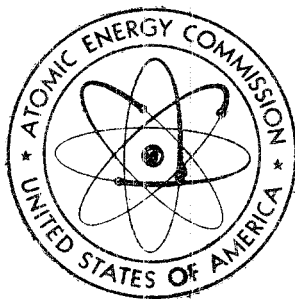


UNITED STATES  
ATOMIC ENERGY COMMISSION

RESEARCH CONTRACTS  
in the  
PHYSICAL SCIENCES



JULY 1, 1968  
DIVISION OF RESEARCH

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

The Physical Research Program, though including some applied investigations initiated to develop certain aspects of the practical utilization of nuclear energy, consists mainly of basic research undertaken to discover new scientific knowledge in the fields of high, medium, and low energy physics, mathematics, chemistry, metallurgy, materials, and controlled thermonuclear reactions.

Approximately three-fourths of the costs of operations and related capital equipment acquisition of the Physical Research program are associated with the support of research conducted in AEC national and other multiprogram laboratories and special research centers. Most of the research conducted at sites other than such major research centers ("off-site") is carried out at universities and other institutions of higher education, and is based almost entirely on unsolicited proposals.

### Major Research Centers

There is no clear line of demarcation between "major research centers" and "other sites." The AEC investment in facilities ranges from zero for some contractors to tens of millions for others, and likewise, the annual level of AEC support ranges from a few thousand dollars for some contractors to tens of millions for others - the spectrum is broad with no significant peaks or breaks.

Many of the major research centers are also engaged in research and development activities other than under the Physical Research Program; namely activities for the Production, Weapons, Reactor Development and Technology, Biology and Medicine, Isotopes Development and Peaceful Applications of Nuclear Explosives programs. The Physical Research Program at multiprogram laboratories provides, in varying degrees, the basic investigations underlying the applied and developmental activities of the individual laboratory. Some of the other major research centers tend to be more specialized and are engaged in research in a single, defined area, such as high energy physics. They all have the following 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 vested in the laboratory management with only major overall research guidance supplied by AEC.

### Washington-Designated Contract-Research Program

In addition to the research conducted at the major research centers, 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, although in many instances, practical applications are not immediately discernible from the basic research effort. Thus the off-site program aids in the advancement of science in those disciplines that are fundamental to AEC's programs.

As a supplement to AEC's programs at the major research centers, the contract-research program has a number of distinct benefits:

1. When the amount provided by AEC is added to the 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, and Mathematics & Computer research.

Division of Biology and Medicine:

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

Division of Reactor Development and Technology:

Nuclear Reactor Technology.

Division of Isotopes Development:

Radioisotope Technology; Applications of Radioisotopes; and Industrial Process Radiation.

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. 13-38, 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.

MAJOR RESEARCH CENTERS

For purposes of this report, the following may be considered major research centers 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 1968</u> (in thousands)	
	<u>Operations</u>	<u>Equipment</u>
<u>Ames Laboratory, Ames, Iowa</u> Iowa State University, W-7405-ENG-82	\$ 6,949	\$ 1,437
<u>Argonne National Laboratory, Argonne, Illinois</u> Argonne Universities Association and University of Chicago, W-31-109-ENG-38	36,476	6,082
<u>Brookhaven National Laboratory, Upton, L. I., New York</u> Associated Universities, Inc., AT(30-2)-GEN-16	33,738	6,367
<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	8,050	2,212
<u>Knolls Atomic Power Laboratory, Schenectady, New York</u> General Electric Company, W-31-109-ENG-52	480	43
<u>Lawrence Radiation Laboratory, Berkeley and Livermore, California</u> University of California, W-7405-ENG-48	39,641	8,152
<u>Los Alamos Scientific Laboratory, Los Alamos, New Mexico</u> University of California, W-7405-ENG-36	5,915	534
<u>Mound Laboratory, Miamisburg, Ohio</u> Monsanto Chemical Company, AT(33-1)-GEN-53	446	137
<u>National Accelerator Laboratory, DuPage and Kane Counties, Illinois</u> Universities Research Association, Inc., AT(49-8)-3000	1,274	277
<u>National Reactor Testing Station, Idaho Falls, Idaho</u> Idaho Nuclear Corporation, AT(10-1)-1230	151	15
<u>Oak Ridge K-25 Plant, Oak Ridge, Tennessee</u> Union Carbide Nuclear Company, W-7405-ENG-26	49	--
<u>Oak Ridge National Laboratory, Oak Ridge, Tennessee</u> Union Carbide Nuclear Company, W-7405-ENG-26	<del>31,580</del>	2,620
<u>Pacific Northwest Laboratory, Richland, Washington</u> Battelle Memorial Institute, AT(45-1)-1830	2,245	167
<u>Princeton-Pennsylvania Proton Accelerator, Princeton, New Jersey</u> Princeton University, AT(30-1)-2137 University of Pennsylvania, AT(30-1)-2171	7,925	1,104
<u>Princeton Plasma Physics Laboratory, Princeton, New Jersey</u> Princeton University, AT(30-1)-1238	6,879	440
<u>Stanford Linear Accelerator Center, Stanford, California</u> Stanford University, AT(04-3)-400, AT(04-3)-515	21,167	5,334
	<u>\$ 202,955</u>	<u>\$ 34,921</u>

\*FY 1968 Costs for Operations and Capital Equipment

SUMMARY OF OFF-SITE CONTRACTS

The following summarizes the number and level of Washington-designated off-site contracts in effect on July 1, 1968 and supported under the Physical Research Program:

<u>Type of Organization</u>	<u>No. of Institutions</u>	<u>No. of Contracts</u>	<u>FY 1968 Funding (in 1000's)</u>
Educational Institutions	140	545	\$ 60,782
Not-for-Profit Institutes	7	8	380
Industrial Organizations	6	10	1,806
Total	<u>153</u>	<u>563</u>	\$ <u>62,968</u>

(Under "No. of Institutions", the separate campuses of the University of California, Louisiana State University, 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 1968 Funding (in 1000's)</u>
High Energy Physics	37	\$ 17,995
Medium Energy Physics	13	4,059
Low Energy Physics	56	14,407
Mathematics and Computer Research	23	3,343
Chemistry	230	10,821
Metallurgy and Materials	163	9,395
Controlled Thermonuclear Research	41	2,948
Total	<u>563</u>	\$ <u>62,968</u>

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 60 new contracts written and a corresponding number of old contracts terminating each year. In FY 1968, 71 new projects were started, while 49 contracts terminated. While the total number of contracts has tended to remain rather constant, the total dollar level increased from \$52.4 million in 1963 to \$63.0 million in 1968.

The above summary does not include the portion of the Physical Research Program supported through reimbursable agreements with other Federal agencies. In FY 1968 there were four such agreements in effect between AEC and the following Government agencies with a total FY 1968 obligation of \$818,749, as follows:

1. Environmental Science Services Administration	\$ 40,000
2. National Bureau of Standards (2)	678,749
3. Navy - Bureau of Ships	100,000

SUMMARY OF NEW PROPOSALS RECEIVED AND ACTIONS TAKEN

During Fiscal Year 1968 the Division of Research received 400 formal proposals for new research, representing requests for a total of \$46.9 million. On hand at the beginning of FY 1968 pending completion of reviews were 233 new proposals requesting \$35.3 million, for a total of 633 proposals representing requests for \$82.2 million.

Approved during FY 1968 were 71 new proposals for \$3.4 million, while 387 representing \$38.7 million, were declined, tabled, or withdrawn.

NEW PROPOSALS - FY 1968  
(\$ in 1000's)

	<u>On Hand 7/1/67</u>		<u>Received During FY 1968</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	41	\$ 4,328	37	\$ 8,567	78	\$ 12,895
Physics & Mathematics	51	23,806	99	25,396	150	49,202
Chemistry	64	3,251	102	3,384	166	6,635
Metallurgy & Materials	48	1,707	120	4,338	168	6,045
Controlled Thermonuclear	29	2,240	42	5,182	71	7,422
<b>TOTAL</b>	<b>233</b>	<b>\$ 35,332</b>	<b>400</b>	<b>\$ 46,867</b>	<b>633</b>	<b>\$ 82,199</b>

ACTIONS TAKEN - NEW PROPOSALS - FY 1968  
(\$ in 1000's)

	<u>Approved</u>		<u>Declined, etc.</u>		<u>On Hand 6/30/68</u>	
	<u>No.</u>	<u>Amount</u>	<u>No.</u>	<u>Amount</u>	<u>No.</u>	<u>Amount</u>
High Energy Physics	1	\$ 150	55	\$ 10,647	22	\$ 2,098
Physics & Mathematics	11	481	95	17,260	44	31,461
Chemistry	27	798	99	4,456	40	1,381
Metallurgy & Materials	19	746	107	4,035	42	1,264
Controlled Thermonuclear	13	1,262	31	2,299	27	3,861
<b>TOTAL</b>	<b>71</b>	<b>\$ 3,437</b>	<b>387</b>	<b>\$ 38,697</b>	<b>175</b>	<b>\$ 40,065</b>

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 400 in FY 1968. Approval rates have tended to decrease somewhat, averaging 60 annually during the 1964 - 1968 period, compared to 90 annually for the 1959 - 1963 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.



SUMMARY OF CONTRACTS BY STATE

(not including contracts listed on p. 5)

<u>State and Contractor</u>	<u>Number of Contracts</u>	<u>FY 1968 Funding (in 1000's)</u>
<u>Alabama</u>	<u>1</u>	<u>\$ 42</u>
Tuskegee Institute, Tuskegee	1	42
<u>Arizona</u>	<u>9</u>	<u>\$ 440</u>
Arizona State University, Tempe	1	77
Arizona, University of, Tucson	8	363
<u>Arkansas</u>	<u>3</u>	<u>\$ 46</u>
Arkansas, University of, Fayetteville	3	46
<u>California</u>	<u>69</u>	<u>\$ 10,624</u>
Atomics International, Canoga Park	4	824
California Institute of Technology, Pasadena	9	2,492
California, University of, Berkeley	6	369
California, University of, Davis	2	865
California, University of, Irvine	4	687
California, University of, Los Angeles	10	1,529
California, University of, Riverside	3	339
California, University of, San Diego	8	1,623
California, University of, Santa Barbara	2	215
Gulf General Atomic, Inc., San Diego	2	636
Harvey Mudd College, Claremont	1	0
Navy, Bureau of Ships, San Francisco	1	100
Southern California, University of, Los Angeles	4	368
Stanford Research Institute, Menlo Park	1	70
Stanford University, Stanford	12	507
<u>Colorado</u>	<u>7</u>	<u>\$ 836</u>
Colorado State University, Ft. Collins	1	12
Colorado, University of, Boulder	5	784
Environmental Science Services Administration, Boulder	1	40
<u>Connecticut</u>	<u>14</u>	<u>\$ 3,552</u>
Connecticut, University of, Storrs	2	45
New England Institute for Medical Research, Ridgefield	1	50
United Aircraft, East Hartford	1	100
Yale University, New Haven	10	3,357
<u>Delaware</u>	<u>1</u>	<u>\$ 29</u>
Delaware, University of, Newark	1	29
<u>District of Columbia</u>	<u>7</u>	<u>\$ 783</u>
Catholic University of America	1	24
Georgetown University	3	60
George Washington University	1	20
National Bureau of Standards	2	679

<u>State and Contractor</u>	<u>Number of Contracts</u>	<u>FY 1968 Funding (in 1000's)</u>
<u>Florida</u>	<u>16</u>	<u>\$ 671</u>
Florida State University, Tallahassee	7	411
Florida, University of, Gainesville	6	187
Miami, University of, Coral Gables and Miami	3	73
<u>Georgia</u>	<u>9</u>	<u>\$ 293</u>
Georgia Institute of Technology, Atlanta	6	233
Georgia, University of, Athens	3	60
<u>Hawaii</u>	<u>1</u>	<u>\$ 302</u>
Hawaii, University of, Honolulu	1	302
<u>Idaho</u>	<u>1</u>	<u>\$ 10</u>
Idaho State University, Pocatello	1	10
<u>Illinois</u>	<u>29</u>	<u>\$ 5,890</u>
Associated Midwest Universities, Argonne	1	33
Chicago, University of, Chicago	9	1,353
Illinois Institute of Technology, Chicago	5	177
Illinois, University of, Urbana	7	4,071
Northwestern University, Evanston	7	256
<u>Indiana</u>	<u>19</u>	<u>\$ 2,912</u>
Indiana University, Bloomington	3	58
Notre Dame, University of, Notre Dame	4	1,481
Purdue University, Lafayette	12	1,373
<u>Iowa</u>	<u>3</u>	<u>\$ 59</u>
Dordt College, Sioux Center	1	10
Iowa, State University of, Iowa City	2	49
<u>Kansas</u>	<u>9</u>	<u>\$ 491</u>
Kansas State University, Manhattan	3	88
Kansas, University of, Lawrence	6	403
<u>Kentucky</u>	<u>6</u>	<u>\$ 147</u>
Kentucky, University of, Lexington	5	122
Murray State University, Murray	1	25
<u>Louisiana</u>	<u>2</u>	<u>\$ 84</u>
Louisiana State University, Baton Rouge	1	73
Louisiana State University, New Orleans	1	11
<u>Maryland</u>	<u>22</u>	<u>\$ 2,275</u>
Johns Hopkins University, Baltimore	5	431
Maryland, University of, College Park	17	1,844

<u>State and Contractor</u>	<u>Number of Contracts</u>	<u>FY 1968 Funding (in 1000's)</u>
<u>Massachusetts</u>	<u>31</u>	<u>\$ 4,143</u>
Avco-Everett Research Laboratory, Everett	1	85
Boston University, Boston	1	28
Brandeis University, Waltham	5	257
Clark University, Worcester	2	19
Harvard University, Cambridge	4	197
Massachusetts Institute of Technology, Cambridge	12	2,963
Massachusetts, University of, Amherst	1	145
Northeastern University, Boston	1	33
Tufts University, Medford	3	396
Worcester Polytechnic Institute, Worcester	1	20
<u>Michigan</u>	<u>24</u>	<u>\$ 2,530</u>
Michigan State University, East Lansing	10	407
Michigan Technological University, Houghton	3	93
Michigan, University of, Ann Arbor	7	1,921
Wayne State University, Detroit	4	109
<u>Minnesota</u>	<u>10</u>	<u>\$ 1,716</u>
Minnesota, University of, Minneapolis	9	1,702
St. Mary's College, Winona	1	14
<u>Mississippi</u>	<u>2</u>	<u>\$ 50</u>
Mississippi, University of, University	2	50
<u>Missouri</u>	<u>9</u>	<u>\$ 332</u>
Midwest Research Institute, Kansas City	1	30
Missouri, University of, Rolla	2	89
Washington University, St. Louis	6	213
<u>Montana</u>	<u>1</u>	<u>\$ 27</u>
Montana State University, Bozeman	1	27
<u>Nebraska</u>	<u>2</u>	<u>\$ 67</u>
Nebraska, University of, Lincoln	2	67
<u>Nevada</u>	<u>1</u>	<u>\$ 0</u>
Nevada, University of, Reno	1	0
<u>New Hampshire</u>	<u>1</u>	<u>\$ 10</u>
New Hampshire, University of, Durham	1	10
<u>New Jersey</u>	<u>12</u>	<u>\$ 1,503</u>
Institute for Advanced Study, Princeton	1	61
Princeton University, Princeton	5	1,143
Rutgers University, New Brunswick	3	84
Stevens Institute of Technology, Hoboken	3	215
<u>New Mexico</u>	<u>2</u>	<u>\$ 18</u>
New Mexico Highlands University, Las Vegas	1	10
New Mexico, University of, Albuquerque	1	0

<u>State and Contractor</u>	<u>Number of Contracts</u>	<u>FY 1968 Funding (in 1000's)</u>
<u>New York</u>	<u>78</u>	<u>\$ 9,540</u>
Brooklyn, Polytechnic Institute of, Brooklyn	2	22
Clarkson College of Technology, Potsdam	3	46
Columbia University, New York	12	3,823
Cornell University, Ithaca	19	1,258
Fordham University, New York	2	47
Long Island University, Greenvale	1	22
New York, City University of, Brooklyn College	1	34
New York, City University of, Hunter College	1	20
New York, City University of, Queens College	2	66
New York, State University of, Buffalo	4	75
New York, State University of, Stony Brook	4	626
New York University, New York	3	1,289
Rensselaer Polytechnic Institute, Troy	9	282
Rochester, University of, Rochester	8	1,529
Syracuse University, Syracuse	3	265
Yeshiva University, New York	4	136
<u>North Carolina</u>	<u>15</u>	<u>\$ 1,300</u>
Duke University, Durham	5	907
North Carolina State University, Raleigh	3	136
North Carolina, State University of, Greensboro	1	17
North Carolina, University of, Chapel Hill	5	224
Wake Forest University, Winston-Salem	1	16
<u>North Dakota</u>	<u>2</u>	<u>\$ 44</u>
North Dakota, University of, Grand Forks	2	44
<u>Ohio</u>	<u>19</u>	<u>\$ 1,008</u>
Battelle Memorial Institute, Columbus	1	60
Case Western Reserve University, Cleveland	8	503
Kent State University, Kent	1	0
Ohio State University, Columbus	6	416
Ohio University, Athens	2	8
Toledo, University of, Toledo	1	21
<u>Oklahoma</u>	<u>5</u>	<u>\$ 59</u>
Oklahoma State University, Stillwater	1	22
Oklahoma, University of, Norman	4	37
<u>Oregon</u>	<u>9</u>	<u>\$ 431</u>
Oregon State University, Corvallis	5	199
Oregon, University of, Eugene	3	227
Reed College, Portland	1	5
<u>Pennsylvania</u>	<u>32</u>	<u>\$ 3,038</u>
Carnegie-Mellon University, Pittsburgh	9	2,021
Duquesne University, Pittsburgh	1	18
Franklin Institute, Philadelphia	2	135
Lehigh University, Bethlehem	2	14
Pennsylvania State University, University Park	6	277
Pennsylvania, University of, Philadelphia	4	123
Pittsburgh, University of, Pittsburgh	5	273
Temple University, Philadelphia	2	137
Westinghouse Electric, Pittsburgh	1	40

<u>State and Contractor</u>	<u>Number of Contracts</u>	<u>FY 1968 Funding (in 1000's)</u>
<u>Puerto Rico</u>	<u>3</u>	<u>\$ 295</u>
Puerto Rico, University of, Mayaguez and Rio Piedras	3	295
<u>Rhode Island</u>	<u>6</u>	<u>\$ 671</u>
Brown University, Providence	5	626
Rhode Island, University of, Kingston	1	45
<u>South Carolina</u>	<u>4</u>	<u>\$ 83</u>
Clemson University, Clemson	1	38
South Carolina, University of, Columbia	3	45
<u>Tennessee</u>	<u>7</u>	<u>\$ 170</u>
Tennessee, University of, Knoxville	4	91
Vanderbilt University, Nashville	3	79
<u>Texas</u>	<u>23</u>	<u>\$ 2,506</u>
Houston, University of, Houston	2	58
Rice University, Houston	5	774
Southwest Center for Advanced Studies, Dallas	1	2
Texas A & M University, College Station	7	1,011
Texas Christian University, Ft. Worth	1	20
Texas Nuclear Corporation, Austin	1	121
Texas Technological College, Lubbock	1	12
Texas, University of, Austin	5	508
<u>Utah</u>	<u>10</u>	<u>\$ 294</u>
Brigham Young University, Provo	3	64
Utah, University of, Salt Lake City	7	230
<u>Vermont</u>	<u>1</u>	<u>\$ 23</u>
Vermont, University of, Burlington	1	23
<u>Virginia</u>	<u>8</u>	<u>\$ 339</u>
Roanoke College, Salem	1	4
Virginia Polytechnic Institute, Blacksburg	2	52
Virginia, University of, Charlottesville	5	283
<u>Washington</u>	<u>8</u>	<u>\$ 1,268</u>
Washington State University, Pullman	3	155
Washington, University of, Seattle	4	1,103
Western Washington State College, Bellingham	1	10
<u>Wisconsin</u>	<u>13</u>	<u>\$ 2,796</u>
Marquette University, Milwaukee	1	29
Wisconsin, University of, Madison	11	2,754
Wisconsin, University of, Milwaukee	1	13
<u>Wyoming</u>	<u>1</u>	<u>\$ 40</u>
Wyoming, University of, Laramie	1	40

## High Energy Physics

- Associated Midwest Universities, Inc., Argonne, Illinois. J. H. Roberson, Users Group and Related Activities. \$33,000.
- Brandeis University, Waltham, Massachusetts. Lawrence E. Kirsch, Research in Elementary Particle Physics. \$115,000.
- Brown University, Providence, Rhode Island. David Feldman and Anatole M. Shapiro, Experimental and Theoretical High Energy Physics. \$319,000.
- California Institute of Technology, Pasadena, California. R. F. Bacher, Operation and Research with 1.5 BeV Electron Synchrotron; Users Group. \$1,490,000.
- California, University of, Irvine, California. Jonas Schultz, High Energy User Group. \$50,000 (4 months).
- California, University of, Irvine, California. Frederick Reines, Studies of Neutrino and Cosmic Ray Interaction. \$512,000.
- California, University of, Los Angeles, California. Harold K. Ticho and Donald H. Stork, Research in High Energy Physics. \$385,462.
- California, University of, Riverside, California. Peter E. Kaus and Walter H. Barkas, High Energy Physics. \$236,000.
- California, University of, San Diego, California. Oreste Piccioni, Norman Kroll and George Masek, Experimental and Theoretical Particle Physics. \$1,021,000.
- California, University of, Santa Barbara, California. David O. Caldwell, High Energy Physics Users. \$135,000.
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Roger B. Sutton, High Energy Physics Users; Theoretical Research. \$910,248.
- Case Western Reserve University, Cleveland, Ohio. Thomas L. Jenkins, High Energy User Group and Neutrino Experiments. \$75,000.
- Chicago, University of, Chicago, Illinois. Y. Nambu, Theoretical Research in Elementary Particle Physics. \$302,100.
- Chicago, University of, Chicago, Illinois. Roland Winston, Experimental Study of Weak Interactions. \$118,000.
- Colorado, University of, Boulder, Colorado. Leona Marshall Libby, J. B. Kopelman and Alan Franklin, High Energy Physics. \$325,000.
- Columbia University, New York, New York. Leon Lederman and Robert Serber, High Energy Physics Users; Theoretical Research. \$2,222,000.
- Cornell University, Ithaca, New York. Kenneth Greisen, Detection of Super Showers by Atmospheric Scintillation. \$124,000.
- Duke University, Durham, North Carolina. Earle C. Fowler, Research in High Energy Physics. \$305,000.
- Florida State University, Tallahassee, Florida. Joseph E. Lannutti, Elementary Particle Physics. \$135,000.
- Hawaii, University of, Honolulu, Hawaii. Vincent Z. Peterson and San Fu Tuan, Research in High Energy Nuclear Physics. \$302,000 (9 months).
- Illinois, University of, Urbana, Illinois. E. L. Goldwasser and A. Wat@enberg, High Energy Physics Users; Theoretical Research. \$1,419,842.
- Maryland, University of, College Park, Maryland, George A. Snow, Properties of K-Mesons and Hyperons and Related Topics. \$650,000.
- Massachusetts Institute of Technology, (National Magnet Laboratory), Cambridge, Massachusetts. Benjamin Lax, Search for Ferromagnetically Trapped Dirac Monopoles of Cosmic Ray Origin. \$38,000.

## High Energy Physics

- Massachusetts, University of, Amherst, Massachusetts. S. Steven Yamamoto and Janice B. Shafer, High Energy Physics. \$145,000.
- Michigan State University, East Lansing, Michigan. J. H. Hetherington, Theoretical Investigations of Scattering Problems and Nucleon-Nucleon Interactions. \$17,000.
- Michigan, University of, Ann Arbor, Michigan. A. R. Crane, High Energy Physics Users; Theoretical Research. \$831,281.
- Minnesota, University of, Minneapolis, Minnesota. Stephen Gasiorowicz and Hans W. J. Courant, Theoretical Physics and Experimental Study of Elementary Particle Interactions. \$250,000.
- National Bureau of Standards, Boulder, Colorado. Heat Transfer and Associated Fluid Property Studies with Liquid Helium. \$35,000 (3 months).
- New York, State University of, Stony Brook, New York. Juliet Lee-Franzini, C. N. Yang and Myron L. Good, Experimental and Theoretical Subnuclear Physics. \$400,000.
- Ohio State University, Columbus, Ohio. Thomas A. Romanowski, High Energy Physics. \$285,000.
- Oregon, University of, Eugene, Oregon. Michael J. Moravcsik, Theory of Elementary Particles. \$105,500 (2 years).
- Pittsburgh, University of, Pittsburgh, Pennsylvania. Richard H. Pratt, Studies in Quantum Electrodynamics and the Theory of Elementary Particles. \$59,000.
- Purdue University, Lafayette, Indiana. Frank J. Loeffler and Masao Sugawara, Fundamental Particle Physics. \$690,000.
- Rochester, University of, Rochester, New York. Morton F. Kaplon, High Energy Physics Users; Theoretical Research. \$900,319.
- Syracuse University, Syracuse, New York. E. C. George Sudarshan, Research Program in Elementary Particle Theory. \$215,000.
- Tufts University, Medford, Massachusetts. Julian K. Knipp, Experimental and Theoretical High Energy Physics Research. \$346,210.
- Wisconsin, University of, Madison, Wisconsin. A. R. Erwin and M. Ebel, High Energy Physics Users; Theoretical Research. \$1,599,998.
- Yale University, New Haven, Connecticut. Vernon W. Hughes, High Energy Physics Users; Theoretical Research. \$1,030,000.

Medium Energy Physics

California, University of, Davis, California. John A. Jungerman and William W. True, Nuclear Physics Research. \$830,000.

California, University of, Los Angeles, California. Roy P. Haddock, Particle Physics. \$170,000.

Carnegie-Mellon University, Pittsburgh, Pennsylvania. R. B. Sutton, 440 MeV Synchrocyclotron and Associated Research. \$549,229.

Columbia University, New York, New York. W. W. Havens, Medium Energy Physics. \$117,627.

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 Interaction of Intermediate Energy Particles. \$368,451.

Maryland, University of, College Park, Maryland. William M. MacDonald, Theoretical Studies in Nuclear Reactions and Nuclear Structure. \$160,000.

Massachusetts Institute of Technology, Cambridge, Massachusetts. P. T. Demos, Medium Energy Physics. \$262,802.

Minnesota, University of, Minneapolis, Minnesota. J. Morris Blair, George Greenless and Norton Hintz, Experimental Nuclear Physics. \$396,000.

National Bureau of Standards, Washington, D. C. Accelerator Research. \$44,049.

Rochester, University of, Rochester, New York. Morton F. Kaplon, Synchrocyclotron Operation and Associated Research. \$300,676.

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., Research and Operation of the Texas A & M Variable Energy Cyclotron. \$865,000.

Yale University, New Haven, Connecticut. Vernon W. Hughes, Medium Energy Physics. \$38,968.



Low Energy Physics

- Arizona, University of, Tucson, Arizona. Douglas J. Donahue, Research in Nuclear Physics. \$110,000.
- Arizona, University of, Tucson, Arizona. C. Y. Fan, To Measure Lamb Shift in Hydrogen-Like Atoms of Nuclear Charge  $Z \leq 3$ . \$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. \$75,000.
- California Institute of Technology, Pasadena, California. Felix Boehm, Nuclear Spectroscopy and X-ray Studies. \$350,000.
- California, University of, Berkeley, California. Carson D. Jeffries, Dynamic Nuclear Polarization and Solid State Physics. \$52,891.
- California, University of, Berkeley, California. John H. Reynolds, Mass Spectroscopy Research. \$75,000.
- California, University of, Los Angeles, California. J. Reginald Richardson and Byron T. Wright, Nuclear Structure Research. \$450,000.
- California, University of, Los Angeles, California. Leon Knopoff, Space-Time Correlation of Seismic Events. \$42,091.
- California, University of, San Diego, California. Keith A. Brueckner, Problems in Theoretical Nuclear Physics: Many Body Systems. \$156,259.
- California, University of, Santa Barbara, California. Paul H. Barrett and Robert M. Eisberg, Nuclear Structure Research. \$80,000.
- Case Western Reserve University, Cleveland, Ohio. Erwin F. Shrader and R. M. Thaler, Low Energy Nuclear Physics. \$280,000.
- Colorado, University of, Boulder, Colorado. W. R. Smythe and Ernest S. Rost, Study of Fundamental Nuclear Interactions. \$421,000.
- 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. \$1,164,247.
- Cornell University, Ithaca, New York. David D. Clark, Experimental Study of Nuclear Isomers. \$41,598.
- Duke University, Durham, North Carolina. Henry W. Newson, Studies of Nuclear Structure using Neutrons and Charged Particles. \$502,180.
- 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. \$100,000.
- Georgetown University, Washington, D. C. James M. Lambert and Paul A. Treado, Nuclear Structure and Interaction Studies with a Low-Energy Positive Ion Accelerator. No Funds (3 years).
- Gulf General Atomic Incorporated, San Diego, California. W. M. Lopez and A. D. Carlson, Neutron Capture Cross-Section Measurements. \$136,048.
- Johns Hopkins University, Baltimore, Maryland. Henry M. Crosswhite, Jr. and Brian R. Judd, Absorption and Fluorescence Spectra of Uranium Salts and Other Solids - Spectra of Molecules Containing Tritium. \$77,227.
- Johns Hopkins University, Baltimore, Maryland. George E. Owen and Leon Madansky, Studies of Neutron and Charged Particle Reactions. \$215,000.
- Kansas State University, Manhattan, Kansas. Robert B. Leachman, Nuclear Physics Accelerator Facility. \$440,461 (authorized FY 1966).

Low Energy Physics

- Kansas State University, Manhattan, Kansas. Robert B. Leachman, Tandem Van de Graaff Pre-Operational Research. \$70,000.
- Kansas, University of, Lawrence, Kansas. Ralph W. Krone, Nuclear Structure Studies of the Light and Medium-Light Nuclei. \$220,250.
- Maryland, University of, College Park, Maryland. William F. Hornyak, The Structure of Light Nuclei. \$228,200.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. P. T. Demos, Nuclear Physics Research. \$1,244,672.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. Keiti Aki, Measurement of Stress in Place. \$35,700.
- Michigan State University, East Lansing, Michigan. Hugh McManus and Peter S. Signell, Theoretical Investigations of Scattering Problems and Nucleon-Nucleon Interactions. \$152,854.
- Michigan, University of, Ann Arbor, Michigan. H. R. Crane, Low Energy Physics Research. \$931,747.
- Minnesota, University of, Minneapolis, Minnesota. J. Morris Blair, George Greenless, and Norton Hintz, Experimental Nuclear Physics. \$684,000.
- North Carolina State University, Raleigh, North Carolina. L. W. Seagondollar, Nuclear Structure Research at the Regional Nuclear Laboratory. \$80,000 (14 months).
- North Carolina, University of, Chapel Hill, North Carolina. Eugen Merzbacher, Studies of Nuclear Processes. \$70,000 (10 months).
- Notre Dame, University of, Notre Dame, Indiana. Charles J. Mullin, Interactions of Photons and Particles with Nuclei. \$80,000.
- Notre Dame, University of, Notre Dame, Indiana. John W. Mihelich, Nuclear Spectroscopy. \$85,000.
- Ohio University, Athens, Ohio. Raymond O. Bone, 8 MeV Tandem Accelerator Facility. \$1,000,000 (authorized FY 1967).
- Oregon State University, Corvallis, Oregon. Larry Schechter and McAllister H. Hull, Jr., Experimental and Theoretical Nuclear Physics. \$111,800.
- Oregon, University of, Eugene, Oregon. Bernd Crasemann, Nuclear Physics Research. \$195,166.
- Pennsylvania, University of, Philadelphia, Pennsylvania. Henry Faul, Applications of Spontaneous Fission of  $^{238}\text{U}$  in the Study of Natural Crystals and Glasses. \$35,247.
- Princeton University, Princeton, New Jersey. Rubby Sherr, Nuclear Physics Research. \$735,000.
- Purdue University, Lafayette, Indiana. Rolf M. Steffen, Research in Nuclear Physics. \$250,000.
- Rice University, Houston, Texas. G. C. Phillips and G. K. Walters, Nuclear and Extra-Nuclear Research. \$510,000.
- Rochester, University of, Rochester, New York. J. B. French, Nuclear Physics Research. \$127,323.
- South Carolina, University of, Columbia, South Carolina. Frank T. Avignone, III, Antineutrino Absorption Cross Section Measurement. \$25,230.
- Southern California, University of, Los Angeles, California. William H. Louisell, Nuclear Physics with a 32 MeV Proton Linear Accelerator and 50 MeV Cyclotron. \$300,000.
- Southwest Center for Advanced Studies, Dallas, Texas. Mark Landisman, Computer Support for a Study of the Physical Properties of the Earth's Interior by Seismic Wave Generation, Propagation, Dispersion and Attenuation. \$1,800 (17 months).
- Texas Nuclear Corporation, Austin, Texas. William E. Tucker, Gamma Rays Produced by the Interaction of Monoenergetic Neutrons in Several Nuclei. \$120,600.
- Texas, University of, Austin, Texas. S. A. A. Zaidi, Nuclear Structure Physics. \$400,000.

Low Energy Physics

Virginia, University of, Charlottesville, Virginia. Hugh P. Kelly, Theoretical Nuclear Physics. \$70,000.

Washington, University of, Seattle, Washington. Robert Vandenbosch and Marshall Baker, Experimental and Theoretical Nuclear Physics. \$1,016,000.

Wisconsin, University of, Madison, Wisconsin. C. H. Blanchard and H. H. Barschall, Nuclear Research. \$541,500.

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 Charged Particle Reactions. \$40,000.

Yale University, New Haven, Connecticut. Vernon W. Hughes, Studies in Nuclear Physics. \$670,637.

Yale University, New Haven, Connecticut. D. A. Bromley, Emperor Tandem Van de Graaff Research Program. \$886,795.

Yeshiva University, New York, New York. A. G. W. Cameron, Research in Nuclear Physics and Nucleosynthesis. \$39,100.

Mathematics and Computer Research

- California, University of, Berkeley, California. A. H. Taub, Analytical and Numerical Studies in General Relativity. \$92,371 (2 years).
- California, University of, Los Angeles, California. Gerald Estrin, Research Program for the UCLA Variable Structure Computer System. \$250,000.
- 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. \$52,950 (15 months).
- 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.
- 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. \$349,000.
- Illinois, University of, Urbana, Illinois. C. W. Gear and W. J. Poppelbaum, Computer Systems Research. \$484,500.
- Maryland, University of, College Park, Maryland. Bertie E. Hubbard, Studies of the Numerical Solution of Elliptic and Parabolic Boundary Value Problems. \$41,910.
- 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. \$29,985.
- New York, City University of/Queens College, Flushing, New York. Arthur Sard, Optimal Approximation and Differentiable Maps. \$26,215.
- 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. \$1,032,027.
- North Carolina, University of, Chapel Hill, North Carolina. Frederick P. Brooks, Jr., Development, Programming and Human-Factors Investigation of a System for Displaying Computer Outputs to the Kinesthetic Sense. \$70,629.
- Oregon State University, Corvallis, Oregon. Arvid T. Lonseth, Research in Applied Analysis. \$52,799 (13 months).
- Rice University, Houston, Texas. Walter Orvedahl and Zevi W. Salsburg, Computer Research. \$110,440.
- Southern California, University of, Los Angeles, California. Richard Bellman, New Methods for the Numerical Solution of Partial Differential Equations. \$23,620.
- Stanford University, Stanford, California. George B. Dantzig and Robert B. Wilson, Stochastic Mathematical Programs. \$102,200 (2 years).
- Stanford University, Stanford, California. Stefan Bergman, The Kernel Function and the Method of Particular Solutions. \$24,669.
- Stanford University, Stanford, California. William F. Miller, Programming Models and the Control of Parallel Computing Systems. \$58,281 (15½ months).
- Washington University, St. Louis, Missouri. Leon Cooper, Research in Methods of Non-Linear and Combinatorial Programming. \$93,187 (2 years).

Chemistry

- Arizona State University, Tempe, Arizona. LeRoy Eyring, Solid State Chemistry of Rare Earth Oxides. \$77,170.
- Arizona, University of, Tucson, Arizona. Henry Freiser, Development and Testing of Organic Reagents for Use in Inorganic Analysis. \$40,000.
- Arizona, University of, Tucson, Arizona. Paul E. Damon, Correlation and Chronology of Ore Deposits and Volcanic Rocks. \$40,000.
- Arizona, University of, Tucson, Arizona. Leslie S. Forster, The Luminescence of Metal Complexes. \$36,382 (16½ months).
- Arizona, University of, Tucson, Arizona. Quintus Fernando, An Investigation of Steric and Synergic Effects in Metal Chelates. \$17,466.
- Arkansas, University of, Fayetteville, Arkansas. Lester C. Howick, Precipitation from Homogeneous Solutions of Mixed Solvents. \$7,400.
- 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. \$130,000 (18 months).
- Atomics International, Canoga Park, California. S. J. Yosim, High Temperature Chemistry. \$146,898.
- Atomics International, Canoga Park, California. R. B. Ingalls, Radiation Chemistry. \$75,641.
- Avco-Everett Research Laboratory, Everett, Massachusetts. Richard H. Levy, Study of a Heavy Ion Plasma Accelerator. \$85,000 (3 months).
- Brandeis University, Waltham, Massachusetts. Henry Linschitz, Photochemical Reactions of Complex Molecules in Condensed Phase. \$53,526.
- Brandeis University, Waltham, Massachusetts. Saul G. Cohen, Effects of Mercaptans and Disulfides on Photochemical and High Energy Radiation Induced Reactions. \$23,396.
- Brigham Young University, Provo, Utah. Reed M. Izatt and James J. Christensen, Jr., Thermodynamics of Metal-Ligand Interaction in Aqueous Solution. \$20,000.
- Brooklyn, Polytechnic Institute of, Brooklyn, New York. Joseph Steigman, Investigation of Binding of Ions to Polyelectrolytes in Dilute Aqueous Solution. \$25,800 (26 months).
- 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. Robert P. Sharp, Geochemical Studies with Stable and Radioactive Isotopes. \$155,000.
- California Institute of Technology, Pasadena, California. Aron Kuppermann, Studies in Chemical Dynamics and Radiation Chemistry. \$120,000.
- California Institute of Technology, Pasadena, California. Jesse L. Beauchamp and John D. Roberts, The Application of Ion Cyclotron Resonance to the Study of Ion-Molecule Interactions. \$34,583.
- California Institute of Technology, Pasadena, California. Frederick H. Shair, Diffusion of Molecular Species at Low Concentrations in Glow Discharge. \$20,000.
- California, University of, Berkeley, California. John O. Rasmussen, Theoretical Studies on Nuclear Structure and Transitions. \$60,000.
- California, University of, Davis, California. John W. Root, Basic Research in Nuclear Chemistry. \$35,000.
- California, University of, Irvine, California. Frank S. Rowland, Radiochemistry Research. \$125,000.
- California, University of, Los Angeles, California. Clifford S. Garner, Complex Ion Chemistry. \$45,000.

## Chemistry

- California, University of, Los Angeles, California. W. G. McMillan, E. R. Hardwick and M. F. Nicol, Intra- and Inter-molecular Energy Transfer Studies. \$60,000.
- California, University of, Los Angeles, California. M. A. El-Sayed, The Vacuum Ultraviolet Spectra and Photochemistry of Polyatomic Molecules. \$51,590.
- California, University of, Riverside, California. Donald T. Sawyer, Study of Metal Chelates. \$35,700.
- California, University of, San Diego, California. Harold C. Urey, The Distribution and Origin of the Elements and Their Isotopes in Nature. \$95,000.
- California, University of, San Diego, California. Joseph E. Mayer, Interacting Atoms. \$55,115.
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Truman P. Kohman, Nuclear Chemistry and Geochemistry Research. \$79,950.
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Robert H. Schuler, Radiation Research. \$340,000.
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Albert A. Caretto, Jr., High Energy Nuclear Reactions. \$70,000.
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Joe V. Michael, Determinations of Elementary Reaction Rate Constants for the Reactions of Hydrogen Atoms with Various Substrate Molecules in the Gas Phase. \$26,000.
- Case Western Reserve University, Cleveland, Ohio. Edwin W. Abrahamson, Primary Processes in Radiation Chemistry. \$18,700.
- Case Western Reserve University, Cleveland, Ohio. Robert E. Sparks, Velocity Profile Control in Large Scale Chromatographic Columns. \$37,000 (2 years).
- Catholic University of America, Washington, D. C. Theodore A. Litovitz, Ultrasonic Spectroscopy in Liquids at High Temperature. \$24,265.
- Chicago, University of, Chicago, Illinois. Clyde A. Hutchison, Jr., Paramagnetic Resonance Absorption. \$145,000.
- Chicago, University of, Chicago, Illinois. Edward Anders, Radiochemical and Geochemical Studies. \$50,000.
- Chicago, University of, Chicago, Illinois. N. C. Yang, Radiation Chemistry of Organic Compounds. \$27,000.
- Chicago, University of, Chicago, Illinois. Nathan Sugarman and Anthony Turkevich, Nuclear Chemistry Research. \$205,000.
- Chicago, University of, Chicago, Illinois. Ugo Fano, Basic Studies of Atomic Dynamics. \$51,000.
- Clark University, Worcester, Massachusetts. Daeg S. Brenner, Nuclear Chemistry and Geochemistry. \$21,664 (18 months).
- Clark University, Worcester, Massachusetts. Daeg S. Brenner, Nuclear Chemistry and Radiochemistry. \$18,843
- Clarkson College of Technology, Potsdam, New York. Joseph Estrin, Heat and Mass Transfer in the Condensation of Multicomponent Systems. \$8,040 (27 months).
- Clarkson College of Technology, Potsdam, New York. Milton Kerker, Studies on Colloidal Particles: Scavenging of Aerosol Particles by a Falling Microscopic Particle. \$27,000.
- Colorado State University, Fort Collins, Colorado. John D. Vaughn, Chemical Effects of Nuclear Reactions in Nitrogen Compounds. \$12,000.
- Colorado, University of, Boulder, Colorado. Harold F. Walton, Specific Attractions in Ion Exchange. \$13,294.
- Colorado, University of, Boulder, Colorado. Edward L. King, Oxidation-Reduction Reaction Mechanisms. \$9,440.

## Chemistry

- Columbia University, New York, New York. T. I. Taylor, Separation of Isotopes. \$49,580.
- Columbia University, New York, New York. J. M. Miller, Nuclear Chemistry at Medium and High Energy. \$69,032.
- Columbia University, New York, New York. Paul F. Kerr, Alteration and Mineralization of Primary Uranium Deposits. \$34,915.
- 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. \$16,375.
- Cornell University, Ithaca, New York. Franklin A. Long, Mechanisms of Acid-Base Catalysis and Studies in Deuterium Oxide as Solvent. \$27,500.
- Dordt College, Sioux Center, Iowa. Russell Maatman, Interactions of Aqueous and Nonaqueous Ions with Oxide Surfaces. \$10,000.
- Duke University, Durham, North Carolina. Howard A. Strobel, Ion Exchange in Polar Non-Aqueous Solvents. \$10,000 (39 months).
- Duquesne University, Pittsburgh, Pennsylvania. Norman C. Li, Complexes in Chemistry. \$18,000.
- 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. \$40,976.
- Florida State University, Tallahassee, Florida. Raymond K. Sheline, An Experimental Study of Nuclear Models. \$100,500.
- Florida State University, Tallahassee, Florida. James V. Quagliano, Structural Studies of Metal Coordination Compounds. \$14,667.
- Florida State University, Tallahassee, Florida. Bruno Linder, Radiochemical Studies of Nuclear Reactions. \$15,000 (3 years).
- 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. \$53,000.
- Florida, University of, Gainesville, Florida. Robert J. Hanrahan, Radiation Chemistry of Hydrocarbon and Alkyl Halide Systems. \$30,000.
- Florida, University of, Gainesville, Florida. William H. Ellis, Chemical Structural Studies by Nuclear Techniques. \$32,500 (13 months).
- Florida, University of, Gainesville, Florida. T. M. Reed, Radiolytically-Induced Heterogeneous Reactions with Perfluorocompounds. \$5,628.
- Fordham University, New York, New York. Michael Cefola, Kinetics and Structural Studies of Chelates. \$26,640.
- Fordham University, New York, New York. Philip S. Gentile, The Synthesis of Complexes and Related Kinetics, Thermodynamics and Spectral Studies. \$20,000.
- Georgetown University, Washington, D. C. Joseph E. Earley, Substitution in Oxyions. \$9,000.
- George Washington University, Washington, D. C. Nicolae Filipescu, Lanthanide Ions as Sensitive Probes in Intermolecular Energy Transfer and Organic Photochemistry. \$20,000.
- Georgia Institute of Technology, Atlanta, Georgia. Richard W. Fink, Nuclear Spectroscopy and Reaction Studies. \$60,000.

## Chemistry

- Georgia Institute of Technology, Atlanta, Georgia. James A. Knight, Jr., Radiation Chemistry of Monosubstituted Aromatic Compounds. \$21,000.
- Georgia, University of, Athens, Georgia. William C. Sears, Infrared Spectra of Plastics and Elastomers after Nuclear Irradiation. \$11,000.
- Georgia, University of, Athens, Georgia. Francis J. Johnston, Studies of Physical Chemical Behavior and Radiation Effects in Colloids. \$12,000.
- Georgia, University of, Athens, Georgia. Charles E. Melton, Radiolysis of Water in a Wide Range Radiolysis Source. \$37,138 (2 years).
- Harvard University, Cambridge, Massachusetts. Clifford Frondel, Geochemistry and Crystal Chemistry of Rare Elements. \$22,392 (2 years).
- Harvard University, Cambridge, Massachusetts. William A. Klemperer, Molecular Spectroscopy of Substances Existing at High Temperatures. \$65,125.
- Harvard University, Cambridge, Massachusetts. Martin Karplus, Theoretical Studies in Chemical Kinetics. \$95,000.
- Harvey Mudd College, Claremont, California. Arthur J. Campbell, Energy Levels of Polyatomic Inorganic Ions. \$17,260 (15 months).
- Houston, University of, Houston, Texas. Gerhard G. Meisels, Radiolysis of Gases with High Energy Electrons and Fission Fragments. \$46,601.
- Idaho State University, Pocatello, Idaho. Joseph L. Thompson, Consequences of Radioactive Decay: Charge and Kinetic Energy of the Daughter Atom. \$9,840.
- Illinois Institute of Technology, Chicago, Illinois. Phillip G. Wahlbeck, High Temperature Chemistry-Fundamentals of Effusion and Thermodynamics of Materials. \$34,700.
- Illinois Institute of Technology, Chicago, Illinois. Theodore J. Neubert, Color Centers and Related Phenomena in Alkali Halide Type Crystals. \$39,980.
- Illinois, University of, Urbana, Illinois. Russell S. Drago, Non-aqueous Solvents. \$10,000.
- Illinois, University of, Urbana, Illinois. Robert F. Nystrom, Preparation of Carbon-14 and Tritium Labeled Compounds by Hydroboration and Tritioboration Procedures. \$15,009.
- Illinois, University of, Urbana, Illinois. Peter E. Yankwich, Isotope Effects and Chemical Kinetics. \$27,000.
- Indiana University, Bloomington, Indiana. W. B. Schaap and F. C. Schmidt, Electrochemical Research in Amine Solvents. \$36,000.
- Indiana University, Bloomington, Indiana. Ralph L. Seifert, Chemical Equilibria at High Temperatures. \$4,860 (19 months).
- Indiana University, Bloomington, Indiana. V. J. Shiner, Jr., Deuterium and Tritium Isotope Effects on the Rates of Organic Reactions. \$22,000.
- Iowa, State University of, Iowa City, Iowa. E. David Cater, Research in High Temperature Physical Chemistry, Particularly the Vaporization of Refractory Sulfides. \$22,350.
- Iowa, State University of, Iowa City, Iowa. Gilbert Gordon, Stable Isotope Tracer Studies. \$26,607.
- Johns Hopkins University, Baltimore, Maryland. Paul H. Emmett, Study of Catalytic Surfaces and the Mechanism of Catalytic Reactions. \$33,000.
- 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, Reactions of Tritium Atoms and Ions with Solids, Radon and Low Energy Electron Irradiation Chemistry. \$17,780.



## Chemistry

- Kansas, University of, Lawrence, Kansas. Edward J. Zeller, Study of Natural Radiation Damage in Minerals by Electron Spin Resonance and Thermoluminescence. \$28,700.
- Kansas, University of, Lawrence, Kansas. Paul W. Gilles, High Temperature Chemistry. \$90,000.
- Kansas, University of, Lawrence, Kansas. Larry Kevan, Radiolysis Studies on Fluorocarbons and on Reactive Intermediates. \$33,000.
- Kentucky, University of, Lexington, Kentucky. William F. Wagner and Donald E. Sands, Properties and Structure of Solvates of Metal Chelates. \$29,539.
- Kentucky, University of, Lexington, Kentucky. Lyle R. Dawson, Properties of Solvents Having High Dielectric Constants. \$10,186.
- Kentucky, University of, Lexington, Kentucky. William D. Ehmann, Radiochemistry as Applied to Geochemical Problems; Neutron Activation Analysis. \$22,000.
- Kentucky, University of, Lexington, Kentucky. Donald E. Sands, Infrared Studies of Chemisorbed Molecules. \$29,500.
- Lehigh University, Bethlehem, Pennsylvania. James E. Sturm, Studies of Photochemical Processes. \$20,000 (3 years).
- 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.
- Louisiana State University, New Orleans, Louisiana. Jack H. Stocker, A Quantitative Study of Stereoselective Reactions. \$10,947.
- Maryland, University of, College Park, Maryland. Joseph Silverman, Study of Graft Polymerization. \$45,700.
- Maryland, University of, College Park, Maryland. Everett R. Johnson, The Radiation Induced Decomposition of Inorganic Salts. \$33,064 (2 years).
- Maryland, University of, College Park, Maryland. Victor E. Viola, Jr., Nuclear Chemistry. \$34,933.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. David M. Hercules, et al, Nuclear Chemistry Research. \$568,000.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. Patrick M. Hurley, Variations in Isotopic Abundances of Strontium, Calcium and Argon, and Related Topics. \$78,000.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. F. Albert Cotton, Thermodynamic, Spectral and Structural Studies of Complex Ions. \$45,064.
- Miami, University of, Miami, Florida. David E. Fisher, Neutron Activation Analysis Studies of Iron Meteorites. \$25,000.
- Michigan State University, East Lansing, Michigan. Harry A. Eick, An Investigation of Some Rare-Earth Boron, Carbon, Nitrogen, and Related Systems at Elevated Temperatures. \$35,341.
- 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 Poly-functional Anions on Electron-Transfer Between Metal Ions in Solution. \$16,280.
- Michigan State University, East Lansing, Michigan. Max T. Rogers, Electron Spin Resonance Studies of Radiation Effects. \$22,259.
- Michigan State University, East Lansing, Michigan. William G. McHarris, A Nuclear Spectroscopy Program for Investigating Neutron-Deficient Isotopes in the Lead-Bismuth Region. \$35,000.
- Michigan Technological University, Houghton, Michigan. Leslie Leifer, Fundamental Studies of Concentrated Electrolyte Solutions. \$18,000.

## Chemistry

- Michigan, University of, Ann Arbor, Michigan. Adon A. Gordus, Energetic Recoil Atom Reaction Mechanisms. \$33,000.
- Michigan, University of, Ann Arbor, Michigan. Edgar F. Westrum, Jr., Low Temperature Chemical Thermodynamics. \$63,242.
- Michigan, University of, Ann Arbor, Michigan. Charles L. Rulfs, Chemistry of Technetium. \$12,000.
- Minnesota, University of, Minneapolis, Minnesota. Sanford Lipsky, The Contribution of Electronically Excited States in the Radiation Chemistry of Organic Systems. \$48,014.
- Mississippi, University of, University, Mississippi. Theodore J. Klingen, Gamma-Ray Induced Polymer Formation in the Carboranes. \$13,000.
- National Bureau of Standards, Washington, D. C. Nuclear, Structural and Inorganic Chemistry; Radiation, Isotope and Physical Chemistry. \$365,489.
- 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. \$27,000.
- Nevada, University of, Reno, Nevada. Richard D. Burkhart, A Measurement of Diffusion Coefficients of Alkyl Radicals in Solution by Photochemical Space Intermittency. \$12,000 (3 years).
- New England Institute for Medical Research, Ridgefield, Connecticut. John Lee and S. J. Tao, Positronium Chemistry. \$50,000.
- New Hampshire, University of, Durham, New Hampshire. Helmut M. Haendler, Reactions in Non-aqueous Solvents. \$10,405.
- New Mexico Highlands University, Las Vegas, New Mexico. Vincent C. Anselmo, Chemical Effects Following Neutron Capture in Phosphates. \$9,875.
- New Mexico, University of, Albuquerque, New Mexico. Milton Kahn, A Study of the Chemical Behavior of Carrier-Free Iodine-131. \$7,509.
- New York, City University of/Brooklyn College, Brooklyn, New York. Harmon L. Finston, Applications of Nuclear and Radiochemical Techniques in Chemical Analysis. \$34,228.
- New York, City University of/Hunter College, New York, New York. Richard H. Wiley, Ion Exchange Resins. \$20,000.
- New York, State University of, Buffalo, New York. Gordon M. Harris, Applications of Isotopes in Chemical Kinetics. \$4,678.
- 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. \$15,000.
- New York, State University of, Buffalo, New York. Kenneth E. Collins, Chemical Annealing Reactions in Carbonyl Compounds and other Hot Atom Studies. \$15,000.
- 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. \$62,500.
- North Carolina, State University of, Greensboro, North Carolina. Clive I. Wynter, MÜssbauer Effect on Anhydrous Thulium Compounds. \$17,160.
- Northwestern University, Evanston, Illinois. Fred Basolo and Ralph G. Pearson, Mechanisms of Substitution Reactions of Metal Complexes. \$38,500.

Chemistry

- Northwestern University, Evanston, Illinois. Malcolm Dole, Mechanism of High Energy Radiation Effects in High Polymers. \$29,868.
- Northwestern University, Evanston, Illinois. Herman L. Pines, The Use of C-14 and Tritium in the Study of Catalyzed Reactions of Hydrocarbons and Alcohols. \$39,683.
- Northwestern University, Evanston, Illinois. Fred E. Stafford, Physical Chemistry of Highly Energetic Systems. \$35,000.
- Notre Dame, University of, Notre Dame, Indiana. Milton Burton, Radiation Chemistry. \$1,310,695.
- Ohio State University, Columbus, Ohio. Harold H. Nielsen and K. N. Rao, High-Resolution Infrared Spectra of Tritium-Substituted and other Isotopic Molecules. \$28,708.
- Ohio State University, Columbus, Ohio. Richard F. Firestone, Kinetics of Ionizing-Radiation Induced Reactions in Organic Compounds. \$20,000.
- Ohio State University, Columbus, Ohio. Christie J. Geankoplis, Knudsen and Molecular Diffusion of Gases in Capillaries and Porous Solids over Large Pressure Ranges. \$14,913.
- Ohio State University, Columbus, Ohio. Leon M. Dorfman, Pulse Radiolysis of Organic and Aquo-Organic Systems. \$35,980.
- 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. T. H. Norris, A Study of Generalized Acid-Base Phenomena in Non-aqueous Ionizing Solvents with Radioactive Tracers. \$25,000 (2 years).
- Oregon State University, Corvallis, Oregon. Walter D. Loveland, Studies of Low Energy Induced Nuclear Fission. \$22,000.
- Oregon, University of, Eugene, Oregon. Richard M. Noyes, Diffusion Controlled Reactions and Exchange Reactions in Solutions. \$28,910.
- Pennsylvania State University, University Park, Pennsylvania. Joseph Jordon, Electrochemistry Thermochemistry and Fused Salts. \$32,000.
- Pennsylvania State University, University Park, Pennsylvania. F. W. Lampe, Radiation Chemistry, Photosensitization Chemistry and Mass Spectrometry of Silanes and Simple Alkyl-silanes. \$34,288.
- Pennsylvania, University of, Philadelphia, Pennsylvania. John O'M. Bockris, Investigation of the Structure and Properties of Molten Salts. \$56,980.
- Pennsylvania, University of, Philadelphia, Pennsylvania. David White, Rotational Ordering in the Solid Molecular Hydrogens. \$30,460.
- Pennsylvania, University of, Philadelphia, Pennsylvania. Wayne L. Worrell, High-Temperature Galvanic-Cell Investigations Using Solid-Electrolytes. \$32,675 (15 months).
- Pittsburgh, University of, Pittsburgh, Pennsylvania. Robert L. Wolke, Recoil Studies of Nuclear Reactions. \$41,981.
- Princeton University, Princeton, New Jersey. John Turkevich, Heterogeneous Catalysts: Synthesis, Characterization and Investigation of Reaction Kinetics. \$91,000.
- Princeton University, Princeton, New Jersey. Robert A. Naumann, Nuclear Interactions. \$232,110.
- Princeton University, Princeton, New Jersey. R. C. Axtmann, Heavy Particle Energy Transfer to Chemical Systems and Mössbauer Studies of Inorganic Salts. \$58,000.
- Princeton University, Princeton, New Jersey. Leland C. Allen, High Accuracy, Many-Electron Wavefunctions for Noble Gas Molecules. \$27,000.
- Puerto Rico, University of, Mayaguez, Puerto Rico. Owen H. Wheeler, Hot-Atom Chemistry of Organic Phosphorus and Sulphur Compounds. \$35,231.

## Chemistry

- Purdue University, Lafayette, Indiana. Robert T. Grimley, Thermodynamics, Mechanism and Kinetics of Vaporization Processes. \$32,300.
- Purdue University, Lafayette, Indiana. L. B. Rogers, Fundamental Studies of Separation Processes. \$54,000.
- Purdue University, Lafayette, Indiana. Grant W. Urry, Covalently Bonded Compounds of the Light Elements. \$20,000.
- Purdue University, Lafayette, Indiana. Norbert T. Porile, Deexcitation Processes in Nuclear Reactions. \$66,000.
- Purdue University, Lafayette, Indiana. Patrick J. Daly, Radiative Capture Reactions and Nuclear Spectroscopy. \$30,000.
- Purdue University, Lafayette, Indiana. James W. Cobble, Thermodynamics of Heavy Elements and Studies in Nuclear Chemistry. \$65,000.
- Reed College, Portland, Oregon. Arthur F. Scott, Studies in Physical and Inorganic Chemistry. \$5,000.
- Rensselaer Polytechnic Institute, Troy, New York. Howard Littman, Gas-Particle Heat Transfer Coefficients in Packed Beds by Frequency Response Techniques. \$29,000.
- 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. \$19,000.
- Rensselaer Polytechnic Institute, Troy, New York. Ivor L. Preiss and Herbert M. Clark, Decay Properties of Neutron Isotopes. \$40,000.
- Rice University, Houston, Texas. Kenneth S. Pitzer and John L. Margrave, Physical Chemistry of High Temperature Systems. \$89,000.
- 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  $C^{12}$  in the Bombardment of Carbon and Oxygen with High-Energy Protons. \$14,764.
- Rochester, University of, Rochester, New York. H. Marshall Blann, Nuclear Reaction Mechanisms. \$60,500.
- Rochester, University of, Rochester, New York. John R. Huizenga, Studies of Nuclear Fission, Low-Energy Nuclear Reactions, Transuranic Nuclei and Geo- and Cosmo-chemistry. \$60,000.
- Rochester, University of, Rochester, New York. Jacob Bigeleisen, Fundamental Studies in Isotope Chemistry. No Funds.
- Rutgers University, New Brunswick, New Jersey. Rolfe H. Herber, Studies in Nuclear and Radio-chemistry. \$20,000.
- Rutgers University, New Brunswick, New Jersey. Richard W. Laity, Ion Mobility in Molten Salts. \$34,105.
- South Carolina, University of, Columbia, South Carolina. O. D. Bonner, Fundamental Studies of Ion Exchange Equilibria. \$11,000 (2 years).
- South Carolina, University of, Columbia, South Carolina. Edward E. Mercer, Chemistry of Ruthenium. \$19,376.
- Southern California, University of, Los Angeles, California. Wayne K. Wilmarth, Aqueous Chemistry of Free Radicals and Other Inorganic Reactive Intermediates. \$20,000.
- Southern California, University of, Los Angeles, California. Arthur W. Adamson, The Photo-chemistry of Complex Ions. \$24,462.

## Chemistry

- Stanford Research Institute, Menlo Park, California. Daniel Cubicciotti, A Fundamental Study of Fused Salts and Metal-Salt Systems. \$70,000.
- Stanford University, Stanford, California. George A. Parks, Inorganic Oxides in Aqueous Systems: The Zero Point of Charge. \$11,024.
- Stanford University, Stanford, California. Henry Taube, Reactions of Solvated Ions. \$40,000.
- Stanford University, Stanford, California. Thomas J. Connolly, Radiation-Induced Nucleation of Bubbles in Superheated Water. \$16,000.
- Temple University, Philadelphia, Pennsylvania. A. V. Grosse, High Temperature Inorganic Chemistry. \$40,000.
- Tennessee, University of, Knoxville, Tennessee. T. Ffrancon Williams, Research Concerning Ionic and Free Radical Reactions in Radiation Chemistry. \$33,000.
- Tennessee, University of, Knoxville, Tennessee. Gleb Mamantov, Electrochemical Studies in Molten Fluorides and Other Halides. \$15,000.
- Texas A & M University, College Station, Texas. Ralph A. Zingaro and Kurt J. Irgolic, Chemistry of the Metalloids of Group VA and Group VIA. \$27,000.
- Texas A & M University, College Station, Texas. Arthur E. Martell, Chelation and Olation Reactions of Metal Ions in Aqueous Solution. \$18,000.
- Texas A & M University, College Station, Texas. Joseph B. Natowitz, Angular Momentum Effects in Nuclear Reactions. \$20,926.
- Texas A & M University, College Station, Texas. T. T. Sugihara and R. L. Watson, Nuclear Spectroscopy. \$35,000.
- Texas A & M University, College Station, Texas. Ronald D. Macfarlane, "On-Line" Alpha and Proton Decay Spectrometry. \$45,000 (10 months).
- Texas, University of, Austin, Texas. George W. Watt, Unusual Oxidation States of Transitional Elements. \$41,000.
- Texas, University of, Austin, Texas. David M. Himmelblau, Initiation of Bubbles in Super-saturated Solutions by Ionizing Radiation. \$10,488 (3 years).
- Toledo, University of, Toledo, Ohio. Jack G. Kay, Chemical Effects of Nuclear Transformations, Flash Heating or Flash Photolysis. \$21,000.
- Tufts University, Medford, Massachusetts. T. R. P. Gibb, Jr. and Charles E. Messer, Research on Hydrides. \$25,864.
- Tufts University, Medford, Massachusetts. B. M. Fung, Deuteron Magnetic Resonance. \$24,000.
- Utah, University of, Salt Lake City, Utah. Mead LeRoy Jensen, Carbon, Oxygen, and Sulfur Isotopes and the Origin and Sources of Uranium Mineralization. \$38,769.
- Vanderbilt University, Nashville, Tennessee. Mark M. Jones. Some Aspects of the Stabilities of Complex Compounds. \$17,000.
- Vanderbilt University, Nashville, Tennessee. Thomas W. Martin, Studies in Radiation Chemistry by Mass Spectrometry, Flash Spectroscopy and Magnetic Techniques. \$32,500.
- Virginia Polytechnic Institute, Blacksburg, Virginia. Hans J. Ache, Reactions of Charged and Neutral Recoil Particles Following Nuclear Transformations. \$27,000.
- Virginia Polytechnic Institute, Blacksburg, Virginia. Alan F. Clifford, Studies in Hydrogen Fluoride Solvent Systems and Mössbauer Spectroscopy of Rare Earth Compounds. \$25,000.
- Washington State University, Pullman, Washington. John B. Gruber, Spectroscopic Studies of Actinide Ions in Crystalline Solids. \$63,000.
- Washington State University, Pullman, Washington. John P. Hunt, Inorganic Reaction Mechanisms in Aqueous and Non-Aqueous Solvents. \$32,000.

## Chemistry

- Washington University, St. Louis, Missouri. Arthur C. Wahl, Radiochemical Studies of the Fission Processes. \$38,000.
- Washington University, St. Louis, Missouri. Demetrios G. Sarantites, Low Energy Nuclear Reactions and Spectroscopy. \$40,000.
- Washington University, St. Louis, Missouri. Paul L. Reeder, Delayed-Particle Spectroscopy. \$35,000.
- Washington University, St. Louis, Missouri. Peter P. Gaspar, Reaction Studies of Hot Silicon Radicals. \$52,500 (18 months).
- Washington University, St. Louis, Missouri. F. B. Shull, Arthur C. Wahl, Demetrios G. Sarantites, Paul L. Reeder and Peter P. Gaspar, The Cyclotron as an Instrument for Chemical Research. \$100,000.
- Washington University of, Seattle, Washington. Albert L. Babb, Dynamics of Solvent Extraction Systems. \$30,000.
- Wayne State University, Detroit, Michigan. Karl H. Gayer, A Kinetic and Reaction Mechanism Study of the Formation and Decomposition of Uranium Oxide  $U_3O_8$  in Organic Media. \$10,000.
- 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. \$9,778.
- Wisconsin University of, Madison, Wisconsin. Walter J. Blaedel, Use of Radiotracers in Continuous Analysis. \$13,868.
- Wisconsin University of, Madison, Wisconsin. Irving Shain, Kinetic and Mass Transfer Processes in Electrochemistry: Application to Analytical Methods. \$19,268.
- Wisconsin University of, Madison, Wisconsin. John E. Willard, Studies in Hot Atom and Radiation Chemistry. \$91,280.
- Wisconsin University of, Milwaukee, Wisconsin. Werner W. Brandt, Diffusion in Zeolites and Glasses. \$13,336.
- Worcester Polytechnic Institute, Worcester, Massachusetts. Alfred A. Scala, The Gas Phase Radiolysis of Cyclic Ketones. \$19,996.
- Yale University, New Haven, Connecticut. Richard Wolfgang, Research on High Energy Chemical Reactions. \$95,000.
- Yale University, New Haven, Connecticut. Robert Beringer, Nuclear Chemistry and Physics at the Yale Heavy Ion Linear Accelerator. \$409,752.
- Yale University, New Haven, Connecticut. Morton Kaplan, Research in Nuclear Chemistry. \$55,000.
- Yeshiva University, New York, New York. William Spindel, Stable Isotope Studies. \$45,000.
- 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. \$18,000.

Metallurgy and Materials

- Arizona, University of, Tucson, Arizona. Carl T. Tomizuka, Impurity Diffusion in Solids. \$69,600.
- Arizona, University of, Tucson, Arizona. Roy M. Emrick, High Temperature Anneals of Defects Quenched in Metals. \$25,715.
- Atomics International, Canoga Park, California. H. J. Fink and S. L. Wipf, Electronic Structure of Metals and Alloys. \$201,709.
- Atomics International, Canoga Park, California. W. Bauer and K. H. Thommen, Radiation Damage and Lattice Defects in Crystalline Solids. \$399,312.
- 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. \$27,890.
- Brandeis University, Waltham, Massachusetts. Christoph Hohenemser, Critical Point Behavior in Magnetically Ordered Solids. \$30,871.
- Brandeis University, Waltham, Massachusetts. H. Daniel Cohen, Low Temperature Properties of Solid Helium. \$33,903.
- Brigham Young University, Provo, Utah. J. Bevan Ott and J. Rex Goates, Thermodynamic Investigation of Alkali Metal Mixtures. \$43,976.
- Brooklyn, Polytechnic Institute of, Brooklyn, New York. Louis S. Castleman, Binary Multiphase Diffusion in Metallic Systems. \$22,158.
- Brown University, Providence, Rhode Island. P. J. Bray, Radiation Damage Studies in Solids Using Magnetic Resonance Techniques. \$71,164.
- Brown University, Providence, Rhode Island. Joseph Gurland and Daniel C. Drucker, 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 of Alloy Structure and Properties. \$207,400.
- 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, Berkeley, California. Carson D. Jeffries, Dynamic Nuclear Polarization and Solid State Physics. \$35,600.
- California, University of, Los Angeles, California. Marvin Chester. Electroabsorption in Semiconductors. \$25,339.
- California, University of, Riverside, California. A. W. Lawson, Electric and Magnetic Properties of Transition Metals and Their Compounds. \$67,582.
- California, University of, San Diego, California. John C. Wheatley, Research on the Properties of Materials at Very Low Temperatures. \$145,939.
- California, University of, San Diego, California. Huey-Lin Luo, New Materials by Low Temperature Condensation. \$53,000.
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. T. B. Massalski, Stability of Alloy Phases. \$39,000.
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Ned S. VanderVen, Radiation Effects in Solids. \$44,400 (2 years).
- Carnegie-Mellon University, Pittsburgh, Pennsylvania. Paul A. Flinn, Application of the Mössbauer Effect to the Study of Metallic Solid Solutions. \$6,865.
- Case Western Reserve University, Cleveland, Ohio. R. F. Hehemann, Solid State Transformations in Zirconium, Hafnium and Titanium Alloys. \$25,395.
- Case Western Reserve University, Cleveland, Ohio. Richard W. Hoffman, Solid State Physics. \$73,120.

### Metallurgy and Materials

- Case Western Reserve University, Cleveland, Ohio. Ronald Gibala, Dislocation-Solute Atom Interactions in Alloys. \$31,000.
- Chicago, University of, Chicago, Illinois. Robert Gomer, Interactions on Metallic Surfaces. \$44,534.
- Clarkson College of Technology, Potsdam, New York. Alvin W. Czanderna, The Oxidation of Copper Films. \$18,662.
- Clemson University, Clemson, South Carolina. Robert L. Chaplin, Radiation Effects in Crystalline Materials. \$37,657.
- 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. \$48,746.
- Columbia University, New York, New York. Eugene S. Machlin, A Study of the Feasibility of Obtaining Field Ion Microscope Images of Interstitial Solutes. \$25,000.
- Connecticut, University of, Storrs, Connecticut, Otis R. Gilliam, Investigations of Radiation Effects in Solids by Electron Spin Resonance. \$28,000.
- Connecticut, University of, Storrs, Connecticut. Ralph H. Bartram, Theoretical Investigations of Radiation Effects in Ionic Crystals. \$17,306.
- Cornell University, Ithaca, New York. R. H. Silsbee and Raymond Bowers, Solid State Physics: Magnetic Phenomena. \$113,400.
- Cornell University, Ithaca, New York. James A. Krumhansl, A. J. Sievers and R. O. Pohl, Experimental Phonon Physics. \$148,370.
- Cornell University, Ithaca, New York. Henri S. Sack, A Study of Imperfections in Crystals. \$64,430.
- Cornell University, Ithaca, New York. Arthur L. Ruoff, Elastic and Plastic Deformation of Solids. \$118,400.
- Cornell University, Ithaca, New York. John Silcox and W. W. Webb, Hard Superconducting Materials. \$85,917.
- Cornell University, Ithaca, New York. John Silcox, Correlation of Physical Properties of Crystals with Microstructure. \$3,770.
- Cornell University, Ithaca, New York. Che-Yu Li, Solid Liquid Interface. \$25,986 (19 months).
- Cornell University, Ithaca, New York. Mark S. Nelkin, The Theory of Slow Neutron Inelastic Scattering by Liquids. \$45,120.
- Cornell University, Ithaca, New York. Douglas B. Fitchen, Electronic Properties of Defects in Ionic Crystals. \$36,642.
- Cornell University, Ithaca, New York. Robert W. Balluffi and David N. Seidman, Defects in Metal Crystals. \$152,948.
- Cornell University, Ithaca, New York. James A. Krumhansl and P. A. Carruthers, Theoretical Phonon Physics. \$57,503.
- Cornell University, Ithaca, New York. B. W. Batterman, Low Temperature Phase Transformations in High Field Superconductors. \$37,290.
- Cornell University, Ithaca, New York. A. Taylor, Radiation Damage Studies Using the Cornell 3 MeV Dynamitron. \$52,437.
- Cornell University, Ithaca, New York. H. H. Johnson, Effect of Environment on Fracture Behavior. \$36,408.
- Delaware, University of, Newark, Delaware. Richard B. Murray, Radiation-Induced Defects in Alkali Halides, and Their Role in Recombination Processes. \$28,905.



Metallurgy and Materials

- Florida, University of, Gainesville, Florida. Frederick N. Rhines, John Kronsbein and R. T. DeHoff, Topological Study of the Sintering Process. \$40,816.
- Florida, University of, Gainesville, Florida. Robert E. Reed-Hill, Deformation Processes in Hexagonal Metals. \$24,734.
- Franklin Institute, Philadelphia, Pennsylvania. John D. Meakin, A Study of Non-Stoichiometry in Carbides by Field Ion Microscopy. \$34,930.
- 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. \$54,473.
- Georgia Institute of Technology, Atlanta, Georgia. Stephen Spooner, Magnetic Phenomena at Metal Surfaces. \$38,346.
- Illinois Institute of Technology, Chicago, Illinois. Leonard I. Grossweiner, Investigation of Energy Transfer Processes by Flash Photolysis. \$26,582.
- Illinois Institute of Technology, Chicago, Illinois. Harold Weinstock, Thermal Measurements on Solids Below 1°K. \$41,000.
- Illinois Institute of Technology, Chicago, Illinois. Lawrence J. Broutman, Effects of Combined Stress on the Fracture Strengths of Brittle Ceramic Materials. \$35,000.
- Illinois, University of, Urbana, Illinois. Robert J. Maurer, The Science of Materials. \$1,765,240.
- Johns Hopkins University, Baltimore, Maryland. Peter E. Wagner, Phonon Imprisonment Studies. \$33,981.
- Kansas, University of, Lawrence, Kansas. Robert J. Friauf, Point Defects in Ionic Crystals. \$41,000 (16 months).
- Kansas, University of, Lawrence, Kansas. Peter M. Richards, Experimental and Theoretical Studies of Magnetic Resonance and Relaxation. \$31,200.
- Kent State University, Kent, Ohio. Stanley H. Christensen, A Study of Local Symmetry and Bonding by Electron Paramagnetic Resonance. \$13,771 (15 months).
- Kentucky, University of, Lexington, Kentucky. Ben R. Gossick, Radiation Effects on Germanium. \$30,667.
- Lehigh University, Bethlehem, Pennsylvania. George Krauss, Jr., Strength and Structure in Cyclically Transformed Fe-Ni-C Alloys. \$13,500.
- Louisiana State University, Baton Rouge, Louisiana. J. M. Reynolds, Conductivity Tensors in Metals and Semiconductors. \$73,492.
- Marquette University, Milwaukee, Wisconsin. Robert N. Blumenthal, Defect Structures in Non-stoichiometric Oxides. \$29,373.
- Maryland, University of, College Park, Maryland. Robert M. Asimow, An Investigation of Solid Solution Hardening in Metallic Solid Solution Alloys. \$17,960.
- Maryland, University of, College Park, Maryland. R. J. Arsenault, An Investigation of Irradiation Strengthening of B.C.C. Metals and Solid Solutions. \$30,990.
- 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/cm<sup>2</sup>. \$33,450.
- Maryland, University of, College Park, Maryland. James R. Anderson and S. M. Bhagat, Conduction Electrons and Magnetism. \$34,317.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. M. B. Bever, Thermodynamic and Other Aspects of Metallic Systems. \$48,250 (2 years).
- Massachusetts Institute of Technology, Cambridge, Massachusetts. C. G. Shull, Low Temperature and Neutron Physics Studies. \$111,260.

Metallurgy and Materials

- Massachusetts Institute of Technology, Cambridge, Massachusetts. Walter A. Backofen, Mechanical Properties of Metals. \$18,400.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. W. D. Kingery and R. L. Coble, Basic Research in Ceramics and Noncrystalline Systems. \$304,608.
- Michigan State University, East Lansing, Michigan. J. Bass, Studies of Electrical and Defect Properties of Thin Metallic Wires. \$34,204.
- Michigan State University, East Lansing, Michigan. Edward H. Carlson, Study of Interactions Between f-Shell Transition Ions in Non-metallic Crystals. \$29,885.
- Michigan State University, East Lansing, Michigan. Gerald L. Pollack, Properties of Rare-Gas Solids. \$29,418.
- 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. \$32,329.
- Michigan, University of, Ann Arbor, Michigan. Robert D. Pehlke, Thermodynamic Activities in Solid Alloys. \$29,520.
- Minnesota, University of, Minneapolis, Minnesota. Richard A. Swalin, Diffusion Studies in Liquid Metals. \$47,915.
- Minnesota, University of, Minneapolis, Minnesota. Morris E. Nicholson, Effect of Short-Range Order on Mechanical Properties of Alloys. \$22,000.
- 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. \$161,112.
- Minnesota, University of, Minneapolis, Minnesota. Dale F. Stein, A Study of Grain Boundary Segregation Using the Auger Electron Emission Technique. \$26,541.
- Minnesota, University of, Minneapolis, Minnesota. Thomas E. Hutchinson, "In Situ" Electron Microscope Investigation of the Nucleation and Growth of Sputtered Thin Films. \$66,814.
- Mississippi, University of, University, Mississippi. Arthur B. Lewis, The Effects of Neutron Irradiation on the Resistivity of Binary Alloys. \$37,450.
- Missouri, University of, Rolla, Missouri. Robert Gerson and William J. James, Ferroelectric Properties of Bismuth Ferrate and Related Materials. \$40,388.
- Missouri, University of, Rolla, Missouri. Charles A. Goben, Nuclear Radiation Effects on Silicon P-N Junctions. \$48,404.
- Montana State University, Bozeman, Montana. Harry W. Townes, An Investigation of Turbulent Flow in a Rough Pipe. \$27,010.
- Murray State University, Murray, Kentucky. L. Bridwell, Interaction of Fission Fragments with Thin Films. \$25,470.
- National Bureau of Standards, Washington, D. C. Solid State Physics. \$54,725.
- 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 (14 months).
- New York, City University of/Queens College, Flushing, New York. Robert D. Hatcher, Theoretical Research on Radiation Induced Defects in LiH. \$39,839.
- New York University, New York, New York. Irving Cadoff, Study of Subtractive Phases in the Transition Metal-Tellurium Systems. \$27,573.
- North Carolina State University, Raleigh, North Carolina. Hayne Palmour, III, Grain Boundary Sliding in Alumina Bicrystals. \$31,694.

Metallurgy and Materials

- North Carolina State University, Raleigh, North Carolina. Thomas S. Elleman, The Effects of Radiation and Gas Concentration on Rare Gas Diffusion in Solids. \$23,992.
- North Carolina, University of, Chapel Hill, North Carolina. Lawrence Slifkin, Atomic Diffusion in Crystals. \$33,399.
- North Carolina, University of, Chapel Hill, North Carolina. James H. Crawford, Jr., Investigation of Defect Structures by Electric Polarization and Relaxation Methods. \$25,923.
- North Carolina, University of, Chapel Hill, North Carolina. Charles S. Smith, Jr., Pressure Variation of Single Crystal Elastic Constants. \$24,611.
- North Dakota, University of, Grand Forks, North Dakota. Harold D. Bale, Radiation Damage to Silica Structures. \$10,992 (19 months).
- 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. \$44,425.
- Northeastern University, Boston, Massachusetts. Carl A. Shiffman, Calorimetric Studies of the Proximity Effect in Superconductors. \$32,554.
- Northwestern University, Evanston, Illinois. Roderick L. Hines, Radiation Effects of Ion Bombardment. \$32,363.
- Northwestern University, Evanston, Illinois. John W. Kauffman, Studies of Radiation Damage Resulting from Electron Bombardment. \$41,113.
- Northwestern University, Evanston, Illinois. M. Meshii, Effect of Point Defects on Mechanical Properties of Metals. \$39,383.
- Notre Dame, University of, Notre Dame, Indiana. B. D. Cullity, Magnetoelastic Phenomena in Metals. \$5,072.
- Ohio State University, Columbus, Ohio. Robert A. Rapp, An Investigation of Mixed Conduction in Solid Electrolytes. \$31,446.
- Oklahoma, University of, Norman, Oklahoma. Raymond D. Daniels and C. R. Haden, Influence of Imperfections and Interstitial Contaminants on the Superconducting Behavior of Metals. \$28,000 (16 months).
- Oklahoma, University of, Norman, Oklahoma. C. A. Plint, Formation Energies of Individual Vacancies in Alkali Halides. \$10,505.
- Oklahoma, University of, Norman, Oklahoma. Frank B. Canfield, Diffusion in Binary Liquid Metal Systems. \$23,380 (20 months).
- Oklahoma, University of, Norman, Oklahoma. Robert J. Block, The Effects of Surface Coatings on the Plastic Deformation of Metal Single Crystals. \$26,220.
- Oregon State University, Corvallis, Oregon. Melvin Cutler, The Electronic Properties of Liquid Semiconductors. \$12,247.
- Pennsylvania State University, University Park, Pennsylvania. P. L. Walker, Jr., Research on Graphite. \$109,674.
- Pennsylvania State University, University Park, Pennsylvania. Arnulf Muan, Thermodynamic Properties of Solid Solutions at High Temperatures. \$29,788.
- Pennsylvania State University, University Park, Pennsylvania. Earle Ryba, Transformations in AB<sub>2</sub> Intermetallic Compounds. \$28,450.
- Pennsylvania State University, University Park, Pennsylvania. G. R. Barsch, Nonlinear Elastic and Thermoelastic Properties of Materials. \$42,999 (10 months).
- Pittsburgh, University of, Pittsburgh, Pennsylvania. Richard A. Butera, Magneto-thermodynamics of Para- and Antiferromagnets. \$43,178.
- Pittsburgh, University of, Pittsburgh, Pennsylvania. Raymond S. Craig and W. E. Wallace, Thermal, Structural and Magnetic Studies of Metals and Intermetallic Compounds. \$97,834.

Metallurgy and Materials

- Pittsburgh, University of, Pittsburgh, Pennsylvania. John R. Townsend, A Study of Radiation Induced Defects in Metals. \$31,000.
- Puerto Rico, University of, Mayaguez, Puerto Rico. Mortimer I. Kay, Neutron Diffraction Program. \$194,577.
- Puerto Rico, University of, Rio Piedras, Puerto Rico. Amador Cobas, Radiation Damage in Organic Crystals. \$65,537.
- Purdue University, Lafayette, Indiana. John W. MacKay, Basic Radiation Damage Studies. \$73,782.
- Purdue University, Lafayette, Indiana. Richard E. Grace, Transport and Thermodynamic Properties of Solids. \$28,953.
- Purdue University, Lafayette, Indiana. James G. Mullen, Mössbauer Studies of the Properties of Solids. \$29,960.
- Purdue University, Lafayette, Indiana. James R. Cost, Diffusion and Precipitation of Inert Gases in Metals. \$32,791.
- Rensselaer Polytechnic Institute, Troy, New York. H. B. Huntington, Anisotropic Diffusion and Electromigration. \$59,000.
- Rensselaer Polytechnic Institute, Troy, New York. Edmond Brown, Theoretical Research on Electron Behavior in Crystals. \$24,800.
- Rensselaer Polytechnic Institute, Troy, New York. Norman S. Stoloff, Precipitation and Dispersion Hardening in Magnesium-Base Alloys. \$20,000.
- Rensselaer Polytechnic Institute, Troy, New York. H. Michael Gilder, Effect of Hydrostatic Pressure on Self-Diffusion Rates in Hexagonal Metals. \$32,000.
- Rensselaer Polytechnic Institute, Troy, New York. Fritz V. Lenel, Research in Powder Metallurgy. \$32,000.
- 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.
- Rochester, University of, Rochester, New York. Theodore G. Castner, Electron Spin Resonance in Solids. \$47,814.
- Rutgers University, New Brunswick, New Jersey. John A. Sauer, Relaxation Behavior, Molecular Motion and Structure in Polymers and Related Materials. \$29,962.
- St. Mary's College, Winona, Minnesota. Donald R. Morgan and William E. Blass, Experimental Study of the Surface Structure and Electronic Properties of Single Crystal Molybdenum and Tungsten Ribbons. \$13,700.
- Stanford University, Stanford, California. David A. Stevenson, Thermodynamic Properties and Defect Structure of Intermetallic Compounds. \$29,000 (13 months).
- Stanford University, Stanford, California. Oleg D. Sherby and O. Cutler Shepard, Effect of Point Defects on Mechanical Behavior of Crystalline Solids. \$19,000.
- Stanford University, Stanford, California. Craig R. Barrett and William D. Nix, Structure Dependence of High Temperature Deformation of Metals. \$38,750.
- Syracuse University, Syracuse, New York. F. A. Kanda, Physical Properties and Alloying Behavior of Alkali and Alkaline Earth Metals. \$22,284.
- Syracuse University, Syracuse, New York. Richard W. Vook, In Situ Ultra High Vacuum High Energy Electron Diffraction Studies. \$27,818.
- 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. \$21,990.
- Texas Christian University, Fort Worth, Texas. Richard F. Raeuchle, Structural Studies of Amorphous Aluminum Oxide. \$20,319.

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- Tuskegee Institute, Tuskegee, Alabama. Ira C. Dillon, Density Determinations Using a Gamma Radiation Attenuation Technique. \$42,000.
- Utah, University of, Salt Lake City, Utah. Ivan B. Cutler, Recrystallization and Sintering of Oxides. \$14,900.
- Utah, University of, Salt Lake City, Utah. William D. Ohlsen, A Magnetic Resonance Study of Defects in Solids. \$29,928.
- Utah, University of, Salt Lake City, Utah. Owen W. Johnson, Interstitial Diffusion in Non-Metallic Crystals. \$21,000.
- Utah, University of, Salt Lake City, Utah. John W. DeFord, Radiation Damage in Nb and Ta. \$30,385.
- Utah, University of, Salt Lake City, Utah. Ronald S. Gordon, Impurity Effects on the Creep of Polycrystalline Magnesium and Aluminum Oxides at Elevated Temperatures. \$18,262.
- Utah, University of, Salt Lake City, Utah. Abraham Sosin, The Fundamentals of Radiation Damage. \$76,283.
- Vanderbilt University, Nashville, Tennessee. James J. Wert, Deformation Studies of Superlattice Structures. \$29,000.
- Vermont, University of, Burlington, Vermont. Ted B. Flanagan, Absorption of Hydrogen and Deuterium by Palladium-Rich Alloys. \$23,021.
- Virginia, University of, Charlottesville, Virginia. Robert V. Coleman, Electronic Properties of Metals and Alloys. \$68,000.
- Virginia, University of, Charlottesville, Virginia. Doris Kuhlmann-Wilsdorf, Investigations on the Behavior of Point Defects and Dislocations. \$62,806.
- 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. \$58,000.
- Wake Forest University, Winston-Salem, North Carolina. Thomas J. Turner and George P. Williams, Jr., A Study of Atomic Mobility in Crystalline Materials. \$16,073.
- Washington, University of, Seattle, Washington. Douglas H. Polonis, A Study of Phase Transformations and Superconductivity. \$28,150.
- Washington, University of, Seattle, Washington. Robert L. Ingalls, Mössbauer Studies at High Pressures. \$29,230.
- Wayne State University, Detroit, Michigan. Yeong-Wook Kim, Electron Paramagnetic Resonance Studies of Radiation Effects in Solids and Chemical Compounds. \$55,000.
- Wayne State University, Detroit, Michigan. Henry O. Hooper, Atomic Structure and Nature of the Magnetism in Several Magnetic Glasses. \$25,239.
- Wisconsin, University of, Madison, Wisconsin. Richard A. Dodd and P. R. Strutt, Creep Mechanisms in B.C.C. Alloy Crystals. \$27,273.
- Wisconsin, University of, Madison, Wisconsin. J. S. Hirschhorn, The Effect of Surface Tension on the Sintering Rate of Metal Alloys. \$12,264.
- Yale University, New Haven, Connecticut. C. N. J. Wagner, X-ray Study of the Structure of Liquid Metals and Alloys. \$23,353.
- Yale University, New Haven, Connecticut. Werner P. Wolf, The Study of Ideal Magnetic Crystals. \$112,500.

Controlled Thermonuclear Research

- California Institute of Technology, Pasadena, California. Roy W. Gould, Plasma Waves. \$40,000.
- California, University of, Berkeley, California. Charles K. Birdsall, Computer and Alkali Plasma Instability Experiments. \$53,398 (13 months).
- California, University of, Irvine, California. Nathan Rynn, Experiments on Alkali Metal and Barium Plasmas. No Funds (2 years).
- 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. \$49,938.
- California, University of, San Diego, California. William B. Thompson, Plasma Physics Research (Theoretical). \$96,254.
- Colorado, University of, Boulder, Colorado. C. Forbes Dewey, Jr., Porous Ionizers as Improved Plasma Sources. \$14,947 (7 months).
- Columbia University, New York, New York. Chia-Kun Chu, Research in Computational Plasma Physics. \$44,037.
- Cornell University, Ithaca, New York. Peter L. Auer, Properties of the High Beta Plasma State. \$50,000.
- Cornell University, Ithaca, New York. Charles B. Wharton, Turbulent Heating of a Plasma by Means of Microwave Scattering. \$62,117.
- 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 for Hydrogen and Helium Ions in Gases in the Energy Range 0.15-1.0 MeV. \$59,515.
- Georgia Institute of Technology, Atlanta, Georgia. John W. Hooper, The Excitation and Ionization of Ions by Electron Impact. \$42,000 (15 months).
- Gulf General Atomic, Inc., San Diego, California. T. Ohkawa and John Jukes, Plasma Confinement in Toroidal Multipoles. \$500,000 (13 months).
- Houston, University of, Houston, Texas. Gregory M. Haas and Melvin Eisner, Investigation of Ion Heating by Modulated Electron Beams. \$12,000.
- Institute for Advanced Study, Princeton, New Jersey. Marshall N. Rosenbluth, Theoretical Plasma Physics Research. \$60,500.
- 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. \$66,000 (15 months).
- Maryland, University of, College Park, Maryland. David W. Koopman and D. A. Tidman, Collisionless Shock Studies Using Laser-Produced Plasmas. \$46,535.
- Massachusetts Institute of Technology, Cambridge, Massachusetts. George Bekefi, Abraham Bers, Lawrence M. Lidsky and David J. Rose, Plasma Physics Research. \$256,745.
- Miami, University of, Coral Gables, Florida. Harry S. Robertson, Instabilities and Turbulence in Alkali Vapor Plasmas. \$48,000.
- Miami, University of, Coral Gables, Florida. Daniel R. Wells, Investigation of Plasma Vortex Structures. No Funds.
- Michigan, University of, Ann Arbor, Michigan. Terry Kammash, Microinstabilities in Inhomogeneous Plasma. \$20,000.
- National Bureau of Standards, Washington, D. C. High Field Magnet Research; Hydrogen Cross Section Measurements; Ultraviolet Optical and Photoelectric Properties of Solid Materials. \$151,486.
- New York University, New York, New York. Harold Grad, Plasma Physics and Magneto-Fluid Dynamics. \$229,395.

Controlled Thermonuclear Research

- Roanoke College, Salem, Virginia. Charles R. Finfgeld, Proton Sputtering. \$3,921.
- Rochester, University of, Rochester, New York. Albert Simon, An Investigation of Non-Linear Transport Coefficients Using Moment Description of Plasma. \$32,000.
- Stanford University, Stanford, California. Frederick W. Crawford, Research on Plasma Oscillations and Instabilities. \$141,760.
- Stanford University, Stanford, California. Keith I. Thomassen and Heinrich Derfler, Study of Anomalous Cross-Field Diffusion. \$83,645.
- Stanford University, Stanford, California. Oscar Buneman, Use of Computer Models of Plasma in Controlled Thermonuclear Research. \$45,000.
- Stevens Institute of Technology, Hoboken, New Jersey. George J. Yevick, Experimental Investigations of Cusped Containment Geometries. \$107,500.
- Stevens Institute of Technology, Hoboken, New Jersey. Kenneth C. Rogers, Investigations in Plasma Dynamics. \$69,994.
- Stevens Institute of Technology, Hoboken, New Jersey. George Schmidt, Investigations in Plasma Dynamics. \$38,000.
- Tennessee, University of, Knoxville, Tennessee. Edward G. Harris, Instabilities Due to Anisotropic Velocity Distributions. \$21,426.
- Texas Technological College, Lubbock, Texas. Magne Kristiansen, Theoretical and Experimental Investigations of Harmonic Ion Cyclotron Wave Propagation and Plasma Heating. \$12,000.
- Texas, University of, Austin, Texas. William E. Drummond, Anomalous Diffusion and Thermalization of Turbulent Plasmas. \$66,631.
- Texas, University of, Austin, Texas. William E. Drummond and Anthony E. Robson, Oblique Collisionless Shocks. \$50,000 (15 months).
- United Aircraft Corporation, East Hartford, Connecticut. Alan F. Haught, Production of Plasmas for Thermonuclear Research by Laser Beam Irradiation of Solid Particles. \$99,994.
- Washington State University, Pullman, Washington. Edward E. Donaldson and M. J. Dresser, Chemical Sputtering of Solids. \$60,000.
- Westinghouse Electric Corporation, Pittsburgh, Pennsylvania. A. G. Englehardt, Plasma Production by a High-Power Q-Switched Laser. \$40,000 (6 months).
- 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. \$357,660.
- 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. \$35,000.