

## APPENDIX V

### SURVEY OF FEDERAL OBLIGATIONS FOR SCIENTIFIC RESEARCH AND DEVELOPMENT AT NONPROFIT INSTITUTIONS

PRELIMINARY ESTIMATES OF FEDERAL FUNDS FOR SCIENTIFIC RESEARCH AND DEVELOPMENT AT NONPROFIT INSTITUTIONS, BY SCIENTIFIC FIELDS, FOR YEARS ENDING JUNE 30, 1951, AND 1952

(In millions of dollars)

Character of work	Field of work						Total	
	Biological, medical, and agricultural sciences		Physical, mathematical and engineering sciences		Social sciences			
	1951	1952	1951	1952	1951	1952	1951	1952
Basic research . . . . .	14.1	15.7	59.8	54.0	1.9	1.4	75.8	71.1
Applied research . . . . .	43.7	47.0	91.5	110.7	8.5	15.0	143.7	172.7
Development . . . . .	2.8	3.1	51.4	74.0	.3	.2	54.5	77.3
Increase of Research and Development Plant . . . . .	5.6	4.0	17.1	16.2	.2	0	22.9	20.2
Total . . . . .	66.2	69.8	291.8	254.9	10.9	16.6	296.9	341.3

PRELIMINARY ESTIMATES OF FEDERAL FUNDS FOR SCIENTIFIC RESEARCH AND DEVELOPMENT AT NONPROFIT INSTITUTIONS BY SELECTED FEDERAL AGENCIES AND CHARACTER OF THE OBLIGATION, FOR YEARS ENDING JUNE 30, 1951 AND 1952

(In millions of dollars)

Agency	Character of work								Total	
	Basic re- search		Applied research		Develop- ment		Increase of research and de- velop- ment plant			
	1951	1952	1951	1952	1951	1952	1951	1952	1951	1952
Department of Defense.....	43.9	34.3	94.5	119.5	20.4	27.3	2.8	0	161.6	181.1
Atomic Energy Commission.....	24.4	27.9	22.7	26.6	30.5	46.4	20.1	20.2	97.7	121.1
Federal Security Agency (PHS)...	5.1	5.1	11.7	12.8	.2	.4	0	0	17.0	18.3
Department of Agriculture.....	1.0	1.3	11.7	11.7	.3	.3	0	0	13.0	13.3
Other Agencies....	1.4	2.5	3.1	2.1	3.1	2.9	0	0	7.6	7.5
<b>Total.....</b>	<b>75.8</b>	<b>71.1</b>	<b>143.7</b>	<b>172.7</b>	<b>54.5</b>	<b>77.3</b>	<b>22.9</b>	<b>20.2</b>	<b>296.9</b>	<b>341.3</b>

DEFINITIONS FROM INSTRUCTIONS FOR REPORTING DATA TO THE NATIONAL  
SCIENCE FOUNDATION

*Scientific research and development* is intended broadly to include not only the actual conduct of research and development, but also obligations incurred for: (a) Indirect costs of nonprofit institutions related to their conduct of research and development; (b) operating and maintenance costs of research and development facilities, installations, or activities owned, used or managed by nonprofit institutions, even though no actual research or development may be sponsored at the facility or installation by the agency involved; (c) increases in the capital research and development plant of nonprofit institutions; and (d) arrangements under which funds will be distributed by a nonprofit institution to other organizations or individuals for research and development. It is not intended to include obligations for activities concerned *primarily* with the dissemination of scientific information or with the training of scientific manpower.

*Research and development classifications.* For this report, data is requested by three categories, *basic research*, *applied research*, and *development*. Simple, brief definitions of each of these general classifications are given below. In presenting these definitions it is recognized that simple definitions for items such as these are exceedingly difficult to formulate in such a way as to be acceptable to the scientist and to the administrator. The general concept of basic research in particular has often been subdivided into a number of additional categories such as background and fundamental, directed and undirected, programmatic and nonprogrammatic, etc., in order to distinguish between what sometimes appear as widely differing types of activity, or to characterize the motivation behind the work. Similar difficulties have been experienced with applied research and development. However, in a report of this nature, covering an extensive body of facts developed from a large number of sources, it appears desirable to keep the categories as few, and their definitions as simple, as possible. Admittedly, there is often no clear-cut line of demarcation between categories such as these. Nevertheless, it is evident that very many cases, certainly the majority, may be classified with little difficulty. Thus the names of the categories themselves have a general validity as definitions.

In cases where uncertainty exists with respect to the proper classifications, the advice of research scientists representative of the field or fields concerned is of value. In cases where an overlap between categories exists, the obligation with its associated activity should be assigned to the category most appropriate to the principal emphasis of the undertaking, unless there is a logical basis for subdividing the work among different classifications.

As a general statement, *research* may be said to be systematic, intensive study directed toward fuller knowledge of the subject studied. For proper prosecution it requires highly trained personnel and special techniques.

1. *Basic research* is that type of research which is directed toward the increase of knowledge in science.
2. *Applied research* is that type of research which is directed toward practical applications of science.
3. *Development* is the systematic use of scientific knowledge directed toward the production of useful materials, devices, systems, methods or processes; the term excludes design and production engineering.

*Scientific fields.* In addition to the classification by the nature of the activity, it is also requested that the data be classified according to scientific fields. Short definitions of the field classifications to be used are given below. As in the case of the classification by type of research, it is recognized that many specific undertakings can

be classified only with difficulty and will tend to overlap other fields. Again, it is suggested that, where classification difficulties arise, the opinion of representative research scientists be sought and, that where overlap exists, the obligation be assigned to the category most appropriate to the principal emphasis, unless a logical basis for subdividing the work is present.

1. *Biological, Medical, and Agricultural Sciences.* Generically speaking, the biological sciences are those sciences dealing with life processes. For this report, the biological sciences as a whole are divided into (a) *medical sciences*, i. e., those sciences which, apart from the clinical aspects of professional medicine, are concerned primarily with the utilization of scientific principles in understanding diseases and in maintaining and improving health; (b) the *agricultural sciences*, i. e., those sciences directed primarily toward understanding and improving agricultural productivity such as agronomy, animal husbandry, forestry, horticulture, range management, soil culture, etc.; and (c) *biological sciences*, all sciences other than those listed in (a) and (b) above which deal with life processes. In addition to work done in disciplines traditionally considered as being a biological science there should also be included work done in other disciplines or subjects where the work is undertaken primarily for the purpose of understanding life processes.
2. *Physical, Mathematical, and Engineering Sciences.* For this report (a) *physical sciences* are those sciences concerned primarily with the understanding of the natural phenomena associated with nonliving things; (b) *mathematical sciences* are those sciences which employ logical reasoning with the aid of symbols and which are concerned with the development of methods of operations employing such symbols, including mathematics, pure and applied; astronomy, theoretical mechanics, statistics, logistic research, and computer research exclusive of engineering; (c) *engineering sciences* are those sciences which are concerned with studies directed toward making specific scientific principles usable in engineering practice.
3. *Social sciences* are those sciences directed toward an understanding of the behavior of individuals as members of a group. These include such sciences as cultural anthropology, economics, education, history, logistics, political science, social psychology, sociology, etc. In addition to work done in disciplines or subjects traditionally considered as being a social science, there should also be included work done in other disciplines or subjects where the work is undertaken primarily for the purpose of understanding group behavior.