

**AAAS REPORT  
XXXVIII**

**RESEARCH AND  
DEVELOPMENT  
FY 2014**

**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 © 2013 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 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 2014 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>	23
Chapter 3	<b>Political and Policy Context for the FY 2014 Budget</b> <i>Joanne Padrón Carney, AAAS</i>	29
Chapter 4	<b>Education and Workforce Development in the FY 2014 Budget</b> <i>Richard A. Weibl, Yolanda Comedy, and Shirley M. Malcom, AAAS</i>	37
Overview Tables		49
<b>PART II: AGENCY R&amp;D BUDGETS</b>		
Chapter 5	<b>Department of Defense</b> <i>Travis Doom, CSPO</i>	65
Chapter 6	<b>National Science Foundation</b> <i>Amy Scott and Tobin Smith, AAU</i>	73
Chapter 7	<b>National Institutes of Health</b> <i>Erin Heath, AAAS</i>	83
Chapter 8	<b>Department of Energy</b> <i>Michael S. Lubell, APS</i>	91
Chapter 9	<b>National Aeronautics and Space Administration</b> <i>Ross B. Garelick Bell, AIAA</i>	101

Chapter 10	<b>U.S. Department of Agriculture</b> <i>Elizabeth Allred, Ian L. Maw, and Eddie G. Gouge, 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		137
Historical Tables		171
<b>PART III: DISCIPLINARY ANALYSES</b>		
Chapter 13	<b>Physics in the FY 2014 Budget</b> <i>Christopher J. Mustain, CoC</i>	181
Chapter 14	<b>Astronomy and Astrophysics in the FY 2014 Budget</b> <i>Joel R. Parriott and Kevin B. Marvel, AAS</i>	189
Chapter 15	<b>Climate in the FY 2014 Budget</b> <i>Jonah V. Steinbuck and Paul A.T. Higgins, AMS</i>	195
Chapter 16	<b>Earth Sciences in the FY 2014 Budget</b> <i>Maeve Boland and Wilson Bonner, AGI</i>	203
Chapter 17	<b>Biological and Ecological Sciences in the FY 2014 Budget</b> <i>Julie Palakovich Carr, AIBS; and Nadine Lynn, ESA</i>	211
Chapter 18	<b>Chemical Sciences in the FY 2014 Budget</b> <i>Keri A. Moss, Caroline M. Trupp Gil, and Katherine P. Weber, ACS</i>	217
Chapter 19	<b>Social and Behavioral Science Research in the FY 2014 Budget</b> <i>Howard J. Silver and Angela L. Sharpe, COSSA; Heather Kelly and Patricia Kobor, APA; and Gerald E. Sroufe, AERA</i>	225

Chapter 20	<b>Federal Statistics in the FY 2014 Budget</b> <i>Katherine R. Smith, COPAFS</i>	235
Chapter 21	<b>Mathematical Sciences in the FY 2014 Budget</b> <i>Samuel M. Rankin, III, AMS</i>	245
Chapter 22	<b>Computing Research in the FY 2014 Budget</b> <i>Peter Harsha and Melissa Norr, CRA</i>	251
Chapter 23	<b>National Nanotechnology Investment in the FY 2014 Budget</b> <i>M. C. Roco, ASME</i>	257
Chapter 24	<b>Electrotechnology-Related Research in the FY 2014 Budget</b> <i>Chris J. Brantley, IEEE-USA</i>	267
Chapter 25	<b>Mechanical Engineering in the FY 2014 Budget</b> <i>Stephen D. Tse, ASME</i>	275
Chapter 26	<b>Materials Science in the FY 2014 Budget</b> <i>Ronald L. Kelley and Jocelyn D. Goldblatt, MRS</i>	285
Chapter 27	<b>Food, Nutrition, Agriculture, and Natural Resource Sciences in the FY 2014 Budget</b> <i>William Fisher, IFT; Sarah Ohlhorst, ASN; Karl Glasener and Karl Anderson, ASA, CSSA, SSSA; Lowell Randel, FASS; and Jim Gulliford, SWCS</i>	291
Appendix 1: The Federal Budget Process	101	303
Appendix 2: Methodology and Data Sources		307
Appendix 3: Definitions		309
Appendix 4: COSEPP		311
Appendix 5: Intersociety Working Group Directory		312

# List of Tables

## OVERVIEW TABLES

Table I-1.	R&D in the FY 2014 Budget by Agency	51
Table I-2.	Distribution of the FY 2014 Budget	52
Table I-3.	Historical Trends in R&D and Federal Outlays	53
Table I-4.	Major Functional Categories of R&D	54
Table I-5.	Defense and Nondefense R&D by Character of Work	55
Table I-6.	Federal Homeland Security R&D by Agency	56
Table I-7.	R&D Funding by Congressional Appropriations Subcommittee	57
Table I-8.	Interagency Science and Technology Initiatives	58
Table I-9.	R&D Expenditures at Colleges and Universities	59
Table I-10.	Historical Tables: Federal R&D by Agency, FY 2004-2014	60

## AGENCY TABLES

Table II-1.	R&D in the FY 2014 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	154
Table II-9.	National Institutes of Health by Institute	155
Table II-10.	National Institutes of Health by Funding Mechanism	156
Table II-11.	Department of Energy	157
Table II-12.	National Aeronautics and Space Administration	161
Table II-13.	U.S. Department of Agriculture	164
Table II-14.	Department of Commerce	165
Table II-15.	Department of Transportation	166
Table II-16.	Department of the Interior	167
Table II-17.	Environmental Protection Agency	168
Table II-18.	Department of Education	169
Table II-19.	Department of Veterans Affairs	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 Directory at the end of this report for contact information for each association). This year marks the 38th 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 necessitated a delay in our own publishing schedule. Still, we hope that a late release will not prevent readers from finding these analyses useful, especially given the recent trend towards (very) late appropriations.

The timing of the President's budget is not the only victim of late appropriations. The FY 2014 request does not adjust for either the final FY 2013 appropriations or sequestration, and compares the request to FY 2012 estimates. What this means is that the FY 2013 figures presented by the Administration are unusually imprecise. Rather than simply report those numbers as they are, we have taken the unusual step of generating rough estimates of R&D funding in FY 2013, incorporating adjustments from the final appropriations bill and accounting for sequestration. These estimates are certainly subject to revision, and may already be outdated by the time of publication. Nevertheless, we felt it important to present readers with at least a rough idea of where FY 2013 funding might end up at the time of this writing.

The structure of this report parallels recent editions. Part I provides an

overview of the budget, the political context of FY 2014, 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, and key congressional debates surrounding each. Finally, Part III includes cross-cutting analyses that cover the R&D budget by discipline. Tables are interspersed through the volume.

Two notable additions are included this year. A new set of tables in Part II show agency R&D funding since FY 2004. Second, a new appendix provides a basic summary of the federal budget process for budget neophytes.

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. When this is the case, and authorship changes significantly, acknowledgment is given at the end of the chapter. In most cases, the authorship of the chapters is relatively consistent from year to year and this acknowledgement is not given explicitly. For those cases, 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  
May 2013