

Federal R&D and Scientific Innovation



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FOREWORD

The ACS SYMPOSIUM SERIES was founded in 1974 to provide a medium for publishing symposia quickly in book form. The format of the Series parallels that of the continuing ADVANCES IN CHEMISTRY SERIES except that in order to save time the papers are not typeset but are reproduced as they are submitted by the authors in camera-ready form. Papers are reviewed under the supervision of the Editors with the assistance of the Series Advisory Board and are selected to maintain the integrity of the symposia; however, verbatim reproductions of previously published papers are not accepted. Both reviews and reports of research are acceptable since symposia may embrace both types of presentation.

PREFACE

Over 50% of all research and development funds in the United States originates from the federal government. How to most efficiently effect commercialization and utilization (innovation) of this large amount of research and development remains an ongoing challenge.

The unique nature of federally funded R&D, in addition to its size, makes this a special topic in its own right. A number of problems for commercialization and, therefore, innovation are similar to industrially supported research. However, a great many more problems are not related, including ownership of patent rights, goal-oriented programs not related to the commercial market, lack of incentives, questions as to the extent of government involvement, etc.

In order to obtain current thinking, experience, and comments relating to the commercialization of federally funded R&D, the Division of Industrial and Engineering Chemistry of the American Chemical Society sponsored a symposium on this topic "The Commercialization of Federally Funded R&D" during the National meeting held in Miami Beach, Florida.

The participants in this symposium were selected because they represented either government or nongovernment organizations, and because they were involved directly in the problem of commercialization of federally funded R&D.

Because of outside interest in this symposium, we have added related papers for the publication of this book. "Innovation" has been added to the title to better reflect the relationship of these papers to what will be the long standing concern of the entire research and development area of the United States—government and private sector.

This book is not the final word, but is an initial statement by many of the participants who are directly involved in and concerned with ways to more extensively and effectively utilize the results of federally funded R&D.

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INTRODUCTION

Innovation has entered the language of national politics, and it is a term that begs to be understood. A baffling set of dilemmas involving the relationships between the market economy and government surround the choices to be made in the sphere of public policy. Straight-line solutions are suspect because innovation involves as much art as invention, and because a multitude of institutional forces converge on the process of innovation. Among them are the legal system, economics, social policy, management, and politics.

We have been here before. It is not the first time that the question of the role of government in influencing the shape and quality of the industrial economy has been before us. Too often it has been the case that governmental intervention has been of the adversarial kind. Now we are observing the discovery by government that innovation suffers from some kind of drag, and the problem is to distinguish between government-induced causation and that which arises from within the industry sector itself. It will not be easy, and it may not be done quickly. It remains to be seen what innovation needs most: public policy action or public policy reform.

There is a degree of consensus at the core of the debate. In terms, it admits to a shared apprehension that the historical dynamics of industrial risk-taking, new market formation, and technological innovation are not working according to form, and that the resulting decline in innovative vitality spells bad news for the future worth and advancement of the national economy. Surface signs of a genuinely ailing economy are plainly visible in the tortured state of the dollar on the international exchanges, dismal productivity, and tenacious inflation. Coupling this syndrome with anxiety over innovativeness and a prevailing business climate that hedges risk-taking may be, on the one hand, a case of mixing chalk and cheese or, on the other hand, an admirable flash of intuition. It is very hard indeed to dismiss the probability of a connection.

Whatever may ail the once rampant dynamic of U.S. technological exuberance, and whatever the superficial or fundamental remedies, astonishingly little mind is being paid, in high echelons of economic policy management, to the function performed by research, development, and innovation in influencing the performance, near or long term, of the national economy. Though the point has been taken at the political level in President Carter's summons to "a new surge of technological innovation," it has not shown up conspicuously in the essays of his economic general

staff. The field of policy attention is limited, on government's side, to the Commerce Department, the President's Science Adviser, the National Science Foundation, and scattered interest in the Congress. As for the business sector, there has been no dearth of alarm and less reluctance to indict flawed public policy as the source of the mischief.

The old myth about the separateness between the "private" and "public" sector was demolished long ago. The U.S. market economy is far from resembling the classic free market. Its performance is heavily socialized and politicized, both directly and indirectly through government's influence on the climate of risk and benefit, to say nothing of the play of such externalities as foreign energy pricing and supply. All this, coupled with the sophistication of decision analysis systems in corporate resource allocation, sharpens the sensitivity of business to the uncertainties and contradictions of the public sector. Though the environments and the working premises of the two sectors are poles apart, they mingle and traffic in the real world in a way that suggests nothing as much as the scientific phenomenon known as the Brownian movement.

Research and development strategies of government and industry might, in a rational political economy, be complementary. In the case of major competitors and adversaries of the U.S., they are indeed; but not here. Whether this is good or bad, for us is a debaters' argument laced with opposing premises. To bring proprietary R&D within some orbit of combined public/private rationalization might simply start us on a long journey to nowhere. Conversely, the total lack of combined strategy may lie precisely at the heart of the disruption of innovative capacity and a drifting national economy.

An introduction is no place to settle that argument. The provocative papers which the American Chemical Society has assembled from its 1978 Symposium on "The Commercialization of Federally Funded R&D" serve better to draw the lines and examine the predicament from a wide spectrum of thought, evidence, and opinion. Though the topic is centered on the role of federally funded R&D in generating commercialization, the authors have not been shy in addressing the larger context of problems of choice in rationalizing the infrastructure of innovation. All sides are heard from: industry, government agencies, Congressional staff, and independent experts whose qualifications are more than ample to contribute to the discussion. One can hope that our harassed policy makers in board rooms, in the Administration, and in the Congress will have the interest and the open minds to reflect on what is here.

American Association for the Advancement
of Science

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March 13, 1979

CONTENTS

Preface	vii
Contributing Authors	ix
Introduction	xiii

OVERVIEW

1. The Political Nature of Civilian R&D Management	3
Stephen A. Merrill	
2. Can You Innovate in Uncle Sam's Embrace?	15
Arlen J. Large	
3. Federal Policy Concerns Regarding Commercialization of Federally Funded R&D	23
Richard Penn	
4. Productivity in Federally Funded R&D Programs	31
Albert T. Maasberg	

APPROACHES

5. Cooperative Agreements: A Key to Accelerated Industrial Innovation	39
Michael Michaelis	
6. The Federal Role in Industrial Energy Conservation Technology ..	53
Douglas G. Harvey	
7. NASA Technology Utilization Program	65
Leonard A. Ault	
8. Patents and Technology Transfer	79
William O. Quesenberry	
9. Commercialization of Technology Through the Federal Laboratory Consortium for Technology Transfer	87
Charles F. Miller	

ANALYSIS

10. Commercialization of R&D Results	97
Robert J. Creagan	
11. Commercialization and the Assessment of Federal R&D	113
George Tolley and Stuart Townsend	
12. Assessing the Government Role in the Commercialization of Federally Funded R&D	129
Alden S. Bean and J. David Roessner	

CASES

13. Federal R&D as an Internal Push for Commercialization of Technology	151
Clyde McKinley	
14. Commercialization of a New Starch-Based Polymer	161
William M. Doane	
Index	165

OVERVIEW

The Political Nature of Civilian R&D Management¹

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Contributors to this symposium and other discussions and studies preceding it share a belief in the desirability of commercializing the products of Federal research and development efforts as a way of serving important public needs and increasing the productivity of Federal expenditures. They are concerned that the results so far are mixed; few doubt that efforts to transfer Federal R&D products to the private sector have encountered difficulties and fallen short of their potential. Often the conclusion is that we must systematically identify the barriers to commercialization, whether in government policies and program management or in the market, and devise ways of overcoming them. It is presumed that program and project managers will follow effective innovation strategies if they are made aware of them. The implication of these assumptions is that the issue is one of means, not ends.

A number of observations suggests otherwise, at least with regard to that part of the Federal R&D effort whose purpose is to produce widely distributed social benefits, primarily through the commercialization of new products, processes and services. The growing criticism of direct government interventions in the

¹ The views expressed in this paper are those of the author, but they reflect the broader concerns of the Senate Commerce, Science, and Transportation Committee and, in particular, its Subcommittee on Science, Technology, and Space. The Subcommittee was reconstituted in 1977 as a result of the sweeping Senate reorganization, which enlarged the jurisdiction of the Commerce Committee by giving it legislative authority and oversight responsibility for NASA and Federal research and development policy generally as well as the Office of Science and Technology Policy and the science and technology activities of the Commerce Department.