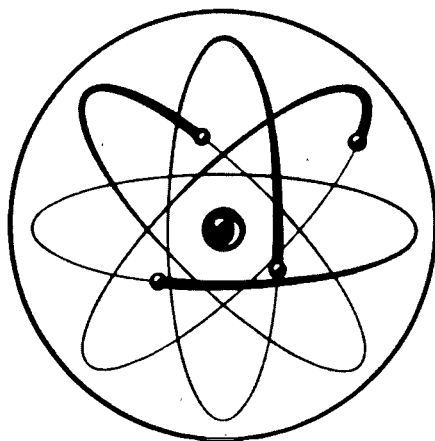


A STATISTICAL SUMMARY OF THE
PHYSICAL RESEARCH PROGRAM

JUNE 30, 1971



DIVISION of RESEARCH

UNITED STATES ATOMIC ENERGY COMMISSION

WASH-1189

UNITED STATES ATOMIC ENERGY COMMISSION

A STATISTICAL SUMMARY OF THE PHYSICAL RESEARCH PROGRAM
AS OF JUNE 30, 1971

Prepared by:
Reports and Statistics Branch
Division of Research
October 1971

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C., 20402 - Price 40 cents

PREFACE

This report presents a statistical analysis of the physical research program administered by the Division of Research. Separate analyses are made for the physical research conducted at the Federally Funded Research and Development Centers (FFRDC's), and for the off-site contract research program. Included is information on funds budgeted for salaries and wages, materials and supplies, travel, communications, publications, indirect expenses, and equipment. Definitions used in this report are:

Equipment: Any item individually costing more than \$100 and that is expected to have an extended period of service, generally one year or more, in its original form. Title may vest either in the Government or in the contractor.

Publications: Usually refer to journal publications but includes letters such as appear in Physical Review Letters, and notes such as appear in Journal of the American Chemical Society, and other journals. Contributions to books are included if they represent summaries and evaluations of a limited area, e.g., contributions to the Annual Review of Nuclear Science. Also included are papers not abstracts that appear in published proceedings of technical meetings including international meetings, and installation reports that are available for sale.

Personnel categories shown in the analyses are established according to information provided in the proposal or other material supplied by contractors. For educational institutions:

Principal Investigators: Usually are members of the academic staff and includes professors, chairmen/heads of departments, associate professors, or assistant professors who direct the project.

Other Permanent Scientific Staff: Are generally professors, associate professors or assistant professors who work with the principal investigators. (The principal investigator and other professional staff usually divide their time between teaching and the research project.) Also includes visiting scientists, i.e., those at the faculty level but who do not have a position on the faculty of the educational institution where they are temporarily working.

Research Associates: Are generally working full-time on the research investigation and usually are in the post-doctoral category.

Research Assistants: Usually are graduate students working for their doctorate or masters degree.

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PHYSICAL RESEARCH PROGRAM

Division of Research

The Physical Research Program is chiefly concerned with basic research investigations undertaken to discover new scientific knowledge and also includes some applied research investigations relevant to certain aspects of the practical utilization of nuclear energy. Research is conducted in the fields of high, medium, and low energy physics; mathematics and computers; chemistry; metallurgy and materials; and controlled thermonuclear reactions. Approximately three-fourths of the costs are associated with support of research conducted in AEC-owned, contractor-operated, Federally Funded Research and Development Centers (FFRDC's). A little less than one-fourth of the costs are associated with the contract support of research conducted in other laboratories. The major portion of the research at sites other than at FFRDC's is conducted at educational institutions.

Federally Funded Research and Development Centers

There is no clear line of demarcation between Federally Funded Research and Development Centers and other laboratories. The AEC investment in facilities ranges from zero for some contractors to tens of millions of dollars for others, and the annual level of AEC support ranges from a few thousand dollars for some contractors, to tens of millions of dollars for others -- the spectrum is broad with no significant peaks or breaks. For purposes of this report, the following are considered Federally Funded Research and Development Centers operated for the AEC. The listing is consistent with Federally Funded Research and Development Centers as defined by the National Science Foundation and the Office of Science and Technology:

<u>Laboratory</u>	<u>Contractor</u>
1. Ames Laboratory Ames, Iowa	Iowa State University
2. Argonne National Laboratory Argonne, Illinois	Argonne Universities Association (AUA) and University of Chicago
3. Brookhaven National Laboratory Upton, Long Island, New York	Associated Universities, Inc. (AUI)
4. Cambridge Electron Accelerator Cambridge, Massachusetts	Harvard University
5. Lawrence Radiation Laboratory* Berkeley and Livermore, California	University of California

*Effective June 18, 1971, the Lawrence Radiation Laboratories at Berkeley and Livermore were administratively separated and renamed the Ernest Orlando Lawrence Berkeley Laboratory (LBL), and the Ernest Orlando Lawrence Livermore Laboratory (LLL).

Laboratory

Contractor

6. Los Alamos Scientific Laboratory Los Alamos, New Mexico	University of California
7. Mound Laboratory Miamisburg, Ohio	Monsanto Chemical Laboratory
8. National Accelerator Laboratory Batavia, Illinois	Universities Research Association, Inc. (URA)
9. Oak Ridge National Laboratory Oak Ridge, Tennessee	Union Carbide Nuclear Company
10. Pacific Northwest Laboratory Richland, Washington	Battelle Memorial Institute
11. Princeton Proton Accelerator* Princeton, New Jersey	Princeton University
12. Princeton Plasma Physics Laboratory Princeton, New Jersey	Princeton University
13. Stanford Linear Accelerator Center Stanford, California	Stanford University

Some of the FFRDC's are multi-program laboratories engaged in other AEC programs such as nuclear materials production, weapons, biology and medicine, reactor development, etc. The Physical Research Program at these FFRDC's provides, in varying degrees, the basic investigations underlying the applied and development activities of such laboratories. Some of the FFRDC's, however, are engaged in research in a single, well defined area. All FFRDC's have the following common characteristics:

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

* AEC support terminated 6/30/71--not funded beyond FY 1971.

The Contract-Research Program

The Division of Research supports, by means of the contract-research program, off-site research investigations at educational institutions, and in a few instances, also at non-profit research institutes and industrial laboratories. In this program, the Division of Research, in AEC Headquarters, is responsible for the approval of AEC support and for the review of the technical progress of research projects in the fields of high, medium, and low energy physics; mathematics and computers; chemistry; metallurgy and materials; and controlled thermonuclear reactions. The AEC's operations offices in the field negotiate and administer the non-technical aspects of the contracts. Proposals for contracts in basic physical research usually are initiated by the scientist interested in performing the work.

The contract-research program affords a number of distinct benefits.

1. When funds provided by the AEC are added to other funds available to the contractor, the effectiveness of both the basic research program of the AEC and contractor's program increases.
2. The AEC receives the services, in fields of science fundamental to the AEC's future capabilities, of highly qualified scientists who prefer employment at outside laboratories or who prefer to teach and 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 the AEC's program.

In conducting this program, the AEC generally uses either a special research support agreement (SRSA), or a cost-type contract. The total cost estimate is reflected in a budget, submitted by the prospective contractor, and includes such items as salaries, materials and supplies, equipment, communications, publications, travel, and indirect expenses.

Special Research Support Agreements: The SRSA's are used for most basic research with educational institutions. It provides for payment to the contractor of a specified amount, which is referred to as the Support Ceiling, and for adjustment of the amount if total costs are less than expected. Payments are made in consideration for the contractor's performance of research activities described in the contract and in accordance with the provisions of the contract. Costs are determined in accordance with Bureau of the Budget Circular No. A-21. When the special research support agreement is used for not-for-profit organizations other than educational institutions, AEC's commercial cost principles may be used in determining actual cost, or the contract provisions may be revised to provide for a lump-sum payment, i.e., fixed-price contract to the contractor in consideration for its commitment to perform particular research at a specified level of effort.

Cost-type Contract: A cost-reimbursement type contract is used for certain mission-oriented large-scale research programs performed in laboratories using equipment or facilities that are usually either partially or wholly AEC owned or controlled.

In most cases, the total costs of the research is shared by the contractor and the AEC.

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 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.

SUMMARY OF PHYSICAL RESEARCH PROGRAM

SUMMARY OF PHYSICAL
(Dollars in

Activity	TOTAL		Federally Funded Research and Development Centers		
	Scientific Man-Years ^{a/}	Publications	Amount	Man- Years	Publications
High Energy Physics	1,738	1,208	\$109,241	1,208	539
Medium Energy Physics.....	209	148	11,058	147	110
Low Energy Physics	550	871	17,081	290	297
Mathematics & Computers ...	108	219	2,653	65	135
Chemistry	935	1,355	43,581	712	719
Metallurgy & Materials	493	932	20,715	353	490
Controlled Thermonuclear ..	366	351	25,941	292	211
General Purpose Equipment .	0	0	1,012	0	0
	4,399	5,084	\$231,282	3,067	2,501

^{a/} Does not include part time employment of 3,147 graduate students engaged in performing research.

^{b/} Represents amount of AEC estimated support ceiling included in the latest extension of contracts in effect as of 6/30/71. (Contracts are usually written for one year and extended annually if necessary.)

^{c/} The amount includes \$7,267,000 for research activities included under FFRDC's in the 1969 and earlier editions of this analysis, but more appropriately belong under educational institutions.

RESEARCH PROGRAM
Thousands)

Educational Institutions			Not-for-profit Research Institutes and Industrial Laboratories		
Amount ^{b/}	Man- Years	Publications	Amount ^{b/}	Man- Years	Publications
\$25,342 ^{c/}	530	669	\$ 0	0	0
3,540	62	38	0	0	0
12,326	259	569	67	1	5
3,178	43	84	0	0	0
8,972	219	627	83	4	9
8,225	140	441	5	0.1	1
3,501	65	129	1,028	9	11
0	0	0	0	0	0
\$65,084 ^{c/}	1,318	2,557	\$ 1,183	14	26

FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS

Costs and Manpower
As of June 30, 1971

<u>Laboratory</u>	<u>Total Cost</u> <u>(In thousands)</u>	<u>Scientific Man-Years</u>		<u>Number of</u> <u>Graduate Students</u> <u>Engaged in Research</u>	<u>Number of</u> <u>Publications</u>
		<u>Permanent</u>	<u>Visiting</u>		
Ames Laboratory	\$ 7,702	77	1	204	294
Argonne National Laboratory	40,778	615	72	225	327
Brookhaven National Laboratory . .	40,707	390	52	96	264
Cambridge Electron Accelerator . .	2,638	49	0	0	32
Ernest Orlando Lawrence Laboratory.	40,124	484	78	319	523
Los Alamos Scientific Laboratory .	11,564	130	6	19	85
Mound Laboratory	560	10	0	0	27
National Accelerator Laboratory . .	13,968	182	5	0	83
Oak Ridge National Laboratory . . .	34,522	484	29	154	663
Pacific Northwest Laboratory . . .	967	11	3	2	21
Plasma Physics Lab., Princeton U. .	8,105	81	7	0	75
Princeton Proton Accelerator ^{a/} . . .	1,999	19	0	23	27
Stanford Linear Accelerator Center.	27,648	270	12	45	80
TOTAL	\$ 231,282	2,802	265	1,087	2,501

^{a/}AEC support terminated 6/30/71--not funded beyond FY 1971.

FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS

AMES LABORATORY

<u>Activity</u>	<u>Total Cost</u> (In thousands)	<u>Scientific Man-Years</u>		<u>Number of</u> <u>Graduate Students</u> <u>Engaged in Research</u>	<u>Number of</u> <u>Publications</u>
		<u>Permanent</u>	<u>Visiting</u>		
High Energy Physics	\$ 554	7	0	17	12
Medium Energy Physics	212	2	0	10	7
Low Energy Physics	568	4	0	14	16
Mathematics & Computers	115	3	0	2	14
Chemistry	3,217	28	0	86	151
Metallurgy & Materials	2,876	33	1	75	94
General Purpose Equipment	160	0	0	0	0
TOTAL	\$ 7,702	77	1	204 ^{a/}	294

^{a/} Includes 5 students engaged in research activities
but whose salaries are not paid by AMES.

FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS

ARGONNE NATIONAL LABORATORY

<u>Activity</u>	<u>Total Cost (In thousands)</u>	<u>Scientific Man-Years</u>		<u>Number of Graduate Students Engaged in Research</u>	<u>Number of Publications</u>
		<u>Permanent</u>	<u>Visiting</u>		
High Energy Physics	\$ 19,364	185	26	146	58
Medium Energy Physics	35	1	0	0	0
Low Energy Physics	4,602	81	11	54	38
Mathematics & Computers	1,300	33	2	5	30
Chemistry	9,209	195	17	10	97
Metallurgy & Materials	6,233	119	16	10	104
Controlled Thermonuclear Research	35	1	0	0	0
TOTAL	\$ 40,778	615	72	225 ^{a/}	327 ^{b/}

^{a/}Includes 214 students engaged in research activities but whose salaries are not paid by ANL.

^{b/}Includes 14 publications that resulted from collaborative efforts with universities.

FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS

BROOKHAVEN NATIONAL LABORATORY

<u>Activity</u>	<u>Total Cost</u> (In thousands)	<u>Scientific Man-Years</u>		<u>Number of</u> <u>Graduate Students</u> <u>Engaged in Research</u>	<u>Number of</u> <u>Publications</u>
		<u>Permanent</u>	<u>Visiting</u>		
High Energy Physics	\$ 25,213	194	17	77	50
Medium Energy Physics	124	2	0	0	0
Low Energy Physics	5,016	55	9	3	49
Mathematics & Computers	689	12	2	0	25
Chemistry	5,669	90	14	4	73
Metallurgy & Materials	3,251	36	10	12	67
Controlled Thermonuclear Research	15	1	0	0	0
General Purpose Equipment	730	0	0	0	0
TOTAL	\$ 40,707	390	52	96^{a/}	264^{b/}

^{a/} Includes 94 students engaged in research activities but whose salaries are not paid by BNL.

^{b/} Includes 67 publications that resulted from collaborative efforts with universities.

FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS

ERNEST ORLANDO LAWRENCE LABORATORY^{a/}

<u>Activity</u>	<u>Total Cost</u> (In thousands)	<u>Scientific Man-Years</u>		<u>Number of</u> <u>Graduate Students</u> <u>Engaged in Research</u>	<u>Number of</u> <u>Publications</u>
		<u>Permanent</u>	<u>Visiting</u>		
High Energy Physics	\$ 17,475	199	36	69	174
Medium Energy Physics	1,808	10	16	7	11
Low Energy Physics	299	7	0	5	7
Mathematics & Computers	167	5	0	0	14
Chemistry	10,653	147	17	126	193
Metallurgy & Materials	1,979	28	8	91	79
Controlled Thermonuclear Research	7,621	88	1	21	45
General Purpose Equipment	122	0	0	0	0
TOTAL	\$ 40,124	484	78	319 ^{b/}	523 ^{c/}

^{a/} Effective June 18, 1971, Lawrence Radiation Laboratories at Berkeley and Livermore were administratively separated and renamed the Ernest Orlando Lawrence Berkeley Laboratory (LBL), and the Ernest Orlando Lawrence Livermore Laboratory (LLL).

^{b/} Includes 49 students engaged in research activities but whose salaries are not paid by the Ernest Orlando Lawrence Laboratory.

^{c/} Includes 3 publications that resulted from collaborative efforts with other universities.

FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS

OAK RIDGE NATIONAL LABORATORY

<u>Activity</u>	<u>Total Cost</u> (In thousands)	<u>Scientific Man-Years</u>		<u>Number of</u> <u>Graduate Students</u> <u>Engaged in Research</u>	<u>Number of</u> <u>Publications</u>
		<u>Permanent</u>	<u>Visiting</u>		
High Energy Physics	\$ 382	7	0	2	23
Medium Energy Physics	1,755	35	1	5	48
Low Energy Physics	6,271	105	10	70	160
Mathematics & Computers	382	8	0	3	52
Chemistry	14,308	190	6	60	200
Metallurgy & Materials	5,699	83	11	12	130
Controlled Thermonuclear Research	5,725	56	1	2	50
TOTAL	\$ 34,522	484	29	154^{a/}	663^{b/}

^{a/} Includes 103 students engaged in research activities but whose salaries are not paid by ORNL.

^{b/} Includes 20 publications that resulted from collaborative efforts with universities.

FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS

	<u>Total Cost</u> <u>(In thousands)</u>	<u>Scientific Man-Years</u>		<u>No. of Grad.</u> <u>Res. Students</u>	<u>Number of</u> <u>Publications</u>
		<u>Permanent</u>	<u>Visiting</u>		
<u>CAMBRIDGE ELECTRON ACCELERATOR</u>					
High Energy Physics	\$ 2,638	49	0	0	32
<u>LOS ALAMOS SCIENTIFIC LABORATORY</u>					
Medium Energy Physics	7,124	76	4	12	44
Controlled Thermonuclear Research	4,440	54	2	7	41
<u>MOUND LABORATORY</u>					
Low Energy Physics	204	4	0	0	19
Chemistry	256	4	0	0	4
Metallurgy & Materials	100	2	0	0	4
<u>NATIONAL ACCELERATOR LABORATORY</u>					
High Energy Physics	13,968	182	5	0	83
<u>PACIFIC NORTHWEST LABORATORY</u>					
Low Energy Physics	121	2	2	1	8
Chemistry	269	3	1	1	1
Metallurgy & Materials	577	6	0	0	12
<u>PLASMA PHYSICS LABORATORY</u>					
Controlled Thermonuclear Research	8,105	81	7	0	75
<u>PRINCETON PROTON ACCELERATOR</u>					
High Energy Physics	1,999	19	0	23	27
<u>STANFORD LINEAR ACCELERATOR CENTER</u>					
High Energy Physics	27,648	270	12	45	80

EDUCATIONAL INSTITUTIONS

NUMBER OF AGREEMENTS, TOTAL COSTS, AND CONTRACTOR
AND AEC CONTRIBUTIONS IN THE PROGRAM BY ACTIVITY
As of June 30, 1971

<u>Activity</u>	<u>Number of Agreements</u>	<u>Total Project Cost</u>	<u>Contractor Contribution</u>	<u>Percent of Total</u>	<u>AEC Contribution</u>	<u>Percent of Total</u>
High Energy Physics	52	\$29,063,028 ^{a/}	\$ 3,721,255	13	\$25,341,773 ^{a/}	87
Medium Energy Physics ...	16	4,330,939	790,840	18	3,540,099	82
Low Energy Physics	59	15,211,717	2,885,522	19	12,326,195	81
Mathematics & Computers .	22	3,391,851	214,114	6	3,177,737	94
Chemistry	191	10,213,668	1,242,226	12	8,971,442	88
Metallurgy & Materials ..	141	9,035,004	809,663	9	8,225,341	91
Controlled Thermonuclear Research	39	3,890,538	389,998	10	3,500,540	90
TOTAL	520	\$75,136,745 ^{a/}	\$10,053,618	13	\$65,083,127 ^{a/}	87

^{a/}Includes \$7,267,000 for research activities included under FFRDC's in the 1969 and earlier editions of this analysis, but more appropriately belong under educational institutions.

EDUCATIONAL INSTITUTIONS

CONSOLIDATED BUDGET
INCLUDED IN THE
As of
(Dollars in

<u>Items of Expense</u>		Total		High		Medium	
SRSA Projects		Amount	%	Energy	%	Energy	%
				Physics		Physics	
(1)	Salaries and Wages	\$12,996	53.4	1,767	51.4	374	55.9
(2)	Equipment	1,137	4.7	97	2.8	26	4.0
(3)	Materials and Supplies	3,348	13.7	633	18.4	75	11.2
(4)	Travel	492	2.0	124	3.6	27	4.0
(5)	Communications	42	.2	5	.1	1	.1
(6)	Publication Costs	342	1.4	59	1.7	3	.4
(7)	Indirect Expenses	5,995	24.6	756	22.0	163	24.4
(8)	TOTAL	\$24,352	100.0	3,441	100.0	669	100.0
(9)	Contributed by Universities.....	3,817	15.7	908	26.4	105	15.7
(10)	Supported by AEC	20,535	84.3	2,533	73.6	564	84.3
(11)	Including Unexpended Balance of.	628		120		19	
<hr/>							
<u>Cost-Type Projects</u>							
(12)	Salaries and Wages	\$23,915	47.1	11,957	46.7	1,639	44.8
(13)	Equipment	4,234	8.3	1,528	6.0	545	14.9
(14)	Materials and Supplies	9,137	18.0	4,955	19.3	672	18.4
(15)	Travel	1,173	2.3	882	3.4	36	.9
(16)	Communications.....	186	.4	106	.4	13	.4
(17)	Publication Costs	251	.5	126	.5	18	.5
(18)	Indirect Expenses	11,888	23.4	6,068	23.7	739	20.1
(19)	TOTAL	\$50,784 ^{a/}	100.0	25,622 ^{a/}	100.0	3,662	100.0
(20)	Contributed by Universities	6,235	12.3	2,813	11.0	686	18.7
(21)	Supported by AEC	44,549 ^{a/}	87.7	22,809 ^{a/}	89.0	2,976	81.3
(22)	Including Unexpended Balance of.	184		24		41	

^{a/} Includes \$7,267,000 for research activities included under FFRDC's in the 1969 and earlier editions of this analysis, but more appropriately belong under educational institutions.

OF THE 520 PROJECTS
PHYSICAL RESEARCH PROGRAM

EDUCATIONAL INSTITUTIONS

June 30, 1971
(Thousands)

Low Energy Physics	%	Mathematics and Computers	%	Chemistry	%	Metallurgy and Materials	%	Controlled Thermonuclear	%	
1,621	54.2	557	59.6	3,922	52.2	3,654	53.7	1,101	55.1	(1)
182	6.1	44	4.7	436	5.8	235	3.5	117	5.9	(2)
393	13.1	59	6.3	1,058	14.1	959	14.1	171	8.6	(3)
68	2.3	18	2.0	132	1.7	85	1.2	38	1.9	(4)
6	0.2	2	0.2	12	0.2	12	0.2	4	0.2	(5)
37	1.2	13	1.4	108	1.4	95	1.4	27	1.4	(6)
686	22.9	241	25.8	1,845	24.6	1,766	25.9	538	26.9	(7)
2,993	100.0	934	100.0	7,513	100.0	6,806	100.0	1,996	100.0	(8)
687	23.0	59	6.3	976	13.0	810	12.0	272	13.6	(9)
2,306	77.0	875	93.7	6,537	87.0	5,996	88.0	1,724	86.4	(10)
36		44		179		176		54		(11)
6,043	49.5	1,264	51.4	1,277	47.3	984	44.1	751	39.6	(12)
1,088	8.9	176	7.2	292	10.8	235	10.5	370	19.5	(13)
1,990	16.3	315	12.8	448	16.6	461	20.7	296	15.6	(14)
164	1.3	19	.8	24	.8	16	.7	32	1.7	(15)
36	.3	4	.2	13	.5	12	.6	2	.1	(16)
53	.4	6	.2	15	.6	24	1.1	9	.5	(17)
2,844	23.3	673	27.4	632	23.4	497	22.3	435	23.0	(18)
12,218	100.0	2,457	100.0	2,701	100.0	2,229	100.0	1,895	100.0	(19)
2,198	18.0	154	6.3	266	9.8	0	.0	118	6.2	(20)
10,020	82.0	2,303	93.7	2,435	90.2	2,229	100.0	1,777	93.8	(21)
83		0		2		0		34		(22)

EDUCATIONAL INSTITUTIONSNUMBER OF SCIENTIFIC EMPLOYEES, RESEARCH ASSISTANTS & PUBLICATIONS
UNDER THE PHYSICAL RESEARCH PROGRAM

<u>Activity</u>	<u>Principal Investigators</u>		<u>Research Associates</u>		<u>Other Permanent Scientific Staff (Including Visitors)</u>		<u>Research Assistants</u>	<u>Publications</u>
	<u>No.</u>	<u>MY's</u>	<u>No.</u>	<u>MY's</u>	<u>No.</u>	<u>MY's</u>		
High Energy Physics	147	68	296	214	389	248	536	669
Medium Energy Physics....	27	11	31	21	57	30	72	38
Low Energy Physics	114	40	147	108	212	111	411	569
Mathematics & Computers .	28	10	30	8	56	25	75	84
Chemistry	194	54	189	142	71	23	410	627
Metallurgy & Materials ..	155	47	88	70	75	23	436	441
Controlled Thermonuclear.	49	16	24	16	68	33	120	129
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TOTAL	714	246	805	579	928	493	2,060	2,557

EDUCATIONAL INSTITUTIONS

TYPE OF ORGANIZATIONS

<u>Projects with:</u>	<u>Division Total</u>	<u>High Energy Physics</u>	<u>Medium Energy Physics</u>	<u>Low Energy Physics</u>	<u>Math and Computer</u>	<u>Chemistry</u>	<u>Metallurgy & Materials</u>	<u>Controlled Thermonuclear</u>
State Institutions	290	27	8	40	10	107	75	23
Private Institutions ..	226	25	8	19	11	81	66	16
Municipal Institutions.	4	0	0	0	1	3	0	0
TOTAL	520	52	16	59	22	191	141	39

OPERATIONS OFFICES ADMINISTERING
THE BUSINESS ASPECTS OF THE AGREEMENTS

<u>Operations Offices</u>	<u>Division Total</u>	<u>High Energy Physics</u>	<u>Medium Energy Physics</u>	<u>Low Energy Physics</u>	<u>Math and Computer</u>	<u>Chemistry</u>	<u>Metallurgy & Materials</u>	<u>Controlled Thermonuclear</u>
Chicago	140	14	1	19	4	55	42	5
Idaho	1	0	0	0	0	1	0	0
New York	170	21	5	16	6	55	54	13
Nevada	1	0	0	0	0	1	0	0
Oak Ridge	119	5	7	8	4	51	30	14
Richland	21	1	0	6	1	8	4	1
San Francisco	64	11	3	10	7	16	11	6
Savannah River	4	0	0	0	0	4	0	0
TOTAL	520	52	16	59	22	191	141	39

EDUCATIONAL INSTITUTIONS

TYPE OF AGREEMENTS

<u>Type</u>	<u>Division Total</u>	<u>High Energy Physics</u>	<u>Medium Energy Physics</u>	<u>Low Energy Physics</u>	<u>Math and Computer</u>	<u>Chemistry</u>	<u>Metallurgy & Materials</u>	<u>Controlled Thermonuclear</u>
Cost Contracts	79	27	7	22	5	9	4	5
SRSA	441	25	9	37	17	182	137	34
TOTAL	520	52	16	59	22	191	141	39

AGREEMENTS BY AEC DOLLAR LEVEL

<u>Dollar Level</u>	<u>Division Total</u>	<u>High Energy Physics</u>	<u>Medium Energy Physics</u>	<u>Low Energy Physics</u>	<u>Math and Computer</u>	<u>Chemistry</u>	<u>Metallurgy & Materials</u>	<u>Controlled Thermonuclear</u>
0	22	1	1	2	0	10	8	0
1 - 9,999	8	0	0	0	0	5	3	0
10,000 - 19,999	41	1	2	2	0	23	9	4
20,000 - 29,999	93	1	1	6	2	57	20	6
30,000 - 39,999	99	1	2	2	3	37	45	9
40,000 - 49,999	53	2	0	6	4	17	18	6
50,000 - 59,999	36	3	1	2	5	15	7	3
60,000 - 69,999	19	1	0	4	0	5	6	3
70,000 - 79,999	13	2	0	3	1	4	3	0
80,000 - 89,999	13	0	1	2	1	3	5	1
90,000 - 99,999	8	2	0	1	0	1	4	0
100,000 - 249,999	57	15	3	13	2	10	10	4
250,000 - 499,999	25	7	1	8	2	3	2	2
500,000 +	33	16	4	8	2	1	1	1
TOTAL	520	52	16	59	22	191	141	39

EDUCATIONAL INSTITUTIONS

PERCENT OF AEC CONTRIBUTION TO THE TOTAL COST OF THE RESEARCH

<u>Percentage</u>	<u>Division Total</u>	<u>High Energy Physics</u>	<u>Medium Energy Physics</u>	<u>Low Energy Physics</u>	<u>Math and Computer</u>	<u>Chemistry</u>	<u>Metallurgy & Materials</u>	<u>Controlled Thermonuclear</u>
0 - 9	25	1	1	2	0	12	9	0
10 - 19	2	0	0	1	0	1	0	0
20 - 29	1	0	1	0	0	0	0	0
30 - 39	2	2	0	0	0	0	0	0
40 - 49	7	2	2	1	0	1	1	0
50 - 59	20	3	0	7	0	8	1	1
60 - 69	33	4	0	4	0	15	7	3
70 - 79	53	6	3	9	1	17	15	2
80 - 89	115	6	1	11	5	42	41	9
90 - 99	52	0	0	3	5	20	14	10
100*	210	28	8	21	11	75	53	14
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TOTAL	520	52	16	59	22	191	141	39

* Includes a large number of contracts where the universities contribute to the cost of the research but do not estimate a specified amount.

EDUCATIONAL INSTITUTIONS

NUMBER OF AGREEMENTS BY STATES AND CONTRACTORS

<u>State and Contractor</u>	<u>Division Total</u>	<u>High Energy Physics</u>	<u>Medium Energy Physics</u>	<u>Low Energy Physics</u>	<u>Math and Computer</u>	<u>Chemistry</u>	<u>Metallurgy & Materials</u>	<u>Controlled Thermonuclear</u>
<u>Alabama</u>	4	0	0	0	0	2	2	0
Alabama A&M University ...	1	0	0	0	0	0	1	0
Alabama, University of ...	1	0	0	0	0	1	0	0
Auburn University	1	0	0	0	0	1	0	0
Tuskegee Institute	1	0	0	0	0	0	1	0
<u>Alaska</u>	2	0	0	2	0	0	0	0
Alaska, University of	2	0	0	2	0	0	0	0
<u>Arizona</u>	6	0	0	2	0	2	2	0
Arizona State University .	1	0	0	0	0	1	0	0
Arizona, University of ...	5	0	0	2	0	1	2	0
<u>Arkansas</u>	2	0	0	0	0	2	0	0
Arkansas, University of ..	2	0	0	0	0	2	0	0
<u>California</u>	62	10	3	10	7	16	10	6
California Inst. of Tech..	9	1	0	1	0	4	2	1
California, University of								
Berkeley	5	0	0	3	1	0	0	1
Davis	5	1	1	1	0	2	0	0
Irvine	4	2	0	0	0	2	0	0
La Jolla	5	0	0	1	0	1	2	1
Los Angeles	12	1	2	2	1	3	1	2
Riverside	2	1	0	0	0	0	1	0
San Diego	1	1	0	0	0	0	0	0
Santa Barbara	2	1	0	1	0	0	0	0
Santa Cruz	1	1	0	0	0	0	0	0
Southern California, U. of .	6	0	0	1	1	2	2	0
Stanford University	10	1	0	0	4	2	2	1

EDUCATIONAL INSTITUTIONS

NUMBER OF AGREEMENTS BY STATES AND CONTRACTORS

<u>State and Contractor</u>	<u>Division Total</u>	<u>High Energy Physics</u>	<u>Medium Energy Physics</u>	<u>Low Energy Physics</u>	<u>Math and Computer</u>	<u>Chemistry</u>	<u>Metallurgy & Materials</u>	<u>Controlled Thermonuclear</u>
Colorado	4	1	0	1	0	1	0	1
Colorado State Univ.	1	0	0	0	0	1	0	0
Colorado, University of ..	3	1	0	1	0	0	0	1
Connecticut	8	1	1	2	0	2	1	1
Yale University	8	1	1	2	0	2	1	1
District of Columbia	7	0	0	1	0	4	2	0
Catholic University	2	0	0	1	0	1	0	0
Georgetown University	1	0	0	0	0	0	1	0
George Washington Univ. ..	1	0	0	0	0	1	0	0
Howard University	3	0	0	0	0	2	1	0
Florida	8	1	0	0	0	5	1	1
Florida State University .	4	1	0	0	0	3	0	0
Florida, University of ...	3	0	0	0	0	2	1	0
Miami, University of	1	0	0	0	0	0	0	1
Georgia	9	0	0	0	0	5	2	2
Georgia Inst. of Tech. ...	6	0	0	0	0	2	2	2
Georgia, University of ...	3	0	0	0	0	3	0	0
Hawaii	2	1	0	0	0	0	1	0
Hawaii, University of	2	1	0	0	0	0	1	0
Idaho	1	0	0	0	0	1	0	0
Idaho State University ...	1	0	0	0	0	1	0	0

EDUCATIONAL INSTITUTIONS

NUMBER OF AGREEMENTS BY STATES AND CONTRACTORS

<u>State and Contractor</u>	<u>Division Total</u>	<u>High Energy Physics</u>	<u>Medium Energy Physics</u>	<u>Low Energy Physics</u>	<u>Math and Computer</u>	<u>Chemistry</u>	<u>Metallurgy & Materials</u>	<u>Controlled Thermonuclear</u>
<u>Illinois</u>	28	3	0	1	3	13	8	0
Chicago, University of ...	10	2	0	0	1	5	2	0
Illinois Inst. of Tech. ..	4	0	0	0	0	2	2	0
Illinois, University of ..	7	1	0	1	2	2	1	0
Northwestern University ..	7	0	0	0	0	4	3	0
<u>Indiana</u>	18	2	0	3	0	9	4	0
Indiana University	2	1	0	0	0	1	0	0
Notre Dame, University of.	3	0	0	2	0	1	0	0
Purdue University	13	1	0	1	0	7	4	0
<u>Iowa</u>	3	0	0	0	0	2	0	1
Iowa, University of	3	0	0	0	0	2	0	1
<u>Kansas</u>	6	0	0	3	0	3	0	0
Kansas State University ..	3	0	0	2	0	1	0	0
Kansas, University of	3	0	0	1	0	2	0	0
<u>Kentucky</u>	4	0	0	0	0	3	1	0
Kentucky, University of ..	4	0	0	0	0	3	1	0
<u>Louisiana</u>	3	0	0	1	0	1	1	0
Louisiana State Univ.	1	0	0	0	0	0	1	0
Southern University	2	0	0	1	0	1	0	0
<u>Maryland</u>	23	2	2	3	3	6	4	3
Johns Hopkins University .	5	1	0	2	1	1	0	0
Maryland, University of ..	18	1	2	1	2	5	4	3

EDUCATIONAL INSTITUTIONS

NUMBER OF AGREEMENTS BY STATES AND CONTRACTORS

<u>State and Contractor</u>	<u>Division Total</u>	<u>High Energy Physics</u>	<u>Medium Energy Physics</u>	<u>Low Energy Physics</u>	<u>Math and Computer</u>	<u>Chemistry</u>	<u>Metallurgy & Materials</u>	<u>Controlled Thermonuclear</u>
<u>Massachusetts</u>	30	7	1	1	1	9	10	1
Boston University	1	0	0	0	0	0	1	0
Brandeis University	5	1	0	0	0	2	2	0
Clark University	1	0	0	0	0	1	0	0
Harvard University	5	2	0	0	1	2	0	0
Massachusetts Inst. of Tech.	10	1	1	1	0	2	4	1
Massachusetts, Univ. of ...	2	1	0	0	0	0	1	0
Northeastern University ...	2	0	0	0	0	0	2	0
Southeastern Massachusetts University	1	1	0	0	0	0	0	0
Tufts University	2	1	0	0	0	1	0	0
Worcester Polytechnic Inst.	1	0	0	0	0	1	0	0
<u>Michigan</u>	24	2	0	4	0	9	8	1
Michigan State Univ.	10	1	0	2	0	4	3	0
Michigan Tech. Univ.	3	0	0	0	0	1	2	0
Michigan, University of ...	9	1	0	2	0	3	2	1
Wayne State University	2	0	0	0	0	1	1	0
<u>Minnesota</u>	9	1	0	1	0	2	5	0
Minnesota, Univ. of	9	1	0	1	0	2	5	0
<u>Mississippi</u>	1	0	0	0	0	1	0	0
Mississippi, Univ. of	1	0	0	0	0	1	0	0
<u>Missouri</u>	5	1	0	0	0	4	0	0
Washington University	5	1	0	0	0	4	0	0
<u>Montana</u>	2	0	0	0	0	1	1	0
Montana State University ..	2	0	0	0	0	1	1	0

EDUCATIONAL INSTITUTIONS

NUMBER OF AGREEMENTS BY STATES AND CONTRACTORS

<u>State and Contractor</u>	<u>Division Total</u>	<u>High Energy Physics</u>	<u>Medium Energy Physics</u>	<u>Low Energy Physics</u>	<u>Math and Computer</u>	<u>Chemistry</u>	<u>Metallurgy & Materials</u>	<u>Controlled Thermonuclear</u>
Nebraska	1	0	0	0	0	1	0	0
Nebraska, University of ..	1	0	0	0	0	1	0	0
Nevada	1	0	0	0	0	1	0	0
Nevada, University of	1	0	0	0	0	1	0	0
New Hampshire	2	0	0	0	0	1	1	0
New Hampshire, Univ. of ..	1	0	0	0	0	1	0	0
Dartmouth College	1	0	0	0	0	0	1	0
New Jersey	11	1	0	1	0	5	1	3
Princeton University	6	1	0	1	0	3	1	0
Rutgers University	2	0	0	0	0	2	0	0
Stevens Inst. of Tech. ...	3	0	0	0	0	0	0	3
New Mexico	1	0	0	0	0	1	0	0
New Mexico Highlands University	1	0	0	0	0	1	0	0
New York	75	7	1	7	4	24	25	7
Brooklyn, Polytechnic Inst. of	1	0	0	0	0	0	0	1
Clarkson College of Tech..	4	0	0	0	0	2	2	0
Columbia University	10	1	1	2	0	3	2	1
Cornell University	17	1	0	1	0	1	11	3
New York, City Univ. of ..	4	0	0	0	1	3	0	0
New York, State Univ. of .								
Albany	1	0	0	0	0	0	1	0
Buffalo	3	0	0	1	0	2	0	0
Stony Brook	9	1	0	1	1	2	4	0

EDUCATIONAL INSTITUTIONS

NUMBER OF AGREEMENTS BY STATES AND CONTRACTORS

<u>State and Contractor</u>	<u>Division Total</u>	<u>High Energy Physics</u>	<u>Medium Energy Physics</u>	<u>Low Energy Physics</u>	<u>Math and Computer</u>	<u>Chemistry</u>	<u>Metallurgy & Materials</u>	<u>Controlled Thermonuclear</u>
<u>New York (Cont'd.)</u>								
New York University	3	0	0	0	2	0	0	1
Rensselaer Polytechnic Institute	8	0	0	0	0	4	4	0
Rochester, University of .	6	1	0	1	0	3	0	1
Rockefeller University ...	2	2	0	0	0	0	0	0
Syracuse University	3	1	0	0	0	1	1	0
Yeshiva University	4	0	0	1	0	3	0	0
<u>North Carolina</u>	<u>14</u>	<u>1</u>	<u>0</u>	<u>3</u>	<u>1</u>	<u>2</u>	<u>7</u>	<u>0</u>
Duke University	2	1	0	1	0	0	0	0
North Carolina State Univ.	4	0	0	1	0	1	2	0
North Carolina, Univ. of .	7	0	0	1	1	1	4	0
Wake Forest College	1	0	0	0	0	0	1	0
<u>North Dakota</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>0</u>
North Dakota, Univ. of ...	1	0	0	0	0	0	1	0
<u>Ohio</u>	<u>20</u>	<u>3</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>6</u>	<u>8</u>	<u>0</u>
Case Western Reserve	9	1	1	1	0	1	5	0
Cincinnati, Univ. of	2	1	0	0	0	0	1	0
Kent State University	1	0	0	0	1	0	0	0
Ohio State University	7	1	0	0	0	4	2	0
Toledo, University of ...	1	0	0	0	0	1	0	0
<u>Oklahoma</u>	<u>3</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>0</u>
Oklahoma State Univ.	1	0	0	0	0	1	0	0
Oklahoma, University of ..	2	0	0	0	0	0	2	0
<u>Oregon</u>	<u>8</u>	<u>1</u>	<u>0</u>	<u>2</u>	<u>1</u>	<u>3</u>	<u>1</u>	<u>0</u>
Oregon State Univ.	5	0	0	1	1	2	1	0
Oregon, University of	3	1	0	1	0	1	0	0

EDUCATIONAL INSTITUTIONS

NUMBER OF AGREEMENTS BY STATES AND CONTRACTORS

<u>State and Contractor</u>	<u>Division Total</u>	<u>High Energy Physics</u>	<u>Medium Energy Physics</u>	<u>Low Energy Physics</u>	<u>Math and Computer</u>	<u>Chemistry</u>	<u>Metallurgy & Materials</u>	<u>Controlled Thermonuclear</u>
<u>Pennsylvania</u>	33	3	2	1	0	12	14	1
Carnegie-Mellon Univ.	10	1	1	1	0	5	2	0
Lehigh University	3	0	0	0	0	1	2	0
Lincoln University	1	0	0	0	0	1	0	0
Pennsylvania State Univ. .	7	0	0	0	0	1	5	1
Pennsylvania, Univ. of ...	4	1	0	0	0	2	1	0
Pittsburgh, University of.	6	1	0	0	0	2	3	0
Temple University	2	0	1	0	0	0	1	0
<u>Puerto Rico</u>	2	0	0	0	0	1	1	0
Puerto Rico, Univ. of	2	0	0	0	0	1	1	0
<u>Rhode Island</u>	5	1	0	2	0	1	1	0
Brown University	5	1	0	2	0	1	1	0
<u>South Carolina</u>	2	0	0	0	0	1	1	0
Clemson University	1	0	0	0	0	0	1	0
South Carolina, Univ. of .	1	0	0	0	0	1	0	0
<u>Tennessee</u>	9	1	0	0	0	4	2	2
Tennessee State Univ.	1	0	0	0	0	1	0	0
Tennessee, University of .	7	1	0	0	0	2	2	2
Vanderbilt University	1	0	0	0	0	1	0	0
<u>Texas</u>	29	1	3	2	1	16	1	5
Baylor University	2	0	0	0	0	2	0	0
Houston, Univ. of	3	0	1	0	0	2	0	0
Rice University	6	0	1	1	1	3	0	0
Texas A&M University	9	0	1	0	0	8	0	0
Texas Tech University	1	0	0	0	0	0	0	1
Texas, University of	8	1	0	1	0	1	1	4

EDUCATIONAL INSTITUTIONS

NUMBER OF AGREEMENTS BY STATES AND CONTRACTORS

<u>State and Contractor</u>	<u>Division Total</u>	<u>High Energy Physics</u>	<u>Medium Energy Physics</u>	<u>Low Energy Physics</u>	<u>Math and Computer</u>	<u>Chemistry</u>	<u>Metallurgy & Materials</u>	<u>Controlled Thermonuclear</u>
Utah	5	0	0	1	0	0	4	0
Brigham Young Univ.	2	0	0	1	0	0	1	0
Utah, Univ. of	3	0	0	0	0	0	3	0
Vermont	1	0	0	0	0	0	1	0
Vermont, Univ. of	1	0	0	0	0	0	1	0
Virginia	8	0	2	0	0	2	3	1
Roanoke College	1	0	0	0	0	0	0	1
Virginia Polytechnic Inst. and State Univ.	3	0	1	0	0	2	0	0
Virginia, Univ. of	4	0	1	0	0	0	3	0
Washington	9	0	0	2	0	4	2	1
Washington State Univ.	3	0	0	0	0	2	0	1
Washington, Univ. of	5	0	0	2	0	1	2	0
Western Washington State College	1	0	0	0	0	1	0	0
Wisconsin	9	1	0	2	0	2	2	2
Marquette University	1	0	0	0	0	0	1	0
Wisconsin, Univ. of	8	1	0	2	0	2	1	2
TOTAL	520	52	16	59	22	191	141	39

NOT-FOR-PROFIT RESEARCH INSTITUTES AND INDUSTRIAL LABORATORIES

In addition to the contract-research program at educational institutions, the Research Division supports some research projects at not-for-profit research organizations and at industrial laboratories.

On June 30, 1971, there were 12 such projects in effect, for a total AEC FY 1971 funding level of \$1,182,615. Nine of these were with 5 nonprofit research organizations, totalling \$133,120, and 3 were with 3 industrial firms, for a total of \$1,049,495.

Of these 12 contracts, 6 were of the SRSA or Lump Sum type, while 6 were cost-reimbursement. Ten were administered by the New York Operations Office, and 2 by San Francisco.

An estimated 33 scientific employees provided about 14 man-years and published some 26 papers under these 12 contracts.

	<u>Number of Projects</u>	<u>AEC Support FY 1971</u>
Franklin Institute, Pennsylvania	1	\$ 11,994
Gulf General Atomic Co., California	1	864,095
Institute for Advanced Study, New Jersey	1	33,701
Ion Physics Corporation, Massachusetts	1 ^{a/}	55,400 ^{a/}
National Academy of Sciences, Washington, D.C.	5	16,425
New England Institute, Connecticut	1	41,000
Stanford Research Institute, California	1	30,000
United Aircraft Corporation, Connecticut	1	130,000
	<hr/>	<hr/>
TOTAL	12	\$ 1,182,615

^{a/}Terminated 8/16/71--not funded beyond FY 1971.