

**AAAS REPORT  
XXXIX**

**RESEARCH AND  
DEVELOPMENT  
FY 2015**

**Intersociety  
Working  
Group**

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE  
1200 New York Avenue NW, Washington, DC 20005

The AAAS Board of Directors, in accordance with Association policy, has approved publication of this report as a contribution to the understanding of an important process. The interpretations and conclusions are those of the authors and do not purport to represent the views of the Board or the Council of the Association.

Printed in the United States of America

Copyright © 2014 by the  
American Association for the Advancement of Science  
1200 New York Avenue NW, Washington, DC 20005

## **Intersociety Working Group**

(see the Directory at the end of this report for contact information)

American Association for the Advancement of Science  
American Astronomical Society  
American Chemical Society  
American Educational Research Association  
American Geosciences Institute  
American Institute of Aeronautics and Astronautics  
American Institute of Biological Sciences  
American Institute of Physics  
American Mathematical Society  
American Meteorological Society  
American Physical Society  
American Psychological Association  
American Society of Agronomy  
American Society for Nutrition  
American Society of Mechanical Engineers  
Association of American Universities  
Association of Public and Land-grant Universities  
Computing Research Association  
Consortium for Science, Policy and Outcomes at Arizona State  
Consortium of Social Science Associations  
Council on Competitiveness  
Council of Professional Associations on Federal Statistics  
Crop Science Society of America  
Ecological Society of America  
Federation of Animal Science Societies  
Geological Society of America  
Institute of Electrical and Electronics Engineers-USA  
Institute of Food Technologists  
Materials Research Society  
Soil and Water Conservation Society  
Soil Science Society of America

## Contents

List of Tables		vii
Preface		ix
<b>PART I: OVERVIEW</b>		
Highlights		3
Chapter 1	<b>Federal R&amp;D in the FY 2015 Budget: An Introduction</b> <i>Matt Hourihan, AAAS</i>	5
Chapter 2	<b>Historical Trends in Federal R&amp;D</b> <i>Matt Hourihan, AAAS</i>	25
Chapter 3	<b>Political and Policy Context for the FY 2015 Budget</b> <i>Joanne Padrón Carney, AAAS</i>	31
Chapter 4	<b>Education and Workforce Development in the FY 2015 Budget</b> <i>Christine Grant, Yolanda L. Comedy, and Shirley M. Malcom, AAAS</i>	39
Overview Tables		55
<b>PART II: AGENCY R&amp;D BUDGETS</b>		
Chapter 5	<b>Department of Defense</b> <i>Travis Doom, CSPO</i>	71
Chapter 6	<b>National Science Foundation</b> <i>Amy Scott and Tobin Smith, AAU</i>	79
Chapter 7	<b>National Institutes of Health</b> <i>Erin Heath, AAAS</i>	87
Chapter 8	<b>Department of Energy</b> <i>Mark T. Elsesser and Michael S. Lubell, APS</i>	95
Chapter 9	<b>National Aeronautics and Space Administration</b> <i>Steven Howell, AIAA</i>	103

Chapter 10	<b>U.S. Department of Agriculture</b> <i>Elizabeth Allred, Eddie G. Gouge, and Ian L. Maw, APLU</i>	113
Chapter 11	<b>Department of Homeland Security</b> <i>Jodi Lieberman, APS</i>	121
Chapter 12	<b>Other Selected Agencies</b> (Commerce, DOT, Interior, EPA, VA) <i>Kasey Shewey White, GSA; Heather Kelly, APA; and Sara Spizzirri, AAAS</i>	129
Agency Tables		139
Historical Tables		171
<b>PART III: DISCIPLINARY ANALYSES</b>		
Chapter 13	<b>Physics in the FY 2015 Budget</b> <i>Christopher J. Mustain, COC; and Aline D. McNaull, AIP</i>	181
Chapter 14	<b>Astronomy and Astrophysics in the FY 2015 Budget</b> <i>Joshua H. Shiode and Joel R. Parriott, AAS</i>	189
Chapter 15	<b>Weather and Climate in the FY 2015 Budget</b> <i>Paul A.T. Higgins and Shalini Mohleji, AMS</i>	195
Chapter 16	<b>Geosciences in the FY 2015 Budget</b> <i>Abigail Seadler and Maeve Boland, AGI</i>	201
Chapter 17	<b>Biological and Ecological Sciences in the FY 2015 Budget</b> <i>Julie Palakovich Carr, AIBS; and Terence Houston, ESA</i>	207
Chapter 18	<b>Chemical Sciences in the FY 2015 Budget</b> <i>Keri A. Moss, Caroline M. Trupp Gil, and Katherine P. Weber, ACS</i>	213
Chapter 19	<b>Social and Behavioral Science Research in the FY 2015 Budget</b> <i>Wendy Naus and Angela L. Sharpe, COSSA; Heather Kelly and Patricia Kobor, APA; and Gerald E. Sroufe and Christy Talbot, AERA</i>	219

Chapter 20	<b>Federal Statistics in the FY 2015 Budget</b> <i>Katherine R. Smith, COPAFS</i>	227
Chapter 21	<b>Mathematical Sciences in the FY 2015 Budget</b> <i>Samuel M. Rankin, III, AMS</i>	233
Chapter 22	<b>Computing Research in the FY 2015 Budget</b> <i>Peter Harsha and Brian Mosley, CRA</i>	239
Chapter 23	<b>National Nanotechnology Investment in the FY 2015 Budget</b> <i>M. C. Roco, ASME</i>	245
Chapter 24	<b>Electrotechnology-Related Research in the FY 2015 Budget</b> <i>Chris J. Brantley and James Savage, IEEE-USA</i>	255
Chapter 25	<b>Mechanical Engineering in the FY 2015 Budget</b> <i>Dan Deckler, ASME</i>	263
Chapter 26	<b>Materials Science in the FY 2015 Budget</b> <i>Ronald L. Kelley, MRS</i>	271
Chapter 27	<b>Food, Nutrition, Agriculture, and Natural Resource Sciences in the FY 2015 Budget</b> <i>Bethany Johns, ASA, CSSA, SSSA; Sarah Ohlhorst, ASN; Jianrong (Janet) Zhang, IFT; Lowell Randel, FASS; Jim Gulliford, SWCS</i>	277
	Appendix 1: The Federal Budget Process 101	289
	Appendix 2: Methodology and Data Sources	293
	Appendix 3: Definitions	295
	Appendix 4: COSEPP	297
	Appendix 5: Intersociety Working Group Directory	298

## List of Tables

### OVERVIEW TABLES

Table I-1.	R&D in the FY 2015 Budget by Agency	57
Table I-2.	Distribution of the FY 2015 Budget	58
Table I-3.	Historical Trends in R&D and Federal Outlays	59
Table I-4.	Major Functional Categories of R&D	60
Table I-5.	Defense and Nondefense R&D by Character of Work	61
Table I-6.	Federal Homeland Security R&D by Agency	62
Table I-7.	R&D Funding by Congressional Appropriations Subcommittee	63
Table I-8.	Interagency Science and Technology Initiatives	64
Table I-9.	R&D Expenditures at Colleges and Universities	65
Table I-10.	Historical Tables: Federal R&D by Agency, FY 2005-2015	66

## AGENCY TABLES

Table II-1.	R&D in the FY 2015 Budget by Agency and Character of Work	139
Table II-2.	Department of Defense	146
Table II-3.	DOD R&D by Military Departments and Agencies	147
Table II-4.	Department of Defense Basic Research (“6.1”)	148
Table II-5.	Department of Defense S&T (“6.1” – “6.3”)	149
Table II-6.	Department of Homeland Security	150
Table II-7.	National Science Foundation	151
Table II-8.	Department of Health and Human Services	153
Table II-9.	National Institutes of Health by Institute	154
Table II-10.	National Institutes of Health by Funding Mechanism	155
Table II-11.	Department of Energy	156
Table II-12.	National Aeronautics and Space Administration	160
Table II-13.	U.S. Department of Agriculture	163
Table II-14.	Department of Commerce	164
Table II-15.	Department of Transportation	165
Table II-16.	Department of the Interior	166
Table II-17.	Environmental Protection Agency	167
Table II-18.	Department of Education	168
Table II-19.	Department of Veterans Affairs	169
Table II-20.	The Opportunity, Growth, and Security Initiative	170

**Note: Tables within chapters are not included in this list.**



## **HISTORICAL TABLES**

Table III-1.	Department of Defense	173
Table III-2.	Military Departments and Agencies	174
Table III-3.	National Science Foundation	175
Table III-4.	National Institutes of Health	176
Table III-5.	Department of Energy	177
Table III-6.	U.S. Department of Agriculture	178

## **Preface**

Scientific research and development (R&D) continue to be of vital importance to the United States in the 21st century, and the federal role in supporting the national science enterprise remains substantial. The President's annual budget submission and the congressional debate that ensues are the mechanisms through which that role is defined and embellished. Since 1976, AAAS has published an annual report analyzing federal R&D in the proposed budget, to make timely and objective information about the Administration's plans available to the scientific and engineering communities and to policymakers. It originally began in-house at AAAS, under the auspices of the Committee on Science, Engineering and Public Policy (Appendix 5). Shortly thereafter, it became a collaborative effort, and it now involves contributors from more than two dozen scientific, engineering, higher education, and industrial associations known collectively as the Intersociety Working Group (see the Appendix 5 directory at the end of this report for contact information for each association). This year marks the 39th in the series.

Ordinarily, this report is issued at the annual AAAS Forum on Science and Technology Policy, held in Washington, DC in late April or early May. However, the late release of the President's budget has again necessitated a delay in our own publishing schedule. Still, we hope that a late release will not prevent readers from finding these analyses useful, even as the current appropriations cycle appears set to follow regular order, at least for the time being.

The structure of this report parallels recent editions. Part I provides an overview of the budget, the political context of FY 2015, and analyses of major funding trends, as well as funding for science, engineering, and mathematics education. Part II examines the proposed R&D budget by agency and department. Finally, Part III includes cross-cutting analyses that cover the R&D budget by discipline. Tables are interspersed through the volume.

Readers should be aware that chapters have been prepared largely independently of one another and under extremely tight deadline pressure. Although every effort has been made to assure a high quality

product, some overlap and inconsistencies among the chapters are, unfortunately, inevitable.

Many of the chapters reuse a substantial amount of text from prior editions of this report. In most cases, the authorship of the chapters is relatively consistent from year to year, though there is always some change. The Intersociety Working Group hereby acknowledges the efforts of past authors and contributors to this annual report.

On behalf of the members of the Intersociety Working Group, we would like to express our appreciation to the officers, members, and staffs of the participating organizations for their support and assistance in preparing this report. Thanks also to the AAAS Committee on Science, Engineering and Public Policy, which initiated the R&D Program and periodically reviews it and provides guidance to it. We are very grateful to individuals in the Office of Management and Budget, in agency budget offices, on congressional staffs, and elsewhere who aided us in collecting the information and advised us on its interpretation.

Matt Hourihan  
April 2014