopkins University, Baltimore, Maryland. Paul H. Emmett, Study of Catalytic Surfaces and the Mechanism of Catalytic Reactions. \$26,105.
- Johns Hopkins University, Baltimore, Maryland. Walter S. Koski, Studies in Hot Atom and Radiation Chemistry. \$72,072 (18 months).
- Kansas State University, Manhattan, Kansas. Herbert C. Moser, Chemical Effects of Low Energy Electron Irradiation: Reactions of Tritium Atoms and Ions. \$18,552.
- Kansas, University of, Lawrence, Kansas. Edward J. Zeller, Study of Natural Radiation Damage in Minerals by Electron Spin Resonance and Thermoluminescence. \$27,000.
- Kansas, University of, Lawrence, Kansas. Paul W. Gilles, High Temperature Chemistry. \$92,000.
- Kansas, University of, Lawrence, Kansas. Larry Kevan, Radiolysis Studies on Fluorocarbons and on Reactive Intermediates. \$37,000.
- Kentucky, University of, Lexington, Kentucky. William F. Wagner and Donald E. Sands, Properties and Structure of Solvates of Metal Chelates. \$27,500.
- Kentucky, University of, Lexington, Kentucky. William D. Ehmann, Radiochemistry as Applied to Geochemical Problems; Neutron Activation Analysis. \$20,500.

CHEMISTRY

- Kentucky, University of, Lexington, Kentucky. Charles E. Hamrin, Jr., Separation of Boron Isotopes by Parametric Pumping. \$18,696.
- Lehigh University, Bethlehem, Pennsylvania. James E. Sturm, Studies of Photochemical Processes. \$20,000 (3½ years).
- Lehigh University, Bethlehem, Pennsylvania. Edward K. Levy, Vapor Compressibility Effects in Heat Pipes. \$20,385 (16 months).
- Long Island University, Greenvale, New York. James J. Barker, Particle-to-Fluid Heat Transfer Coefficients in Fluidized Beds by Means of a Microelectronic Device. \$21,565 (2 years).
- Maryland, University of, College Park, Maryland. Joseph Silverman, Graft Polymerization. \$26,900.
- Maryland, University of, College Park, Maryland. Everett R. Johnson, The Radiation Induced Decomposition of Inorganic Salts. \$24,580 (18 months).
- Maryland, University of, College Park, Maryland. Victor E. Viola, Jr., Research in Nuclear Chemistry. \$34,995.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. Charles D. Coryell, et al, Nuclear Chemistry Research. \$379,150.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. Patrick M. Hurley, Variations in Isotopic Abundances of Strontium, Calcium and Argon, and Related Topics. \$75,000.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. F. Albert Cotton, Thermodynamic, Spectral and Structural Studies of Complex Ions. \$42,000.
- Miami, University of, Miami, Florida. David E. Fisher, Studies on Meteorites and Related Subjects. \$24,000.
- Michigan State University, East Lansing, Michigan. Harry A. Eick, An Investigation of Some Rare Earth Boron, Carbon, Nitrogen, and Related Systems at Elevated Temperatures. \$35,984.
- Michigan State University, East Lansing, Michigan. James L. Dye, Electrochemistry and Spectra of Metal-Ammonia and Metal-Amine Solutions and Kinetics of Electron-Attachment Reactions. \$35,000.
- Michigan State University, East Lansing, Michigan. Carl H. Brubaker, Jr., Effects of Polyfunctional Anions on the Electron-Transfer Between Metal Ions in Solution. \$20,000.
- Michigan State University, East Lansing, Michigan. Max T. Rogers, Electron Spin Resonance Studies of Radiation Effects. \$24,760.
- Michigan State University, East Lansing, Michigan. William G. McHarris, A Nuclear Spectroscopy Program for Investigating Neutron Deficient Isotopes in the Lead-Bismuth Region. \$40,000.
- Michigan Technological University, Houghton, Michigan. Leslie Leifer, Fundamental Studies of Concentrated Electrolyte Solutions. \$17,000.
- Michigan, University of, Ann Arbor, Michigan. Adon A. Gordus, Radiochemical Studies. \$73,100.
- Michigan, University of, Ann Arbor, Michigan. Edgar F. Westrum, Jr., Low Temperature Chemical Thermodynamics. \$62,555.
- Michigan, University of, Ann Arbor, Michigan. George S. Springer, Theoretical and Experimental Study of Film Condensation of Liquid Metal Vapors. \$26,000.
- Minnesota, University of, Minneapolis, Minnesota. Sanford Lipsky, The Contribution of Electronically Excited States to the Radiation Chemistry of Organic Systems. \$51,489.
- Minnesota, University of, Minneapolis, Minnesota. Robert W. Carr, Jr., Kinetics of Methylene and Hydroxyl Radical Reactions. \$24,807.

CHEMISTRY

- Mississippi, University of, University, Mississippi. Theodore J. Klingens, Investigation of Gamma-Ray Induced Polymer Formation in the Carboranes. \$13,000.
- Montana State University, Bozeman, Montana. J. A. Scanlan and E. H. Bishop, Natural Convection Heat Transfer Between Concentric Spheres. \$45,000 (2 years).
- National Bureau of Standards, Washington, D. C. Nuclear, Structural and Inorganic Chemistry; Radiation, Isotope and Physical Chemistry. \$378,000.
- Navy, Bureau of Ships, Naval Radiological Defense Laboratory, San Francisco, California. Nathan E. Ballou and E. C. Freiling, High Temperature Chemistry and Nuclear Chemistry. \$100,000.
- Nebraska, University of, Lincoln, Nebraska. Edward P. Rack, Hot Atom Chemistry of Neutron Capture Reactions and Isomeric Transitions. \$25,000.
- Nevada, University of, Reno, Nevada. Richard D. Burkhardt, A Measurement of Diffusion Coefficients of Alkyl Radicals in Solution by Photochemical Space Intermittency. \$12,000 (3 years).
- The New England Institute, Inc., Ridgefield, Connecticut. S. J. Tao, Positronium Chemistry. \$48,000.
- New Hampshire, University of, Durham, New Hampshire. Helmut M. Haendler, Reactions in Nonaqueous Solvents. \$11,550.
- New Mexico Highlands University, Las Vegas, New Mexico. Vincent C. Anselmo, Chemical Effects Following Neutron Capture in Phosphates. \$10,400.
- New York, City University of/Brooklyn College, Brooklyn, New York. Harmon L. Finston, Applications of Nuclear and Radiochemical Techniques in Chemical Analysis. \$25,058.
- New York, City University of/Hunter College, New York, New York. Richard H. Wiley, Ion Exchange Resins. \$32,350.
- New York, State University of, Buffalo, New York. Jacob A. Marinsky, Studies in Solution and Nuclear Chemistry. \$40,000.
- New York, State University of, Buffalo, New York. David A. Cadenhead, Chemisorption Studies at Metal Alloy-Gaseous Interfaces. \$12,000.
- New York, State University of, Buffalo, New York. Philip Coppens, Charge Density Studies by Combined X-ray and Neutron Diffraction. \$36,000.
- New York, State University of, Stony Brook, New York. John M. Alexander, Nuclear Reaction Studies. \$105,100 (18 months).
- New York, State University of, Stony Brook, New York. Oliver A. Schaeffer, High Energy Nuclear Interactions with Matter. \$60,201.
- North Carolina State University, Raleigh, North Carolina. Wilbur C. Peterson, Dynamics and Control of a Heat Transfer Process. \$25,000 (15 months).
- North Carolina, University of, Chapel Hill, North Carolina. Richard C. Jarnagin, Organic Thin Films: Photoexcited Properties and Electron Energy Loss. \$19,370.
- Northwestern University, Evanston, Illinois. Fred Basolo and Ralph G. Pearson, Mechanisms of Substitution Reactions of Metal Complexes. \$40,000.
- Northwestern University, Evanston, Illinois. Malcolm Dole, Mechanism of High Energy Radiation Effects in High Polymers. \$29,000.
- Northwestern University, Evanston, Illinois. Herman L. Pines, The Use of C-14 and Tritium in the Study of Catalyzed Reactions of Hydrocarbons and Alcohols. \$36,000.

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- Northwestern University, Evanston, Illinois. Fred E. Stafford, Physical Chemistry of Highly Energetic Systems. \$36,000.
- Notre Dame, University of, Notre Dame, Indiana. Milton Burton, Radiation Chemistry. \$1,215,000.
- Ohio State University, Columbus, Ohio. Harold H. Nielsen and K. N. Rao, High-Resolution Infrared Spectra of Tritium-Substituted and other Isotopic Molecules. \$30,000.
- Ohio State University, Columbus, Ohio. Richard F. Firestone, Kinetics of Ionizing Radiation Induced Chemical Reactions. \$35,898.
- Ohio State University, Columbus, Ohio. Christie J. Geankoplis, Knudsen and Molecular Diffusion of Gases in Capillaries and Porous Solids over Large Pressure Ranges. \$16,523.
- Ohio State University, Columbus, Ohio. Leon M. Dorfman, Pulse Radiolysis of Organic and Aquo-Organic Systems. \$40,692.
- Ohio University, Athens, Ohio. James Y. Tong, An Investigation of Chromate Complexes. \$8,000.
- Oklahoma State University, Stillwater, Oklahoma. J. Paul Devlin, A Vibrational Study of Molten Salt Systems by Attenuated Total Reflection Infrared Spectroscopy. \$22,000 (2 years).
- Oregon State University, Corvallis, Oregon. Walter D. Loveland, Studies of Low Energy Induced Nuclear Fission. \$22,000.
- Oregon State University, Corvallis, Oregon. Carroll W. DeKock, Molecular Symmetry and Origin of Hypersensitive Transitions of Rare Earth Trihalides. \$12,000.
- Oregon, University of, Eugene, Oregon. Richard M. Noyes, Diffusion Controlled Reactions and Exchange Reactions in Solutions. \$30,000.
- Pennsylvania State University, University Park, Pennsylvania. F. W. Lampe, Radiation Chemistry, Photosensitization Chemistry and Mass Spectrometry of Silanes and Simple Alkyl-silanes. \$36,970.
- Pennsylvania, University of, Philadelphia, Pennsylvania. David White, Rotational Ordering in the Solid Molecular Hydrogens. \$30,925.
- Pennsylvania, University of, Philadelphia, Pennsylvania. Wayne L. Worrell, High-Temperature Galvanic-Cell Investigations Using Solid-Electrolytes. \$29,961.
- Pittsburgh, University of, Pittsburgh, Pennsylvania. Robert L. Wolke, Recoil Studies of Nuclear Reactions. \$37,000.
- Princeton University, Princeton, New Jersey. John Turkevich, Research in the Field of Catalysis. \$91,000.
- Princeton University, Princeton, New Jersey. Robert A. Naumann, Nuclear Interactions: \$212,000.
- Princeton University, Princeton, New Jersey. R. C. Axtmann, Heavy Particle Energy Transfer to Chemical Systems and Mössbauer Studies of Inorganic Salts. \$54,807.
- Princeton University, Princeton, New Jersey. Leland C. Allen, High Accuracy, Many-Electron Wavefunctions for Noble Gas Molecules. \$27,000 (26 months).
- Puerto Rico, University of, Mayaguez, Puerto Rico. Owen H. Wheeler, Hot-Atom Chemistry of Organic Phosphorus and Sulphur Compounds. \$38,000.
- Purdue University, Lafayette, Indiana. Robert T. Grimley, Thermodynamics, Mechanism and Kinetics of Vaporization Processes. \$32,000.
- Purdue University, Lafayette, Indiana. L. B. Rogers, Fundamental Studies of Separation Processes. \$53,000.

CHEMISTRY

- Purdue University, Lafayette, Indiana. Norbert T. Porile, Deexcitation Processes in Nuclear Reactions. \$66,000.
- Purdue University, Lafayette, Indiana. Patrick J. Daly, Radiochemical Investigations of Nuclear Properties. \$32,000.
- Purdue University, Lafayette, Indiana. James W. Cobble, Thermodynamics of Heavy Elements and Studies in Nuclear Chemistry. \$70,000.
- Purdue University, Lafayette, Indiana. Rolf M. Steffen, Research in Nuclear Physics. \$30,000.
- Purdue University, Lafayette, Indiana. C. Austen Angell, A Detailed Physico-Chemical Study of $ZnCl_2$ - and $BiCl_3$ - Based Molten Salt Binary Systems. \$30,000.
- Rensselaer Polytechnic Institute, Troy, New York. Howard Littman, Gas-Particle Heat Transfer Coefficients in Packed Beds by Frequency Response Techniques. \$27,100.
- Rensselaer Polytechnic Institute, Troy, New York. Paul Harteck and Seymour Dondes, A Study of the Pulse Radiolysis of Gases. \$26,500.
- Rensselaer Polytechnic Institute, Troy, New York. Daniel Sperber, Highly Excited and High-Spin Nuclear Emissions. \$18,000.
- Rensselaer Polytechnic Institute, Troy, New York. Ivor L. Preiss and Herbert M. Clark, Decay Properties of Neutron-Excess Isotopes. \$40,000.
- Rice University, Houston, Texas. John L. Margrave, Physical Chemistry of Selected High Temperature Systems. \$90,000.
- Rice University, Houston, Texas. J. L. Franklin and P. R. Brooks, Recombination of Positive Ions with Electrons in Gases. \$50,000.
- Rice University, Houston, Texas. Dieter Heymann, Studies of the Cross Sections of H^3 , He^3 , He^4 and Cl^{14} in the Bombardment of Carbon and Oxygen with High-Energy Protons. \$10,948.
- Rochester, University of, Rochester, New York. H. Marshall Blann, Nuclear Reaction Mechanisms. \$58,000.
- Rochester, University of, Rochester, New York. John R. Huizenga, Studies of Nuclear Fission, Low-Energy Nuclear Reactions, Transuranic Nuclei and Geo- and Cosmochemistry. \$80,000.
- Rochester, University of, Rochester, New York. Jacob Bigeleisen, Fundamental Studies in Isotope Chemistry. \$80,000 (17 months).
- Rutgers University, New Brunswick, New Jersey. Rolfe H. Herber, Studies in Nuclear and Radiochemistry. \$32,500.
- Rutgers University, New Brunswick, New Jersey. Richard W. Laity, Ion Mobility in Molten Salts. \$32,000.
- South Carolina, University of, Columbia, South Carolina. Edward E. Mercer, Chemistry of Ruthenium. \$20,000.
- Southern California, University of, Los Angeles, California. Wayne K. Wilmarth, Aqueous Chemistry of Free Radicals and Other Inorganic Reactive Intermediates. \$20,347.
- Southern California, University of, Los Angeles, California. Arthur W. Adamson, The Photochemistry of Complex Ions. \$22,945.
- Stanford Research Institute, Menlo Park, California. Daniel Cubicciotti, A Fundamental Study of Fused Salts and Metal-Salt Systems. \$70,000.
- Stanford Research Institute, Menlo Park, California. Felix T. Smith, Fundamental Principles of Collision Spectroscopy in Diatomic Systems. \$34,002.

CHEMISTRY

- Stanford University, Stanford, California. Henry Taube, Reactions of Solvated Ions. \$32,115.
- Stanford University, Stanford, California. Thomas J. Connolly, Radiation-Induced Nucleation of Bubbles in Superheated Water. \$41,000 (2 years).
- Syracuse University, Syracuse, New York. S. Alexander Stern, Separation of Krypton and Xenon from Reactor Atmospheres by Selective Permeation. \$17,762.
- Temple University, Philadelphia, Pennsylvania. A. V. Grosse, High Temperature Inorganic Chemistry. \$34,990.
- Tennessee, University of, Knoxville, Tennessee. T. Ffrancon Williams, Research Concerning Ionic and Free Radical Reactions in Radiation Chemistry. \$41,000.
- Tennessee, University of, Knoxville, Tennessee. Gleb Mamantov, Electrochemical Studies in Molten Fluorides and Other Halides. \$17,000.
- Texas A & M University, College Station, Texas. Ralph A. Zingaro and Kurt J. Irgolic, Chemistry of the Metalloids of Group VA and Group VIA. \$18,000.
- Texas A & M University, College Station, Texas. A. D. Suttle, Jr. and John A. McIntyre, TAMVEC Research Program. \$115,000.
- Texas A & M University, College Station, Texas. Arthur E. Martell, Chelation and Olation Reactions of Metal Ions in Aqueous Solution. \$22,000.
- Texas A & M University, College Station, Texas. Ronald D. Macfarlane, On-Line Alpha and Proton Decay Spectrometry. \$55,000.
- Texas A & M University, College Station, Texas. Yi-Noo Tang, Reaction of Recoil Atoms with Silicon Containing Systems. \$15,267.
- Texas A & M University, College Station, Texas. T. T. Sugihara and R. L. Watson, Nuclear Spectroscopy. \$42,000.
- Texas A & M University, College Station, Texas. Emile A. Schweikert, Research in Charge Particle Activation Analysis. \$22,812.
- Texas A & M University, College Station, Texas. Joseph B. Natowitz, Angular Momentum Effects in Nuclear Reactions. \$22,000.
- Texas, University of, Austin, Texas. George W. Watt, Unusual Oxidation States of Transitional Elements. \$35,000.
- Toledo, University of, Toledo, Ohio. Jack G. Kay, Chemical Effects of Nuclear Transformations, Flash Heating or Flash Photolysis. \$14,353.
- Toledo, University of, Toledo, Ohio. H. Bradford Thompson, Molecular Structure Studies: A Gas Phase Electron Diffraction Unit Employing Counting Techniques. \$20,000 (10 months).
- Tufts University, Medford, Massachusetts. T. R. P. Gibb, Jr. and Charles E. Messer, Research on Hydrides. \$25,864 (18 months).
- Tufts University, Medford, Massachusetts. B. M. Fung, Deuteron Magnetic Resonance. \$22,000.
- Tufts University, Medford, Massachusetts. Grant W. Urry, Covalently Bonded Compounds of the Light Elements. \$25,000.
- Vanderbilt University, Nashville, Tennessee. Mark M. Jones, Some Aspects of the Behavior of Complex Compounds. \$16,500.
- Vanderbilt University, Nashville, Tennessee. Thomas W. Martin, Studies in Radiation and Catalytic Chemistry by Mass Spectrometry, Flash Photolysis and Magnetic Techniques. \$33,000.

CHEMISTRY

- Virginia Polytechnic Institute, Blacksburg, Virginia. Hans J. Ache, Reactions of Charged and Neutral Recoil Particles Following Nuclear Transformations. \$28,000.
- Virginia Polytechnic Institute, Blacksburg, Virginia. Alan F. Clifford, The Hydrogen Fluoride Solvent System and Mössbauer Studies on Rare Earth Compounds. \$25,000.
- Washington State University, Pullman, Washington. John B. Gruber, Spectroscopic Studies of Actinide Ions in Crystalline Solids. \$64,000.
- Washington State University, Pullman, Washington. John P. Hunt, Inorganic Reaction Mechanisms in Aqueous and Non-Aqueous Solvents. \$28,000.
- Washington University, St. Louis, Missouri. Arthur C. Wahl, Radiochemical Studies of the Fission Processes. \$40,000.
- Washington University, At. Louis, Missouri. Demetrios G. Sarantites, Low Energy Nuclear Reactions and Spectroscopy. \$40,000.
- Washington University, St. Louis, Missouri. Paul L. Reeder, Delayed-Particle Spectroscopy. \$36,000.
- Washington University, St. Louis, Missouri. Peter P. Gaspar, Reaction Studies of Hot Silicon Radicals. \$29,670.
- Washington University, St. Louis, Missouri. Franklin B. Shull, The Cyclotron as an Instrument for Chemical Research. \$100,000.
- Washington, University of, Seattle, Washington. Albert L. Babb and Kermit L. Garlid, Dynamics of Solvent Extraction Systems. \$31,000.
- Wayne State University, Detroit, Michigan. H. K. Livingston, Controlled Polymerization of Adsorbed Monolayers. \$18,500.
- Western Washington State College, Bellingham, Washington. Edward F. Neuzil, Fission Studies on Elements Below Polonium. \$9,770.
- Wisconsin, University of, Madison, Wisconsin. Walter J. Blaedel, Use of Radiotracers in Continuous Analysis. \$15,000.
- Wisconsin, University of, Madison, Wisconsin. John E. Willard, Studies in Hot Atom and Radiation Chemistry. \$85,000.
- Wisconsin, University of, Milwaukee, Wisconsin. Werner W. Brandt, Diffusion in Zeolites and Glasses. \$13,400.
- Worcester Polytechnic Institute, Worcester, Massachusetts. Alfred A. Scala, The Gas Phase Radiolysis and Vacuum Ultraviolet Photolysis of Cyclic Ketones, Cyclic Ethers and Aliphatic Amines. \$25,000.
- Yale University, New Haven, Connecticut. Richard Wolfgang, Research on High Energy Chemical Reactions. \$100,000.
- Yale University, New Haven, Connecticut. Robert Beringer, Nuclear Chemistry and Physics at the Yale Heavy Ion Linear Accelerator. \$504,000.
- Yale University, New Haven Connecticut. Morton Kaplan, Research in Nuclear Chemistry. \$53,000.
- Yeshiva University, New York, New York. William Spindel, Stable Isotope Studies. \$41,100.
- Yeshiva University, New York, New York. Marvin J. Stern, Isotope Effects on Rate and Equilibrium Processes. \$34,000.
- Yeshiva University, New York, New York. Max Lipsicas, A Nuclear Magnetic Resonance Study of the Hydrogen Gas-Liquid Critical Point. \$19,774.

METALLURGY AND MATERIALS

- Arizona, University of, Tucson, Arizona. Carl T. Tomizuka, Impurity Diffusion in Solids. \$72,900.
- Arizona, University of, Tucson, Arizona. Roy M. Emrick, High Temperature Anneals of Defects Quenched in Metals. \$24,785.
- Atomics International, Canoga Park, California. H. J. Fink and S. L. Wipf, Electronic Structure of Metals and Alloys. \$205,000.
- Atomics International, Canoga Park, California. W. Bauer and K. H. Thommen, Radiation Damage and Lattice Defects in Crystalline Solids. \$286,000.
- Battelle Memorial Institute, Columbus, Ohio. E. W. Collings, Electronic and Structural Properties of Metals and Semiconductors in the Liquid State. \$60,000.
- Boston University, Boston, Massachusetts. Gilbert R. Hoy, Coincidence - Mössbauer Studies of Solid State Phenomena. \$34,231.
- Brandeis University, Waltham, Massachusetts. Christoph Hohenemser, Experimental Studies of Critical Point Behavior in Magnetically Ordered Solids using Nuclear Gamma-Ray Spectroscopy and Related Experiments. \$31,680.
- Brandeis University, Waltham, Massachusetts. H. Daniel Cohen, Low Temperature Properties of Solid Helium. \$34,760.
- Brigham Young University, Provo, Utah. J. Bevan Ott and J. Rex Goates, Thermodynamic Investigation of Alkali Metal Mixtures. \$43,976 (16 months).
- Brooklyn, Polytechnic Institute of, Brooklyn, New York. Louis S. Castleman, Study of Binary Multiphase Diffusion in Metallic Systems. \$23,933.
- Brown University, Providence, Rhode Island. P. J. Bray, Radiation Damage Studies in Solids Using Magnetic Resonance Techniques. \$31,879.
- Brown University, Providence, Rhode Island. Joseph Gurland, A Combined Macroscopic and Microscopic Approach to the Mechanical Properties of Metals. \$106,972 (18 months).
- California Institute of Technology, Pasadena, California. Pol Duwez, Studies in Alloy Chemistry and Physics. \$235,020.
- California Institute of Technology, Pasadena, California. David S. Wood and Thad Vreeland, Jr., Dislocation Mobility and Density in Metallic Crystals. \$75,000.
- California, University of, Los Angeles, California. Marvin Chester, Electroabsorption in Semiconductors. \$16,729.
- California, University of, Los Angeles, California. Alan J. Ardell, The Effect of Controlled Variations of Particle Size Distributions on the Mechanical Properties of Precipitation-Hardened Nickel-Based Y/Y' Alloys. \$37,000.
- California, University of, Riverside, California. A. W. Lawson, Electric and Magnetic Properties of Transition Metals and Their Compounds. \$62,810.
- California, University of, San Diego, California. John C. Wheatley, Research on the Properties of Materials at Very Low Temperatures. \$142,869.
- California, University of, San Diego, California. Huey-Lin Luo, New Materials by Low Temperature Condensation. \$85,000.
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Ned S. VanderVen, Radiation Effects in Solids. \$37,438 (32 months).
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Paul A. Flinn, Application of the Mössbauer Effect to the Study of Metallic Solid Solutions. \$27,202.

METALLURGY AND MATERIALS

- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Joseph O. Artman, Optical and Microwave Spectroscopy of Np and Co in Scheelites and other Crystalline Environments. \$30,000.
- Case Western Reserve University, Cleveland, Ohio. R. F. Hehemann, Kinetics of Phase Transformations in Zirconium, Hafnium and Titanium Alloys. \$25,100.
- Case Western Reserve University, Cleveland, Ohio. Richard W. Hoffman, Solid State Physics. \$76,901.
- Case Western Reserve University, Cleveland, Ohio. Ronald Gibala, Dislocation-Solute Atom Interactions in Alloys. \$37,000.
- Case Western Reserve University, Cleveland, Ohio. A. J. Dahm, Motion of Ions in Solid Helium. \$24,470.
- Chicago, University of, Chicago, Illinois. Robert Gomer, Interactions on Metallic Surfaces. \$30,917.
- Clarkson College of Technology, Potsdam, New York. Alvin W. Czanderna, The Oxidation of Copper Films. \$21,000.
- Clarkson College of Technology, Potsdam, New York. Sigurds Arajs, Transport and Magnetic Phenomena in Chromium and Iron Alloys. \$24,751.
- Clemson University, Clemson, South Carolina. Robert L. Chaplin, Radiation Effects in Crystalline Materials. \$43,662.
- Columbia University, New York, New York. Stephen P. Denker, Electronic Properties of Refractory Monoxides Having Intrinsic Lattice Vacancy Concentrations. \$31,075 (27 months).
- Columbia University, New York, New York. Arthur S. Nowick, Defects in Crystals. \$47,491.
- Columbia University, New York, New York. Eugene S. Machlin, A Study of the Feasibility of Obtaining Field Ion Microscope Images of Interstitial Solutes. \$34,000.
- Connecticut, University of, Storrs, Connecticut. Otis R. Gilliam, Investigations of Radiation Effects in Solids by Electron Spin Resonance. \$28,000 (18 months).
- Cornell University, Ithaca, New York. R. H. Silsbee and Raymond Bowers, Solid State Physics: Magnetic Phenomena. \$127,000.
- Cornell University, Ithaca, New York. James A. Krumhansl, A. J. Sievers and R. O. Pohl, Experimental Phonon Physics. \$141,310.
- Cornell University, Ithaca, New York. Henri S. Sack, A Study of Imperfections in Crystals. \$64,685.
- Cornell University, Ithaca, New York. Arthur L. Ruoff, Elastic and Plastic Deformation of Solids. \$122,700.
- Cornell University, Ithaca, New York. John Silcox and W. W. Webb, Hard Superconducting Materials. \$96,000.
- Cornell University, Ithaca, New York. John Silcox, Correlation of Physical Properties of Crystals with Microstructure. \$3,770 (22 months).
- Cornell University, Ithaca, New York. Mark S. Nelkin, The Theory of Slow Neutron Inelastic Scattering by Liquids. \$39,380.
- Cornell University, Ithaca, New York. Douglas B. Fitchen, Electronic Properties of Defects in Ionic Crystals. \$34,881.
- Cornell University, Ithaca, New York. Robert W. Balluffi and David N. Seidman, Defects in Metal Crystals. \$178,151.
- Cornell University, Ithaca, New York. James A. Krumhansl and P. A. Carruthers, Theoretical Phonon Physics. \$74,496.

METALLURGY AND MATERIALS

- Cornell University, Ithaca, New York. B. W. Batterman, Studies of the Lattice Properties of High Field Superconductors and Vanadium. \$43,138.
- Cornell University, Ithaca, New York. A. Taylor, Radiation Damage Studies Using the Cornell 3 MeV Dynamitron. \$41,364 (8 months).
- Cornell University, Ithaca, New York. H. H. Johnson, Effect of Environment on Fracture Behavior. \$32,407.
- Cornell University, Ithaca, New York. Edward J. Kramer, A Study of the Interaction Between Magnetic Fluxoids and Crystal Defects in Type II Superconductors. \$33,365.
- Delaware, University of, Newark, Delaware. Richard B. Murray, Radiation-Induced Defects in Alkali Halides, and Their Role in Recombination Processes. \$35,315.
- Florida, University of, Gainesville, Florida. Robert E. Reed-Hill, Deformation Processes in Hexagonal Metals. \$29,125.
- Franklin Institute, Philadelphia, Pennsylvania. John D. Meakin, G. J. London and V. V. Damiano, Studies of Crystal Perfection--Tantalum Silicide and Beryllium. \$66,150.
- Georgetown University, Washington, D. C. William D. Gregory, The Study of Very Pure Metals at Low Temperatures. \$50,758 (18 months).
- Georgia Institute of Technology, Atlanta, Georgia. Edwin J. Scheibner, Surface Properties of Magnetic Materials. \$57,570.
- Georgia Institute of Technology, Atlanta, Georgia. Stephen Spooner, Magnetic Phenomena at Metal Surfaces. \$45,000.
- Georgia Institute of Technology, Atlanta, Georgia. Bruce G. LeFevre and Edgar A. Starke, A Study of the Structure and Mechanical Properties of Ordered Alloys. \$35,000.
- Illinois Institute of Technology, Chicago, Illinois. Leonard I. Grossweiner, Investigation of Energy Transfer Processes by Flash Photolysis. \$26,582 (14½ months).
- Illinois Institute of Technology, Chicago, Illinois. Harold Weinstock, Thermal Measurements on Solids Below 1°K. \$49,000.
- Illinois Institute of Technology, Chicago, Illinois. Lawrence J. Broutman, Effects of Combined Stress on the Fracture and Fatigue of Brittle Ceramic Materials. \$34,000.
- Illinois, University of, Urbana, Illinois. Robert J. Maurer, The Science of Materials. \$1,556,000.
- Johns Hopkins University, Baltimore, Maryland. Peter E. Wagner, Phonon Imprisonment Studies. \$13,449.
- Kansas, University of, Lawrence, Kansas. Peter M. Richards, Experimental and Theoretical Studies of Magnetic Resonance and Relaxation. \$31,150.
- Kentucky, University of, Lexington, Kentucky. Ben R. Gossick, Radiation Effects on Germanium, \$32,570.
- Lehigh University, Bethlehem, Pennsylvania. George Krauss, Jr., Strength and Structure in Cyclically Transformed Fe-Ni-C Alloys. \$13,816.
- Lehigh University, Bethlehem, Pennsylvania. Betzalel Avitzur, Analysis of Flow and Fracture of Composite Materials During Gross Plastic Deformation. \$35,000.
- Louisiana State University, Baton Rouge, Louisiana. J. M. Reynolds, Conductivity Tensors in Metals and Semiconductors. \$75,476.
- Marquette University, Milwaukee, Wisconsin. Robert N. Blumenthal, Defect Structures in Non-stoichiometric Oxides. \$31,189.

METALLURGY AND MATERIALS

- Maryland, University of, College Park, Maryland. Robert M. Asimow, An Investigation of Solid Solution Hardening in Metallic Solid Solution Alloys. \$26,610.
- Maryland, University of, College Park, Maryland. R. J. Arsenault, An Investigation of Irradiation Strengthening of B.C.C. Metals and Solid Solutions. \$31,696.
- Maryland, University of, College Park, Maryland. Ian L. Spain, The Galvanomagnetic Properties of Graphite in the Temperature Range 4-300°K and Pressure Range 0-10,000 kg/cm². \$29,908.
- Maryland, University of, College Park, Maryland. James R. Anderson and S. M. Bhagat, Conduction Electrons and Magnetism. \$29,139.
- Maryland, University of, College Park, Maryland. M. J. Marcinkowski, Alloy Strengthening Due to Atomic Order. \$34,000.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. C. G. Shull, Low Temperature and Neutron Physics Studies. \$93,347.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. Walter A. Backofen, Mechanical Properties of Metals. \$18,608.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. W. D. Kingery and R. L. Coble, Basic Research in Crystalline and Noncrystalline Ceramic Systems. \$307,820.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. Thomas O. Ziebold, Microcracking in Welds of Nickel Base Alloys. \$17,000 (18 months).
- Massachusetts Institute of Technology, Cambridge, Massachusetts. Sow-Hsin Chen and Sidney Yip, Thermal Neutron Scattering Studies of Molecular Dynamics and Critical Phenomena in Liquids and Solids. \$90,211.
- Massachusetts, University of, Amherst, Massachusetts. Allan R. Hoffman, Ultrasonic Attenuation Studies of the Electronic Structure of Metals. \$36,000.
- Michigan State University, East Lansing, Michigan. J. Bass, Studies of Electrical and Defect Properties of Thin Metallic Wires. \$37,000.
- Michigan State University, East Lansing, Michigan. Edward H. Carlson, Study of Interactions Between f-Shell Transition Ions in Non-Metallic Crystals. \$29,850.
- Michigan State University, East Lansing, Michigan. Gerald L. Pollack, Properties of Rare-Gas Solids. \$35,266.
- Michigan Technological University, Houghton, Michigan. A. A. Hendrickson, Structure and Properties of Solid Solutions. \$43,093 (15½ months).
- Michigan Technological University, Houghton, Michigan. Donald E. Mikkola, Effect of Annealing on the Substructure of Cold Worked fcc Metals and Alloys. \$25,286.
- Michigan, University of, Ann Arbor, Michigan. Robert D. Pehlke, Thermodynamic Activities in Solid Alloys. \$31,000.
- Michigan, University of, Ann Arbor, Michigan. David R. Bach, Fission Fragment Induced Electrical Transients in Dielectric Materials. \$11,870.
- Minnesota, University of, Minneapolis, Minnesota. Richard A. Swalin, Diffusion Studies in Liquid Metals. \$48,709.
- Minnesota, University of, Minneapolis, Minnesota. Morris E. Nicholson, Effect of Short-Range Order on Mechanical Properties of Alloys. \$19,000.
- Minnesota, University of, Minneapolis, Minnesota. William Zimmermann, Jr., Lewis H. Nosanow, Walter V. Weyhmann and Allen M. Goldman, Experimental and Theoretical Studies in Solid State and Low Temperature Physics. \$179,300.

METALLURGY AND MATERIALS

- Minnesota, University of, Minneapolis, Minnesota. Dale F. Stein, A Study of Grain Boundary Segregation Using the Auger Electron Emission Technique. \$26,072.
- Minnesota, University of, Minneapolis, Minnesota. Thomas E. Hutchinson, "In Situ" Electron Microscope Investigation of the Nucleation and Growth of Sputtered Thin Films. \$47,000.
- Missouri, University of, Rolla, Missouri. Robert Gerson and William J. James, Ferroelectric Properties of Bismuth Ferrate and Related Materials. \$21,482.
- Missouri, University of, Rolla, Missouri. Charles A. Goben, Nuclear Radiation Effects on Silicon P-N Junctions. \$45,000.
- Montana State University, Bozeman, Montana. Harry W. Townes, An Investigation of Turbulent Flow in a Rough Pipe. \$27,010 (17 months).
- Murray State University, Murray, Kentucky. L. Bridwell, Interaction of Fission Fragments with Thin Films. \$22,700.
- National Bureau of Standards, Washington, D. C. Solid State Physics. \$63,357.
- National Bureau of Standards, Washington, D. C. Constitution of Binary Alloys. \$28,000.
- Nebraska, University of, Lincoln, Nebraska. Edgar A. Pearlstein, Studies of Imperfections in Solids. \$40,039 (20 months).
- New York, State University of, Albany, New York. James W. Corbett, Theory of Reaction Kinetics. \$48,872.
- New York, State University of, Stony Brook, New York. John C. Bilello, Study of Microplastic Behavior of Tungsten and other Refractory Metals in Relation to the Brittle Fracture Problem. \$17,729.
- New York, State University of, Stony Brook, New York. Robert Nathans, Thermal Neutron Scattering on Magnetic Materials and Liquids. \$49,000.
- New York, State University of, Stony Brook, New York. Herbert Herman, Fatigue-Enhancement of Diffusion. \$14,752.
- North Carolina State University, Raleigh, North Carolina. Hayne Palmour, III, Grain Boundary Sliding in Alumina Bicrystals. \$20,000.
- North Carolina State University, Raleigh, North Carolina. Thomas S. Elleman, Behavior of Gases in Solids. \$32,909.
- North Carolina State University, Raleigh, North Carolina. Raymond F. Saxe, An Experimental Investigation of Boiling Bubbles. \$25,996.
- North Carolina, University of, Chapel Hill, North Carolina. Lawrence M. Slifkin, Atomic Diffusion in Crystals. \$31,208.
- North Carolina, University of, Chapel Hill, North Carolina. James H. Crawford, Jr., Investigation of Defect Structures by Electric Polarization and Relaxation Methods. \$34,031.
- North Carolina, University of, Chapel Hill, North Carolina. Charles S. Smith, Jr., Pressure Variation of Single Crystal Elastic Constants. \$19,907.
- North Carolina, University of, Chapel Hill, North Carolina. Louis D. Roberts, The Properties of Metals and Alloys. \$66,000.
- North Dakota, University of, Grand Forks, North Dakota. Henn H. Soonpaa, Physical Phenomena in Crystals Consisting of a Finite and Countable Number of Atoms in One Direction. \$35,000.
- Northeastern University, Boston, Massachusetts. Carl A. Shiffman, Calorimetric Studies of the Proximity Effect in Superconductors. \$31,771.

METALLURGY AND MATERIALS

- Northeastern University, Boston, Massachusetts. B. C. Giessen, Structural, Thermal, and Electronic Properties of Metastable Binary Alloys of Thorium and Uranium Produced by Rapid Quenching. \$32,664.
- Northwestern University, Evanston, Illinois. Roderick L. Hines, Radiation Effects of Ion Bombardment. \$32,363 (2 years).
- Northwestern University, Evanston, Illinois. John W. Kauffman, Studies of Radiation Damage Resulting from Electron Bombardment. \$41,113 (16 months).
- Northwestern University, Evanston, Illinois. M. Meshii, Effect of Point Defects on Mechanical Properties of Metals. \$43,049.
- Northwestern University, Evanston, Illinois. Toshio Mura, Analytical Study on Dislocations in Thin Films. \$34,180.
- Ohio State University, Columbus, Ohio. Robert A. Rapp, An Investigation of Mixed Conduction in Solid Electrolytes. \$31,015.
- Ohio State University, Columbus, Ohio. David A. Rigney, Liquid Metals Research--Electrotransport and Solidification Studies. \$34,043.
- Oklahoma, University of, Norman, Oklahoma. Robert J. Block, The Effects of Surface Coatings on the Plastic Deformation of Metal Single Crystals. \$28,176.
- Oklahoma, University of, Norman, Oklahoma. Ronald R. Bourassa, Thermoelectric Size Effect in Noble Metals. \$26,604.
- Oregon State University, Corvallis, Oregon. James R. Welty, Natural Convection Heat Transfer in Liquid Metals. \$20,843.
- Pennsylvania State University, University Park, California. P. L. Walker, Jr., Research on Graphite. \$110,333.
- Pennsylvania State University, University Park, Pennsylvania. Arnulf Muan, Thermodynamic Properties of Solid Solutions at High Temperatures. \$29,309.
- Pennsylvania State University, University Park, Pennsylvania. Earle Ryba, Transformations in AB₂ Intermetallic Compounds. \$11,000.
- Pennsylvania State University, University Park, Pennsylvania. G. R. Barsch, Nonlinear Elastic and Thermoelastic Properties of Materials. \$50,036.
- Pennsylvania State University, University Park, Pennsylvania. Richard C. Bradt and John H. Hoke, Ceramic Research on Transformational Superplasticity and Ferroelectric Domain Boundaries. \$26,000.
- Pittsburgh, University of, Pittsburgh, Pennsylvania. Raymond S. Craig and W. E. Wallace, Thermal, Structural and Magnetic Studies of Metals and Intermetallic Compounds. \$97,972.
- Pittsburgh, University of, Pittsburgh, Pennsylvania. John R. Townsend, A Study of Radiation Induced Defects in Metals. \$30,154.
- Pittsburgh, University of, Pittsburgh, Pennsylvania. William A. Soffa, Precipitation from Supersaturated Copper-Titanium Solid Solutions: The Aging Process in Copper-Titanium Side-Band Alloys. \$25,902.
- Puerto Rico, University of, Mayaguez, Puerto Rico. Mortimer I. Kay, Neutron Diffraction Studies. \$199,000.
- Puerto Rico, University of, Rio Piedras, Puerto Rico. Amador Cobas, Radiation Damage in Organic Crystals. \$62,000.
- Purdue University, Lafayette, Indiana. John W. MacKay, Basic Radiation Damage Studies. \$81,000.

METALLURGY AND MATERIALS

- Purdue University, Lafayette, Indiana. Richard E. Grace, Transport and Thermodynamic Properties of Solids. \$27,163.
- Purdue University, Lafayette, Indiana. James G. Mullen, Mossbauer Studies of the Properties of Solids. \$32,000.
- Purdue University, Lafayette, Indiana. James R. Cost, Diffusion and Precipitation of Inert Gases in Metals. \$31,080.
- Rensselaer Polytechnic Institute, Troy, New York. H. B. Huntington, Anisotropic Diffusion and Electromigration. \$55,200.
- Rensselaer Polytechnic Institute, Troy, New York. Edmond Brown, Theoretical Research on Electron Behavior in Crystals. \$29,000 (19½ months).
- Rensselaer Polytechnic Institute, Troy, New York. Norman S. Stoloff, Precipitation and Dispersion Hardening in Hexagonal Alloys. \$22,700.
- Rensselaer Polytechnic Institute, Troy, New York. H. Michael Gilder, Effect of Hydrostatic Pressure on Self-Diffusion Rates in Hexagonal Metals. \$33,000.
- Rensselaer Polytechnic Institute, Troy, New York. Fritz V. Lenel, Research in Powder Metallurgy. \$33,000.
- Rhode Island, University of, Kingston, Rhode Island. J. S. Desjardins and S. S. Malik, Measurement of Frequency Spectra of Normal Modes by Means of Inelastic Neutron Scattering from Oriented Single Crystals. \$44,718 (2 years).
- Rochester, University of, Rochester, New York. Theodore G. Castner, Jr., Electron Spin Resonance in Solids. \$16,333.
- St. Mary's College, Winona, Minnesota. Donald R. Morgan, Experimental Study of the Surface Structure and Electronic Properties of Single Crystal Molybdenum and Tungsten Ribbons. \$13,700 (22 months).
- Southern California, University of, Los Angeles, California. Lawrence E. Murr, The Effects of Electric and Magnetic Fields on the Nucleation, Structure, and Residual Properties of Vapor Deposited Metal Films. \$25,000.
- Southern California, University of, Los Angeles, California. Young B. Kim, Materials Research on High-Field Superconductors. \$95,000.
- Stanford University, Stanford, California. Oleg D. Sherby and O. Cutler Shepard, Effect of Point Defects on Mechanical Behavior of Crystalline Solids. \$19,000 (22 months).
- Stanford University, Stanford, California. Craig R. Barrett and William D. Nix, Structure Dependence of High Temperature Deformation of Metals. \$44,000.
- Stanford University, Stanford, California. David A. Stevenson, Thermodynamic Properties and Defect Structure of Intermetallic Compounds. \$30,000 (16 months).
- Stanford University, Stanford, California. Norman A. Parlee, Nitride Forming Reactions in Liquid Uranium Alloys. \$37,636.
- Syracuse University, Syracuse, New York. Richard W. Vook, In Situ Ultra High Vacuum High Energy Electron Diffraction Studies. \$29,000.
- Temple University, Philadelphia, Pennsylvania. Leonard Muldawer and Henri Amar, Study of the IB-IIB Beta Phase Alloys. \$97,500.
- Tennessee, University of, Knoxville, Tennessee. E. E. Stansbury and C. R. Brooks, Application of Adiabatic Calorimetry to Metal Systems. \$23,180.
- Texas Christian University, Fort Worth, Texas. Richard F. Raeuchle, Structural Studies of Amorphous Aluminum Oxide. \$20,319 (2 years).

METALLURGY AND MATERIALS

- Texas, University of, Austin, Texas. Thomas H. Courtney, Elevated Temperature Morphological Stability of Metal Matrix Fiber Composites. \$16,849.
- Tuskegee Institute, Tuskegee, Alabama. Ira C. Dillon, Density Determinations Using a Gamma Radiation Attenuation Technique. \$34,270.
- Utah, University of, Salt Lake City, Utah. Ivan B. Cutler, Recrystallization and Sintering of Oxides. \$14,634.
- Utah, University of, Salt Lake City, Utah. William D. Ohlsen, A Magnetic Resonance Study of Defects in Solids. \$14,421.
- Utah, University of, Salt Lake City, Utah. Owen W. Johnson, Interstitial Diffusion in Non-Metallic Crystals. \$21,500.
- Utah, University of, Salt Lake City, Utah. Ronald S. Gordon, Impurity Effects on the Creep of Polycrystalline Magnesium and Aluminum Oxides at Elevated Temperatures. \$19,513.
- Utah, University of, Salt Lake City, Utah. Abraham Sosin, The Fundamentals of Radiation Damage. \$78,203.
- Vanderbilt University, Nashville, Tennessee. James J. Wert, Deformation Studies of Superlattice Structures. \$29,693.
- Vermont, University of, Burlington, Vermont. Ted B. Flanagan, Absorption of Hydrogen and Deuterium by Palladium-Rich Alloys. \$29,456.
- Vermont, University of, Burlington, Vermont. John S. Brown, Thermodynamic and Transport Properties of Interstitial Hydrogen Isotopes in Palladium. \$22,836.
- Virginia, University of, Charlottesville, Virginia. Robert V. Coleman, Electronic Properties of Metals and Alloys. \$76,692.
- Virginia, University of, Charlottesville, Virginia. Doris Kuhlmann-Wilsdorf, Investigations on the Behavior of Point Defects and Dislocations. \$61,149.
- Virginia, University of, Charlottesville, Virginia. Kenneth R. Lawless, Electron Diffraction Studies of Single Crystal Metal Surfaces. \$24,203 (16 months).
- Virginia, University of, Charlottesville, Virginia. John W. Mitchell, Dynamic Dislocation Phenomena in Single Crystals of Metals and Alloys. \$37,516.
- Wake Forest University, Winston-Salem, North Carolina. Thomas J. Turner and George P. Williams, Jr., A Study of Atomic Mobility in Crystalline Materials. \$17,250.
- Washington, University of, Seattle, Washington. Douglas H. Polonis, A Study of Phase Transformations and Superconductivity. \$33,086.
- Washington, University of, Seattle, Washington. Robert L. Ingalls, Mössbauer Studies at High Pressure. \$33,950.
- Wayne State University, Detroit, Michigan. Yeong-Wook Kim, Electron Paramagnetic Resonance Studies of Radiation Effects in Solids and Chemical Compounds. \$50,000.
- Wayne State University, Detroit, Michigan. Henry O. Hooper, Atomic Structure and Nature of the Magnetism in Several Magnetic Glasses. \$25,000.
- Wisconsin, University of, Madison, Wisconsin. Richard A. Dodd, Creep Mechanisms in B.C.C. Alloy Crystals. \$26,782.
- Yale University, New Haven, Connecticut. C. N. J. Wagner, X-ray Study of the Structure of Liquid Metals and Alloys. \$25,824.

METALLURGY AND MATERIALS

Yale University, New Haven, Connecticut. Werner P. Wolf, The Study of Ideal Magnetic Crystals.
\$115,000.

Yeshiva University, New York, New York. Martin Goldstein, Phase Convectivity in Diffusion Limited
Separations. \$18,265 (32 months).

CONTROLLED THERMONUCLEAR RESEARCH

- Brooklyn, Polytechnic Institute of, Farmingdale, New York. KunMo Chung, Experimental Study of Plasma Turbulence using a Hollow Cathode Discharge. \$49,647 (19 months).
- Brooklyn, Polytechnic Institute of, Brooklyn, New York. Alan Oppenheim, Bremsstrahlung Radiation in High Temperature Plasmas. \$17,000.
- California Institute of Technology, Pasadena, California. Roy W. Gould, Plasma Waves. \$42,000.
- California, University of, Berkeley, California. Charles K. Birdsall, Computer and Alkali Plasma Instability Experiments. \$67,243.
- California, University of, Davis, California. James P. Hurley, An Upper Bound on Plasma Containment. \$7,000.
- California, University of, Irvine, California. Nathan Rynn, Experiments on Alkali Metal and Barium Plasmas. No Funds.
- California, University of, Los Angeles, California. William B. Kehl and Burton D. Fried, Interactive Display System for the IBM 360 Model 91 for Plasma Physics. \$62,389 (18 months).
- California, University of, Los Angeles, California. Burton D. Fried, Alfredo Banos, Jr., K. R. MacKenzie and A. Y. Wong, Joint Experimental-Theoretical Program in Plasma Physics. \$73,850.
- California, University of, San Diego, California. William B. Thompson, Plasma Physics Research (Theoretical). \$105,752.
- Columbia University, New York, New York. Chia-Kun Chu, Research in Computational Plasma Physics. \$57,317.
- Cornell University, Ithaca, New York. Peter L. Auer, Properties of the High Beta Plasma State. \$53,897.
- Cornell University, Ithaca, New York. Charles B. Wharton, Investigation of Plasma Turbulence by Microwave Scattering. \$65,704.
- Cornell University, Ithaca, New York. Ravindra N. Sudan, Theoretical Studies on Astron Stability. \$40,787.
- Environmental Science Services Administration, Boulder, Colorado. Relationship of Density Correlation Measurements of Plasma Diffusion. \$40,000.
- Georgia Institute of Technology, Atlanta, Georgia. David W. Martin and Edward W. Thomas, Ionization, Charge Transfer and Emission Cross Sections in the Energy Range 0.15 to 1.0 MeV. \$54,000.
- Georgia Institute of Technology, Atlanta, Georgia. John W. Hooper, The Excitation and Ionization of Ions by Electron Impact. \$39,469.
- Gulf General Atomic, Inc., San Diego, California. T. Ohkawa, Plasma Confinement in Toroidal Multipoles. \$533,200.
- Houston, University of, Houston, Texas. Gregory M. Haas and Melvin Eisner, Investigation of Ion Heating by Modulated Electron Beams. \$18,900.
- Institute for Advanced Study, Princeton, New Jersey. Marshall N. Rosenbluth, Theoretical Plasma Physics Research. \$61,238.
- Iowa, University of, Iowa City, Iowa. Georg E. Knorr, Numerical and Analytical Investigation of Non-Linear Properties of the Vlasov Equation and of Plasmas. \$31,000.
- Maryland, University of, College Park, Maryland. Hans R. Griem, Applications of Light Scattering to Plasma Diagnostics. \$60,000.
- Maryland, University of, College Park, Maryland. Herbert Lashinsky, Investigation of Universal Plasma Instabilities. \$54,000.

CONTROLLED THERMONUCLEAR RESEARCH

- Maryland, University of, College Park, Maryland. David W. Koopman and D. A. Tidman, Collisionless Shock Studies Using Laser-Produced Plasmas. \$82,535 (15 months).
- Massachusetts Institute of Technology, Cambridge, Massachusetts. George Bekefi, Abraham Bers, Lawrence M. Lidsky and David J. Rose, Plasma Physics Research. \$336,000.
- Miami, University of, Coral Gables, Florida. Daniel R. Wells, Investigation of Plasma Vortex Structures. No Funds.
- Miami, University of, Coral Gables, Florida. Harry S. Robertson, Containment and Heating of Lithium Plasma. \$69,215.
- Michigan, University of, Ann Arbor, Michigan. Terry Kammash, Microinstabilities in Inhomogeneous Plasma. \$38,000.
- National Bureau of Standards, Washington, D. C. High Field Magnet Research; Hydrogen Cross Section Measurements; Ultraviolet Optical and Photoelectric Properties of Solid Materials. \$157,302.
- New York University, New York, New York. Harold Grad, Plasma Physics and Magneto-Fluid Dynamics. \$234,000.
- Pennsylvania State University, University Park, Pennsylvania. Edward H. Klevans and James W. Robinson, The Experimental and Theoretical Investigation of an Inertial, Electrostatic Confinement Device. \$50,000 (2 years).
- Roanoke College, Salem, Virginia. Charles R. Finfgeld, Proton Sputtering. \$15,833.
- Rochester, University of, Rochester, New York. Albert Simon, An Investigation of Non-Linear Transport Coefficients Using Moment Description of Plasma. \$33,400.
- Rochester, University of, Rochester, New York. Moshe J. Lubin, An Experimental Investigation of Laser Plasma Injection in a Toroidal Multipole. \$35,850.
- Stanford University, Stanford, California. Frederick W. Crawford, Peter Sturrock and Oscar Buneman, Plasma Physics Research. \$211,435 (10 months).
- Stevens Institute of Technology, Hoboken, New Jersey. George J. Yevick, Experimental Investigations of Cusped Containment Geometries. \$122,626.
- Stevens Institute of Technology, Hoboken, New Jersey. Kenneth C. Rogers and Robin Motz, Investigations in Plasma Dynamics. \$69,926.
- Stevens Institute of Technology, Hoboken, New Jersey. George Schmidt, Investigations in Plasma Dynamics. \$43,634 (14 months).
- Tennessee, University of, Knoxville, Tennessee. Edward G. Harris, Instabilities Due to Anisotropic Velocity Distributions. \$20,224.
- Texas Technological College, Lubbock, Texas. Magne Kristiansen, Theoretical and Experimental Investigations of Harmonic Ion Cyclotron Wave Propagation and Plasma Heating. \$22,559.
- Texas, University of, Austin, Texas. William E. Drummond, Anomalous Diffusion and Thermalization of Turbulent Plasmas. \$80,000.
- Texas, University of, Austin, Texas. D. Gary Swanson, Quasistatic Ion Cyclotron Wave Studies. \$20,000.
- United Aircraft Corporation, East Hartford, Connecticut. Alan F. Haught, Production of Plasmas for Thermonuclear Research by Laser Beam Irradiation of Solid Particles. \$119,900.
- Washington State University, Pullman, Washington. Edward E. Donaldson and M. J. Dresser, Chemical Sputtering of Solids. \$60,000.

CONTROLLED THERMONUCLEAR RESEARCH

Wisconsin, University of, Madison, Wisconsin. Juda L. Shohet, Plasma Instabilities and Waves
Excited by Electron Temperature Anisotropy Produced by Electron Cyclotron Resonance. \$22,500.

Wisconsin, University of, Madison, Wisconsin. Donald W. Kerst, Thermonuclear Plasma Studies.
\$448,840.

Wisconsin, University of, Madison, Wisconsin. John E. Scharer, Cyclotron Wave Plasma Experiment.
\$8,000 (17 months).

Yale University, New Haven, Connecticut. David E. Baldwin and Ira B. Bernstein, Theoretical
Research in the Fundamentals of Plasma Physics. \$34,809.