

91st Cong. 1st sess. [COMMITTEE PRINT]

TECHNICAL INFORMATION  
FOR  
CONGRESS

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REPORT

TO THE  
SUBCOMMITTEE ON SCIENCE, RESEARCH,  
AND DEVELOPMENT  
OF THE  
COMMITTEE ON SCIENCE AND ASTRONAUTICS  
U.S. HOUSE OF REPRESENTATIVES  
NINETY-FIRST CONGRESS  
FIRST SESSION

PREPARED BY  
THE SCIENCE POLICY RESEARCH DIVISION  
LEGISLATIVE REFERENCE SERVICE  
LIBRARY OF CONGRESS

Serial A



APRIL 25, 1969

Printed for the use of the Committee on Science and Astronautics

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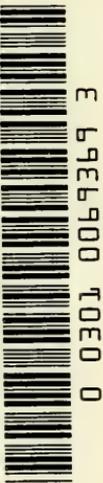
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## LETTER OF TRANSMITTAL

APRIL 25, 1969.

HON. GEORGE P. MILLER,  
*Chairman, Committee on Science and Astronautics,  
House of Representatives,  
Washington, D.C.*

DEAR MR. CHAIRMAN: Pursuant to the identification in 1965 of the area of technology assessment as a major activity of the subcommittee, work has been proceeding steadily along two lines. One of these has been investigations and inquiry by the committee itself; second, has been the instigation of a number of special studies dealing with different phases of technology assessment by outside groups.

This report by the Science Policy Research Division of the Library of Congress represents the completion of the first of the outside studies. It was inaugurated by the subcommittee late in 1967. Substantive work began several months later following the formulation of specific objectives and study parameters.

In our view, the report represents a major effort to delineate the kinds of scientific and technological problems which Congress is increasingly being called upon to face. It also illustrates in specific terms just how these problems have been approached and handled by the Congress during the peak technological era in American history—that is, the period from the close of World War II up to the present time.

This study should be of use to every member of the Congress. For our committee, it should serve an indispensable purpose in helping us determine what precise mechanism for technology assessment now needs to be established. We believe the effect of the report will be a lasting one, both as a reference work of great intrinsic merit and as a guide to the science policies of tomorrow.

Sincerely yours,

EMILIO Q. DADDARIO,  
*Chairman, Subcommittee on Science, Research and Development.*

## LETTER OF SUBMITTAL

THE LIBRARY OF CONGRESS,  
LEGISLATIVE REFERENCE SERVICE,  
Washington, D.C., April 18,\* 1969.

HON. EMILIO Q. DADDARIO,

*Chairman, Subcommittee on Science, Research, and Development, Committee on Science and Astronautics, House of Representatives, Washington, D.C.*

DEAR MR. DADDARIO: I am pleased to submit the study, "Technical Information for Congress," in response to your request.

The study contains 17 chapters. The first two chapters contain introductory discussion about the problems of congressional management of information about technical issues, and indicate the approach to be taken in studying them. These are followed by 14 chapters, each presenting a case study of one particular technical issue that underwent congressional scrutiny and action. A closing chapter of summary observations and conclusions brings together the salient elements of the entire study.

The project was under the direction of Dr. Franklin P. Huddle, of the Science Policy Research Division. He was assisted by Miss Genevieve Knezo, who prepared drafts of chapters 4, 6, 9, 12, and 13, and managed bibliographic referencing for the entire study.

Many persons in and out of government contributed source data, and deserve our thanks. Staff members of the Legislative Reference Service, and particularly in the Science Policy Research Division, under the direction of Dr. Charles S. Sheldon II, reviewed the manuscript and contributed to its completeness. Particular acknowledgement is made of the helpful guidance of Mr. Philip B. Yeager, counsel to the Committee on Science and Astronautics, who monitored the project for your subcommittee.

On behalf of the staff of the Legislative Reference Service, may I express my enthusiasm for this interesting, demanding, and, I believe, productive assignment.

Sincerely,

LESTER S. JAYSON, *Director.*

(IV)

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\* Anniversary date.

## PREFACE

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The findings of this study can be stated briefly. Few politicians are scientists, and few scientists are politicians. In the communication of technical information from one group to another, some members of the receiving group, as well as the members of the transmitting group, need to have special qualifications.

To help the Congress to assure itself of the quality and thoroughness, as well as to determine the direction and validity, of the technical testimony it receives calls for a strengthening of the resources of personnel that serve it. The requirement is for support by specialists with adequate and sound qualifications for understanding, analyzing, and interpreting technical testimony.

Technical issues requiring congressional resolution are becoming broader in scope; they are more serious, more complex, and more urgent. Information about them is voluminous and abstruse. The division of labor among the continuing committees of Congress, by which some Members become quasi-specialists on each issue, is becoming increasingly hard to plan and execute. Congressional penetration into new technical issues is becoming more onerous and time consuming.

Arrangements are needed to shorten the leadtime in the making of congressional decisions on technical matters. Leadtime can be shortened by improving the management of technical information. Sound management of technical information can improve the sources of information to raise its quality. It can structure it to bring out its essentials, analyze it to test its completeness, and filter it to eradicate inaccuracies, contradictions, and irrelevancies.

The leadtime can be further reduced. Anticipatory studies by a capable staff can identify technical issues likely to require future resolution by the Congress. The collection of reliable factual information about such potential issues can take place in advance, uncolored by political controversy, and unhurried by the pressures of urgent need. Then, when the issue needs to be decided, the groundwork will have been done and the Congress can more quickly and confidently come to grips with the political assessment of the problem.



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**PART I**

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**TECHNICAL INFORMATION FOR CONGRESS**

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# CONTENTS

## PART I

### TECHNICAL INFORMATION FOR CONGRESS

	Page
Chapter One—Introduction.....	1
Statement of the problem.....	1
Plan for the study.....	1
Chapter Two—Some general observations on science and government....	5
The search for a common ground.....	5
The political framework.....	8
The scientific framework.....	11
Chapter Three—AD-X2: The difficulty of proving a negative.....	14
I. Background of the case.....	14
The story in brief.....	14
Relevant historical elements in the background.....	15
Issues growing out of the AD-X2 case.....	17
The illustrative features of the case.....	18
II. Beginnings of the AD-X2 story.....	19
The protagonist: Mr. Jesse M. Ritchie.....	19
Uncertain composition of the battery additive AD-X2.....	20
III. How the AD-X2 issue came before the Congress.....	22
Bureau of Standards involvement with AD-X2.....	23
The Federal Trade Commission and AD-X2.....	26
The Post Office Department and AD-X2.....	28
AD-X2 and the Office of the Secretary of Commerce.....	29
AD-X2 and the Senate Select Committee on Small Business.....	31
IV. Management of the issue.....	35
Structuring the issue.....	36
Assessment of the issue.....	39
Definition of alternatives.....	39
V. Sources of the committee's information.....	40
Testimony of Ritchie before the committee.....	40
Testimony of Dr. Astin on AD-X2 and NBS.....	42
Dr. Weber's description of the MIT tests.....	45
Other technical evidence presented to the committee.....	46
Recapitulation: A plethora of data.....	46
VI. The decisionmaking method.....	47
The decision method in the testing issue.....	48
The decision method in the regulatory issue.....	49
The decision method in the science policy issue.....	51
VII. The outcome of the AD-X2 controversy.....	52
Direct consequences of the controversy.....	54
Indirect consequences of the controversy.....	54
VIII. Lessons of the controversy—The role of scientific information..	56

	Page
Chapter Four—The point IV program: Technological transfer as the basis of aid to developing countries.....	61
I. The point IV problem and its background.....	61
Summary of the legislative history of point IV.....	62
II. Central issues of point IV as seen by Congress and the administration.....	64
Political justification.....	64
Business and financing.....	65
The alternative of a study commission.....	68
III. The role of technology in economic development.....	68
IV. U.S. experience with technical assistance before 1950.....	78
V. Importance of long-range, comprehensive, and integrated development programs.....	81
VI. Evaluation of aspects of the point IV program.....	84
Research.....	84
Personnel.....	86
Agriculture.....	87
Business.....	89
Labor.....	90
Education.....	91
Population.....	92
VII. Conclusions.....	94
Chapter Five—Inclusion of the social sciences in the scope of the National Science Foundation, 1945-47: A groundwork for future partnership.....	97
I. Background of the issue.....	97
Origins of the National Science Foundation concept.....	97
The decision process on NSF legislation.....	102
Contemporary relevance of the social science issue.....	103
II. Issues confronting acceptance of the social sciences in 1945.....	104
III. Lessons of the Senate hearings on NSF bills.....	106
Testimony of the physical scientists.....	106
Testimony of the social scientists on NSF legislation.....	109
Social science views of Government witnesses.....	112
IV. Structuring the issue.....	112
V. The decision process—Senate and House.....	115
Congressional adoption of permissive formula in 1947.....	117
VI. Contemporary views of the social science community.....	119
VII. Federal sponsorship of social science research after 1950.....	121
Growth in social science sponsorship by NSF.....	122
Present status of the social sciences.....	125
Effect of deferred decision on the social sciences.....	125
Chapter Six—Congressional response to Project Camelot.....	126
I. Introduction.....	126
II. Establishment of the issue.....	128
Military uses of behavioral research in foreign areas.....	128
The rise and demise of Project Camelot.....	131
Administration activities.....	131
Congressional reaction.....	133
Congressional inquiry.....	134
DOD's need for foreign area social science data.....	134
The conduct of foreign area research by the Department of State.....	136

Chapter Six—Continued	
III. Determination of alternatives and enlargement of the scope of the issue	Page 137
Foreign area research coordination	137
Subcommittee concern for the relationship of the social sciences and the Federal Government	137
Assessment of the social science/Federal Government relationship	138
Congress	138
Social science response	140
Constructive criticism	141
The Administration responds	143
DOD and NAS	143
State Department	144
Other responses in the "Advisory Community"	144
IV. Congressional response	145
Fascell bills—Toward a national social science policy	145
National Science Foundation	145
NSF information assessed	146
National Foundation for the Social Sciences	147
Objectives	147
Testimony received	148
Federal support of social sciences	150
Foreign area social science research	150
Administrative mechanisms	151
Responsibilities of social scientists in policymaking	152
The proposal for a Social Science Foundation	152
Pro	152
Con	153
V. Consequences of Camelot for Government social science	153
Military-sponsored foreign area research	153
State Department response	153
DOD response	154
The social sciences and the Federal Government	156
The proposal to create a National Foundation for the Social Sciences, and amendment of the National Science Foundation	156
Congressional stimulation of administration and legislative assessment of the problem	158
Social science response	158
Administration response	158
Conclusion	159
Chapter Seven—Congressional concern with the decline and fall of Mohole	161
I. Background of the Mohole issue	161
The situation facing the earth sciences in 1957	162
Evolution of Project Mohole	162
Mohole's administrative growing pains	164
Issues raised by the Mohole episode	167
Relevance of the Mohole experience for the future	169
II. The case in Congress	171
Possible congressional response to AMSOC first feasibility report	171
Congressional assessment following phase I success of Mohole	172
Congressional review following Mohole contract placement	176
The intermediate versus the ultimate drilling vessel	177
NSF interrogation by Subcommittee on Science, Research, and Development	183
Congressional action to terminate the Mohole project	185
III. Conclusions	188
Chapter Eight—The test ban treaty—A study in military and political cost effectiveness	193
I. Introduction	193
Issues and consequences of the treaty	193
Obstacles to acceptance of the treaty	194
Considerations favoring approval of the treaty	196
Assessment of the process of approving a weapons treaty	198

Chapter Eight—Continued	Page
II. Background of the issue.....	199
Status of nuclear tests in 1961.....	199
President Kennedy's search for a test ban agreement.....	199
Collapse of the test moratorium.....	200
Impetus to détente after Cuban missile crisis.....	201
Divisions of opinion on test ban scope.....	202
Indications of United States and Soviet Union détente.....	203
Guidelines for treaty negotiations.....	204
Completion of the negotiation process.....	205
III. The test ban treaty hearings.....	206
Complications of hearings in two committees.....	207
Testimony of the Secretary of State.....	208
Testimony of the Secretary of Defense.....	210
Testimony of the Chairman of the AEC.....	212
Testimony of the Chairman of the JCS.....	213
Testimony by opponents of the treaty.....	215
Technical support for the treaty.....	216
Legal and political considerations, pro and con.....	218
Analysis of political impacts of the treaty.....	220
Hearings before Preparedness Investigating Subcommittee.....	222
Military opposition: The theory of maximum deterrence.....	223
IV. Reports of the committees.....	226
Findings of the Foreign Relations Committee.....	228
Committee citations of principal points in testimony.....	228
Importance ascribed to military safeguards.....	229
Findings as to proliferation, plowshare, radiation, military acceptance.....	230
Findings of Preparedness Investigating Subcommittee.....	230
Military advantages neglected by the subcommittee.....	232
V. Final Senate decision process on the treaty.....	232
Preservation of the treaty from "eroding" amendments.....	233
Protection of Senate prerogatives in treaty-making.....	234
Preservation of the national security under the treaty.....	234
VI. The aftermath and the significance of the Test Ban Treaty.....	238
Expectations of President Kennedy for the Treaty.....	238
Future guidance afforded by the treaty debates.....	239
Chapter Nine—Establishment of the Peace Corps.....	241
I. Introduction.....	241
II. Identification of the issue.....	242
Congressional proposals by Reuss and Neuberger.....	243
The Peace Corps bill introduced by Senator Humphrey.....	244
The Kennedy proposal.....	245
Public reaction pro and con to the Peace Corps plan.....	245
III. Assessment of the issue.....	246
International versus National Peace Corps.....	247
Evolving scope of the plan through professional reviews.....	247
The Reuss conferences on Peace Corps proposals.....	248
Peace Corps evaluation contract for the Congress.....	248
The Peace Corps task force report to the President.....	250
IV. Information assessed by the Congress.....	251
Grassroots technology aspects in Peace Corps presentations.....	252
V. Congressional hearings and enactment of legislation.....	253
Objections.....	254
Compatibility of the Peace Corps with U.S. foreign policy and goals.....	254
Language training.....	255
Enactment of the Peace Corps legislation.....	255
VI. Assessment of consequences.....	255
Neglect of research as a major program defect.....	257
Technology transfer in the Peace Corps.....	259
VII. Conclusion.....	261

	Page
Chapter Ten—High-energy physics: An issue without a focus.....	263
I. Introduction.....	263
Priority of high-energy physics among basic research disciplines.....	265
Direct rewards of national investment in high-energy physics.....	266
National security aspects of high-energy physics.....	266
Indirect social benefits of high-energy physics.....	267
Considerations of continued Government support.....	268
Recapitulation.....	269
II. Advice to the Congress on high energy physics.....	270
The technical advisory panel as a mechanism to advise Congress.....	271
Presidential support for high-energy physics programs.....	277
Hearings before the Joint Committee on Atomic Energy.....	278
Testimony of the Director of the National Science Foundation.....	280
Panel discussion by senior Government officials.....	281
Roundtable discussion in Joint Committee on Atomic Energy hearing.....	282
III. Status of high-energy physics support after 1965.....	285
Chapter Eleven—The Office of Coal Research: The use of applied research to restore a "sick" industry.....	288
I. Statement of the problem.....	288
The changing product mix of energy sources.....	288
Problems and opportunities in coal research.....	290
National moves to strengthen the coal industry.....	291
Plan of investigation of the Special Subcommittee on Coal Research.....	294
II. The investigation by the Special Subcommittee on Coal Research.....	295
Scope of testimony in coal research hearings.....	296
Position of Bureau of Mines on expanded research in coal.....	296
Scope of potentially useful research in coal.....	298
Proposed magnitude of expanded coal research effort.....	299
Organizational issues in expanded coal research program.....	300
Findings of the Special Subcommittee on Coal Research.....	301
III. Subsequent history of the coal research program.....	301
Presidential veto of independent coal research agency.....	302
Provisions of the Coal Research Act.....	303
Implementation of the Coal Research Act.....	303
Uncertainties over the goals of the program.....	305
Status of coal research program in 1968.....	305
IV. Assessment of OCR in the light of congressional objectives.....	307
Consideration of the information-gathering procedures leading to the Coal Research Act.....	307
Chapter Twelve—Congressional response to the Salk vaccine for immunization against poliomyelitis.....	309
I. Introduction.....	309
Increasing incidence of polio in early 1950's.....	309
Present immunization treatments for polio.....	310
Controversy over introduction of the Salk vaccine.....	310
Congressional concern over Salk vaccine distribution.....	312
II. Congressional consideration of arrangements for distributing the new vaccine.....	312
Early difficulties with quantity production.....	313
The distribution issue in congressional hearings.....	313
Distribution—The administration plan.....	314
III. The safety and efficacy aspects of the vaccine.....	319
Initial congressional probes of the safety and efficacy issue.....	320
Technical questions probed by House Commerce Committee.....	324
Additional sources of technical information tapped by Commerce Committee.....	327
Acceptance of enabling legislation for distribution of vaccine.....	331
IV. Assessment of the congressional information process.....	331
Smooth acceptance and distribution of Sabin vaccine.....	334

	Page
Chapter Thirteen—The Water Pollution Control Act of 1948: the dilemma of economic compulsion versus social restraint.....	337
I. Introduction.....	337
The issues of national water pollution and pollution control.....	337
Evolving problems with water pollution in prewar years.....	340
II. Postwar consideration of antipollution legislation.....	341
Legislative proposals for water pollution abatement in 1947.....	341
Testimony in support of the water pollution control bill.....	343
Industrial opposition to Federal pollution control.....	346
Ambivalence of State and municipal views on Federal legislation.....	348
Interagency contest over pollution control jurisdiction.....	349
Summary of positions of groups for and against the legislation.....	350
Final congressional action on 1948 water pollution control bill.....	351
III. Gradual evolution of comprehensive pollution control.....	352
National assessments of water needs and resources.....	352
Resistance to amending legislation, 1954-55.....	353
Passage of the 1956 amendments; presidential reservations.....	354
Renewed activity in Federal control legislation after 1960.....	355
Significance of the 1948 act for subsequent pollution control.....	356
Chapter Fourteen—Thalidomide: The complex problem of drug control in a free market.....	357
I. Introduction.....	357
Medical and pharmaceutical ethics in a free enterprise economy.....	357
Background of the thalidomide episode.....	358
II. Criticism of ethical drug industry in antitrust investigation, 1959-61.....	362
Professional criticism of drug industry and drug control.....	363
The need for strengthening of arrangements for drug evaluation.....	367
Senate conclusions of drug investigation.....	368
III. Proposals to strengthen control of new drugs, 1961-62.....	369
Improved drug information program of AMA.....	369
Recommendations of the National Academy of Sciences.....	371
Senate hearings on Drug Industry Antitrust Act.....	372
IV. The thalidomide story.....	375
Early evidences of thalidomide side effects.....	377
Medical determination that thalidomide was associated with phocomelia.....	378
Fortunate exclusion of thalidomide from U.S. markets.....	380
The thalidomide testing program in the United States.....	381
V. Congressional response to the thalidomide near-disaster.....	385
Presidential interest in drug efficacy and safety.....	386
The spate of drug testimony available to Congress.....	387
Provisions of the 1962 Drug Act for increased Federal control.....	390
VI. Aftermath of the thalidomide episode.....	391
Implementation of the Drug Amendments of 1962.....	391
Evaluation of efficacy, safety, and comparative merits of drugs.....	393
The issue of generic versus brand name drugs; clinical equivalence.....	395
Problems in the exchange of drug information.....	396
Proposals for an authoritative drug compendium.....	398
Report on biochemical mechanism of phocomelia from thalidomide.....	400
VII. The continuing problem of securing and using scientific guidance on drug issues.....	400

Chapter Fifteen—The Insecticide, Fungicide, and Rodenticide Act of 1947	Page
I. Introduction	404
An overview of public attitudes on pesticide regulation	404
Trends in scientific agriculture after 1860	405
Essentiality of pesticides in single-crop farming	406
Alternatives to chemical control of pests	406
Federal regulation of agricultural pesticides	407
The dilemma of pesticide contamination and essentiality	408
II. Congressional consideration of pesticide legislation, 1946-47	409
Hearings on H.R. 1237, the 1947 pesticide bill	410
Legislative action on H.R. 1237	412
III. Growing awareness of important secondary effects of pesticide residues	414
Medical interest in human response to insecticide toxicity	416
Appearance of "Silent Spring"; wide impact of its message	417
IV. Conversion of pesticide issue into the issue of total environmental preservation	419
Resolution of the chemical pesticide issue	421
Pesticides as one of many pollutants of the environment	424
Chapter Sixteen—Congressional decisions on water projects	426
I. Introduction	426
Growing complexity of water management	427
II. Evolution of U.S. policy in water resource management	429
The search for coherence in water planning	432
Emphasis of Truman administration studies on social goals	435
Growing importance of qualitative criteria	436
Allocation of costs and benefits; economic analysis in planning	439
III. Senate investigation into national water policy	447
Manning and staffing of the investigation	448
The time-phased program of committee operation	449
The findings and recommendations of the select committee	453
Committee rejection of restrictive cost/effectiveness formulas	456
IV. Impact of the select committee's report	457
Easing of departmental criteria for projects	458
Increased attention of Kennedy administration to water research	458
Coordinated development of drainage system water projects	460
V. Observations on the resolution of the water policy issue	463

---

## PART II

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### SUMMARY

I. Introduction	473
The conceptual framework: Decisionmaking in Congress	473
Congressional management of issues in process	473
The kinds of information required for decisionmaking	474
Acceptance of a problem for decisionmaking	474
Preparation for structuring the problem for decision	474
Structuring and deciding the issue	475
Differences between scientific and political decisionmaking	475
Differences between scientific and political information	475
Procedures and methodology used in the study	476
Scientific and political behavior in contrast	479

	Page
II. Fields of congressional concern in science policy decisions.....	480
Political identification of incompatibilities of man with his environment.....	480
Determination of political goals and their relative priorities, in improving the compatibility of man with his environment....	480
The forecasting of technology.....	480
Establishment of technological goals and priorities.....	480
Establishment of related basic and supporting research goals and priorities.....	481
Applied technological system building.....	481
Technological assessment.....	481
Technological control.....	481
Technological transfer.....	481
Management of technological obsolescence.....	482
Science policy factors relevant to cases studied.....	483
III. The technical information function in political decisionmaking:	
The cases summarized.....	484
Case 1: The AD-X2 battery additive.....	484
Case 2: The point IV program.....	485
Case: Inclusion of the social sciences in the National Science Foundation (1946).....	486
Case 4: Project Camelot.....	488
Case 5: Mohole.....	489
Case 6: The Test Ban Treaty.....	491
Case 7: The Peace Corps.....	492
Case 8: High energy physics.....	493
Case 9: The Office of Coal Research.....	495
Case 10: The Salk vaccine.....	497
Case 11: Water Pollution Control Act, 1948.....	499
Case 12: Thalidomide.....	500
Case 13: Federal pesticide control, 1947.....	502
Case 14: Criteria for water projects.....	504
IV. Some elements of technical information for political decisionmaking..	506
Priority of a technical issue embedded in a political issue.....	506
Some obstacles to the receiving by Congress of technical information..	507
Hypotheses.....	507
Sensationalism.....	507
Outstanding personalities as witnesses.....	508
A list of "near impossibilities".....	508
Technical differences of opinion.....	509
Administration versus Congress.....	509
V. Technical information-gathering methodologies useful for the Congress	
Congressional information sources on technical issues.....	510
Congressional requirements for technical information.....	513
Ways to secure information pertinent to the issue.....	513
Assuring authoritative, accurate, objective, technically sound information.....	514
Authoritative.....	514
Accurate.....	514
Objective.....	514
Technically sound.....	515
Arrangements to assure completeness of technical information.....	515
Staff functions.....	516
Classes of witnesses.....	517
Modes of information gathering.....	518
Data analysis.....	518
Iterative nature of the process.....	519
Achievement of maturity and full development of structured information.....	519
Organization of a system to achieve and maintain technical perspective.....	519

## TECHNICAL INFORMATION FOR CONGRESS

(Case Studies of Information Collection and Analysis to Support  
Congressional Decision-Making on Technical Issues)

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### CHAPTER ONE—INTRODUCTION

This report is introductory to a series of case studies of selected past decisions by the Congress involving the interface between science and politics. The focus of the case studies is on the sources of the scientific and technical information and advice received by those participating in the decision process. The purpose of the case studies is to shed light on the processes involved in congressional decisions on scientific issues.

#### STATEMENT OF THE PROBLEM

The Congress of the United States has the responsibility under the Constitution for making the law. Increasingly, the lawmaking function has been taking on a scientific content. The necessity has accordingly arisen for Members of Congress to participate in many decisions relating to science.

They must resolve issues and make laws for the achievement of social objectives involving programs, activities, and persons characterized as "scientific." The problem is: How do politicians obtain information and advice from scientists?

In order to investigate this subject, a case study approach has been proposed that will illustrate the dimensions and the character of this question. The distinctive features of the scientific world and the political world can be recognized and described. The nature and problems of communication between these two worlds can, it is hoped, be presented in meaningful terms.

#### PLAN FOR THE STUDY

The case histories to be examined in the following chapters of this study are purposefully selected to bring out the various aspects of the problem. They are selected to reveal how the Congress, in dealing with various kinds of scientific issues and by various kinds of decision mechanisms, has obtained and applied scientific advice and information.

In selecting instructive cases to bring out the essential elements and problems of the scientific advisory function relative to political decisionmaking, the following criteria were used for an initial screening:

1. Reasonably recent (since World War II).
2. Significant enough to have evoked some debate.

3. Involving a definable political decision of a definable issue.

4. Concerned with a political issue having substantial scientific or technological content.

5. Presenting difficulties of communication between scientists and politicians.

Other consideration in the selection of cases included—

1. Achievement of widely representative examples, including basic research (big science, little science); applied science (the four categories cited on p. 11); and technology (the same four categories); science matters of local, regional, national, and international concern; problems concerning a science project, a regulatory problem, a treaty, and legislative oversight.

2. Achievement of widely representative examples as to the variety of congressional decision mechanisms, the ways issues arise and come to Congress, and the pattern of derivative subsidiary issues.

Fourteen cases have been selected for study. It is believed that these provide a sufficient range of variation in subject matter, sources and kinds of information inputs needed and used, and decisionmaking procedures employed by the Congress. The first case, that of the battery additive controversy, is taken up to illustrate the kinds of questions and issues that are evolved at the interface between science and politics. Other cases to be considered include—

The issues of basic science (Mohole, High-energy physics);

The issues of applied biomedical research (Thalidomide);

The issues of resource research (Office of Coal Research);

The issues of pollution research (1947 Insecticide, Fungicide, and Rodenticide Act);

The issues of behavioral research (Inclusion of social science in NSF and Camelot);

The issues of biomedical engineering (the Salk vaccine);

The issues of resource engineering (Criteria for water projects);

The issues of pollution engineering (Water Pollution Control Act of 1948);

The issues of social science engineering (Peace Corps); and

The issues of international science (Test ban treaty, Point IV).

A concluding section will extract from the discussion of these cases the salient aspects bearing on the four questions delineated on page 8 of the following chapter.

In each case history, approximately the same general outline will be followed. The hypothesis to be investigated is that any political decisionmaking process consists of a succession of steps or events, about as follows:

(a) Identification of an issue requiring legislative action;

(b) Accumulation of factual data about the issue, its significance, and the urgency of taking action;

(c) Determination of available alternative courses of action;

(d) Establishment of technical data as to the consequences and costs of the alternatives;

(e) Establishment of the probable political consequences and costs of the alternatives;

(f) Selection of a preferred alternative;

(g) Establishment of a consensus as to whether or not to accept the preferred alternative.

For each case, after a brief synopsis of the chronology, these steps will be identified; the "scientific" contribution of information bearing on each step will be characterized as to validity, appropriateness, certification, and impact; the total effect of the "scientific" testimony will be assessed; and the significance of the event will be discussed from the vantage point of hindsight. To achieve this "hindsight," some attention will be given to the subsequent history of the issue, but no effort will be made to present a complete historical account up to 1969.

With reference to the above sequence of steps in political decision-making, the questions to be researched at each point will be about as follows:

(a) *Issue identification*

From what source did the indication come as to the need for action?

What institutional and substantive form did it take?

Did the source or form of the indication have bearing on its reception?

How was the indication validated?

How was the need for action made evident?

How was the urgency of the action characterized?

(b) *Issue assessment*

What organizational arrangement was made to place the asserted need for action in proper perspective?

What evidence was provided for this purpose?

What persons and groups were consulted?

What was the time relationship of this assessment to the initial indication as to the need for action?

What form did the findings of the assessment take?

(c) *Definition of alternatives*

What alternative courses of action were proposed?

Were they presented in the form of legislative proposals?

What different sources did they come from?

What organizational arrangement was made to collect data needed for decisionmaking?

How did it relate to the way the issue was structured?

(d) *Technical data on alternatives*

What quantitative data were presented bearing on the alternatives?

What sources were used?

How were these data validated?

Was quantitative evidence presented that conflicted, or seemed to be in conflict, with other quantitative evidence or testimony?

How were such conflicts resolved?

Were all relevant questions asked, and was all available information at hand, bearing on the decision?

(e) *Action decision*

What decision process was employed, and what organization?

Was decision to act separated from selection of preferred alternative?

How was technical information presented to the decisionmakers?

What was the decision?

Did the decision respond primarily to scientific evidence, to political evidence, or to a melding of the two?

Was the final form of the decision sufficient to result in implementation?

Did it provide for followup to meet the scientific and political criteria bearing on the decision?

Assessment of the consequences of a political decision can be made on several different bases. It can be evaluated in terms of—

The intent of the Congress at the time (with respect to the legislative history of the action);

The subsequent need for further corrective action (which may indicate imperfection in the initial action taken);

The sum total of subsequent social benefits and costs of the implementation of the action, as looked at from historical perspective;

A comparison of the actual consequences of the action with the conjectural consequences, had it not been taken.

The questions to be considered in this study deal centrally with the acquisition of scientific and technological information by the political decisionmakers, to assist them in deciding issues with a considerable content of scientific and technological matters. Accordingly, the assessment of the consequences of the action needs to be made in terms of such questions as the following:

Did the advice of technical witnesses correctly forecast the costs and benefits of the action at the time it was under consideration?

Were subsequent adverse consequences and needs for amending action correctly foreseen by technical witnesses in their testimony?

If conflicting evidence was given on the issue by technical witnesses, what evaluation of these different sources can be made in retrospect?

Did the language barrier between scientific or technical witnesses and political decisionmakers result in any lasting disadvantageous consequences?

The general aim of this study is to develop an understanding of the process of drawing from the scientific community information and guidance needed by the Congress in legislating on issues with a substantial technical content. By identifying strengths and weaknesses of past experiences with this problem, it is hoped that the study will contribute to the never-ending process by which the Congress strives to adapt itself to a changing environment.

By identifying such past weaknesses in the information process as the breakdown in communications between the scientific community and political decisionmakers, the neglect of valuable sources of information, inappropriate selection of sources, and unstructured, unplanned acquisition of data, ways may be found of avoiding possible sources of error in the future. By determining the criteria of effectiveness in the selection of witnesses, in preparing and structuring the acquisition and evaluation of information, in the design of organizational arrangements and procedures, ways may become evident for the more effective consideration of legislation at the interface between science and politics.

If, as seems likely, the role of science in government continues to expand in range and volume, these lessons extracted from the past can serve many useful purposes of guidance for the future. In this endeavor, two things are sure: there will be found no single correct answer, and there will be no definitive finding for once and for all. The subject is too complex to permit of the first, and too dynamic for the second.

## CHAPTER TWO—SOME GENERAL OBSERVATIONS ON SCIENCE AND GOVERNMENT

### THE SEARCH FOR A COMMON GROUND

The interaction of science and politics has often proved rewarding to mankind. Great periods of science have had direct bearing on political innovation and advance. For example, the scientific achievements of Isaac Newton, early in the 18th century, were the primary motivating force in the "age of reason," a period in which, perhaps for the first time, man perceived the possibility of scientifically designing his government to fit his needs on a practical basis. This rational, analytical approach to the political order was one of the main intellectual ingredients of the Constitutional Convention that met in Philadelphia in 1787.

One of the great accomplishments of science in the 20th century was the development and confirmation of the theory of equivalence of matter and energy. Up to this time, these two physical quantities had been regarded as separate and unrelated. The theory of the equivalence of matter and energy merged two great sets of information, linked up two worlds, and generated countless new opportunities for further scientific discovery and practical human benefits.

The stimulus given to science by this latter event has been matched by the stimulus given to the effort to make effective political use of the skills and methods of science. However, as this effort proceeds, mankind encounters the extremely difficult task of reconciling scientific values with human values. For there is no theory of the equivalence of the physical world and the normative world. The values of science remain distinct from the values of politics.

Even between the scientist and the politician, in a pure sense, there are differences in habits of thought and language. These differences can easily be exaggerated, and are rarely as pure as the following enumeration might be taken to imply. However, for purposes of simplicity, the important differences in tendency between these two groups can be stated in absolute terms, as follows:

The vocabulary of science is elaborate and specialized, but objective and factual; that of politics is more everyday, and is centered on value judgments.

The rules of science data differ from the rules of legal evidence: scientific truth is established by objective demonstration and confirmed by replication; political truth is established by consensual agreement, usually after an "adversary" contest.

Science deals with its subject matter in mainly quantitative terms, politics in mainly qualitative terms.

The subject matter of scientific issues is foreign to the experience of political decisionmakers; few scientists join the ranks of the political decisionmakers, and few political decisionmakers can accept the product of scientific analysis as unqualified guidance in making political decisions.

Basic science is insulated from personal desires, expectations, or motivations as to what is discovered; applied science is concerned with meeting a social goal, but the scientific tests of effectiveness of any particular project of applied science are objective rather than subjective. Conversely, the thrust of politics focuses on human desires, expectations, and motivations; the political test of effectiveness is mainly whether or not the social response to a project is (or is likely to be) favorable.

Given these two differing groups, with differing habits of thought, sets of values, and rules of evidence, how does communication flow from the scientific world to the political world? How are "spokesmen for science" selected to give evidence on scientific aspects of pending legislation? Is it important that they be regarded by political leadership as "eminent scientists" or that they are accepted by the scientific community as its authentic spokesmen and interpreters? How is scientific information converted from data into evidence useful to political decisionmakers? To what extent is there a tendency for scientific witnesses to volunteer information or respond to questions beyond the limits of their competence? To what extent do political decisionmakers accept the unquestioned eminence of chosen scientists in particular disciplines as a general certification of their wisdom respecting matters external to their discipline? Do the personal biases and motivations of scientists impair the objectivity of their testimony or render it suspect to the political decisionmaker?

In a broader sense, how do political decisionmakers weigh the relative merits of scientific and social values? Do scientists have a legitimate role in assessing the relative importance or merit that society should attach to scientific truth and political value? Are normative judgments outside the scope of competence of the scientist? How far should a scientist go in interpreting his data in support of an issue in which both scientific and political factors are involved? These questions underlie the quandary of the political leaders of society in attempting to harness science to the achievement of social goals.

A practical illustration of the interaction between science and politics, and between the scientific goal of achieving the best combination of measurable quantities, and the political goal of expanding human freedom, can be drawn from the system of personal transportation by automobile. In this case, human freedom is defined as the absence of regulation of the behavior of the individual. Extreme assertion of individual freedom in the use of this means of transportation, experience suggests, would take such forms as competitive behavior, discourtesy, flouting of commonsense precautions, the right to drive unsafe vehicles, etc. Untrammelled freedom on the highway would almost certainly have intolerably dangerous consequences: Practically speaking, motorists would be denied freedom to drive in reasonable safety. Even with present highway regulations and enforcement levels, some 50,000 persons are killed and millions are injured annually in the operation of the system. With less control, these numbers could be expected to be higher. On the other hand, it would be technically feasible to reduce this carnage virtually to zero by the development of a comprehensive and disciplined system of highway transportation designed to do the best possible job of moving people about as they wish, but giving an absolute, overriding priority to the total elimination of all causes of unsafety. It is possible to do this.

But the inconvenience to the individual highway user would be intolerable.

The costs of such a system would almost certainly include decreased personal freedom of all highway users under close regulation. Up to now, society has rejected such an extreme solution, and has accepted the compromise between complete (unregulated) freedom on the highway and complete (closely regulated) safety on the highway. The practical question facing society is whether the compromise is at a satisfactory balance point between freedom from regulation and freedom from risk of accident; any political action respecting this balance point might logically be subjected to scientific analysis to determine such questions as: What are the costs and benefits of the proposed change? What reduction in the probability of accident and what reduced freedom will result from some new control or technological innovation? At the same time, political analysis might consider such issues as: Does society find the cost acceptable in terms of the benefit? Have the scientific potentials been fully exploited within the limits of tolerable levels of regulation?

For practical purposes, accident victims are not merely those self-selected by their own carelessness. Everybody is exposed to some average level of risk, and the total amount of risk per individual depends on how much time he spends on the road. Risk is thus a factor of use, and in this sense it is "equitable." If society at large were to pay all direct and indirect costs of highway unsafety, each reduction in personal freedom caused by safety regulations could be related to actual dollar savings achieved by the reduction of accidents. The gain could be measured and indicated in dollar terms. But the cost—in human freedom—cannot be measured or expressed in dollars. It would be impossible to say—scientifically—that any given reduction in freedom in order to achieve a given increase in highway safety is warranted by the dollar savings. In the language of the systems analyst, science cannot "optimize" for freedom but only for system performance. As long as society continues to aspire to the political goal of freedom, there will remain an inherent disparity between social goals and scientific goals.

The role of the political system is to mediate this conflict, to resolve these two sets of goals and standards in a practical way. Somehow the political system has to decide how much freedom ought to be sacrificed, in the interest of achieving some generally satisfactory or tolerable level of safety. The scientist measures quantities, defines alternatives, and states the physical costs and rewards of the alternatives. But it is up to the politician, not the scientist, to choose the preferred alternative. Can a scientist advocate a policy decision without either (1) discounting as inconsequential such political values as freedom, happiness, and the like; or (2) accepting responsibility for making unscientific comparisons of scientific values with intangible normative values?

In general terms, the problem of the Congress in dealing with scientific issues of politics appears to be fourfold: First, to identify and delimit the scientific content of political issues; second, to devise intellectual bridges to enable the scientific world to communicate effectively with the political world; third, to establish practical political techniques for assessing and validating scientific evidence; and fourth, to formalize the process by which the quantitative cost/effectiveness

concepts of science and technology are weighed along with, or balanced against, the qualitative values of politics and society. In the projected series of case histories of recent political decisions involving science and technology, attention will be given to ways in which the Congress came to grips with this fourfold problem. Specifically, answers will be sought to the following questions:

1. How are scientific issues brought to the Congress and how does the manner of their presentation influence the outcome?
2. What information from what sources, bearing on the issue, was received by the congressional decisionmakers, and how did it influence the outcome?
3. What institutional decisionmaking method was employed in the Congress for each issue, and how did the method of decision influence the outcome?
4. What was the outcome of each issue, both in terms of the values expressed at the time of decisionmaking, and in retrospect—as judged by the values of the present day?

### THE POLITICAL FRAMEWORK

It would seem to be a basic proposition that any assessment of the social function of science, or of political decisionmaking as to the social uses of science, must be relative to the goals of the society. The primary goal that has historically been shared by all political factions in the United States is personal liberty or human freedom. All functions of government in the United States can surely be regarded as contributing to this unifying goal. Freedom, in this context, is a very broad and comprehensive term. It may generally be taken to mean the protection of man against undesired compulsions of the environment, both physical and human, and protection against undesired compulsions of the body and mind of the individual. Science undoubtedly contributes in many important ways to the means by which freedom is sought and attained. But the determination of which program to carry out, or which aspect of freedom to emphasize, is essentially a political task.

Because freedom is elusive, political means to achieve and expand it in the United States have taken many directions and raised many issues. Its achievement has been sought according to different political and economic concepts, logically developed and pragmatically tested. Emphasis has been placed successively on centralized government, with strongly enforced legal responsibility, economic mercantilism, and expanding credit resources (up to 1800); then on local initiative, local police power, and local monetary management (up to 1860); then on national resource and facility development, large corporate organizations, and concentrated investment (up to 1930); then on welfare capitalism, Federal paternalism, and minimum standards of economic well-being (after 1930). During these successive evolutionary periods of U.S. growth, until after World War II, science was largely peripheral. Except for the encouragement of scientific agriculture after 1863, science remained largely a private matter. Technological support for economic growth rested on domestic technological innovation, drawing largely on basic research conducted in Western Europe, and exploited by private citizens and companies for their own profit.

An accelerating tendency has been evident in the United States since about 1915 for the problems and tasks of society to be recognized as national in scope and amenable to solution in primarily national terms. These have included the great depression, war, education, civil rights, environmental pollution, health and medical science, the exploration of space and the oceans. The trend toward a national approach in problem solving has been reinforced by such factors as—

The sheer magnitude and scope of the problems and tasks;

The appearance of an increasing array of major tasks essential to society but offering no evident opportunity for direct profit in their execution;

The superior financial resources of the National Government;

The growing technical sophistication of Federal administrative staffs in tackling large assignments;

The growing skills of the political decisionmakers in defining problems and assigning responsibility for solving them;

The expanding scope of the scientific method, and concurrent political acceptance of the method, in dealing systematically and objectively with an ever-larger fraction of public concerns.

Perhaps the most significant—certainly the most dramatic—event evidencing this centralizing trend was the successful scientific and technological effort in World War II to develop the atomic bomb. The mounting of a large technological effort under Federal sponsorship was not inconsistent with the historical growth of the American Nation. Great national programs had been undertaken in the recent past to dig the Panama Canal, to harness the Tennessee and western rivers, to restore the Dust Bowl. These were in the tradition of a pragmatic Nation that had tied political power of the States to a national head count, that located its county seats for 1-day access by local populations, that built post roads and railroads as national enterprises. But the idea of a national effort toward a big goal achieved a higher level of refinement in the atomic bomb project. It required the marshaling of a large team of scientists, backed by the financial resources and authority of the National Government, coordinated in the quest for a defined objective; its outcome was the achievement of a scientific goal long thought impossible. By the Congress and the public, the conclusion was plausibly drawn in 1945 that the creativity of science could be harnessed similarly to achieve other specific goals of society as these were defined and adopted through the political process.

It is relevant to ask whether the attitude of Congress toward science has been influenced by partisan considerations—whether, for example, it has been closely involved with the contest between liberal and conservative. The details of method, procedure, and scope of the political uses of science are indeed exposed at times to the stresses of political controversy, but there appears to be general agreement that science as an institution ought to be vigorously supported. Both major political parties have accepted the initiative in encouraging expanded Federal sponsorship of scientific research and education. Political activists have recognized in the scientific method a powerful instrument for achieving social objectives while conservatives have seen in science a means by which the products of many independent researchers can stimulate economic and cultural growth with a minimum of Federal contribution or intervention.

The pragmatic character of the American Nation was reinforced by the dramatic lesson of the atomic bomb project. But other less dramatic forces were at work that also encouraged public belief in the efficacy of science for public purposes, such as—

A rising level of public education, with increasing emphasis on scientific materialism;

A great increase in the population of trained scientists; and

A proliferation of demonstrations of scientific success, such as in military hardware and systems, space projects, achievements in biomedicine, and the bewildering proliferation of computer technology.

Science has apparently been enlisted in the national effort to achieve the political goal of freedom. As with each previous period of U.S. history, the means used has tended to shape the objectives and the methodology by which the objectives are sought. Since science is inherently materialistic and systematic, the applications of science to the preservation and expansion of human freedom have led to the extensive use for this purpose of the computer, systems analysis, cost/effectiveness calculations, and quantitative standards of measurement. Political leaders apparently look to the skills and techniques of science to wipe out disease, guarantee military security, extend man's life, control his numbers of progeny, eliminate the hazards of accident and environmental degradation, insure economic growth and stability, erase pockets of poverty, expand the utility of leisure time, achieve the exploration of space and the oceans, and perpetuate the resource base needed to feed, clothe, house, and equip man for safety, comfort, and happiness.

More specifically, science is to be the means by which the political system is to achieve a long list of concrete national projects such as an anticancer campaign, a communications satellite, a rapid transit system, improved technical standards of highway and automotive safety, a desalting plant, and so on.

In the political world, science has become a foremost national resource whose exploitation is regarded as contributing to the enlargement or preservation of human freedom. Basic research is judged to contribute by enlarging human understanding, applied research by enlarging human options, and technology by putting selected options to work to create beneficial structures and systems.

However, as the automotive safety illustration demonstrated, science is not in complete harmony with the political objective of the United States. The achievements of science can sometimes extend freedom, but they also act at times to constrain it. Science is based on the exercise of human discipline to establish a rigorous characterization of cause and effect relationships. Applied research exploits these relationships by being obedient to them. Engineering materializes these relationships into coherent structures and systems. In these contexts, man emerges as a human component of systems, subservient to the same natural laws of cause and effect as are the inanimate elements of systems.

If the Congress is confronted by the opportunity to exploit science to expand human freedoms, the Congress would also seem to be confronted by the obligation to constrain or resist the encroachment of science on human freedoms. Science does not create ideal relationships of man and nature; it identifies and applies the laws of nature.

Man can achieve a wider range of goals by the use of science than without. But the application of science defines limits as well as opportunities, and sometimes both together. Science has become the art of the possible; politics is evolving into an institution for reconciling the force of inexorable cause-and-effect natural law with the perversities of human desires and preferences. It must answer the question: How much science does society want?

### THE SCIENTIFIC FRAMEWORK

The concept followed in this study is that basic scientific research has as its goal the discovery of facts about nature. It is structured into such disciplines as physics, chemistry, biology, astronomy, et cetera; into such subdisciplines as solid state physics, inorganic chemistry, solar astronomy, et cetera; and into such integrating disciplines as physical chemistry, astrophysics, ecology, et cetera.

Applied research is the use of information about nature, derived from basic research, and employed to make feasible some social goal. It is structured in two ways: (1) Into loose categories of like fields or disciplines, such as meteorology, metallurgy, electronics, agronomy, et cetera; these overlap with (2) subject categories suggesting purpose, such as transportation, communications, materials, and standards, et cetera. All goals of applied research aim at a single overriding objective, which is to improve the compatibility between man and his environment.

For purposes of social analysis, it is convenient to classify applied scientific research into four types of activities by broad social purpose, as follows:

1. Physical modification of man: An improvement in the feasibility of man's capability to adapt himself to his environment by physical changes of his own structure.

2. Application of natural resources: An improvement in the feasibility of man's exploitation of the resources of nature to change the physical environment to render it more compatible with man.

3. Environmental restoration: An improvement in the feasibility of corrective actions to restore the physical environment by reversing impairments wrought by man or by natural forces.

4. The social environment: An improvement in the feasibility of actions by man to enhance his compatibility as an element of the changing social/human environment.

The relationship between science and politics is epitomized by a comparison of their respective goals: environmental compatibility versus human freedom. Human freedom is evidently diminished by man's incompatibility with his environment. It is also diminished by the imposition of regulation and control to improve his compatibility with his environment. In assessing each issue involving scientific matters, Congress appears to need advice that will help to answer three fundamental questions:

(1) What is the potential contribution of the action to improved compatibility of man with his environment?

(2) What are the costs and benefits of the action, in terms of human freedom?

(3) In the particular issue, how much freedom is equal to how much compatibility?

The formal limits of the scientific method are that it can describe relationships and outcomes of given conditions, but cannot make value judgments about these relationships and outcomes. The trained scientist can collect and examine the scientific data in his field, and can draw conclusions as to their validity and meaning. In basic research, he can conclude that further research in some particular area has some degree of probability of disclosing information of significance relative to many elements of nature—contributing new knowledge to fill many gaps or open up many new possibilities of understanding. In applied research, he can identify possible scientific solutions affording alternative means of achieving some social goal; he can estimate what order of magnitude of effort would be required by each alternative and what probability each has of succeeding. The trained technologist can calculate the relative cost/effectiveness of carrying out alternative engineering approaches to the achievement of social goals (or of not doing so). But the scientist or technologist transcends his discipline when he advises on whether society should exploit some technical opportunity, should embark upon some applied project, or should apply some particular set of performance criteria.

Full compliance with this disciplinary constraint on science advice is rarely observed. In the purest philosophic sense, even the invariable appeal of the scientist that more money be invested in research in his area of interest is a technical violation. Evidently there is a quandary, here. Basic research, applied research, and technological engineering are peopled by motivated specialists with personal hopes and professional ambitions. For them to live within the philosophic constraint of nonadvocacy is to deny themselves the opportunity to increase the probability of achieving their ambitions. For them not to practice this self-denial is to contravene their own discipline.

The opportunities in all three areas of technical endeavor are limitless, while the availability of supporting resources is not. Since society cannot support all worthy projects, on what basis can it choose, other than by consultation with those who seek to carry out the endeavors, who are the most knowledgeable about the possible rewards of doing so?

On the other hand, several pitfalls lie in the way of communication from the scientist to the politician relative to public issues with a scientific content. Some of these have already been enumerated in Chapter One, such as differences in vocabulary, rules of validation, quantification, subject-matter, et cetera. However, a general characterization of these pitfalls is illustrated by a social phenomenon classically known as the "Egyptian priesthood." Under the Pharaohs, the Egyptian priests had special knowledge of geometry, which enabled them to control the distribution of lands. They had special knowledge of the mysteries of nature, and special vocabularies in which to express their findings. By this exclusive knowledge they were able to control and influence the administration of the government. Their judgments were unchallenged because only their associates in the temples knew the language; the loyalty of the cult preserved their solid front. In a sense, the Pharaohs had the same problem as the Congress of today; how to achieve credible communication with a knowledgeable cult of specialists whose social contribution was undeniable, but whose ways were obscure and whose findings were not subject to proof test outside of the priestly cartel.

Under these conditions the scientist is—or may be thought to be—subject to the temptation of advising not only on *what* but as to *whether*. Even when a survey of a field of science concludes that more money should be spent on research, it is in effect making a value judgment on social priorities. Another danger is that in the interpretation of data to the politician the scientist will incline, or permit himself to be encouraged, toward a finding in response to the situation rather than strictly limited to the data. Scientific data are rarely absolute, and are more usually approximations or probabilities. Informed judgment plays an important part in scientific decisions. Here the politician may be at the mercy of the scientist, but at the same time the politician—by structuring the situation—may influence the interpretation of the data.

The difficulty is compounded by the difference in symbols of the scientific and the political subcultures. Communicating among themselves, scientists express technical issues in confidence levels, figures of merit, uncertainties and probabilities, all in quantitative terms. But in communicating with politicians, they encounter the obstacle that the accustomed quantitative indicators lack significance and need to be translated into words. For example, the difference between a purity of aluminum of “four nines” and “six nines” is understandable to a scientist, but not necessarily to a politician. (These are 99.99 percent pure and 99.9999 percent pure.)<sup>1</sup> Both forms of aluminum are very pure, but one is more so than the other. The communication could be improved by giving relative costs per pound of material at each level of purity (say, 40 cents and \$800). Or by indicating how much of each is normally produced (say, several tons versus a few pounds). Or it might be helpful to indicate the kinds of uses each level of purity has. The purpose of scientific language is to concentrate meaning. The necessity to explain and clarify his terms leads the scientist to virtually endless explanation, and it is sometimes easier to accept shortcuts in which the truth is somehow lost.

<sup>1</sup> Actually, for higher orders of purity the scientist would be unlikely to use a percentage figure for total impurities, except as a loose, order-of-magnitude term, measured by electrical resistivity ratio. If purity was important for some scientific test, it might be statistically determined throughout a sample, for five or six specific impurities, but not for others. Levels of some impurities would be important for the scientist's purposes; others would not.

## CHAPTER THREE—AD-X2: THE DIFFICULTY OF PROVING A NEGATIVE

### I. BACKGROUND OF THE CASE

The purpose of this case study of congressional management of the battery additive controversy of 1953 is to draw from recent history useful lessons on the legislative role of scientific information.

The hypothesis is that the world of politics is concerned with decisions on issues based on moral and social values, while the world of science is concerned with matters of measured fact. Since political decisions involve both facts and values, the political problem of collection and interpretation of data for decisionmaking is particularly difficult with respect to issues having a considerable scientific or technological content.

The battery additive controversy was selected as the initial case study in this investigation because it shows how complex and far reaching a seemingly simple technical issue can become, once it has been identified with political values. It introduces many of the problems of political use of scientific information that will reappear in cases projected for subsequent investigation. During the battery controversy, which simmered from 1948 through 1952, and climaxed in 1953, many political values were at stake. Seemingly, the virtue of a battery additive was somehow ideologically related to the freedom of science from political influence, the conflict between small business and monopoly, the oppressiveness of business regulation by Government bureaucrats, and the controversy as to whether the proofs of pure science should prevail over the test of the marketplace, as applied by practical men.

#### *The story in brief*

The initial statement of the facts is as follows: A west coast vendor of a white powder, represented as beneficial to the operation and useful life of electric storage batteries, is asked by the Federal Trade Commission to moderate his advertising claims for his product, and is advised by the Post Office Department that transactions involving his product may not go through the mails. These actions derive from findings by the National Bureau of Standards that battery additives are without merit, including specifically the questioned product AD-X2. The vendor challenges the NBS competence in battery additive testing, and more particularly the use of NBS findings to support and benefit commercial interests adverse to his own; he appeals for exception through political channels.

Before the issue died away—it was never cleanly resolved—the resignation of a Director of the National Bureau of Standards had been requested, accepted, deferred, rescinded; an Assistant Secretary of Commerce had resigned; a Senate committee had produced a 785-page set of hearings to ascertain “whether or not agencies of the

Government have been fair and just in the treatment of Mr. Ritchie and his product, battery AD-X2."

A succession of laboratory tests of the battery additive had been conducted at NBS, and in response to a request by the Senate Select Committee on Small Business, a separate set of tests had been performed in 1952 at the Massachusetts Institute of Technology. Because of apparent differences in the findings of these two sets of tests, the Secretary of Commerce requested the President of the National Academy of Sciences, May 3, 1953, to "\* \* \* appoint a committee to objectively appraise the quality of the work performed by the National Bureau of Standards in relation to battery additive AD-X2." Concurrently, a separate committee of senior scientists, organized by the President of the National Academy of Sciences at the request of the Secretary of Commerce, undertook an evaluation of the role and mission of the NBS.

The latter committee reported first: NBS should divest itself of an accumulated load of military research and concentrate on its primary function; with respect to commercial testing, there should be a separation between the purely scientific and technical work, as performed by NBS, and the political and economic aspects, which were the responsibility of the Secretary of Commerce.

The Committee on Battery Additives of NAS was chosen by the President of the Academy with attention to the political as well as the scientific and economic ramifications of the issue. It met, assembled the available data, enlisted highly qualified technical assistance, deliberated, and on October 30, 1953, issued its findings in a report to the Secretary of Commerce. It found the additive to have no merit, and the NBS abundantly qualified and motivated to test battery additives objectively and authoritatively.

Subsequently, notwithstanding the NAS report, the Post Office rescinded its fraud order, and eventually FTC voided the complaint against Ritchie and his product.

#### *Relevant historical elements in the background*

The years between 1946 and 1953 afforded an unusual opportunity for small business in the field of materials salvage and brokerage. Disposal of World War II surplus materiel was proceeding at an enormous rate. Shortages of consumer durable goods, together with abundant savings in the hands of the public, combined to produce a large pent-up demand. Materials shortages were sustained by the accumulation of a national stockpile, by foreign aid exports, by domestic industrial consumption, and—after June 1950—by production of materiel for the Korean war. Return of World War II scrap and salvage from abroad was negligible, but vigorous efforts were made by private companies to recycle old domestic scrap into reuse. Lead was especially short in 1947-49. Needs for new storage batteries to equip the outpouring of U.S. vehicles from Detroit, needs for lead-sheathed cable for catchup capital construction and replacement of corroded lines, production of bearing bronze (10 percent lead), and the new requirement for atomic shielding, all combined to place heavy demands on supplies of lead. Leaded gasoline was a large and expanding use without recovery.

During the 3 years, 1943-45, automobile production had been suspended, and during and after this period considerable attention was given by car owners to keeping their irreplaceable vehicles

operating as they continued to age. Among replacement parts in high demand were storage batteries. Battery life was commonly considered to be upwards of 2 years or less, although there was no technical reason why this life should not be doubled or tripled. The obvious implication was that batteries in the hands of the public were receiving insufficient care and attention. However, a lively market existed for batteries: As scrap from which the lead could be extracted to produce new batteries for the market; as replacement batteries to be "reconditioned" and sold as such; and as a source of replacement parts for the reconditioning of other batteries. Battery technology called for a particular and critical composition of lead, such that battery producers constituted a preferential market for battery scrap lead.

An important complication was the technological aspect of storage batteries themselves. Although they are universally required for auto operation, as well as for many industrial and standby power sources, their characteristics and behavior in practice are not well known by the using public, and their detailed processes have been imperfectly characterized in the scientific literature. During the AD-X2 controversy, much was made of the fact that "even scientists do not know how batteries work,"—or so it was alleged. This point was taken to signify that an additive whose effect was inexplicable might still be of practical value. There was a wide range of popular ignorance among users of batteries as to how to operate them most efficiently, and so as to insure a maximum operational life. There was a great wealth of partial, and partially incorrect, knowledge derived from practical experience on the part of repair and salvage shops. There was also an imperfect level of "supply discipline" observed among these technologists, who did not—for example—follow faithfully the "first in, first out" policy in moving stock from inventory to sales. For another example, distilled water is specified to be added to replace evaporation losses to the battery electrolyte, to keep it above the plates, but some service stations fill the water bottle from the tap; local water supplies vary widely in solute content, and this builds up harmful impurities in the electrolyte. The designs of batteries varied considerably from company to company. Similarly, the owners of batteries exposed them to an infinite variety of conditions of use and misuse. It became evident, as the testimony about AD-X2 accumulated, that scientific data about electrochemical processes under controlled conditions do not translate well into the indeterminate, usually dirty, and invariably complex and disorderly conditions and effects of battery maintenance and service.

In summary, there was an urgent demand for batteries, new or rebuilt; lead was scarce and costly, and old batteries were the ideal raw material to produce new batteries; any lag in the cycling of batteries to the customer, into use, into the junkyard, and to reclamation of their lead, was disadvantageous to the producers of batteries. Care, maintenance, and operation of batteries was an imperfectly practiced art, rather than a science. The circumstances called for invention of a means for prolonging the life and improving the performance of batteries, insofar as the customer was concerned. Battery producers saw monetary advantage in accelerating the turnaround time of batteries, once their efficiency began to dip. A two-way trade

in used batteries became an active form of small enterprise, in conflict with the interests of battery manufacturers.

In the larger arena of national concern was the economic question as to the role of small business and the concentration of economic power in the United States. A number of congressional investigations before and during World War II had revealed that major consolidations of economic power had occurred. Congressional efforts to diffuse this control and ownership had taken such forms as encouraging preferential contractual opportunities for small businesses, establishment of credit and information assistance, and the like. However, it was generally held that wartime production tended to favor larger enterprises. This had happened in World War II (1941-45) and again in the Korean war (1950-53). Concern for the health and vigor of small business was a well-established feature of public policy by 1953.

Also relevant to the battery additive controversy was the relationship of the Federal Government to private business generally. During 20 years of administration by the Democratic Party, economic activity and regulation of business by the Government had increased, attributable generally to successive periods of depression, war, reconversion, and war again. The new Republican administration, assuming office in January 1953, had campaigned on a platform that included a promise to reverse the trend toward intervention and regulation of private enterprise.

Finally, the scientific community had assumed greatly increased importance, nationally, during and after World War II. Scientific contributions to military weaponry had prompted a general belief in science as a potential source of solutions to many public problems. Unprecedented resort was had by committees of Congress to the advice and information of leaders of the scientific community. Scientific groups had quickly learned to "politicize" themselves—to achieve effective access to the political decisionmaking points in Congress and the executive branch, and to express their views as representatives of substantial and concerted groups.

#### *Issues growing out of the AD-X2 case*

Initially, the AD-X2 issue appeared as a conflict between the regulatory processes of Government to protect the consumer from fraud and misrepresentation and fairness to an entrepreneur.

The political context of 1953 gave force to the issues of small business versus big business, and small business versus Government bureaucracy.

The initial response of the Secretary of Commerce—which was to redress the balance more in favor of small business by removal of the Director of NBS to signalize a shift in policy—was interpreted by the scientific community as the application of pressure on science to produce politically acceptable findings. Political objectives were thus counterposed to scientific objectivity.

Once the scientific issue was raised, the Secretary of Commerce and others read into the controversy a confirmation of the nonobjectivity of NBS itself—as already alleged by Ritchie. This injected into the controversy the question as to the merits and value of NBS itself as a great national laboratory.

In the subsequent assessment of the merits of NBS, adverse testimony took the form of laboratory findings, interpretations of laboratory findings, and, above all, the evidence of many satisfied customers and detailed favorable testimonials of use. Practical experience was ranged evidentially against scientific laboratory tests by NBS, which were themselves clouded by contradictory findings and interpretations of laboratory tests conducted outside the NBS.

Other issues concerned such matters as whether the tests conducted by some particular laboratory had been properly designed, conducted, and interpreted; whether the product being tested was different from others previously found without virtue; whether the asserted virtues of the product could be quantitatively characterized by a laboratory test; and whether or not the product really contained a "mystery" ingredient.

Also of importance was the role of the NBS as a consultant and associate with a nongovernmental organization that served as a mechanism of self-regulation by private enterprise itself, in its relations with the consumer.

#### *The illustrative features of the case*

Because of the wealth of issues involved in the AD-X2 case, it offers useful and instructive penetration into the many aspects of the congressional problem of securing reliable information about scientific matters. No effort will be made in the study to resolve the issues that remained in dispute as the case faded from view. It is the virtue of science that truth is finally proved by communication and criticism. In the words of the Committee on Battery Additives of the National Academy of Sciences: "Unsound or illogical scientific work, once published, will not long survive the fierce light of criticism to which it is subjected." On the other hand, it is the virtue of politics to seek out (and find) accommodations by which people can live together in reasonable peace and freedom. Political decisions and policies are sometimes found necessary to mediate, postpone, or circumvent the effects of harsh and arbitrary findings of science that impose unacceptable obligations or conditions on the electorate.

The issue of AD-X2 arose at the interface of science and politics. It grew out of the underlying question as to whether science should find increasing employment in regulating the quality and reliability of commercial products. Out of the case came the decision that the primary role of science in commerce should not be to regulate the quality of products to protect the consumer but to discover the truths of nature, and use them more particularly to create additional products for human satisfaction and entrepreneurial exploitation. The issue apparently resolved in the case of AD-X2 is germane in the present day. As American society becomes increasingly aware of the impairments to the human environment that result from the application of technological innovation, the move toward regulation of products and product use to protect the environment is gathering impetus. It is easy to foresee the possibility of some future cause célèbre, paralleling that of AD-X2, in which the rights of some small businessman to sell his product come into conflict with the regulatory mechanisms of government and science to protect the environment.

## II. BEGINNINGS OF THE AD-X2 STORY

The case would never have arisen had it not been for an individualistic entrepreneur whose determined efforts to sell his product brought him in conflict with competitive and institutional obstacles, and whose persistence and ingenuity were sustained in the face of accumulating adversity. The protagonist in this episode was Jesse M. Ritchie, president of Pioneers, Inc., of Oakland, Calif. He described himself in these words: "I am not a chemist; I am an engineer. I am basically a bulldozer operator."<sup>1</sup> Elsewhere, he has been described as a man of versatile and somewhat informal interests:

Ritchie, a self-educated engineer, was born in 1909 in Sharp County, Ark. He supplemented a sixth-grade education with correspondence courses, worked as a certified bulldozer operator and as a journeyman diesel engineer. During World War II he worked as a civilian in charge of various defense contracts and in 1946 joined the Drake-Utah-Grove construction combine on an \$80 million Army Engineer contract, serving as general superintendent of construction with headquarters in the Philippines. In 1945 he qualified as a class A general contractor in California. In 1953 he listed himself as a "Psychologist-Specialist in Alcoholism" in the phone directory in Oakland, Calif. By this time, too, he was able to claim a doctor of psychology degree from a Chicago institution called the College of Universal Truth.<sup>2</sup>

In his testimony before the Senate Select Committee on Small Business, Ritchie described the evolution of his formula for a battery additive. Upon his return to California from the Philippines, early in 1947, he bought a partnership in a firm that made and sold a storage battery additive called Protecto-Charge. He found this additive to be harmful to batteries, and undertook to develop a satisfactory one. He enlisted the aid of Dr. Merle Randall, professor emeritus of physical chemistry at the University of California. After an earlier partial success, he assertedly settled on the "AD-X2" formula in October 1947.<sup>3</sup> To protect his proprietary interest in the new additive he relied on secrecy. In the Senate hearings Ritchie introduced various documents signed or authored by Dr. Randall describing the effect of the new additive in qualitative terms. Experience with the new additive, according to Dr. Randall, showed that it held the active lead paste tightly to the plates in storage batteries with "an apparent, possibly real, decrease in the amount of battery mud." The bubbles of gas generated during the charging phase were small and distributed, resulting, he said, in a decreased evaporation of liquid from batteries.<sup>4</sup>

Elsewhere, Dr. Randall had said that the additive AD-X2 contributed a desirable softening action to hardened "sulfated" battery plate material, and that by electrophoretic action it caused particles of battery mud to be "attracted to the plates, where they lodge and gradually form additional active material." He also attributed to the compounds of sodium sulfate and magnesium sulfate the property of diminishing the rate of growth of crystals of lead sulfate; size of these

<sup>1</sup> Testimony of Jesse M. Ritchie, president, Pioneers, Inc., Oakland, Calif. In U.S. Congress, Senate, Select Committee on Small Business, Battery AD-X2. Hearings before the \* \* \* on Investigation of Battery Additive AD-X2. Mar. 31, June 22, 23, 24, 25, and 26, 1953. 83d Cong., first session. (Washington, U.S. Government Printing Office, 1953), p. 18.

<sup>2</sup> Samuel A. Lawrence. "The Battery Additive Controversy." The Inter-University Case Program, No. 68. (University of Alabama, University of Alabama Press, 1962), p. 5.

<sup>3</sup> This account is pieced together from Ritchie's testimony in Senate, Battery, AD-X2. Hearings, op. cit., pp. 17-18, 20, 196-197.

<sup>4</sup> Letter of June 23, 1948, from Dr. Merle Randall to Dr. George W. Vinal, National Bureau of Standards. In Senate, Battery AD-X2. Hearings, op. cit., p. 44.

crystals was associated with the aging of storage batteries with consequent loss of efficiency.<sup>5</sup> Other favorable effects included an increase in the porosity of the plate surfaces and a slightly lower temperature of batteries both while charging and discharging.

*Uncertain composition of the battery additive AD-X2*<sup>6</sup>

From the various documents in the case it is evident that the composition of AD-X2 was inconstant. According to Ritchie's testimony in 1953:

It is a secret formula. It contains sodium sulfate and magnesium sulfate, but—and this is important—they do not appear as epsom and glauber salts. There are also seven trace elements and a pH of 7.9, if that means anything to you, Senator.<sup>7</sup>

The composition, he said, had not been changed since October 1947.<sup>8</sup>

Senator Hubert H. Humphrey, in the Senate hearings, vainly sought more information about the material. Ritchie was carefully uncommunicative, except to admit that some trace elements were added, and that there was silver \* \* \*.<sup>9</sup>

In an exchange with Senator George A. Smathers, Ritchie admitted that Professor Randall had never made reference to any "secret trace substance or element" in the additive, but that he had said there was magnesium oxide in it.<sup>10</sup>

A memorandum "to all bureau managers," by Jack A. Harris, general manager of the Oakland Better Business Bureau, February 21, 1949, reported the results of a chemical analysis of AD-X2 made at his request by an "independent and disinterested chemical laboratory" that described it as follows: Sodium sulfate 60.16, magnesium sulfate 28.64, magnesium oxide 6.95, combined water 3.82. Harris added: "Mr. Ritchie, of Pioneers, Inc., states that this chemical analysis is the most accurate he has seen."<sup>11</sup>

In connection with the extensive NBS tests in June 1952 the "manufacturer supplied an ample quantity of his additive." It was analyzed by the NBS chemists and was found to contain 99.84 percent soluble materials (magnesium sulfate, anhydrous, 47.3, sodium sulfate, anhydrous, 41.2, water of hydration, 11.5) and 0.16 percent insoluble material (mainly barium sulfate).<sup>12</sup>

The report of the Academy Committee on Battery Additives, October 30, 1953, cited as a "typical" composition for AD-X2 the laboratory analysis by Squier Signal Laboratory of material supplied early in 1948. It was reported to contain 48.5 percent of sodium sulfate, 42.5 percent of magnesium sulfate, and 8.6 percent of water of hydration. ("The remainder [0.4 percent] was presumably insoluble material.")

<sup>5</sup> Document titled "Aging of Lead Sulfate in the Lead-Acid Storage Battery," by Merle Randall. Submitted by Mr. Ritchie to the Senate Small Business Committee and identified as a paper that Dr. Randall had delivered at the spring meeting of the American Chemical Society, San Francisco, 1941. In Hearings, op. cit., pp. 72-75.

<sup>6</sup> Hearings, op. cit., p. 71, presents explanation by Mr. Ritchie: "AD is additive; X is the unknown portion of the thing; [and the 2 signifies] 1 ion of sodium and 1 ion of magnesium." For a time the new additive went under the same name, "Protecto-Charge," as had been used to designate the unsatisfactory and partially satisfactory precursor additives sold by Ritchie's company.

<sup>7</sup> Ibid., p. 18.

<sup>8</sup> Ibid., p. 20.

<sup>9</sup> Ibid., p. 22.

<sup>10</sup> Ibid., p. 64.

<sup>11</sup> Ibid., p. 76.

<sup>12</sup> Ibid., p. 565.

The NAS report observed that "later analyses vary above and below these figures somewhat and we note the analyses change significantly from time to time." This was the earliest of "nearly a dozen" analyses encountered by the Academy committee.<sup>13</sup>

According to Dr. Allen V. Astin, Director of NBS, the additive AD-X2 was neither mysterious nor unchanging in composition. He said:

The Bureau's tests have shown that the material is primarily a simple mixture of sodium and magnesium sulfates and that there is no evidence of a compound or alum structure. The analysis also showed a number of trace elements but for the most part these are the same trace elements usually found in varying amounts in commercial grades of sodium sulfate and magnesium sulfate or in the normal battery electrolyte. It is also pertinent to note in connection with the claim of the uniqueness of the composition of AD-X2 that our analyses have shown variations between samples as high as 19 percent in the ratio of sodium sulfate in AD-X2 to the magnesium sulfate. The ratio of the quantities of trace elements also vary appreciably.<sup>14</sup>

In response to questioning by Senator Smathers, the Director said: "We know everything that is in it in concentrations in excess of five parts per million."<sup>15</sup> He testified that the cost of the sulfate salts in the preparation, in a \$36 package would cost about 5 cents at wholesale rates.<sup>16</sup>

An article favorable to the additive, that appeared in Newsweek magazine, December 11, 1950, said that Ritchie had revealed that "the trick is in the way the sulfates are treated during preparation, which takes 4 days and nights."<sup>17</sup>

An element of uncertainty as to the identity of the additive was contributed by the Randall letter to Vinal of April 23, 1948, which ascribed the "invention" of AD-X2 to a Donald E. Keifer, and stated that:

Reductions of 85, 90, and in one instance, 95 percent in annual battery expense during the past year has [sic] been reported by large firms, some of which have always had an intelligent battery service program.<sup>18</sup>

Since the material in question had been in existence only 6 months, according to Ritchie, and the material superseded had been described by Ritchie as unsatisfactory, and an earlier composition positively injurious, the claim of a tenfold to twentyfold improvement in battery cost/effectiveness on an annual basis, in a communication to a fellow scientist is difficult to understand. The material Randall was discussing he described as "a powder mixture of anhydrous sodium sulfate and a slightly basic, nearly anhydrous, magnesium sulfate."<sup>19</sup>

The conclusion of the Academy committee was that the composition of the battery additive was of no consequence. It said:

The matter of the composition of AD-X2 is somewhat irrelevant to our discussion since we have found no unusual effects which could not be explained by the assumption that it consists of a simple mixture of sodium and magnesium sulfates.<sup>20</sup>

<sup>13</sup> National Academy of Sciences—National Research Council. Committee on Battery Additives. Report of the Committee on Battery Additives. (Washington, National Academy of Sciences, Oct. 20, 1953), p. 30.

<sup>14</sup> Hearings. Op. cit., pp. 219-220.

<sup>15</sup> *Ibid.*, p. 250.

<sup>16</sup> *Ibid.*, p. 263-264.

<sup>17</sup> "New Life for Batteries." Newsweek (Dec. 11, 1950), p. 62.

<sup>18</sup> Hearings. Op. cit., p. 45.

<sup>19</sup> *Idem.*

<sup>20</sup> Report of the Committee on Battery Additives. Op. cit., p. 30.

A somewhat obscure statement by Ritchie in the Senate hearing seems to foreshadow this comment by the Academy committee. He agreed:

Most of the learned men with whom I have worked on [AD-X2] have expressed the opinion that it did not make a great deal of difference what it is made of. [And later on] It is my opinion that what is in it doesn't have a great deal to do with the subject matter at all. It is what it does.<sup>21</sup>

From the point of view of the scientists of the NBS and the Academy who investigated AD-X2, the composition of the additive was not of consequence. However, if the preparation consisted merely of two salts, untreated, without unusual additives, then some extent of misrepresentation was present—if only in the name of the product. Also, there would be an extraordinary price markup, if the "raw" material wholesaled at 2.5 cents per pound and retailed at \$18. Moreover, it was to be Ritchie's claim that his additive was different in composition from the scores of others tested by the NBS, and that therefore the NBS publications declaring battery additives without virtue did not apply to his. If the first part of his claim was without substance, then there was no substance to the second part.

When Senator John Sparkman, toward the latter part of the hearing, sought advice from Dr. Harold C. Weber, professor of chemical engineering at Massachusetts Institute of Technology, on whether trace elements might prove beneficial the answer was unhelpful.

Senator SPARKMAN. Here is a question that comes over from yesterday. If you were here, you may recall that Dr. Astin stated in answer to a question which I put to him—and I am refreshed by one of Senator Smathers' questions—that in the chemical analysis of this AD-X2, it was broken down to a fineness of five points in a million; in other words, that the seven trace elements were found to that extent. Is that a close enough analysis? Could there be other elements in there in that small amount, five points in 1 million, to be effective?

Dr. WEBER. I cannot answer your question. I do not know.<sup>22</sup>

### III—HOW THE AD-X2 ISSUE CAME BEFORE CONGRESS

The AD-X2 issue emerged gradually as a question inviting congressional consideration. Most of the ways in which it impacted on the Federal Government resulted from the vigorous merchandising and promotional efforts of Ritchie himself. His attempts to establish respectable bona fides for his product brought him successively under scrutiny of the National Better Business Bureau, into controversy with the National Bureau of Standards, and within the regulatory purview of the Federal Trade Commission and the Post Office Department. Progressively, concurrently with these encounters, appeals were made by Ritchie or on his behalf to individual legislators in the Congress. When at length he appealed to the Senate Select Committee on Small Business, that took a leading role in reviewing the issue, some 28 Senators had records in their files of communications with and concerning Pioneers, Inc.

Ritchie's early appeals to individual Members of Congress were dealt with in the customary manner—by being referred to the Bureau of Standards, or to the Department of Commerce, with a request that information be provided as to the merits of the case. His appeals to NBS were dealt with, at first, in accordance with established policy—

<sup>21</sup> Hearings. Op. cit., pp. 183, 184.

<sup>22</sup> *Ibid.*, p. 392.

That NBS would not do any commercial testing at the request of an individual or business firm;

That NBS would not identify tested products by name or company affiliation.

However, Ritchie's dissatisfaction with the status of his product under this policy encouraged him to generate pressure on NBS to test his product before condemning it. Similar pressure was exerted on NBS by the National Better Business Bureau (NBBB) in an effort to counteract Ritchie's promotional claims that his product was different from those found worthless by NBS laboratory tests, and that the various warnings on the subject issued by NBBB, based on NBS findings, did not apply to AD-X2.

When, in response to these pressures, NBS tested the product, assured the NBBB that the product had been tested, and then allowed the fact to be made public by NBBB, Ritchie's status as a political plaintiff became a special one. Summary action by the Post Office made his problem explicit and urgent.

By selecting the Senate Select Committee on Small Business as the forum in which to present his case, Ritchie was assured of a friendly hearing, if he could establish (a) that his was a small business, (b) that his product had a reasonable claim to utility, and (c) that he had been obstructed in the marketplace by "big business" and bureaucratic regulation. Ritchie was able to document these points.

#### *Bureau of Standards Involvement with AD-X2*

The first Federal agency to encounter Ritchie and his company in connection with the controversy was the National Bureau of Standards. Professor Randall's letter of April 23, 1948, written by Randall as consultant to Pioneers, Inc., called attention to the favorable response of batteries when treated with the additive. He said it improved the service and restored the condition of batteries to an extent quite different from that produced by adding equivalent amounts of sodium sulfate and epsom salts.<sup>23</sup>

The Randall letter was apparently the opening gun in a campaign to secure an exception for the product of Pioneers, Inc., then known as Protecto-Charge and later called AD-X2. The NBS in 1931 had issued Circular 302 which had recommended against the use of any battery additive, and had named sodium sulfate and magnesium sulfate (respectively known as glauher salts and epsom salts) as worthless additives.<sup>24</sup> The National Better Business Bureau had long campaigned against battery additives as fraudulent, and had relied mainly on the NBS for technical data and support. During World War II, the NBBB had issued "Facts About Battery Dopes" to further its campaign, and "to help the war effort."<sup>25</sup> Ritchie sought to advance the contention that Circular 302, having antedated his product by 16 years, could not be considered to apply to it.

His success in gaining the support of the local Better Business Bureau of Oakland, Calif., was shown by a "confidential memorandum to all bureau managers," circulated by Jack A. Harris, general manager of the Oakland BBB, February 21, 1949. It recapitulated the state of affairs regarding Ritchie's campaign, as follows:

<sup>23</sup> The Randall letter, cited earlier. Hearings. Op. cit., pp. 44-45.

<sup>24</sup> Text of NBS Circular 302 was reproduced in *Ibid.*, p. 515.

<sup>25</sup> The text of "Facts About Battery Dopes" was reproduced in *Ibid.*, p. 41.

The U.S. Bureau of Standards, Circular No. 302, specifically [sic] condemns battery additives composed of sodium sulfate and magnesium sulfate on the inclusive condemnation that these products are epsom salts and glauber salts. It is Dr. Randall's contention that these two chemicals when used in certain combinations with other elements do not form epsom or glauber salts, but form a new compound which does not possess the harmful qualities of the above-named salts. Numerous attempts have been made by Pioneers, Inc., Dr. Merle Randall, Senator William Knowland, and I, [sic] to get the Bureau of Standards through the Chief of Electro-Chemistry Division, Dr. George W. Vinal, to give this product a fair test to either prove or disprove the statements made in this circular. In every case, the only courtesy received from the Bureau of Standards has been a statement that further test is unnecessary in that the product is admitted by its manufacturers to contain sodium sulfate and magnesium sulfate.<sup>25</sup>

Shortly after receiving the letter from Randall, Vinal wrote Mr. K. B. Willson, operating manager of the NBBB, June 25, 1948, observing that battery compounds "seem to be becoming increasingly numerous and troublesome" and soliciting his opinion "as to the desirability of issuing an up-to-date statement of the problem." He still regarded Circular 302 as valid, but noted that NBS had conducted a 2-year program of unsuccessful research to find satisfactory methods of storing war-surplus batteries, and that information acquired in the course of this work might usefully be incorporated in a revision.<sup>27</sup> Willson replied, June 30, that a new statement would be "extremely helpful to American business and to governmental agencies" as there were several such products on the market. He continued: "Perhaps the most aggressive is Protecto-Charge, which is being promoted out of Oakland, Calif." Willson said he was including in his letter some correspondence with Dr. Merle Randall, objecting to the NBBB bulletin on battery dopes. "I do not know Dr. Randall, but he is presumed to have some standing and his vouching for the product lends further support for it in the minds of the inexperienced and the uninformed."<sup>28</sup>

Dr. Vinal wrote Willson again, July 16, explaining that national defense work had kept him too busy to spend much time "\* \* \* on these rather troublesome battery compounds." He added: "There seems to be unusual activity at the present time, which is probably the result of shortages of lead and finished batteries." He saw no reason, on the basis of the information he had about Protecto-Charge, why any exception could be made for this product in the application of Circular 302.<sup>29</sup> Vinal's next letter to Willson, dated December 9, 1948, contained a rough draft of the revised circular and invited comments "with reference to subject matter and any possible legal complications."<sup>30</sup>

On December 1, 1948, Harris, of the Oakland Better Business Bureau, wrote Vinal on behalf of Pioneers, Inc., asking NBS either to test the company's additive or to make an exception for it from Circular 302. Vinal replied, December 22, explaining that NBS had not tested AD-X2 (Protecto-Charge) because he had been informed by Randall that it was merely magnesium sulfate and sodium sulfate, the effects of which were well known by NBS to be useless in batteries. Moreover, tests of the material were being made at the Signal Corps laboratory at Fort Monmouth and at the New York and Mare Island

<sup>25</sup> *Ibid.*, p. 76.

<sup>27</sup> *Ibid.*, p. 769.

<sup>28</sup> *Ibid.*, p. 770.

<sup>29</sup> *Idem.*

<sup>30</sup> *Ibid.*, p. 741.

Navy Yards. Finally, NBS did not make commercial tests of battery materials, did not endorse commercial products, and did not permit the results of its tests to be used for advertising purposes.<sup>31</sup>

At about this same time (Aug. 25, 1949), a letter from the Oakland Chamber of Commerce, with a copy to NBS, went to the National Better Business Bureau, endorsing in principle the latter's pamphlet against the "battery-dope racket" but asking that AD-X2 be specifically excepted from its application.<sup>32</sup>

During 1949, the NBBB continued to press Vinal for a comprehensive and up-to-date statement that would unmistakably apply to AD-X2. Finally, Vinal wrote, June 22, "It has been our policy not to make any tests on commercial products until requested to do so by some Government agency which is interested in the merits of the product. If this matter is turned over to FTC [the Federal Trade Commission] it is possible we may be requested to make tests."<sup>33</sup> In the Senate hearings, Senator Gillette told Director Astin of NBS that "if that is not a suggestion on how to proceed to ask your organization to make tests, I do not know the English language, Doctor."<sup>34</sup> However, the NBBB had filed a protest with FTC regarding AD-X2 on June 17, and had apparently sent a copy of the action to NBS at the same time. It was probably to this action that Vinal was referring, rather than volunteering the suggestion that the action be taken. Earlier in the hearing, Secretary Weeks, of the Commerce Department, had also been a victim of this same misinterpretation. In his prepared statement, March 31, he had said: "\* \* \* I find the National Bureau of Standards suggesting to the National Better Business Bureau that tests would be made if requested by the Federal Trade Commission."<sup>35</sup>

A reason for NBBB anxiety to have an explicit and authoritative statement as to NBS findings on the inefficacy of AD-X2 was that potential "legal complications" were assuming importance. Willson wrote Vinal, March 29, 1950, to explain:

The reason why we have considered sending a bulletin to battery manufacturers on this subject is because Pioneers, Inc., apparently has been pursuing a deliberate course of making inquiry of various manufacturers and their dealers in regard to the product—AD-X2. When they receive in reply a copy of our bulletin on battery compounds and solutions, they believe they have evidence to show that through the distribution of our bulletin we and the manufacturers distributing it are damaging their business. I do not know what they intend to do with this "evidence," but in view of certain threats which they have made about possible action against the manufacturers, we felt duty-bound to put them on notice \* \* \*.

Pioneers, Inc., has always been in the position to tell us that although they agree completely with everything that Dr. Condon stated in our bulletin, the National Bureau of Standards has not tested their product and, therefore, was not in a position to state with authority that it is not the exception that they claim it to be. If we now can tell Pioneers, Inc., that you have tested their product and found it wanting, they may continue to dispute your findings and conclusions but they cannot claim that they are based upon theory and not an intimate knowledge of the product.<sup>36</sup>

With the permission of NBS, NBBB in August issued a new publication on battery additives specifically identifying AD-X2 (among others) as having been tested and found ineffective by NBS. The

<sup>31</sup> *Ibid.*, p. 772.

<sup>32</sup> *Ibid.*, p. 79.

<sup>33</sup> *Ibid.*, p. 777.

<sup>34</sup> *Ibid.*, p. 250.

<sup>35</sup> *Ibid.*, p. 2.

<sup>36</sup> *Ibid.*, p. 780.

publication noted that the NBS finding was challenged by Pioneers, Inc., on the ground that the "only practical means of determining the product is through field test." The tests of NBS, the protest continued, "were not run in accordance with our specifications and, therefore, did not indicate the value to be derived from our product."<sup>37</sup>

### *The Federal Trade Commission and AD-X2*

A complaint against AD-X2 was filed by the National Better Business Bureau with the FTC, June 17, 1949. The Commission instructed its San Francisco field office to initiate a field investigation of the product. However, this first field investigation appears to have yielded no adverse information about AD-X2. "Instead of unearthing complaints, the [FTC] San Francisco office found wide acceptance for AD-X2 in and around the bay area. The proponents included technical personnel at military installations, the Oakland Chamber of Commerce, the Oakland BBB, and many individual customers."<sup>38</sup>

A second complaint came to FTC, March 10, 1950, from the Association of American Battery Manufacturers, transmitting a letter from Keystone Batteries, Inc. The Keystone letter, dated February 2, 1950, said in part:

When the AD-X2 first came out, we thought they would kill themselves off in short order like most of the other battery additives in the past, but they seem to be getting stronger and reaching out further all the time, and they will probably reach Midwest and East unless something is being done.

As we understand it, they are now appointing dealers in various cities on the west coast who not only try to sell this preparation but also will recondition a stock of old batteries which they will guarantee for 12 months. \* \* \* This is a sweet business because we have been informed that all they do is charge these batteries or, at the most, reinsulate them, which shows a considerable profit \* \* \*.

This is a serious situation. We know that we have lost a considerable amount of business for last month alone and the loss of business to large manufacturers must have run into thousands.<sup>39</sup>

In forwarding this letter to the FTC, the Association of American Battery Manufacturers explained its position as follows:

At one time the association tried to combat the use of dopes or trick electrolytes because after a group of them had been carefully tested in the laboratory it was found that none of the materials tested had been helpful in battery performance and some of them were actually harmful. Many of these were reported to the Federal Trade Commission from time to time. Cease-and-desist orders were issued by the FTC, but the companies would spring up in other localities under different names and it became a hopeless effort.

Moreover, retailers of the dopes used as an argument for selling the materials that the battery industry is interested in obstructing the use of the materials because they would lengthen the life of a battery and reduce sales. This was not the case. The industry was simply trying to protect its product against introduction of foreign materials and at the same time prevent the public from spending its money for something of no value.<sup>40</sup>

Faced with these conflicting views, FTC sought technical advice from NBS as to the merits of the additive, by letter of March 22, 1950.<sup>41</sup> On the basis of chemical analyses of the additive, and earlier experiments with two batteries, Dr. Vinal reported to FTC, May 11, that a series of tests had demonstrated no "significant reduction in harmful sulfation \* \* \*." (Results of these tests were later reported in the NBS Circular 504, Battery Additives, issued in January 1951.)<sup>42</sup>

<sup>37</sup> *Ibid.*, pp. 781-782.

<sup>38</sup> Lawrence, *Op. cit.*, p. 8.

<sup>39</sup> Hearings, *Op. cit.*, pp. 514-515.

<sup>40</sup> *Idem.*

<sup>41</sup> According to Lawrence, *Op. cit.*, p. 8.

<sup>42</sup> *Ibid.*, pp. 8-9. Also, "Report of the Committee on Battery Additives." *Op. cit.*, p.11.

Meanwhile, further information was accumulating in the FTC San Francisco office:

Its San Francisco attorney-examiner did not consider the NBS test results conclusive. He felt that the NBS report would have had greater effect if actual service tests had been made. He felt that the overwhelmingly satisfactory experience of many bay area users, reinforced by tests approving AD-X2 made at the University of San Francisco, outweighed the NBS findings. He, therefore, recommended on December 8, 1950, that the FTC drop its case without prejudice to the right of the Commission to reopen if and when warranted by facts. He was overruled by reviewing officials in both Washington and San Francisco who felt that the laboratory tests at NBS were more competent and conclusive than the experience of users. Attempts were then made to work out a stipulation under which Ritchie would modify some of his advertising claims. Ritchie refused to accept any restrictions on his advertising. The investigation continued.<sup>43</sup>

It is not clear from the record whether or not the article in *Newsweek* magazine, issue of December 11, highly favorable to AD-X2, had appeared before the December 8 recommendation was made in San Francisco.

Of the first test of AD-X2 run by NBS, Dr. Astin was later to explain:

The test was actually run on the Bureau's own initiative, but there had been prior requests from Senator Knowland and from the Oakland Better Business Bureau. About that time, the Federal Trade Commission had asked the National Bureau of Standards to run an evaluation on another battery additive, and it was felt that with very little added effort, AD-X2 could be put in and run along with the other additive, and that was the occasion for starting the test.<sup>44</sup>

The first NBS report was considered defective by FTC from the legal point of view, because the samples used in the test had not been obtained by FTC in the course of its investigation. Accordingly, a request was made by FTC for further tests. Dr. Walter J. Hamer, who had replaced Vinal upon his retirement, after further tests, repeated the earlier NBS finding in a report dated July 21, 1952.<sup>45</sup> Dr. Astin summarized the rather confusing sequence of NBS tests as follows:

There was a request from the Post Office Department in September of 1951, but the Post Office Department was given, in response to that request, the data obtained from the test beginning January 1949, and the second test for the Post Office Department started about the first of 1952, and there was almost simultaneously a second test about that time for the Federal Trade Commission. So the second and third tests which were run by the Bureau on AD-X2 were in the winter of 1951-52. I do not recall the exact dates.<sup>46</sup>

A further test was run publicly in June 1952, with Dr. Astin personally in charge, in an effort to satisfy Ritchie and his supporters by following precisely the test procedure he had specified. Like the other tests conducted by NBS, it found no merit in AD-X2 and was called faulty by Ritchie.<sup>47</sup>

The quasi-judicial character of the FTC as a regulatory agency largely insulated it from external pressures by interested parties or from congressional intervention. Apparently the only congressional exchange was with Senator Henry C. Dworshak, who wrote FTC, October 24, 1951, to suggest that it might be advantageous if tests of

<sup>43</sup> Lawrence. Op. cit., pp. 9-10.

<sup>44</sup> Hearings. Op. cit., p. 258.

<sup>45</sup> Report of the Committee on Battery Additives. Op. cit., p. 10.

<sup>46</sup> Hearings. Op. cit., p. 259.

<sup>47</sup> Idem. Also, see Hearings. Op. cit., pp. 222-225.

AD-X2 were run for FTC by some other laboratory than NBS. The Commission, through Chairman James M. Mead, replied in part:

The Commission has reviewed this matter very carefully and has decided to have new and additional tests made with respect to the product by the National Bureau of Standards. It is being requested \* \* \* that the tests conform, insofar as is possible, to the manufacturer's directions for use of the product \* \* \* .

The Bureau of Standards, of course, has no biased interest in the tests which it runs, and the Commission has always found the Bureau most fair in its position on other matters in the past.<sup>45</sup>

Although the issue of AD-X2 remained on the FTC docket throughout the period of intense congressional concern it did not become active until 1954. Nevertheless, developments in other areas of the case were presumably of interest to FTC, and the ultimate disposition of the FTC complaint was undoubtedly of considerable interest to Ritchie and his associates and supporters. In this sense, the suspended case was a source of pressure on Pioneers, Inc.

#### *The Post Office Department and AD-X2*

Apparently, a complaint was lodged with the Post Office Department some time before September 6, 1951, when the Chief Post Office Inspector asked NBS to advise him if the additive AD-X2, " \* \* \* when used as directed and applied to mechanically sound batteries, will prevent sulfation and extend the life expectancy of mechanically sound batteries; whether it will restore junked batteries to normal use; and whether it will extend the life of batteries 2½ times their normal life."<sup>49</sup> According to Dr. Astin's prepared statement to the Small Business Committee—

The Bureau submitted a report in December 1951 \* \* \* based on results of tests obtained on the sample submitted by the Oakland Better Business Bureau. Following receipt of this report, the Post Office Department also requested additional tests on samples submitted by them. Accordingly, the National Bureau of Standards initiated still another series of tests of AD-X2.<sup>50</sup>

Apparently, this first NBS report to the Post Office Department—like the first report to FTC—was unsatisfactory because the material tested had come to the Government by an inappropriate route (the Oakland Better Business Bureau). The record is not clear as to when and what further tests were performed. Conjecturally, the AD-X2 material supplied by the Post Office Department and the material supplied by FTC were both analyzed in detail. (Dr. Astin mentioned the variation, from time to time, in the analysis of the additive.)<sup>51</sup> Apparently, also, the first NBS test for the Post Office was run in the early days of 1952, almost simultaneously with the first test for FTC. For the Post Office, 14 three-cell batteries were used. At any rate, the Post Office Department notified Ritchie, March 2, 1952, that he was to appear at a hearing in Washington on April 26 to answer charges that he was "conducting an unlawful enterprise through the mails." After a series of postponements, the hearing was eventually held October 13-14.<sup>52</sup>

<sup>45</sup> Foregoing statement based on text and internal evidence in FTC letter, appearing in Hearings, op. cit., p. 122.

<sup>46</sup> Report of Committee on Battery Additives, op. cit., p. 11.

<sup>49</sup> Hearings, op. cit., p. 221.

<sup>51</sup> *Ibid.*, pp. 221-222.

<sup>52</sup> Account taken from Lawrence. Op. cit., pp. 11-12, 14-16. Post Office Solicitor's docket No. 2., op. cit., notes for the October hearing: "No one appeared for respondent at the hearing these dates."

Ritchie, upon receiving the Post Office notification, immediately went to Washington where he endeavored to recruit a legal and technical staff, and sought support of the Committees on Small Business of the House of Representatives and the Senate. The House committee responded to Ritchie's appeal by directing a request, over the signature of the executive director of the staff, that the NBS " \* \* \* make a new test of [Ritchie's] product and submit a report on specific results of your testing."<sup>53</sup> This test was supposed to be carried out in accordance with procedures specified by Ritchie. Subsequently, the House committee withdrew from further participation in the controversy, and left the followup action on tests and testimony to the Senate Select Committee on Small Business.

The tests run by NBS of AD-X2 in June 1952, were with the cooperation and participation of Ritchie, and were under the personal supervision of Dr. Astin.

As he told the Senate committee, the following year, " \* \* \* I had hoped that by using a procedure described by [Ritchie], the matter could be settled decisively for all concerned."<sup>54</sup> An elaborate series of tests was performed and was reported on July 11, 1952. Again, the NBS found no merit in the additive, and again Ritchie assailed the tests as having been improperly performed.<sup>55</sup>

When the rescheduled Post Office hearing took place, October 13-14, 1952, Ritchie did not appear. Testimony was provided by Dr. Astin and seven senior scientists from NBS. Decision was issued February 18, 1953, then suspended within a week by order of the Postmaster General, Arthur Summerfield, on March 2, and eventually was canceled, August 20, 1953.<sup>56</sup>

#### *AD-X2 and the Office of the Secretary of Commerce*

During the closing months of the Administration of President Truman, after nearly 20 years of Democratic succession, policies had become habit and a minimum of policy surveillance was exercised by departmental secretaries over bureau chiefs. The AD-X2 controversy at NBS did not involve the Secretary of Commerce. However, the advent of the Administration of President Eisenhower brought important changes in policy and personnel. The new Secretary of Commerce, Sinclair Weeks, was particularly outspoken as to the need for restoring a "climate" favorable to private business. When his appointment was announced, in December 1952, he received considerable mail from—

\* \* \* People telling me that an outfit in Oakland, Calif., making a product called AD-X2 to prolong battery life through reducing sulfation, was having tough sledding in Washington. Your committee, in fact, issued a report on the subject last December. One of the first things I did was to ask Mr. Sheaffer, Assistant Secretary for Domestic Affairs, to make a full and impartial investigation. He and his men have gone through file after file extending over the past 5 years.<sup>57</sup>

<sup>53</sup> Hearings, op. cit., pp. 222-223.

<sup>54</sup> Ibid., p. 222.

<sup>55</sup> Ibid., pp. 223-224. The report of NBS on the test is presented at p. 551.

<sup>56</sup> Lawrence, Op. cit., pp. 16, 19-20; 27.

<sup>57</sup> Hearings, op. cit., p. 1. On Weeks' outspokenness, Lawrence, p. 18, notes: "Weeks' approach in his early months as Commerce Secretary was direct and forceful. 'We shall clean up the mess,' he promised in his first public statement. 'The administration has the backbone to do the job. \* \* \* Shrill cries will be heard as the ax is swung on deadwood and poison ivy.' This pledge was followed by replacement of five high-level officials \* \* \*"

When the Post Office decision on AD-X2 was made public, Secretary Weeks actively intervened. By correspondence and interdepartmental meeting he encouraged the suspension by the Postmaster General of the ruling against Pioneers, Inc.<sup>58</sup> He also acquiesced in the action of Craig R. Sheaffer in requesting the resignation of NBS Director Astin.<sup>59</sup> When this action was represented in the press as a political assault against "science" as symbolized by NBS, the Secretary appeared before the Senate Small Business Committee to advance his philosophy as to the interface between private business and Government science. He made a brief but emphatic statement, expressing sympathy for Ritchie, criticizing the NBS as not "sufficiently objective," and indicating dissatisfaction with Director Astin. He said:

We have felt rather strongly about this particular situation. It is one of many phases of that particular picture that caused us to decide that it would be well to have a change in the administration of the department.<sup>60</sup>

Weeks pledged to the committee that he would obtain the best scientific advice available to evaluate the role and mission of NBS, that he would have new tests of AD-X2 performed by "scientists in the Bureau who have never had any connection with this matter," and that in the meantime he would suspend all NBS circulars dealing with battery additives.

The forced resignation of the Director of NBS brought sharp critical response from the scientific community. "With the criticism mounting, the Secretary turned to the Visiting Committee of the National Bureau of Standards."<sup>61</sup> A meeting of the full Committee was held April 14. That same day, Dr. Detlev Bronk, president of the National Academy of Sciences and a member of the Visiting Committee, wrote Weeks urging that Astin's dismissal not take effect until the AD-X2 issue had been studied.

Weeks announced April 17 that Dr. Astin would remain temporarily as NBS Director, and that Dr. Mervin J. Kelly, president of Bell Telephone Laboratories and a member of the Visiting Committee, had been asked to form a group to evaluate the general situation of NBS. Weeks had already discussed with Dr. Bronk the possibility of a separate study to be conducted by the National Academy of Sciences to clear up some technical uncertainties as to the merits of AD-X2. A formal request was made by Weeks to the Academy on this matter, May 3, 1953.<sup>62</sup> The response of the Academy was a report by the Committee on Battery Additives, of the NAS, October 30, providing two conclusions: NBS had done excellent work in battery testing, and

<sup>58</sup> Lawrence, op. cit., p. 19, describes a departmental meeting on the Post Office action. Solicitor's docket No. 2, op. cit., at 3-2-53, notation reads: "Letter from Secretary of Commerce to Postmaster General, advising that it has come to his attention that there is available certain credible and pertinent evidence not introduced in the hearings of POD concerning respondent corporation; and requesting that the POD suspend the fraud order of 2-24-53."

<sup>59</sup> *Ibid.*, p. 21.

<sup>60</sup> Hearings, op. cit., pp. 1-5, especially 5.

<sup>61</sup> Lawrence, op. cit., p. 23. According to the official history of NBS, the sequence of events was as follows: "In April 1953, in the midst of the impasse raised by the controversy over AD-X2, Secretary of Commerce Weeks asked the National Academy of Sciences to convene an ad hoc committee to evaluate the functions and operations of the National Bureau of Standards in relation to the current national needs \* \* \*. ¶ \* \* \* In March 1953, anticipating Secretary Weeks' own request by almost a month, the Director of the Bureau had written him to seek the counsel of the National Academy of Sciences on the current program and operations of the Bureau." (U.S. Department of Commerce, National Bureau of Standards. "Measures for Progress: A History of the National Bureau of Standards." By Rexmond C. Cochrane, editorial consultant—James R. Newman (Washington, U.S. Department of Commerce, 1966, p. 495.)

<sup>62</sup> Lawrence, op. cit., p. 27. (According to this source, the letter noted that "the matter has been discussed over the phone and otherwise on an informal basis," but that the letter was judged necessary by Weeks to firm up the assignment.)

the additive in question was without merit.<sup>63</sup> Of greater significance for the underlying issue was the report of the Kelly committee, whose initial findings went to the Secretary in late July, and whose formal report was transmitted October 15.

The Kelly committee found that the quality of personnel and scientific research of the Bureau were high, but that basic research had lost ground "at a tragic rate" to sponsored development of military hardware for the Department of Defense and the U.S. Atomic Energy Commission. With respect to the AD-X2 controversy, the committee recommended that the NBS be insulated from contact with private industry on the nontechnical aspects of commercial testing, and that the Secretary of Commerce be made responsible for the "policy and the establishment of the nontechnical procedures on commercial product tests."<sup>64</sup> In carrying out this second recommendation, the Secretary transferred NBS from the jurisdiction of the Assistant Secretary for Domestic Affairs to the Assistant Secretary for Administration. The Kelly committee quite evidently sought to remove the NBS from the kind of contacts with private industry that had led to the AD-X2 controversy, which was explicitly cited in the report: "The current 'Battery Additive' evaluation is typical of others that have sporadically occurred throughout the Bureau's history where its findings have been challenged and wide public attention directed to them."

The committee recommends that policy and procedures of a nontechnical nature, particularly with other agencies of Government, for handling commercial product tests be reviewed by the Secretary of Commerce and appropriate members of his staff with the Director of the Bureau of Standards. The committee recommends that the policy and establishment of the nontechnical procedures on commercial product tests be the responsibility of the Secretary of Commerce. The policy on the technical content of the problem should reside with the Director of the Bureau. We believe that the area of commercial product tests involves policies and actions of a nontechnical nature on which the Director of the Bureau should not be required to make the decisions.<sup>65</sup>

Apparently his contacts with Director Astin, and his discussions with Dr. Kelly on the future of the Bureau, satisfied Secretary Weeks as to the merits of Dr. Astin. Members of the Visiting Committee had been asked to nominate possible candidates for the directorship, and had unanimously agreed to recommend Astin's retention. Accordingly, on August 21, he announced that Dr. Astin was being retained as "a member of my team."<sup>66</sup>

#### *AD-X2 and the Senate Select Committee on Small Business*

At the opening of the hearings on "Investigation of Battery Additive AD-X2," the chairman, Senator Edward J. Thye, described the function of his committee: "\* \* \* to help create an atmosphere in our general economy that is conducive to the welfare of small-business enterprise and the creation of new business."<sup>67</sup> Subsequent testimony brought out the fact that the particular product that was the subject

<sup>63</sup> Report of the Committee on Battery Additives. Op. cit., p. 1.

<sup>64</sup> Ad Hoc Committee for Evaluation of the Present Functions and Operations of the National Bureau of Standards. A "Report to the Secretary of Commerce on the Present Functions and Operations of the National Bureau of Standards With Their Evaluation in Relation to Present National Needs and Recommendations for Improvement and Strengthening of the Bureau." (Washington, processed Oct. 15, 1953), p. 16.

<sup>65</sup> Idem.

<sup>66</sup> Lawrence, op. cit., p. 27. Noted the New York Times: "Dr. Astin has since been reinstated, and Craig R. Sheaffer, an Assistant Secretary of Commerce, who has been popularly credited with trying to get rid of Dr. Astin, has resigned" ("Scientists Praise Standards Agency," New York Times, (Oct. 16, 1953), p. 11, col. 3).

<sup>67</sup> Hearings, op. cit., p. 1.

of the hearings had been repeatedly brought to the attention of individual members, and of the committee staff. For example, referring to a "letterwriting campaign to the Congress that started in the summer of 1951 \* \* \*," Senator Sparkman observed:

By the way, let me say this: I was chairman of the committee when this matter came up. I have no apology to offer for our committee's having undertaken it. I think we would have been neglectful of our duty if we had not.

You point out that some 28 Senators had interested themselves in it. Those same Senators were calling upon a committee that had been set up in the Senate for the purpose of protecting the interests of the small businessman, to intercede in behalf of this small business. We handled it as a routine matter. We have literally hundreds of these cases throughout the year, and it was handled by the staff as a routine matter.<sup>65</sup>

A second wave of letterwriting to the Congress on behalf of AD-X2 occurred in February 1952. Again, according to Senator Sparkman—

Apparently these letters started coming to the Senators about February. The letter that I received originally was February 19, 1952. That letter was referred to the committee staff. Copies of that letter have been sent also to other members of the committee.

Action in response to this letter, by the committee staff, was to request from the Director of NBS available information on the additive AD-X2.<sup>66</sup>

Shortly after March 2, 1952, when the Post Office Department summoned Ritchie to appear in Washington to answer mail fraud charges, he went in person to the Small Business Committees of the House and Senate to appeal for their help. The House committee wrote NBS, March 11, asking that further tests be made of AD-X2. In the Senate committee, a more comprehensive response resulted. The Senate committee staff also asked NBS to make further tests. However, Blake O'Connor, committee staff member, became active in pursuing the truth of the controversy as a test case of justice to small business confronted by big business and big government.<sup>70</sup>

When the extensive set of NBS tests of AD-X2 in June 1952 had been completed, the Senate Small Business Committee staff pressed for an indication of results. Dr. Astin, in his testimony to the committee, noted that "Mr. O'Connor of your committee had requested that we make every effort to expedite the report \* \* \*."<sup>71</sup> When the report was transmitted to the committee, July 11, O'Connor apparently regarded it as unsatisfactory.<sup>72</sup> Dr. Astin said that O'Connor had asked him, later in the summer, "\* \* \* if we would be willing to run still another test."<sup>73</sup> (Dr. Astin had replied that he would be willing to do so, if the test were designed to establish some new pertinent factor, and if Ritchie would provide the batteries.)

At any rate, the staff of the Senate Small Business Committee persisted in the matter. Technical support was provided by Dr. Keith Laidler, associate professor of chemistry at Catholic University,

<sup>65</sup> *Ibid.*, pp. 258, 234.

<sup>66</sup> *Ibid.*, pp. 286-287.

<sup>70</sup> According to Lawrence, *op. cit.*, p. 12, the opposition of battery manufacturers to the promotion and sale of AD-X2 served as confirmation that it had merit, insofar as the committee staff was concerned. O'Connor—says Lawrence—"saw in AD-X2 a test for the committee:" (apparently quoting O'Connor.) "Would [it] be content merely to make more or less innocuous studies of small business problems and file reports for the record or would the committee turn when needed into an aggressive champion of the right of the Nation's small businessman?"

<sup>71</sup> Hearings, *op. cit.*, p. 224.

<sup>72</sup> *Idem.* Also, Lawrence, p. 14.

<sup>73</sup> Hearings, *op. cit.*, p. 224.

who had accepted employment in 1952 as consultant to Ritchie;<sup>74</sup> on July 29, Dr. Laidler, accompanied by O'Connor, met with Dr. Astin to discuss the results of the NBS tests the previous month. In a subsequent letter, August 5, to Ritchie, Dr. Laidler expressed dissatisfaction with the NBS interpretation of the data. He also indicated the existence of a hostile attitude that existed between himself and the Director.<sup>75</sup> Dr. Astin later described "proponents of AD-X2" at this time as "looking for minor flaws in the report and the testing procedure \* \* \* ." <sup>76</sup>

The proponents of AD-X2 continued to press for further action by NBS to validate the product. As a result of the conversations between Dr. Astin and O'Connor, a meeting was convened, September 29, in Dr. Astin's office at the Bureau.

Its purpose, according to O'Connor, was to "clear the air." In attendance were Dr. Astin, O'Connor, Ritchie, Laidler, two representatives of the Post Office Department, a representative of the Department of Justice, and several NBS scientists. Also present was Dr. Harold C. Weber, the chemical engineering professor from MIT, who reported favorable results from some preliminary tests of AD-X2 he had run on his own initiative.<sup>77</sup>

The interest of the Justice Department related to an antitrust case in preparation against the Association of American Battery Manufacturers for conspiracy to prevent resale of used battery lead. Dr. Weber's interest appears to have derived from his contact with Norman Goodwin, president of Guaranteed Batteries, Inc., of Boston, and local sales representative for Ritchie's product.<sup>78</sup> Laidler's role at this time seems to have been as consultant to the Small Business Committee.<sup>79</sup>

According to a memorandum of that meeting, circulated by the chairman of the Senate committee, and apparently prepared by O'Connor, it was agreed that additional tests of AD-X2 would be desirable, that preferably such tests should be held elsewhere than in the NBS, and that NBS would agree to participate. (Dr. Weber's recollection was that Dr. Astin did not agree to participate, but merely said "it could be arranged" or something of the sort.)<sup>80</sup> Dr. Astin's own explanation was that no definite agreement had been made, and that in view of Ritchie's attitude toward the Bureau, "\* \* \* we concluded that it would be better if MIT carried out its tests completely independently." He added that at the September 29 meeting Ritchie had said that "\* \* \* he would believe no results which were not favorable to his product and that he did not believe Bureau personnel could be depended on to give a fair test."<sup>81</sup>

O'Connor wrote NBS, September 30, suggesting that Bureau literature critical of AD-X2 not be circulated by the Bureau until conflicting technical points of view were resolved. On October 8 he wrote

<sup>74</sup> According to Lawrence, p. 17, in late 1952 Laidler was "the Committee's unpaid consultant, who had until recently been Ritchie's scientific adviser and would be again in 1953."

<sup>75</sup> Hearings, op. cit., p. 150 (where the letter is reproduced in full).

<sup>76</sup> Hearings, op. cit., p. 224.

<sup>77</sup> Lawrence, op. cit., p. 14.

<sup>78</sup> Hearings, op. cit., p. 380.

<sup>79</sup> In the hearings, Senator Humphrey asked Ritchie how Dr. Laidler had become acquainted with the committee. Ritchie replied, in part, that: "Dr. Laidler had been helping me with this situation, and due to some difficulties with the Director of the Bureau of Standards, he reached the conclusion that he had better not work for me any more, and the committee was just entering into the thing then, and \* \* \* really taking an interest in the situation, and they had no technical help. I believe that the committee felt at that time that possibly Dr. Laidler's academic freedom was threatened, and they asked him. To the best of my knowledge, they knew at that time that he had been helping me (p. 267)."

<sup>80</sup> Hearings, op. cit., p. 384.

<sup>81</sup> Ibid., p. 225.

Dr. Julius Stratton, provost of MIT, asking "if it would be possible for the tests agreed upon to be conducted by MIT as a public service and at no expense to the committee." The following day, Dr. Stratton replied agreeing to have MIT conduct the agreed-upon tests.<sup>82</sup>

The MIT tests were completed November 7, and a report of results prepared early in December. A transmittal letter to the Senate Small Business Committee was written by Provost Stratton, December 16, and a sealed copy of the report was delivered personally to the committee by Goodwin, December 17. That same day the committee released a statement analyzing the report and criticizing the work of the NBS in battery additive testing.

The release identified eight effects of the additive upon batteries that had been found by the MIT tests, and said that the results of these tests completely supported the claims of the manufacturer. A 15-page commentary by Dr. Laidler accompanied the release; it asserted that the MIT tests were a thorough assessment of the effectiveness of the additive, and were "in sharp contrast to the results of tests conducted \* \* \* by the National Bureau of Standards." The Laidler statement called the NBS findings "reprehensible," and said the NBS researchers responsible for testing AD-X2 were "simply psychologically incapable of giving battery AD-X2 a fair trial."<sup>83</sup>

Dr. Astin later commented on the procedure employed in the MIT tests, and on the resultant eight effects:

A major conclusion of the Bureau's investigations with respect to the effect reported by MIT is that the effect is observable in the batteries only with electrolyte of extremely dilute acid concentration, so dilute in fact that it appears to be of no significance whatever in normal storage battery operation.<sup>84</sup>

Reorganization of the Senate under the Republican majority after the elections of 1952 placed Senator Thye in the chairmanship of the Small Business Committee, but did not change the staff of the committee. At the close of the year, Ritchie was endeavoring, with the assistance of the committee staff, to have the Post Office Department reopen his case. However, his petition was denied, February 18, 1953, and the Post Office fraud order went into effect February 24. At this point, Ritchie obtained the help of the new committee chairman. Senator Thye wrote a transmittal letter to accompany a final petition by Ritchie to Postmaster General Arthur Summerfield to set aside the fraud order. According to Lawrence: "Blake O'Connor delivered the documents late Friday night, February 27, to Summerfield at his Connecticut Avenue apartment."<sup>85</sup> Subsequently, the order was set aside, and by the end of March, Dr. Astin's resignation was on the President's desk.

When a newspaper columnist "exposed" the resignation as having been forced by the AD-X2 issue and the personal hostility of Assistant Secretary Sheaffer, a hearing was convened by the Senate Small Business Committee on the afternoon of the same day, March 31.

<sup>82</sup> *Ibid.*, p. 384. (This information is contained in an extract of a memorandum introduced in the record of the hearing by Senator Guy M. Gillette.)

<sup>83</sup> "Senate Unit Plays NBS Battery Test," *Washington Post* (Dec. 18, 1953), p. 37, col. 3. Also, see Lawrence, *op. cit.*, p. 17. Lawrence supplies a later explanation by Laidler that his commentary had been "written hastily" and that it had been his impression that he was "preparing background material on the basis of which the committee would pursue its investigations." He said that he still stood "behind the opinions expressed in my report," but that he would have worded it differently had he known it was for publication. He also indicated that a final paragraph had been added to his report by someone else. The additional paragraph had hinted that the close association of the NBS scientists with the battery industry might have led them, despite their "considerable scientific distinction," to have made "such grave errors."

<sup>84</sup> Hearings, *op. cit.*, pp. 225-226.

<sup>85</sup> Lawrence, *op. cit.*, p. 19.

Weeks and Sheaffer were the only witnesses and the hearing lasted less than an hour. The Secretary traced succinctly the history of the controversy between Pioneers, Inc., and NBS, involving the FTC and the Post Office. He noted that there were many testimonials from satisfied users of AD-X2 (including his own company). He noted that "The manufacturer had independent tests made by the U.S. Testing Co., of Hoboken, N.J.—controlled field tests extending over a period of 362 days." The results of these tests, he said, "rendered credible the experience reported by consumers."<sup>86</sup> He took note, also, of the tests at MIT under the sponsorship of the committee. Then he said:

I am not a man of science, and I do not wish to enter into a technical discussion or be accused of overruling the findings of any laboratory. But as a practical man, I think that the National Bureau of Standards has not been sufficiently objective, because they discount entirely the play of the marketplace and have placed themselves in a vulnerable position by discussing the nature and scope of their prospective reports with the very people who might not want to see the additive remain on the market, and when their reports and results of tests were questioned, discussed the matter with other scientists, engaged by your committee to make separate, objective findings.

I cannot help but wonder how many similar cases have never been heard about—how many entrepreneurs who were convinced they have a good thing for the people, were licked before they started, whether they knew it or not and by their very own Government to whom they paid high taxes.<sup>87</sup>

By way of rectifying the situation, the Secretary promised the committee that he would have the functions and objectives of the NBS examined and reevaluated "\* \* \* in relation to the American business community \* \* \*." He would "\* \* \* put a group of scientists in the Bureau who have never had any connection with this matter and tell them to test this thing in every conceivable way \* \* \*." Meanwhile, all circulars and technical reports dealing with battery additives would be withdrawn until the tests were completed.<sup>88</sup>

The agitation over the "firing of Astin" was not quieted by the Secretary's appearance and testimony. While Secretary Weeks occupied himself with negotiations with the American Association for the Advancement of Science, the National Academy of Sciences, and the Visiting Committee of the NBS, the Senate Small Business Committee staff was engaged in accumulating information bearing on the issue. They visited Ritchie's operation in California, interviewed many users of AD-X2, and collected military test data on field and laboratory experiments with the additive. After several postponements, the committee hearings on the AD-X2 issue resumed June 22.<sup>89</sup>

#### IV. MANAGEMENT OF THE ISSUE

As presented to the Congress, the AD-X2 case does not appear to have been viewed as involving profound or far-reaching issues. The case was described as one of many small grievances in which some small business found itself unable to establish a viable relationship with the Federal bureaucracy and other institutional hazards of the commercial environment. Emphasis in researching the issue centered on factfinding: An effort to establish the facts of the case, and a

<sup>86</sup> Hearings, op. cit., p. 2.

<sup>87</sup> Ibid., p. 3.

<sup>88</sup> Ibid., p. 4.

<sup>89</sup> Ibid., p. 9.

search for an appropriate form of corrective action specifically relevant to it. The Small Business Committee had no jurisdiction over the fundamental protection of the household or private consumer from fraud. The abundant testimonials of satisfied users of AD-X2 apparently foreclosed any interest in the case from the aspect of the small business as a consumer to be protected. The fundamental legal issue of testimonials versus scientific evidence was repeatedly discussed in the hearings, but without being structured as a problem for systematic analysis. Neither the Post Office Department nor the FTC could find in the hearings any substantial guidance on this aspect, other than that the NBS clearly regarded testimonials (or uncontrolled tests) as worthless, while many Members of Congress considered them as of important practical value.

The apparent tendency of the committee to eschew the fundamental aspects of the case, in order to dispose of it as a case, was strengthened by the urgency with which it was presented. One source of urgency was the Post Office decision which, if allowed to stand, would probably have put the appellant out of business.<sup>90</sup> Another was the strong disapproval by the scientific community of the treatment of Dr. Astin, as represented in the press.<sup>91</sup>

It is possible, too, that a further sense of urgency was contributed by a recognition on the part of the committee members that too much time and energy was being devoted, in the early days of a new political administration, to an issue of less than transcendent importance. For example, Chairman Thye expressed some irritation that Ritchie, the principal witness for himself, had been unable to present his case in the first day of the hearings, and had run over to midday of the second.<sup>92</sup>

The Ritchie presentation was so voluminous, in fact, and touched on so many points of grievance, with so little organization of material, and with so much documentation of varied germaneness, and so much technical data of varying quality, that the impression it conveyed depended largely on the preconditioning and technical sophistication of the listener.

### *Structuring the issue*

Secretary Weeks made clear to the committee, March 31, 1953, that he regarded the AD-X2 testing controversy as an internal matter within his Department, and described the actions he proposed to take to resolve it. He questioned the power given to the FTC and suggested that restraint of trade by regulatory agencies should be used sparingly. He noted that "business has suffered severely at the hands of certain bureaucrats," and saw no reason "why a product should be denied an opportunity in the marketplace." The enlargement of the issue that

<sup>90</sup> As Chairman Thye told Dr. Astin (Hearings, op. cit., p. 335): " \* \* \* If this becomes a prolonged investigation, the manufacturer in question might well be out of business and long since liquidated by bankruptcy action."

<sup>91</sup> Drew Pearson, "Astin Ouster Laid to Influence," the Washington Post (Mar. 31, 1953), p. B-31. According to Pearson, Dr. Astin was "fired" by Sheaffer, and "lectured regarding the Bureau of Standards diagnosis of battery additives." Lawrence describes the "sharp critical reaction" to the Astin dismissal on the part of "scientists, Congressmen, civil service groups, consumer organizations, newspapers, and private citizens" (p. 22). He notes (p. 24) that politicized organizations of scientists "issued angry press releases, called meetings, badgered the administration, and sought to call public attention to the Government's alleged assault on science." Another line of action was taken by members of the more staid National Academy of Sciences who "did not wish to add to the embarrassment of the administration, and they believed that they could help the Bureau more effectively by working quietly within the administration and through established channels."

<sup>92</sup> Hearings, op. cit., pp. 91, 160.

resulted from the interpretation of the Astin resignation confused the situation rather than clarifying it, and the subsequent hearings revealed how variously the issue was defined.

(a) *The issue as presented by Ritchie.*—Testimony and exhibits offered by Ritchie in the Senate hearings filled some 200 pages of the proceedings—pages 9 to 209. The witness based his case on five principal points:

1. His battery additive was different. It contained a mysterious ingredient or several of them. Or the preparation of the ingredients made it different, or it contained trace elements. An accredited scientist had aided in its development, and had observed differences in its effects from those of the other additives being merchandised.<sup>93</sup>

2. Tests of the additive showed that it had merit except for those tests that were improperly conducted. Properly conducted tests included his own and those at the University of San Francisco physics department, the U.S. Testing Co., and MIT. Those improperly conducted included tests at NBS, and by the Army, Navy, and Air Force. Faults of such tests included: permitting specific gravity of electrolyte to go too high, use of uninspected or excessively aged batteries, dirty electrolyte, and a high initial charge sufficient to "ruin" the test batteries.<sup>94</sup>

3. There were many testimonials from satisfied users of the additive, and no complaints. On the other hand, NBS had run no practical field tests. Although military tests were adverse, there were many indications of satisfied users in the military field installations.<sup>95</sup>

4. The administrative procedures of NBS were unfair to the vendor of AD-X2. The personnel at NBS held patents on designs of batteries contributing an effect that would be competitive with that of the additive, which showed bias. The NBS Circular 302 was unfair because "the product was condemned about 16 or 17 years before it was developed." The NBS Circular 504 was unfair because it was issued before NBS tested AD-X2. The tests performed in preparation for Circular 504, by NBS, were declared faulty by Dr. Laidler. Although NBS claimed not to test individual products or report on them by name, they had done so in effect by permitting NBBB to announce the results of NBS tests, naming AD-X2. There was an implication of animus in the vigor with which NBS testified against AD-X2 in the Post Office Department hearing. (Said Ritchie: "The array of witnesses from the National Bureau of Standards was probably the greatest parade of scientists ever to appear before a Government agency in the history of the United States.")<sup>96</sup>

5. The NBS contributed technical information and assistance that benefited the storage battery manufacturers whose interests were adverse to Ritchie, and did so in a manner injurious to Ritchie. Through the intermediate agency of the NBBB, the battery manufacturers distributed bulletins, circulars, and pamphlets based on NBS data that were critical of AD-X2. The NBBB was in conflict with the Oakland BBB, with which Ritchie had maintained excellent relations, but the NBBB cooperated with the battery manufacturers against him. Close relations were maintained between NBS staff and NBBB. Also, NBS consulted with battery manufacturers respecting AD-X2 matters.<sup>97</sup>

Ritchie summed up his case against NBS in these words:

\* \* \* The Bureau of Standards condemned battery AD-X2, together with all other additives by implication since 1931 to April 1950, whether they were tested or not \* \* \*.

The Bureau of Standards has condemned battery AD-X2 through the National Better Business Bureau publication, "Battery Compounds and Solutions," over protests, when, by their own admission, they had only tested the material in one or, at the most, two batteries which we and others have determined were not opened for inspection of the samples prior to testing; and the overcharge shown in the test report 504 indicates that the batteries were ruined prior to treatment with the product. That in June 1952, they ran tests on a group of batteries and allowed the acid to go well over 1.280, which action ruined the test. This was

<sup>93</sup> *Ibid.*, pp. 20-23, 27-28, 44.

<sup>94</sup> *Ibid.*, pp. 65, 81, 83, 143, 158, 161-2, 192-3.

<sup>95</sup> *Ibid.*, pp. 46, 81, 757-763.

<sup>96</sup> *Ibid.*, pp. 52, 63-65, 123, 136, 170, 177.

<sup>97</sup> *Ibid.*, pp. 77, 86, 124-125, 143, 145.

allowed to happen over our repeated protests; and, yet, at the Post Office hearing on October 14, 1952, the Director of the Bureau of Standards testified to the fact that the test was run, for all practical purposes, in accordance with the manufacturer's instructions.<sup>98</sup>

(b) *The issue as seen by committee members.*—Throughout the hearings, there was incomplete agreement as to what their purpose was, what was to be decided, and what information was germane. Senator Humphrey interested himself in the chemistry of AD-X2, and in the processing competence of its vendor. Senator Nixon (by this time, the Vice President), had expressed concern over the apparent discrepancy between laboratory tests and practical experience in operational use of the product.<sup>99</sup> Most of the committee members were concerned over the small business versus big government issue.

At various times the chairman of the committee shifted from one issue to another. For example:

The issue \* \* \* is whether or not agencies of the Government have been fair and just in the treatment of Mr. Ritchie and his product, battery AD-X2.<sup>100</sup>

\* \* \* We are trying to comb for the last morsel of evidence as to whether this man should be denied the right to package and sell the product or whether he should be privileged to sell it.<sup>101</sup>

We are trying to determine whether this product has merit or not.<sup>102</sup>

\* \* \* I have absolutely no interest in the product, only as a Member of Congress who is trying to determine whether a businessman should have an opportunity or whether that opportunity should be denied the businessman, because of a finding of a Federal agency.<sup>103</sup>

The issue of monopoly, or the question of the protection of the small business in conflict with the interests of big business evidently interested Senator Gillette:

What I am interested in, and I am sure the other members are in agreement with me on this, is whether or not there was in this entire investigation any discriminatory action against a company or a manufacturer anywhere along the line.<sup>104</sup>

\* \* \* I have no knowledge and little interest as to whether the one test or another shows the particular merchandise to be valuable or not, relatively; but I am tremendously interested if any agency of this Government, the Bureau of Standards, the Federal Trade Commission, the Post Office Department, or any other agency, has been, wittingly or unwittingly, knowingly or unknowingly, used to impair the business and the business position of any citizen of the United States.<sup>105</sup>

For Senator Schoepel the question concerned both the product and the objectivity of NBS:

\* \* \* Probably the central issue here is whether AD-X2 helps batteries or not.<sup>106</sup>

One of the main questions \* \* \* is whether the Bureau [of Standards] was completely objective and fair in the handling of AD-X2.<sup>107</sup>

Senator Smathers saw the issue in a broader perspective, in which the Congress had obligations to both producer and consumer:

As the other Senators have said, we are interested in seeing that no businessman gets put out of business arbitrarily. I think we are also interested in seeing that no consumer gets sold something under representations that do not measure up. So we have sort of a dual responsibility not only of protecting the businessman but also, possibly, the consumer.<sup>108</sup>

<sup>98</sup> *Ibid.*, p. 161.

<sup>99</sup> *Ibid.*, p. 222. (Letter excerpt, introduced as part of prepared testimony of Dr. Astin.)

<sup>100</sup> Hearings, *op. cit.*, p. 9.

<sup>101</sup> *Ibid.*, p. 229.

<sup>102</sup> *Ibid.*, p. 374.

<sup>103</sup> *Idem.*

<sup>104</sup> *Ibid.*, p. 248.

<sup>105</sup> *Ibid.*, p. 384.

<sup>106</sup> *Ibid.*, p. 208.

<sup>107</sup> *Ibid.*, p. 320.

<sup>108</sup> *Ibid.*, pp. 385-386.

(c) *The issue as defined by staff documentation.*—Some indication as to how the committee staff defined the issue may be drawn from the kinds of documentation and witnesses they assembled for the hearing. There was evidence of the interest of battery manufacturers in halting the promotion of AD-X2. There were NBS circulars and memoranda on battery additives. A great deal of military test data of the additive, as well as the MIT test data and report, were included. Some documentation of NBBB interest had been collected, although most of this was supplied by Ritchie as he testified.<sup>109</sup>

The witnesses included two scientists, Dr. Astin and Dr. Harold C. Weber, professor of chemical engineering at MIT; 10 practical technologists, all but one of whom appeared to present testimonials supporting AD-X2; and Ritchie himself. The hearings concluded with testimony by an east coast sales representative of Pioneers, Inc.

Evidently the staff interest was in the performance of the additive in the laboratory and in service, and in the role of NBS both in technical evaluation and in influencing the competitive position of the product.

#### *Assessment of the issue*

The apparent lack of definition of the issue is both understandable and tolerable in a case before a committee with investigative rather than legislative functions. However, it would seem that before the Congress could resolve the issue it needed to be analyzed, and alternatives considered. These alternatives would need to go beyond whether Ritchie had been fairly treated or not, whether AD-X2 was any good or not, and whether it did or did not contain any mysterious ingredients that differentiated it from numerous additives the Bureau of Standards had previously found worthless.

It does not appear that any analysis was made of the AD-X2 case in terms of its public or political significance. Accordingly, the testimony was based on each witness' interpretation of the issue; the choice of witnesses and documentation introduced in the hearings resulted mainly from committee staff interpretation as to what the issue was; and the questions asked of witnesses were essentially ad hoc—responding to the need for clarification or testing of the testimony.

#### *Definition of alternatives*

The most fundamental statement of alternatives offered to the committee was that of Secretary Weeks. He saw the issue in the context of the dichotomy of business versus Government. For him the alternatives were as to whether the test of the marketplace should be permitted to prevail or whether the Government regulation should serve in its place.

It is interesting to note that the report of the National Academy Committee on Battery Additives was later on to take the position that the surest means for the testing of the validity of scientific findings was in the "marketplace of ideas." Only the worthy survived. Whether the commercial marketplace served equally well, however, was not as evident. There were lacking some of the main sources of validation available to the institutions of science, such as the prestige of individual critics, the critical selection of items for publication, the

<sup>109</sup> Ibid. (An index of exhibits contained in the appendix appears on pp. 10-11.)

currency of validated quantitative data, the rapid circulation of established publications, and the means of repeating procedures under challenge.

However, the use of science in support of the regulation of commercial quality was clearly a relative matter. The resources of science would be quickly exhausted by any comprehensive program of testing. The NBS personnel responsible for the tests of AD-X2 found the work distasteful. There was no obvious way to limit the scope of scientific tests in support of regulation. The rights of the consumer to quality, and the rights of the producer to freedom from arbitrary regulation, had not been probed. Selection of products to be tested seemed to be a chancy process, involving at least some admixture of inadvertence, and some of competitive interest.

Less fundamental, but still pertinent, were the alternatives presented by the regulatory mechanism in operation that had raised the AD-X2 issue. For example, one issue was as to whether a scientific laboratory should be insulated from possible bias, or imputation of bias, by dealing with the interested parties to a technological controversy only at arm's length, and through the medium of a political screening process. Another issue was as to whether the role of the Department of Commerce should be limited to—or should emphasize—the facilitating of product sales, or whether it was also interested—even equally interested—in the maintenance of quality of products accepted by the consumer. Still another issue was: Should Government application of science serve neutrally but actively as the guardian of the marketplace, or should it be relegated to the development of new products?

#### V. SOURCES OF THE COMMITTEE'S INFORMATION

The committee hearing was intended, according to Chairman Thye, to provide “\* \* \* a complete presentation of the facts \* \* \*” that would enable the decision process to take place. As the chairman observed, this process was—for this particular case—a diffuse one. It was spread among “\* \* \* the public, the agencies of the Government, and this committee.”<sup>110</sup>

Information was formally presented to the committee by 15 witnesses (in addition to Weeks and Shaeffer, who appeared at the brief preliminary session on March 31). These included Ritchie himself and one of his regional representatives, two scientists (Dr. Astin, of NBS, and Dr. Weber of MIT), four industrial technologists offering testimonials favoring AD-X2, a battery shop manager, and six technologists connected with field installations of the military departments; three of these last reported on military tests of the additive (one favorable, one unfavorable, and one terminated after favorable preliminary results), while the other three attested to favorable experience in field service.

#### *Testimony of Ritchie before the committee*

In the some 200 pages of his testimony, Ritchie dealt with many aspects of his difficulties in marketing his product. He described the background of his scientific associate and consultant, Dr. Randall, including a notarized description of his technical qualifications. He

<sup>110</sup> Hearings, op. cit., p. 9.

offered exhibits of Dr. Randall's technical writings in support of the additive. He graphically described Dr. Randall's reaction to the discovery of AD-X2.

He included documentary evidence of Dr. Randall's repeated attempts to win recognition from NBS of the unique virtue of his product. Ritchie also introduced trade literature favorably describing AD-X2, and evidence (including bills of sale for repeated military orders) demonstrating that his product had numerous satisfied customers. He also gave evidence in the form of correspondence to show that a controversy had occurred between the Oakland Better Business Bureau and the NBBB concerning AD-X2.

The scientific aspects of Ritchie's testimony were largely evidential, as he did not represent himself as technically qualified. In addition to the documents by Dr. Randall, he presented information about the experiences and uncontrolled tests by the Physics Department of the University of San Francisco, reports by the United States Testing Co., various field tests of his own, and an evaluation by Dr. Laidler of NBS Circular 504.

There were evident tactical advantages to Ritchie in leading off as witness. For one thing, he was able to enlighten the committee as to how an electric storage battery worked, couching his explanation in terms compatible with his own explanation of the useful function of his additive. It was also convenient for Ritchie's case for him to be able to interject his own interpretation of the results of the tests he reported on to the committee.

Another 29 pages (482 to 510 of the hearings) were occupied by the testimony of Norman Goodwin, president of Guaranteed Batteries, Inc., of Boston, Mass., and an east coast distributor of AD-X2. His testimony included a nine-page reprint of a trade magazine article, as told by Ritchie ("the exclusive behind-the-scenes story of the fight for recognition of the battery powder which caused all the trouble"). Goodwin claimed to have lost \$40,000 because of the use made by his competitors of NBS Circular 504 to campaign against him.

Goodwin identified his competitors as "battery manufacturers, the manufacturers and dealers or people who were selling batteries."<sup>111</sup> He described a talk he had given on the additive to a group of potential customers at a trade association meeting in Boston, and said that during the 30-minute question period at its close, "the New England manager of a large national battery manufacturer stood up, and he and his assistant took up the whole question period reading the Bureau of Standards 504 Circular, and otherwise fouling up the situation." Goodwin asked why?<sup>112</sup>

Goodwin conceded that "battery additives have, in the past, had an unsavory reputation, and with cause \* \* \*." But, "in view of the actual field experience with battery AD-X2, which has been piled up in all parts of the country, it is absurd that the Bureau of Standards, with their inadequate laboratory tests, would even dare to ignore the excellent results obtained from the wealth of field experience over a period of years \* \* \*."<sup>113</sup> He described a number of favorable experiences by his customers and concluded by recounting the favorable

<sup>111</sup> *Ibid.*, p. 492.

<sup>112</sup> *Ibid.*, p. 497.

<sup>113</sup> *Ibid.*, p. 494.

indications in preliminary tests of the additive to restore a failing submarine battery at the New London Submarine Base.<sup>114</sup>

Dr. Laidler did not testify. He had assisted the committee late in 1952 in preparing a preliminary report on AD-X2, in which the results of the MIT tests were interpreted by him as being favorable to AD-X2. He had also served as a paid consultant to Ritchie both before and after his work for the committee. Laidler was not named by Dr. Astin in his testimony, which is discussed below, but he was referred to indirectly, in the comment: “\* \* \* the proponents of AD-X2 began looking for minor flaws in the report and the testing procedure [of the June 1952 tests], ignoring the major conclusions of the report.”<sup>115</sup>

#### *Testimony of Dr. Astin on AD-X2 and NBS*

Dr. Astin took the stand the afternoon of June 23, and continued until late in the afternoon of June 24. In his prepared statement, Dr. Astin welcomed the scrutiny by the National Academy of Sciences of the battery work of NBS, described the scope and functions of the Bureau, cited its statutory authority for tests and information dissemination about commercial products, and then extensively discussed the testing function itself. In particular, he explained to the committee the differences between laboratory and field tests, and between controlled and uncontrolled tests. He acknowledged that field tests were needed to confirm that an effect or improvement still persisted under the “more rigorous conditions of actual use.” However, the field test, he said, “\* \* \* is not resorted to until some improvement or effect is developed in the laboratory which would then make the field test worthwhile.”<sup>116</sup>

Then Dr. Astin described the extensive work of NBS in storage batteries, the correspondence with Dr. Randall, analysis by NBS of the chemical composition of AD-X2, and initial laboratory tests of the material. In comment on the charge of unfairness on the part of NBS in the testing of battery additives, he said:

First, every action which the Bureau has taken with respect to the testing of AD-X2 and the dissemination of information with respect thereto has been brought about as a direct consequence of the representations and pressures of the proponents of AD-X2. The Bureau became aware of the existence of the product first by approaches made by the manufacturer, and initially declined to make any tests on it because there was no reasonable evidence that the product was, in fact, different from any of the other numerous additives the Bureau had previously tested, and also because the Bureau does not evaluate proprietary products for individual manufacturers. The initial tests made by the Bureau came about largely as a result of inquiries and suggestions from the Oakland Better Business Bureau and from Senator Knowland, their inquiries in turn being instigated by Pioneers, Inc. The subsequent dissemination of information about battery additives came about largely as a result of pressures applied to the National Better Business Bureau to make unwarranted exceptions in the case of Battery AD-X2.<sup>117</sup>

The response to the “pressures” from Pioneers, Inc., said Dr. Astin, had led to the sequence of NBS tests made at the request of the FTC and the Post Office Department. Periodically, there had been a spate of correspondence with Members of Congress in reference to these activities.

<sup>114</sup> *Ibid.*, pp. 508-510. An indication that this reference excited the interest of the committee is provided by the letter the chairman subsequently wrote asking the Department of the Navy to advise him of the results of the tests described by Goodwin. The Navy has no record of any response to this inquiry.

<sup>115</sup> *Ibid.*, p. 224.

<sup>116</sup> *Ibid.*, p. 217. Dr. Astin's testimony runs from p. 209 through p. 335.

<sup>117</sup> *Ibid.*, p. 221.

Finally, he described the procedure used in the NBS tests during June 1952, the methods used in interpreting the test results, and his own conclusions based on these results. He also offered his own conclusions on the MIT tests, which differed from those drawn by Dr. Laidler. He asserted that “\* \* \* the [major] effect reported by MIT is \* \* \* observable in the batteries only with electrolyte of extremely dilute acid concentration, so dilute in fact that it appears to be of no significance whatever in normal storage-battery operation.”<sup>118</sup>

In the interrogation that followed his prepared statement, the committee sought to learn why NBS had conducted no field tests of the battery additive. Dr. Astin explained variously that the field test was less amenable to control of the external variables than was the test in the laboratory, that field tests were employed to explore the practical significance of laboratory findings, and that he knew “\* \* \* of no instance in a field test where something has been demonstrated of this sort which could not be demonstrated in a laboratory test.”<sup>119</sup> Moreover—

\* \* \* We have taken the point of view that if the material performance does anything useful in the operation of a battery, then we should be able to relate it to some performance characteristics that can be measured. That has proved completely fruitless. I mean any pertinent effect, I should say.<sup>120</sup>

In response to repeated comments by the chairman that the layman found the detailed reports of user-experience persuasive, Dr. Astin agreed that he could understand this. But he suggested that the same results would have been obtained with or without the additive, if the batteries in question had received otherwise identical treatment. In answer to Senator Sparkman’s question as to the importance that should be attached to testimony by engineers, on the use of the additive, Dr. Astin suggested—

Well, I think you should ask them for the type of observations and measurements they have made on which to base their decision that the material helps them. You should ask them if they have any control so that they have a base with which to compare their measurements.<sup>121</sup>

Asked whether Dr. Randall was an “eminent scientist,” Dr. Astin said that in the field of battery technology, he was not in a class with Dr. Vinal, and, “I would not endorse him.”<sup>122</sup> He later explained that Dr. Randall’s written submission of his views in an article had been rejected by a scientific journal “as not having adequate technical content.”<sup>123</sup>

Dr. Astin acknowledged that the NBBB request was a factor in the NBS initiation of activity on Circular 504, but insisted that—

\* \* \* our legislation authorizes us to disseminate the information we accumulate when such data is of importance to scientific or manufacturing interest. We had information which has apparent importance to the public. The National Better Business Bureau said it was important.

Now, since our legislation specifically states that we should appraise the interest of science and manufacturing interest before we publish data, I see nothing wrong with that. \* \* \* If, however, this committee does not think it [a legitimate procedure], then we would like your guidance on that.<sup>124</sup>

<sup>118</sup> *Ibid.*, pp. 225–226.

<sup>119</sup> *Ibid.*, p. 224.

<sup>120</sup> *Ibid.*, p. 260.

<sup>121</sup> *Ibid.*, p. 228.

<sup>122</sup> *Ibid.*, p. 251.

<sup>123</sup> *Ibid.*, p. 321.

<sup>124</sup> *Ibid.*, p. 252.

As to the relevance of testimonials to the work of a scientific laboratory, he dismissed them entirely as unacceptable for scientific evidence:

In general, the reports are made by nontrained observers, and the people who supply such information usually have no records or data to support, in a scientific manner, the statements or claims they make. For that reason—first, that there are generally no adequate measures included in a testimonial, no rigorous specifications of the operating conditions under which the measurements were taken, and usually no controls whatever are used—for those reasons we cannot accept testimonials as scientific evidence.<sup>125</sup>

When the questioning turned to the role of NBS in the testing of commercial products and the publication of information about findings in such tests, Dr. Astin stressed the essential neutrality of a scientific laboratory in this work:

We try to confine our reports merely to the presentation of technical data, and we hope thereby that since it is straightforward data, nobody can complain that they are being discriminated against. That is, I gave in my general statement the example of tests on aluminum. It might show that tests on aluminum under a particular set of conditions favor superior performance characteristics to steel. Now would we withhold the dissemination of that data because the steel people would not like it? It is a cold, hard scientific fact. You disseminate it. To withhold the dissemination of scientific information I think is the most prejudicial action.<sup>126</sup>

He defended the practice of consulting with private industry as to the subjects to be investigated by NBS:

\* \* \* We frequently attempt to determine the interest of scientific and manufacturing groups in publications before we distribute them. \* \* \* And since our act specifies that publications should be related to scientific and manufacturing interests, we do make a serious effort to determine the degree of interest in information of a particular type before dissemination.<sup>127</sup>

The influence of the marketplace might generate interest in a subject to be investigated by NBS, but should not be permitted to influence the findings of a scientific investigation:

\* \* \* We are a scientific laboratory. We attempt to determine technical merits; and use consideration, that is, whether a person is satisfied by the use of a product, bears no consideration in influencing our findings. If, however, marketplace factors create interest in a product, then that might determine whether or not we would investigate it. But certainly the customer satisfaction or the demand for a particular product in the market has no bearing whatsoever on the technical merits of a product.<sup>128</sup>

The ultimate issue seemed to be the definition of the regulatory role of a Government scientific laboratory. In response to questions by Senator Homer Ferguson, Dr. Astin sought to reconcile the concept of a neutral Government scientific institution insulated from the interests and stresses of the marketplace with the concept of a Government institution generating data in response to the needs of commerce. Senator Ferguson asked such questions as:

Do you believe that the Congress intended to grant authority to the Bureau of Standards personnel to prepare material at the request of and for publication by private organizations for commercial use?

Do you think that the National Bureau of Standards by following its policy of disseminating technical data, when not specifically directed toward scientific or technological progress, at the professional and production level, is broadening gratuitously and, perhaps, inadvertently, into a regulatory activity?

Dr. Astin responded that (a) he was not sure that the Congress intended the Bureau to channel its reports to commercial use by private

<sup>125</sup> *Ibid.*, p. 262.

<sup>126</sup> *Ibid.*, p. 253.

<sup>127</sup> *Ibid.*, p. 275.

<sup>128</sup> *Ibid.*, p. 272.

organizations; (b) the organic law of NBS authorized dissemination of information of interest to private groups, and did not determine or restrict the use to be made of the information; (c) the conduct of scientific research was inherently regulatory—

\* \* \* All progress in science and technology is regulatory. The invention of the incandescent lamp bulb made obsolete gas lights and so on, so that if you carry this too far, then you would never disseminate any scientific information because it might have some effect on curtailing the marketing of some products that it is related to.<sup>128a</sup>

*Dr. Weber's description of the MIT tests*

Since the MIT tests of AD-X2, performed at the committee's request, had been interpreted and represented as substantiating the advertising claims of Pioneers, Inc., the appearance of Dr. Weber before the committee had special significance. Dr. Weber, a professor of chemical engineering at MIT, had conducted the tests and had had a casual interest in AD-X2 for some time. Dr. Laidler had been quoted in a release by the committee as concluding from the results of the MIT tests that the NBS evaluation of the additive was "reprehensible."<sup>129</sup> However, when the full report and test data were released by MIT, they had created uncertainties rather than helping to resolve the issue as to the merit of the additive. Dr. Astin had dismissed these tests as uninformative because, he said, the electrolyte used in them was of much lower specific gravity than would be required for service use, and the effects noted did not correlate with any significant change in battery performance.<sup>130</sup>

It was notable that in his comments about the performance of AD-X2 to the committee, Dr. Weber was careful to restrict himself to the formal wording of the MIT report; he provided no interpretation of the test data. He disassociated himself from Dr. Laidler's conclusions and accepted, as a precise paraphrase of his own thinking, a statement by James A. Beattie, professor of physical chemistry, concerning the MIT report. Its concluding paragraph read:

I would say that the addition of AD-X2 certainly does have an effect on the behavior of a lead-acid battery. From my brief contact with the work, I cannot say that this effect is correlated with a beneficial action from the standpoint of the normal use of such a battery. I feel that the latter can be determined only after the examination and statistical evaluation of extensive field tests.<sup>131</sup>

The testimony of Dr. Weber differed from that of Dr. Astin in some respects. Thus, while recognizing the competence of the National Academy of Sciences Committee that was to make a definitive finding as to the virtue of AD-X2, said Weber ("\* \* \* I certainly have confidence that they will render as good a decision as such an eminent group of scientists could render"), he nevertheless attached more importance than had Dr. Astin to the "field data" on the additive. For himself, he said that a scientist could not afford to disregard user testimony.<sup>132</sup> He called attention to a passage in the MIT report that said, in part, "\* \* \* laboratory findings must be supplemented by field-use data if a true evaluation is to be obtained."<sup>133</sup> (By contrast,

<sup>128a</sup> Ibid., pp. 315-316.

<sup>129</sup> "Senate Unit Flays NBS Battery Test," op. cit.

<sup>130</sup> Hearings, op. cit. pp. 225-226.

<sup>131</sup> Ibid., p. 393. The complete MIT report, and related correspondence are presented in the appendix to the hearings, pp. 565-618. The comments by Professor Beattie are on pp. 589-590.

<sup>132</sup> Ibid., pp. 383, 386.

<sup>133</sup> Ibid., p. 375.

Dr. Astin had said: "If it affects the performance of the battery, it does something to it that can be measured."<sup>134</sup>)

*Other technical evidence presented to the committee*

The rest of the hearings were occupied with three military technologists reporting on military tests, a battery shop operator, and seven users reporting favorable experience with the additive. (These included three persons from military field establishments.) The appendix to the hearings contained data of three sets of military tests (adding up to an inconclusive picture), the full text of the MIT report and test data, affidavits of satisfied users, and correspondence between NBS officials and other persons concerning AD-X2 and battery additives generally.

Typical of the experience reported by the technologists was that of Kenneth W. Binding, experimental and developmental engineer, Market Forge Co., Everett, Mass. His report occupied five pages of the hearings (pp. 421-426). Binding had no special experience with batteries, but designed and developed industrial equipment using them. He testified that he had had one particular battery 5 years old, heavy duty, costing between \$500 and \$600, used continuously for 3 years, then left idle 1 year, because it had begun to operate unsatisfactorily. The battery was then (November 1951) inspected by a battery salesman who recommended its discard. It was ordered junked at scrap lead salvage value of \$29. The battery was then treated with AD-X2, repeatedly charged and discharged in accordance with the instructions provided along with the battery additive, and at the end of the week was put back into service. The cost of the treatment was \$36. The battery was still in service in June 1953. Binding was now using the additive in his other batteries and had not required a replacement battery in the previous 6 months; according to his past experience he would have expected some necessary replacement during this period.

*Recapitulation: A plethora of data*

From the political point of view, the committee had been provided with more information about batteries, battery tests, and battery experience than was really needed. The testimony brought out the fact that Ritchie had gone to the trouble of working with NBS, engaging the services of U.S. Testing Co., and contesting the Government's position regarding his additive. It established that the product was associated by many users with an improvement in battery performance.

Voluminous test data had been collected from military field installations (pp. 618-757), that yielded inconclusive results. There were data and reports of NBS tests, with controls, that uniformly showed an absence of beneficial results. There were the data of the MIT tests, indicating differences in battery behavior with and without the additive, but which the testing institution declined to identify as benefits.

The question was: What did all this evidence prove? How did it bear on the issue? What action should the committee take? Was there conflicting evidence or did it merely look that way?

Despite the advice of Dr. Astin that field data should be looked askance unless they were substantiated by quantitative data in

<sup>134</sup> *Ibid.*, p. 335.

writing, with environment and circumstances properly characterized, and appropriate controls devised, the committee did not raise these questions in taking testimony from witnesses describing favorable experience with AD-X2. Data were almost entirely qualitative. On the other hand, the voluminous quantitative data from the various tests that the committee collected were virtually unmanageable. The tests themselves added up to an inconclusive total, and the information they provided was not usable in resolving the issue.

## VI. THE DECISIONMAKING METHOD

An analysis of the AD-X2 case reveals that it involved three sets of issues. One had to do with the testing process, a second with the regulatory mechanisms of the Government, and a third with broader science policy. The bulk of the evidence was relevant to the first issue, and much less was relevant to the second; the third issue remained largely undefined and was resolved only indirectly. The three sets of issues were as follows:

1. The testing process:
  - (a) Was AD-X2 a useful product?
  - (b) Was NBS qualified to test it?
  - (c) Had the NBS tests been adequate?
2. The regulatory process:
  - (a) Was it desirable to invoke the postal regulations, and was Pioneers, Inc., engaged in a fraud?
  - (b) Was it desirable to invoke the fair trade authority of FTC to moderate the advertising claims of Pioneers, Inc?
  - (c) Was the regulatory process as it involved NBS arbitrary or discriminatory, such as to give unfair treatment to Pioneers, Inc?
3. The science policy issue:
  - (a) Should NBS personnel become involved in contacts with private industry involving evaluation of the merits of commercial products—i.e., give an appearance of interest?
  - (b) Should NBS functions in the regulation or testing of commercial products be more sharply defined and delimited?
  - (c) Should the emphasis of Government sponsorship of science be on the regulation of consumer products or on new discovery and the development of new technology?

These three sets of issues called for three different kinds of treatment. The first set, which had received the bulk of the committee's attention, had given rise to so much information of a detailed and seemingly conflicting nature that the committee saw no way of resolving it, and was content to leave the issue to resolution by the leadership of the national scientific institution.

The regulatory issue, on which Dr. Astin and Ritchie had testified at some length, was of primary concern to the committee because it involved the question of fairplay to small business. It was of particular salience at this time, moreover, because of the emphasis of the new Administration on the need to redress the balance between bureaucratic regulation of business and Government encouragement of free enterprise. In part, the resolution of this second set of issues seemed to hinge on the findings in the first set. However, as will be seen, the regulatory decision was not resolved automatically by the decision as to the merit of the additive.

The science policy issue, least salient from the political point of view, had perhaps the most far-reaching implications and the most protracted consequences. Because it was not made explicit, its resolution was generalized and adaptive, and not easy to identify.

The decision processes concerning all three sets of issues involved a complex of decision points. The role of the Congress was as monitor. No legislation was involved in the decisions. This was partly because the committee itself did not have legislative responsibilities, partly because the issue did not appear to be amenable to resolution by act of Congress, and partly because the Administration—through Secretary Weeks as its spokesman—gave assurances that the organizational and procedural changes found necessary to correct the situation would be taken promptly and decisively by his office.

*The decision method in the testing issue*

Although the committee had received information on upward of a dozen different sets of laboratory tests of AD-X2, and many testimonials from satisfied users and field experience reports, a definitive finding was elusive. For every test there was some criticism as to procedure, sufficient to shake the faith of the committee as to the findings. Originally, the committee had sought to resolve the issue by going to an outside laboratory that was neutral as well as prestigious. MIT's reputation as a practical engineering institution, coupled with its acknowledged scientific competence, made it a logical choice. The MIT tests followed on the heels of an extensive set of tests by NBS which had been criticized by Ritchie principally on the ground that the electrolyte was too high in specific gravity. The MIT tests, conducted in autumn of 1952, identified eight effects in batteries attributable to the addition of AD-X2. The MIT report, as evaluated by Dr. Laidler, seemed to show that these eight effects made the additive meritorious. However, the MIT research people did not make any interpretation of their data, and Dr. Astin rejected the data as derived from an unrealistic condition (in his judgment, the electrolyte had been much too low in specific gravity). It was understandable that Senator Sparkman was moved to ask: "Is there not some way that a conclusive test for the satisfaction of everybody can be conducted and conducted in such a way that there will be no possibility of a mistake?"<sup>135</sup> And again—"Is it not possible to devise a test that can be agreed upon by all, so that, if it is run, it will be foolproof?"<sup>136</sup>

Four conflicting attitudes seemed to persist among the membership of the committee. One was a profound respect for the institution of science, and for NBS as a great national laboratory. This attitude was conditioned somewhat, as shown above, by irritation that science was unable to provide unequivocal answers to the simple question of the virtue of a battery additive—or at least sufficient to silence the critics.<sup>137</sup> A second attitude was the general acceptance of the idea that the Edisonian creativity of the backyard inventor can sometimes accomplish what institutional science has concluded was impossible.<sup>138</sup> The third attitude was a respect for the practical judgment and

<sup>135</sup> *Ibid.*, p. 239.

<sup>136</sup> *Ibid.*, p. 353.

<sup>137</sup> As evidenced by Senator Sparkman's questions above. An additional source of irritation, expressed by Senator Sparkman, *ibid.*, p. 238, was that complaints had been heard from small business people that NBS had not given them fair treatment, that it had adhered to its fixed standards without full regard to changes that may take place.

<sup>138</sup> See *ibid.*, pp. 242, 379, and 381.

experience behind the "hardheaded" test of the marketplace and the testimonials of real-life users, over the theoretical or laboratory findings. Fourth was a tendency to accord respect to a finding held by a unanimous faction (satisfied users) over a faction in conflict (the laboratory testers).

The decision of the committee on this issue was to defer to the findings of the Committee on Battery Additives of the National Academy of Sciences, endorsed in advance by both Dr. Astin and Dr. Weber. Secretary Weeks had indicated his intention of asking for a review of NBS battery additive testing by the best qualified scientists available.<sup>139</sup> Dr. Astin had told the committee that Secretary Weeks had sought the advice of the National Academy of Sciences on this matter.<sup>140</sup> He had also described the Academy and its special qualifications, and had assured the members of the committee that on the issue of the reliability of the NBS tests he "would prefer that this is a question you let the National Academy committee settle."<sup>141</sup>

The decision, however, was a tacit one. The Academy committee was proceeding on the basis of a request from the executive branch. The Small Business Committee might have ignored this development and gone ahead with its own report. That it did not do so, and the open-ended manner in which the chairman terminated the hearing,<sup>142</sup> suggest that the committee had reached no firm conclusion of its own on the merits of AD-X2 nor as to the reliance to be placed on battery additive testing by NBS.

#### *The decision method in the regulatory issue*

With respect to the regulation of small business in battery additives, three quite separate issues confronted the committee. There was the summary issue of the Post Office fraud charge, the more formal but less clear-cut case of the FTC complaint, and there was the role of NBS in the regulatory process in general.

In the Post Office case, a copy of the hearings was sent to the Postmaster General with a letter which said, in part—

The committee has concluded that further hearings should not be held for the time being. It could not, in the present state of the testimony, make a finding of its own. \* \* \* This committee sends you for whatever consideration you care to give it, the testimony presented at its hearings. The decision as to what action your Department should take with relation to the suspended fraud order, the committee emphasizes, is yours.<sup>143</sup>

According to the Lawrence account of the controversy, when the Post Office Department did not find in the record of the hearings a sufficient justification for "expunging" the case from the record at once, the Senate committee staff "urged the Post Office informally to remove the fraud order." It needed documentation to show cause, however, which the staff supplied in a memorandum which drew the following conclusions:

1. A scientific controversy does exist over the merits of AD-X2.
2. The military and commercial users of AD-X2 feel very strongly that this product does all that the manufacturer claims it should do and that they are satisfied that the product can effect large savings in terms of time and money.

<sup>139</sup> *Ibid.*, p. 4.

<sup>140</sup> *Ibid.*, p. 226.

<sup>141</sup> *Ibid.*, pp. 326, 244.

<sup>142</sup> *Ibid.*, p. 510. Concluded the chairman: "\* \* \* and, therefore, we will have to discontinue the hearings for a few days. For the present this will conclude the hearings."

<sup>143</sup> "The Battery Additive Controversy," *op. cit.*, p. 26.

3. No one who has used this product feels in any way that he has been defrauded, either by the manufacturer or by the product.

4. That Mr. Ritchie's advertising is conservative and that his product does exactly what his advertising claims.<sup>144</sup>

Shortly after receipt of this memorandum, the Post Office Department, on August 20, took action to cancel the fraud order against AD-X2. It is possible that this memorandum was too unqualified in its endorsement of the product. However, in view of the evident efforts by Ritchie to expose his product to tests by NBS, MIT, the military departments, U.S. Testing Co., Chicago Development Co., and others, it is difficult to conclude that Ritchie himself considered AD-X2 as other than meritorious. It was accordingly reasonable for the Post Office Department, in dismissing the case, to conclude that “\* \* \* there is insufficient proof of an actual intent by Ritchie to deceive which is required to warrant and maintain a fraud order.”<sup>145</sup> Even assuming the absolute validity of the NBS test conclusions, the record strongly suggests that Ritchie believed otherwise.

There is no evidence that the Senate committee or its staff took any specific interest in the AD-X2 case before the FTC. This case dragged on for a number of years, before Pioneers, Inc., won final vindication. While it presents an interesting question as to relative weights of different types of evidence before a regulatory commission, it is not particularly instructive for the purposes of this study.

The extent of active participation by NBS in the regulatory process was the subject of much of the committee's interrogation of Dr. Astin. This question was the main focus of Secretary Weeks' presentation to the committee, and was also a main theme in Ritchie's testimony.

The potential for discriminatory treatment of an individual company was certainly present in the complex of regulatory arrangements that had evolved for the protection of the consumer. Even wider opportunity was offered by this complex for allegations of discriminatory treatment. Thus, NBS did not test all products, but only those that came to its attention. Its attention was attracted by two routes: either as a consequence of complaints to regulatory agencies, who then brought the product to the Bureau for test, or (very rarely) as a result of direct inquiry to NBS itself. In either case, the contact with the initiating Government agency might be made by a nonprofit institution with a public service character, but the impetus might ultimately be traced to a profitmaking organization with a competitive interest in having such tests made. The hearings did not reveal whether or not NBS had been influenced by its having taken a technical stand against battery additives, or whether it was inflexible in persisting in such a finding in the face of contrary evidence. There was contrary evidence, but its rejection by the Bureau was on the scientific grounds that it was unsoundly based or trivial. On the other hand, the hearings did contain allegations that NBS was both influenced and inflexible. Moreover, the relationships that the Bureau had drifted into, with the battery industry and NBBB, lent credence to the allegation. Further opportunity for criticism lay in the fact that two principal battery experts of the Bureau had accepted employment in the battery industry after leaving NBS. From the point of view of Dr. Astin, it was “very unfair” to read any impropriety into this circumstance; the stature of the

<sup>144</sup> *Idem.*

<sup>145</sup> *Ibid.*, p. 27.

scientists in question ruled out the possibility. Dr. Astin's admission that the Bureau's findings were not absolutely infallible might also be taken as indicative of a degree of flexibility.<sup>146</sup>

Having made the point that the opportunity for impropriety was at least latent in the NBS procedures, the committee did not pursue the subject further. It was left to the Department of Commerce to work out its own resolution of the problem. The recommendations of the Kelly committee and the evolution of NBS policy to increase the distance between commercial interest and scientific investigation appear to have disposed of the issue in a gradual way.

*The decision method in the science policy issue*

The influence of the testing function on the character and program of a Government laboratory was not explored by the committee. Dr. Astin made clear that he did not seek or want regulatory responsibility for his agency.<sup>147</sup> The testing function had indeed involved the Bureau in the AD-X2 controversy; its undesirable byproducts had been shown to include distraction, stress, animus, personnel instability, and a weakening of scientific objectivity and disinterestedness. Although the motivation for NBS involvement in the AD-X2 controversy was described as the desire to be helpful, and a legitimate concern for the interests of the consumer, the consequences were harmful to the work, the reputation, and the stability of the personnel relations within the laboratory.<sup>148</sup>

It was apparent from the line of questioning of Dr. Astin that the committee found the function of a national scientific laboratory difficult to reconcile with that of a monitor of product quality. The members took particular exception to the phrasing of Dr. Vinal's letters to the NBBB inviting comment on the "legal aspects" of an NBS circular.<sup>149</sup> They were also ambivalent about the NBBB itself: on the one hand, it was a constructive, public service organization of merit; on the other hand, it should not be referred to—as it had been—as a "quasi-governmental" institution.<sup>150</sup> Senator Schoeppel suggested that it was "maybe a little irregular approach" for NBS to deal with NBBB on such a basis. Although no explicit conclusions were drawn on this matter by the committee, the implication was clear—

1. That to provide Government support for a private institution engaged in the regulation of business—even in a form of business self-regulation—was regarded with disfavor when it adversely affected the interests of small business and benefited larger business organizations;
2. That an arms-length relationship with commercial institutions should be maintained by NBS in matters other than the purely scientific or technical;
3. That NBS retained a residual responsibility as to the use made of its reports of the results of tests of commercial products.

The proper scope of participation by NBS in regulatory activities affecting private industry was seen by Senator Ferguson in particular as quite narrow. By implication, he would limit it to "matters of

<sup>146</sup> *Ibid.*, pp. 271-272. Senator Smathers apparently accepted this view. Speaking of Dr. Vinal, he asked Dr. Astin (p. 330) the leading question: "Do you think that, having retired and having this experience as an electrician and a battery expert, he should have gone to work for a dairy, for example, or a cement-mixing plant, or do you think it is logical that he went to work for a battery concern?" The disclaimer of NBS in fallibility appears on p. 226.

<sup>147</sup> *Ibid.*, p. 313.

<sup>148</sup> At various points, Lawrence (op. cit.) refers to the newspaper accounts of threatened resignations, "Lysenkoism," and politically directed scientific research. (See especially pp. 22-23.)

<sup>149</sup> Hearings, op. cit., pp. 287, 294.

<sup>150</sup> *Ibid.*, pp. 244-245.

interest to science and technology, broadly speaking, and to manufacturing interests at the technical level \* \* \*." <sup>151</sup> By following a policy of disseminating " \* \* \* technical data, when not specifically directed toward scientific or technological progress, at the professional and production level [suggested Senator Ferguson, the Bureau was] broadening gratuitously and, perhaps inadvertently, into a regulatory activity?" <sup>152</sup>

Having demonstrated their concern with this role of NBS, the committee dropped the matter. It was left to the Department of Commerce to find the way to correct the situation. Secretary Weeks in his opening statement to the committee, had promised action along this line, and the policy instrument he selected was the Kelly committee. This group met during the summer and studied broadly the NBS roles and missions, organization, and procedures. Its findings were relayed to the Secretary periodically and were mostly implemented as received; the final report of the committee, October 15, was accordingly largely pro forma. <sup>153</sup>

The issue as to whether Government science should serve regulatory or developmental functions was not made explicit at any point in the controversy. The "freedom of science"—that is, the insulation of scientists from political pressures, such as those illustrated by the Astin resignation—was indeed an element in the case. But none of the participants expressed the conclusion that the use of science as a part of the regulatory process necessarily exposed it to political pressures.

Dr. Astin had told the committee that the testing of commodities by NBS amounted to about 1 percent of its total activity, and that more than half of its testing was of the commodity cement. <sup>154</sup> The agitation generated by the AD-X2 controversy, in view of this small proportion of NBS effort devoted to testing, was altogether disproportionate to the effort involved. At the same time, the case illustrated the political consequences of the use of science in regulation. Even without dealing with the issue as such, the committee—by focusing attention on the controversy, and by the process of factfinding and cross-examination—made the regulatory function sufficiently onerous that NBS thereafter undertook it sparingly and with reluctance. <sup>155</sup>

## VII. THE OUTCOME OF THE AD-X2 CONTROVERSY

The direct consequences of the AD-X2 case evidence the political character of the episode. They were not unequivocal. The methods of politics were used to mediate a conflict that the methods of science would have resolved in a politically unacceptable way.

The issue did not reach the stage of legislative action. Apart from the technicality that it was presented to a select committee rather

<sup>151</sup> *Ibid.*, p. 314.

<sup>152</sup> *Ibid.*, p. 315.

<sup>153</sup> See Ad Hoc Committee for Evaluation and Operations of the National Bureau of Standards. *Op. cit.* Also, *Measures for Progress*, *Op. cit.*, especially p. 497.

<sup>154</sup> *Hearings*, *op. cit.*, p. 212.

<sup>155</sup> In the words of the official history of NBS ("Measures for Progress," *op. cit.*, p. 485n):

"The action [The Astin resignation and associated events] raised a basic question: whether Government through its regulatory and scientific agencies was to judge the merits of new products offered to the public, or whether this function was to be left to the test of the market place. The integrity of the Government's primary scientific research body had been impugned. The Bureau was being subjected to pressure, and to reorganization in accordance with an outside concept of scientific objectivity. The attack on the Bureau implied a radical reversal in the role of Government as the regulator of commerce."

than to a standing committee, the issue was never presented in a form in which legislation would have been a suitable means of resolution. Most of the decision-points lay outside of the Congress, and were only influenced by actions within the committee of Congress.

The alternatives perceived by the Congress—that is, by the committee—centered on whether or not the battery additive had merit, whether the vendor had been fairly treated, whether arbitrary action of Government was closing the door of opportunity for small business. An investigating committee assumed the primary decisionmaking role. By concentrating on the case at hand, it generated pressure on the executive branch to avoid repetition of the case, but afforded no guidance as to how the repetition was to be avoided, or how this avoidance was to be accomplished without sacrificing the protection of the consumer that had led to the controversy.

The source of the issue was an uncommonly aggressive entrepreneur. The indication of the issue took the form of a complaint of unfair treatment of the individual, supplemented by many letters to Congress from many different jurisdictions. Reception of the entrepreneur's complaint was favorably motivated by a concurrent change in political administration, and by the functional commitment of the membership and staff of the Senate Select Committee on Small Business, to whom the entrepreneur appealed. Validation of the issue to the committee derived mainly from a considerable number of testimonials asserting favorable experience with the product. The need for action was not well expressed because of the way the issue came to the Congress: There was a tendency to lose sight of the functional role of the National Bureau of Standards in a system designed to protect the consumer against fraud and misrepresentation, and instead to concentrate on the issue as to the merits of the product—and as to whether or not NBS was competent to test it.

The urgency of the issue as perceived by the Congress was partly out of consideration for the plaintiff, whose business was in jeopardy, and partly an extension of his plight to an indeterminate number of other persons whose businesses might be similarly jeopardized. Urgency was also contributed by the status of the Director of NBS, whose resignation had been linked publicly with the controversy.

The issue assessment took the form of a thorough investigation by the committee staff of the perceived issue—by resort to a technically qualified scientific laboratory—presumably objective and remote from the issue, by collection of earlier scientific findings, by numerous consultations with users of the product, and by lengthy interrogation of the Director of NBS. Because of the evolutionary way the issue emerged, attitudes and commitments had crystallized around the question as to the merits of the product rather than on the procedures by which the protection of the public against fraud and misrepresentation was reconciled with the protection of the entrepreneur against arbitrary and bureaucratic procedures.

Thus, various statements of the issue were made by members of the committee during the hearings that had little bearing on the question of what to do about it. The most substantive statement was contained in Secretary Weeks' presentation at the opening session of the hearing. He noted that the NBS was the "keystone" on which

other Government agencies depended. Its findings were a source of great power. However:

\* \* \* If the Bureau's foot slips, a business starting in against all the normal competitive hazards, finds itself up against something with which it cannot cope, the vast power of the U.S. Government.<sup>156</sup>

He suggested that the committee " \* \* \* might want to reexamine the legislation giving the Federal Trade Commission very broad powers in matters like this." He might have added that even if NBS had not erred, its relaxed and informal attitude in consulting with a party to a commercial dispute might give color to the charge by the other party that NBS was not objective and without bias.

Other procedural issues suggested by Weeks involved the NBS with the political and economic aspects of the issue. Bureau personnel had become involved in a technical controversy. Finally, he raised the question as to the roles of scientific tests versus practical experience in the evaluation of products. There were " \* \* \* many testimonials to the fact that the product is good \* \* \* ." Then the Secretary stated succinctly the essential issue as he saw it:

As a practical man, I do not see why a product should be denied an opportunity in the market place. I believe that the purpose of the Congress in establishing the Bureau of Standards and in giving powers to such agencies as the Federal Trade Commission and the Post Office Department to act to prevent unfair practices and the perpetration of frauds, was that \* \* \* their powers should be exercised in the interest of the general public and that such interest should be substantial and specifically and positively shown to be adversely affecting before the power is used.<sup>157</sup>

#### *Direct consequences of the controversy*

There were six direct and explicit consequences of the AD-X2 controversy. They were:

1. The Senate Select Committee on Small Business did not report either favorably or unfavorably on the merits of the additive.
2. The Director of the National Bureau of Standards was fully restored to his position by the Secretary of Commerce.
3. The National Bureau of Standards was extensively reorganized in response to the recommendations of the Kelly committee, and in particular was relieved of responsibility for political or other nontechnical decisions relative to commercial testing.
4. The Committee on Battery Additives of the National Academy of Sciences issued a formal report that found:
  - (a) AD-X2 to have no merit;
  - (b) NBS tests of the additive to be of excellent quality;
  - (c) Competence of NBS personnel in battery tests to be high;
  - (d) No want of objectivity of NBC personnel in the conduct or interpretation of tests of battery additives.
5. The Post Office Department canceled its fraud order against Pioneers, Inc.
6. The Federal Trade Commission unanimously dismissed the complaint against Pioneers, Inc.

#### *Indirect consequences of the controversy*

In addition to these direct consequences, there were a number of indirect results or effects, of which the most significant—as seen in retrospect—were the following:

1. Pioneers, Inc., and its proprietor, emerged without legal blemish, although at considerable cost for which he later vainly sought reimbursement at the U.S. Court of Claims. The demonstration by this "Village Hampden" that the regulatory mechanisms of the Government on commerce could be effectively resisted by a determined indi-

<sup>156</sup> Hearings, op. cit., p. 3.

<sup>157</sup> *Idem*.

vidual can be variously evaluated: It might be judged a kind of vindication of individual rights, an erosion of a partial and incomplete mechanism of consumer protection, or a warning to civil servants to interpret any regulatory mandate narrowly and precisely. One effect was an encouragement to Ritchie himself to enter politics.<sup>158</sup>

2. The effect of the case on the value of user testimonials is conjectural. The Academy committee and Dr. Astin made abundantly clear that in the scientific community such testimonials were valueless. On the other hand, the Federal Trade Commission explicitly permitted them to overweigh the evidence judged pertinent by the formal scientific community. On this showing, any business confronted with the prospect of defending itself before the FTC would have reason to collect testimonials and use them with confidence as evidence in its support. Nevertheless, the airing of this issue before the committee was probably educational for the general public—both in principle and with respect to the merits of AD-X2.

3. The message was communicated unmistakably that the new Administration intended to minimize, or at least to moderate, the role of the Federal Government in the regulation of private business.

4. The role of science was confirmed as a respected institution immune from political pressures as long as the institution contributed to technological opportunity, and did not insist on exercising a regulatory function. This effect grew out of an interaction in which the scientific community showed that it had strong views on the insulation of its findings from political pressures, and could speak with a single voice on issues even when the scientific evidence seemed contradictory. On the other hand the political community was unwilling to give political effect to a scientific finding that contravened political values such as business freedom from Government regulation, the well-being of small business, and the acceptability of testimony based on practical experience.

5. The issue demonstrated both the utility and the limitations of a useful methodology for arbitrating issues of a highly technical nature. It highlighted the importance of insuring that those who make, interpret, or arbitrate on scientific evidence are truly disinterested and objective. A committee named by the National Academy of Sciences and consisting of eminent, disinterested, and scientifically qualified individuals had gathered, assessed, and reported on the pertinent evidence, and had been able to arrive at a unanimous conclusion that was technically unassailable. However, it seems to have had an indecisive effect on the political aspect of the case, and was rejected as "hearsay" in the proceedings of the Federal Trade Commission.

6. As to regulatory proceedings, the case established that testimonials of satisfied users were weighty, even to the extent of overmatching the findings of the NBS and the National Academy of Sciences; it defined more precisely the limits of postal regulation when science could not rule completely, unequivocally, and simply on a complex technological process with many variables and unknown factors. In both cases, the result was a lessened interest in the role of the Government as protector of the consumer.

7. The relationship between the Congress and the executive branch on the AD-X2 issue illustrated anew the axioms that careful scrutiny

<sup>158</sup> See Lawrence, *op. cit.*, p. 33.

of any area of Government operations reveals opportunities for tightening of administration and procedures, and that close congressional scrutiny compels agency self-examination and sharpening of policies responsive to statutes and congressional intent.

8. Perhaps the most significant effect of the AD-X2 controversy in the long run was that it turned the attention of Government science away from the monitoring or policing function, and in the direction of positive contributions to knowledge. In the hearings, Dr. Astin was quizzed sharply on the role of NBS in the regulatory process and insisted strongly that NBS was a scientific laboratory that conducted research and made objective findings. It was not, he said, concerned in any way with the application of its findings in the regulatory process. Thus, the point was made by inference that science should not be concerned with regulatory functions. But no testimony was offered or sought to shed light on the uses of science for this purpose. By rejecting the findings of NBS, even though supported by the National Academy of Sciences, the FTC may have contributed to a trend away from scientifically supported regulation.<sup>159</sup>

#### VIII. LESSONS OF THE CONTROVERSY—THE ROLE OF SCIENTIFIC INFORMATION

The effectiveness of the information acquisition process in congressional management of the AD-X2 controversy cannot be assessed without a first determination of the objectives sought. If the objective was simply to win for Ritchie an easement of the regulatory arrangements that impaired his market opportunities, the effort succeeded. The main sources of information yielding this result were the evidences of satisfied users and the apparent technical disagreement in findings between MIT and NBS tests.

If the purpose was to communicate to the business community the intention to reduce the scale of government regulation of commerce, that, too, was successful. Here, the information was primarily in the form of declarations of policy by Secretary Weeks and the tenor of the questioning of Director Astin. But there seem to have been other objectives.

The oft-repeated assertion that the committee sought to determine whether or not AD-X2 was any good remained unsatisfied. The Small Business Committee received more scientific and technological information about AD-X2 tests than it could assimilate or evaluate. Even so, when the Academy Committee on Battery Additives entered the scene, it found this information inadequate.<sup>160</sup> It needed more information about NBS personnel, more information about NBS test procedures, data from additional tests, and more expert consultation from "neutral" sources.<sup>161</sup> The problem of the Senate committee was not in the acquisition of data, but in the specialized skills required to use the data it received. Members of the committee were frank to ad-

<sup>159</sup> Nevertheless, FTC did not itself emerge from the controversy unscathed. Lawrence reports: "The editor of Consumer's Research Bulletin wrote in September 1956: 'There is no doubt that the handling of the AD-X2 case has severely damaged the [FTC's] prestige and ability to provide the American consumer with effective protection against misleading advertising.'" (p. 32.) Lawrence also notes that a study of FTC procedures, made at the instigation of the Small Business Committee, led to a number of procedural changes at the Commission.

<sup>160</sup> Report of the Committee on Battery Additives, *op. cit.*, p. 19. Moreover, the Committee rejected the MIT data as irrelevant, and providing " \* \* \* no basis for an evaluation." (p. 22)

<sup>161</sup> *Ibid.*, pp. 4-5.

mit their bafflement at the complexities of the technology on which they were expected to rule.<sup>162</sup>

Another objective, the protection of small business from a combination of big business (i.e., the battery industry) and Government, was met in the sense that Government participation in an arrangement that constrained a particular small business was undoubtedly curtailed.

The protection of the scientific community in the discharge of its research function while constraining its participation in regulatory activities was achieved, and was almost certainly an objective of the committee. The description by Dr. Astin of the functions of NBS may have helped to define this objective, but it was probably more attributable to the high esteem earned by the scientific community for its achievements in World War II—in which NBS had played an important role in connection with both the atomic bomb and the proximity fuse. However, the ramifications of this policy were not explored at the time, and are only beginning to emerge today. It is possible that if the AD-X2 issue had been studied not as an ad hoc problem of an individual businessman versus bureaucracy, but as a matter of principle—if the questions it raised had been enumerated and the issue analyzed as to its broader implications—an altogether different set of witnesses might have been called. The assistance of the National Academy of Sciences in midsummer of 1952, instead of a separate set of tests at MIT, might have helped to dispose of the controversy more quickly and simply. The collection of the great mass of test data by the committee would have been obviated, the parade of testimonials would have served no purpose, and the questioning of Dr. Astin could have been concentrated on the issue of the role of science in regulation rather than on whether or not NBS had performed imperfectly in a given instance. However, if the question was not as to the virtue of AD-X2, but as to the use of science in Government regulation, the Academy's advice might usefully have been sought on this broader issue. The related question as to whether the National Bureau of Standards was an appropriate agent for regulatory tests or test standards, and how such an agent might be insulated from political intervention on individual cases, might also have been the subject of an Academy inquiry.<sup>163</sup> As it was, the committee was concerned less in protecting a regulatory mechanism from political onslaughts than in interceding on behalf of an affected small business.

The gulf in understanding that prevailed in 1953 between the Congress and the world of science is perhaps best illustrated by the issue of testimonials versus laboratory data. There was a mutual "credibility gap" between Congressmen and scientists. On the one hand, the committee was unable to reject the force of practical experience on the part of practicing technologists, especially when the money of hard-headed businessmen backed their judgment. On the other hand, to the scientists, testimonials were worthless as evidence because the data they provided were uncontrolled, not quantitative, and usually not even well documented.

The National Bureau of Standards found itself in the awkward position of trying to prove a negative, in the face of abundant testimonials supporting the affirmative. In view of the limitless variables

<sup>162</sup> Hearings, *op. cit.*, pp. 174, 183-184, 304, 377-378, for examples.

<sup>163</sup> To be sure, the Kelly committee did make a recommendation as to the inappropriateness of NBS to act in the nontechnical aspects of commercial tests. But its finding was made in the narrower context of the question of NBS reorganization to strengthen its scientific capability. On the broader question of scientific regulation by Government *per se*, the Kelly committee did not rule.

present in some minute extent in the situation, no complete, absolute, unqualified, impregnable proof was possible. A negative finding could be arrived at to the satisfaction of the scientific community, by reducing to a negligible level the residual possibility of error. But it could not be reduced to zero.

Most communications to the Congress appealing for help are from individuals without scientific training, and are based on a layman's judgment and values. Most Members of Congress have legal training in which representation of a client imposes the obligation to accept his story along with the case, and to attempt to substantiate his position. When the scientific evidence is conflicting, obscure, or indecisive, the congressional conclusion may favor the layman's judgment, especially when backed by abundant practical evidence in the form of testimonials. From the scientific point of view, NBS may have been altogether justified in ignoring testimonials. But from the practical or political point of view, the more testimonials in favor of a product, the stronger and more conclusive must be the scientific evidence to nullify it.

Among the difficulties encountered by the Senate Small Business Committee in acquiring technical information, there was the problem of scientific language itself.<sup>164</sup> There was the difference in approach as between the political personality, accustomed to dealing with qualitative information, and the scientific personality, used to quantitative information.<sup>165</sup> There was the problem of obeying the scientific rules in the collection of data.<sup>166</sup> All of these stood in the way of effective communication between the disciplines of physical science and the practice of politics.

On the positive side, the AD-X2 episode contributed usefully to public and political education on matters of science. It afforded instruction in the difficulty of conducting unassailable scientific tests of product performance and properties, the vulnerability of tests to criticism, and particularly the vulnerability of scientific tests to practical criticism. It illustrated the importance of controlled scientific tests, the importance of quantitative data, and the importance of requiring technical witnesses to arm themselves with careful documentation on procedures and results. It explained the difference between laboratory and field tests. In a broader context, it demonstrated the difficulty of resolving a technical issue in a congressional committee. It showed why political factfinding processes needed to separate the consideration of scientific aspects of issues from the political aspects, and to separate administratively the functions of scientific investigation and political or economic policy formulation—in order to preserve the appearance as well as the fact of scientific objectivity.

The battery additive controversy also presented the Congress with a number of difficult policy questions. Some of these were specific to the controversy, as for example—

Was it important for the examination of the issue that the Post Office Department, the FTC, and the NBBB were all impacting on Pioneers, Inc., using the data provided by NBS? And that the motivation for all three lines of attack is

<sup>164</sup> For example, see Hearings, op. cit., p. 397. Also, see references cited in footnote 163.

<sup>165</sup> Hearings, op. cit., pp. 228-229.

<sup>166</sup> For example, the Academy committee rejected 1 set of data received by the Senate committee on the ground that it was not made with AD-X2. (See report of the Committee on Battery Additives, p. 20.) The Academy committee rejected another set of test data partly on the ground that " \* \* \* the manner of reporting the data does not give confidence in the care with which the experiments were performed." (Ibid., p. 22.)

at least conceivably attributable to the battery industry? Did the battery industry use this regulatory complex for its own purposes?

How could the committee ascertain the technical competence of persons offering testimonials? The competence of NBS scientists? The relevance of MIT test procedures?

What conclusions could the committee draw from the detailed descriptions of function and service of a battery additive provided by accomplished salesmen of this product?

Was the committee, after being exposed to much scientific evidence of seemingly conflicting nature, and descriptions by salesmen and users, able to accept the judgment and assessment of test data by a committee of scientists chosen by the National Academy of Sciences?

Other questions raised by the controversy have broader implications, and are likely to recur in a new context. For example—

If it is decided that the Government should maintain a regulatory mechanism to protect the citizen or business from fraud, misrepresentation, and unsatisfactory products, how can the mechanism be designed to be immune from political reprisals following complaints from aggrieved parties, and at the same time maintain its objectivity, and also provide continuous assurance to the Congress that it is maintaining this objectivity? Can an impartial testing laboratory be exposed to political pressures without losing its objectivity and disinterestedness? On the other hand, should science and scientific institutions have immune status, apart from political pressures? Can any group be safely insulated from political stress? Yet—can science be objective and creative if it is subjected to political stress?

In the building of a science institution with esprit and reputation, is this character accompanied sometimes by a sense of superiority and bias against "outside" experts? How does this development influence the objectivity of the "in-group" and the "out-group"? Is there a danger that there may develop a scientific "establishment" infected with this kind of bias—the sort of attitude that scientists themselves have labeled the "NIH (Not Invented Here) Syndrome"?

What policy should govern the relationships among professional people in the same discipline but representing conflicting or competitive commercial interests? In particular, what should be the relationship between civil service scientists and persons in private employment sharing the same scientific discipline?

Many patterns of questioning were observable in the AD-X2 hearings, reflecting both the interests of committee members and their responses to the testimony. This combination of prepared statements and subsequent interrogations is a tried and proved method of eliciting information. However, its effectiveness is maximized by advance planning, and systematic preparation to insure that the questions asked bring out most thoroughly the most important aspects of an issue. In the AD-X2 hearings there was no overall systematic use of the technique to develop factual information relative to major themes or issues. There was no preliminary staff report (except for the brief issuance in December 1952, based mainly on Ritchie's allegations and the MIT report as interpreted by Dr. Laidler), to establish what the issues really were. In more recent years there has been evident a more systematic approach to congressional investigations involving scientific and technological issues. This approach may be gradually evolving into an institutionalized procedure, along approximately the following sequence:

1. Statement of the issue.
2. Structuring of the issue.
3. Identification of the implications and ramifications of the issue.
4. Establishment of the priorities or ordering of the aspects of the issue, ranked in terms of relative significance and import.
5. Definition of the information needs of the Congress relevant to each aspect of the issue to be investigated.

6. Identification of the best sources of the required information.
7. Procurement of the information: as published or unpublished documents, testimony, and witnesses available for questioning.
8. Processing (ordering, analysis, and interpretation) of the information.
9. Statement of findings.
10. Establishment of policy decision or decisions.

Whether for investigations and oversight, or for the testing and evaluation of legislative proposals, the merit of an orderly and structured system of this sort seems compelling. When, at the earliest point of contact, an issue can be identified as of major concern or widespread impact, and congressional investigation of it planned according to an orderly sequence, the outcome is likely to be of superior value. Difficulty is still to be anticipated, even today, with issues like AD-X2 in which a seemingly minor grievance evolves by stages into a front page controversy. It would have been unreasonable to have expected the Senate committee or its staff to have foreseen the scale of agitation that would ultimately result from a complaint over a test of a battery powder. It is much easier to relate the implications of the entire controversy, as they appear in retrospect, than it would have been at the time. While recognizing this, it is still valid to suggest that a searching analysis of these implications, taken at the earliest moment after the issue became momentous, might have served a useful purpose.

## CHAPTER FOUR—THE POINT IV PROGRAM: TECHNOLOGICAL TRANSFER AS THE BASIS OF AID TO DEVELOPING COUNTRIES

### I. THE POINT IV PROBLEM AND ITS BACKGROUND

This chapter is a case study of the decisionmaking process leading to congressional enactment in 1950 of the first long-range U.S. technical assistance program for the less developed countries of the world, the so-called point IV program. The purpose of the study is to examine the use by the Congress of scientific and technical information bearing on this issue.

A principal goal of U.S. policy following World War II was to shield against Communist encroachment the territories of members of the "Atlantic Alliance." Marshall plan assistance to the war-ravaged nations of Western Europe was a principal means for implementing this policy. Progressively, the scope of this effort was enlarged as other nations, many of them former colonies of NATO countries, sought U.S. aid. Foreign economic and military assistance to a long list of beneficiaries thus became a fixture of U.S. policy.

At the same time, a rapid growth in Communist power was taking place—as exemplified by Soviet achievement of nuclear weaponry and Mao Tse-tung's conquest of the Chinese mainland. Communist technological and territorial gains intensified the stresses between the Communist and non-Communist power systems. One area of competition was in the territories that had been colonies of the European nations in Asia, Africa, and the Middle East.

Requirements of all the developing regions for economic assistance quickly threatened to overtax U.S. resources. Unlike the ravaged nations of Western Europe, whose skilled manpower and viable political systems enabled them to make a quick restoration under the stimulus of postwar aid, the developing countries lacked both technological culture and political organization suited to the encouragement and organization of industrial skills. Assistance under United Nations auspices was slow in materializing. It became evident that the United States faced a choice between curtailing the scope or altering the content of the foreign aid program.

Accordingly, a search was undertaken for ways to enlarge the effects of foreign assistance without imposing a corresponding drain on U.S. resources of capital goods. Principal reliance was for a time placed on the concept of exporting U.S. technology. In his inaugural address of 1949, the President voiced this aspiration:

Fourth. We must embark on a bold new program for making the benefits of our scientific advances and industrial progress available for the improvement and growth of underdeveloped areas.<sup>1</sup>

<sup>1</sup> U.S. President (Harry S. Truman). Inaugural address, Jan. 20, 1949. In U.S. Congress. Senate. Committee on Foreign Relations. Development of technical assistance programs: Background information and documents, Subcommittee on Technical Assistance Programs pursuant to S. Res. 214, 83d Cong. Nov. 22, 1954, 83d Cong. 2d sess., Committee print. (Washington, U.S. Government Printing Office, 1954), pp. 53-54.

While the cooperation of other nations should be sought in the investment of capital to aid the poorer nations (said the President), the United States was "preeminent in the development of industrial and scientific techniques" which could be used effectively in areas needing them. Eighteen months later, on June 5, 1950, the Act for International Development, embodying the congressional response to the President's request, received his approval. Its first funding was further delayed until the end of August 1950.

*Summary of the legislative history of Point IV*

The first step in implementing the point IV proposal was the formulation of a set of specifics. This task was undertaken by the Interdepartmental Advisory Committee on Technical Assistance, composed of agency and departmental administrators of assistance programs, acting in concert with the National Advisory Council, composed of departmental chiefs concerned with financial matters and also nongovernmental spokesmen for the American business community. The enterprise was under the general direction of Assistant Secretary of State Willard Thorp. The major product of these deliberations was a program, issued in the form of a series of State Department publications under the title: "Point Four: Cooperative Program for the Development of Economically Underdeveloped Areas."

On the basis of the recommendations in this series of publications, the administration drafted two bills which were introduced as legislative proposals in June 1949. One treated the provision of technical assistance<sup>2</sup> and the other the establishment of safeguards for private capital to finance a large part of the program.<sup>3</sup>

Segments of the business community challenged the position taken by the Administration in offering a flexible aid program, urged a larger role for private capital with stronger safeguards, and opposed the contemplated role of the United Nations as partner in the program. Three sets of hearings were held on the initial bills and on subsequent compromise measures, before the Congress adjourned without taking action.

Deliberations between the executive branch and interested members of the business community continued. Compromise legislation was drawn up and introduced in an attempt to satisfy some of the criticisms of industry. New hearings were held, during the first part of 1950, by the Foreign Relations and Foreign Affairs Committees. The two Houses acted on separate measures, the House version calling for a \$25 million appropriations authorization, with a substantial role for guaranteed private investment, and the Senate version limited to the provision of technical "know-how," supported by a \$45 million appropriations authorization with few guarantees to protect overseas private investment. House and Senate conferees acquiesced essentially on the House version. After much debate in the Senate, the Congress accepted the conference report and the President signed the bill into law June 5.<sup>4</sup> After further debate, the Congress appropriated \$25 million to get the program underway.

The Act for International Development was a compromise between the administration bills and counterproposals for a program of limited

<sup>2</sup> H.R. 5615, introduced in the House by Representative John Kee, chairman of the House Committee on Foreign Affairs.

<sup>3</sup> H.R. 5594, introduced in the House by Representative Brent Spence and S. 2197, introduced in the Senate by Senator Burnet R. Maybank, July 12, 1949.

<sup>4</sup> Act for International Development, 1950, title IV, sec. 403. Public Law 535, 81st Cong., June 5, 1950.

technical assistance emphasizing the flow of private capital, with clear safeguards in the recipient countries to protect private American investment. The major role of the Congress was to amend and enact a policy that had been initiated by the executive branch. The ultimate form of the bill took into account both the Administration concepts and those of the business community, which had been reflected in opposition measures introduced by Senator Leverett Saltonstall and Representative Christian Herter. In its final form the bill contained less emphasis on multilateral programs, and more emphasis on a bilateral investment program, supported by bilateral agreements between the United States and the recipient countries; other provisions were:

- An annual review of requests for assistance;
- Annual legislative authorization for appropriations;
- Establishment of joint commissions to coordinate country programs and recommend specific projects;
- Funding on a functional, rather than a geographic, basis;
- Appropriations on an annual basis;
- Authorization to Export-Import Bank to provide investment guarantees.

The bill did not provide for governmental funding of technical development programs. The role of the State Department in overseeing the administration of the new program was left in some doubt: the President was instructed to establish the Technical Cooperation Administration as a coordinating agency within the Department, but departmental control over programming and management of TCA was withheld. It was the view of some legislators (notably Senator Vandenberg), and some Foreign Service personnel, that diplomatic operations of the Department were not readily reconcilable with the responsibilities for administering a technical assistance program.

The role of the legislative branch in initiating foreign policy is defined by the Constitution as well as constrained by tradition and circumstance. Congress has traditionally relied on the information and analysis resources of the executive branch. In the formulation of the point IV program, the Congress relied for information almost exclusively on the Administration and on those spokesmen of the business community interested in participating in an overseas investment program. The easing of consumer demand during the first half of 1950 (for the first time since the close of World War II) underscored the need for economic stimulus.

Business views in particular were parochial regarding problems facing the underdeveloped world. These views—expressed mainly by business executives rather than either economists or technologists—were a main source of guidance for both the administration and the Congress.

Preparation for the midterm congressional elections of 1950 diverted attention from consideration of the aid plan. Moreover, with the outbreak of the Korean war, late in June 1950, national priorities shifted. The event was widely interpreted as evidence that the Communist world was prepared to employ military force to gain its expansionist ends, and that a countervailing force capability was called for. (Although the war itself did not begin until the end of June, the growing tensions in the area were perceptible 3 months earlier.) Increasingly, the support for the technical assistance program came from those concerned with national security needs and took on a military character. Technical data, some of which had little bearing on economic

development, were presented in support of the measure as a means of strengthening defenses against overt Communist penetration.

Although both the executive branch and the Congress saw the technical assistance program as inherently experimental, the experimental character of the program seemed to serve as justification for setting it in motion without exhaustive intellectual underpinning, rather than the reverse. Neither the Congress nor the Administration attempted to exhaust the sources of relevant information which might have revealed pitfalls in the design and implementation of the program, and ways of avoiding them. Many witnesses, particularly those supplied by the Administration, voiced uncritical expectations about successes to be achieved from the application of science and technology to any developmental program. America's arsenal of technical knowledge, that had served so well in the war against the Axis, was regarded as a universal panacea in the campaign to raise the technological level of lagging economies. Physical and social scientists, and experienced participants in previous U.S. technical assistance programs, might have contributed information to qualify these optimistic views. Such information was circulating within the scientific community and current journals during the 18 months while the policy was before the Congress. But members of the scientific community were not invited, and did not take the initiative, to bring their counsel to the decisionmakers. The scientific and technical problems of underdevelopment were not sharply defined, nor were the scientific and technical requisites of an effective technical assistance policy.

## II. CENTRAL ISSUES OF POINT IV AS SEEN BY CONGRESS AND THE ADMINISTRATION

Other issues than the mechanics of exporting technology occupied most of the testimony and debates during the 18 months of consideration of the measure. These issues centered on political justification of the new program, the role of private business and the need for guarantees for overseas investment, and a counterproposal for a commission to study the need for technical assistance.

### *Political justification*

Following his inaugural address and his July 1949 technical assistance message, the President undertook to build a consensus for his proposal in the Congress. A program of technical assistance would need to be shown to be feasible, beneficial, and combined with low-risk exports of capital so as to be most effectual at least cost to the taxpayer. Of particular importance as justification was the national security as measured by the benefits to be received by the containment of communism and improvement of the availability of strategic and critical materials. For instance, the Secretary of State, Dean Acheson, testified in 1950 on the development bill before the Senate Foreign Relations Committee:

This legislation \* \* \* is a security measure. And, as a security measure, it is an essential arm of our foreign policy, for our military and economic security is vitally dependent on the economic security of other peoples \* \* \*. Economic development will [also] bring us certain practical material benefits.<sup>5</sup>

<sup>5</sup> Statement of Secretary of State Dean Acheson. In U.S. Congress, Senate, Committee on Foreign Relations, Act for International Development. Hearings before the \* \* \* 81st Cong., 2d sess., Mar. 30 and Apr. 3, 1950. (Washington, U.S. Government Printing Office, 1950), p. 5.

Members of Congress were assured—and did not appear to question—that economic development of the poorer countries would benefit the U.S. national interest by eliminating the preconditions for the spread of communism.<sup>6</sup>

Congressional supporters of the legislation dealt mainly with the need to improve the international political posture of the United States. For instance, Representative Abraham Ribicoff regarded it as “an investment, and investment in the future, which will pay off in peace and security.”<sup>7</sup> Some Members attached importance to the potential benefits of the legislation for foreign trade. Said Senator Hubert Humphrey:

Let me say to those who are interested in our business and industrial picture that with point IV we will find markets. We cannot sell American goods to paupers. We can beat our chests for the next 10 years; but until the people of the world have raised their own standards of living and until they have the means to buy our goods, we cannot do business with them.<sup>8</sup>

Others cited improvements that would result in U.S. supplies of strategic materials:

Rubber, sisal, industrial diamonds, bauxite, of which we have a very small and limited supply \* \* \* palm oil, of which we have none, graphite, sperm oil, of which we have none, and other materials of that type.<sup>9</sup>

Opposition to the concept of technical assistance was based not on questions of feasibility, but on such tangential issues as isolationism and opposition to United Nations membership, the need to protect U.S. agriculture and industry, and opposition to what might become excessive interference of Government with trade and commerce. Senator Burnet R. Maybank saw a trend in the bill toward socialism. Others objected to the proposed legislation on the grounds that technical assistance in irrigation might increase cotton production abroad so as to impair U.S. markets.<sup>10</sup>

### *Business and financing*

Issues occupying a major portion of congressional attention related to financing or—as an alternative to public funding—the provision of capital investment by private American business and the establishment of guarantees for its safety.

During the postwar period many business spokesmen had opposed large-scale export of public capital to promote economic development. Instead they preferred more profitable techniques—the provision of private capital investment (with appropriate assurance of guarantees for returns on investments) and international trade.<sup>11</sup>

<sup>6</sup> Whereas, a decade later, Walt W. Rostow was to write: “Communism is best understood as a disease of the transition to modernization.” (“Guerilla Warfare in Underdeveloped Areas.” In “The Guerilla and How To Fight Him.” Selections from the Marine Corps Gazette. Edited by Lt. Col. T. N. Greene. (New York, Praeger, publishers, 1962), p. 56.) Social scientists generally accept the hypothesis that groups most susceptible to the appeals of communism are those who have had their expectations heightened by a measure of advancement, and who are then frustrated and look to the Communist political managers to help transmit their demands to local political leadership through legitimate channels, or, conversely, to help overthrow the existing leadership to accelerate their personal progress.

<sup>7</sup> Statement of Representative Abraham Ribicoff. Foreign Economic Assistance. Consideration on the floor of the House. Congressional Record (Mar. 27, 1950), p. 4140.

<sup>8</sup> Statement of Senator Hubert Humphrey. Economic Cooperation Act of 1948. Consideration on the floor of the House. Congressional Record (Mar. 29, 1950), p. 6263.

<sup>9</sup> Statement of Representative Mike Mansfield. Foreign Economic Assistance. Consideration on the floor of the House. Congressional Record (Mar. 29, 1950), p. 4337.

<sup>10</sup> See statement of Representative Peter Mack. Foreign Economic Assistance. Consideration on the floor of the House. Congressional Record (Mar. 27, 1950), p. 4175. Southern Senators voted against point IV by a margin of 11 to 8.

<sup>11</sup> David Baldwin. “Economic Development and American Foreign Policy 1934-62.” (Chicago, the University of Chicago Press, 1966), *passim*, but especially pp. 103-4.

Experience with the administration of subsequent technical assistance programs has shown that the development of the economically underdeveloped areas will not occur without the presence of large sums of public capital (both bilateral and multilateral) for "social overhead" or public capital investment (public works, education, health, sanitation, etc.).<sup>12</sup> The Congress and the Administration, were not eager to begin another tax-supported program of foreign aid. They were aware of the influence of American business and earnestly solicited the advice and support of this private sector for enactment of the point IV legislation. In the end, the Congress acceded to the need for guarantees for private capital. The program was judged to be a political necessity to meet the Communist threat.

Immediately after the President's inaugural speech the Administration sought the reactions of industrialists to the proposed program.

Interested businessmen were actively responsive to the developmental role assigned to them by the Administration. At first many business spokesmen wanted unequivocal assurance that the Administration did not propose to supply either the funds or technicians for foreign development operations; that these tasks would be entrusted solely to private enterprise. In May 1949, the National Association of Manufacturers said that the best way to promote development would be to encourage a flow of private capital and to protect such investments by requiring the signing of bilateral agreements between the United States and the recipient governments to provide reimbursement in case of confiscation or nationalization, disaster or civil disorder.<sup>13</sup>

As reflected in the press and congressional hearings, the business community offered three arguments in justification for its claim for preferential treatment in the program.<sup>14</sup> First, it was suggested that economic development should proceed and develop according to the lines of a free enterprise system while the use of Government funds would inevitably reshape the beneficiary nation into a socialist system. For instance former Ambassador Spruille Braden said:

Having spent the majority of my mature life, both in business and diplomacy, either in or in direct contact with the so-called undeveloped areas of this hemisphere, it is my firm conviction that the best and often the sole effective means of developing these areas is through free, private, competitive enterprise and not through Government.<sup>15</sup>

Second, the business community contended that private enterprise possessed unique technical skills needed to accomplish the job:

Private industry has the industrial know-how. Government has not. The most effective assistance in industrial development abroad can be provided by skilled technicians of American companies which are investing their funds.<sup>16</sup>

<sup>12</sup> "The lack or shortage of roads, ports, and powerplants are well-known obstacles to economic development. A complete listing \* \* \* would include all forms of transportation, telecommunications, schools, hospitals, sewerage and water systems, streets, administrative buildings, and many other forms of capital investment." (In Lloyd D. Black, "The Strategy of Foreign Aid" (Van Nostrand, 1968), p. 54.)

<sup>13</sup> "Bilateral Pact Urged on Point IV," New York Times (May 24, 1949), p. 41.

<sup>14</sup> See articles of Henry Hazlitt in Newsweek, 1949-50; Hebert Harris, "Point IV Is Big Business," United Nations World magazine (vol. 3, No. 12, December 1949), pp. 55-58; Fortune magazine (October 1949) and February 1950 (issue devoted to U.S. foreign economic policies—especially "Point IV, Has U.S. Capital the Incentive to Carry It Out?") pp. 89-96, 176, 178, 181-182).

<sup>15</sup> Statement of Hon. Spruille Braden. In U.S. Congress. House Committee on Foreign Affairs. International Technical Cooperation Act of 1949 (point IV program). Hearings before the \* \* \* on H.R. 5615, a bill to promote the foreign policy of the United States and to authorize participation in a cooperative endeavor for assisting in the development of economically underdeveloped areas of the world. Sept. 27, 28, 30, Oct. 3, 4, 5, 6, and 7, 1949. 81st Cong., 1st sess. (Washington, U.S. Government Printing Office, 1969), p. 225.

<sup>16</sup> Report of Special Committee on Point IV Program, Chamber of Commerce of the United States. The point IV program, approved by board of directors. In House. International Technical Cooperation Act of 1949, Hearings, op. cit., p. 156.

And third, private industry held that training in technical skills and know-how would rapidly follow on the heels of private foreign investment:

To the average backward country, the chief advantage of private capital, especially direct or equity capital, is that it brings along its own know-how, managerial experience, and the exchange to buy dollar machinery, all of which are welcome.<sup>17</sup>

Representative Christian Herter introduced an alternative bill incorporating business demands. Herter's bill, and a similar one introduced in the Senate by Senator Saltonstall, would have limited the assistance provided by the United States to agriculture, health, sanitation, and education. Bilateral agreements would protect U.S. investors from confiscation of their property and give them special tax privileges. The measure also would rule out U.S. participation in United Nations technical assistance programs and would establish an advisory council of businessmen to select technical assistance projects for the United States; it would establish an administration in the State Department to supervise and implement the program; and would "restrict intergovernmental loans to those designed for purposes for which private capital is not available on reasonable terms and which will contribute to the economic development of the borrower without displacing or competing with the same or similar facilities operated by private enterprise."<sup>18</sup>

The Senate Banking and Currency Committee held one set of hearings on the original administration bill. The House held three sets of hearings—on the original bill, and then on the Herter bill which combined technical assistance and investment provisions, and then on the compromise administration bill. In spite of the repeated exhortations by the President for enactment of his plan and the concessions he granted to business opponents, serious opposition to the President's call for a flexible \$45 million program still remained in the business community and in the Congress.

The Senate was opposed to any provision of guarantees for the protection of private capital. The Foreign Relations Committee stated that there should be no more to an initial program than simply the diffusion of technical know-how. It also suggested that if provisions for the protection of capital were included, the program would eventually involve the United States in a big-money foreign-aid operation. The House, on the other hand, responded to the views of Representative Christian Herter that funding be limited and stronger provisions extended to protect private capital.

After repeated delays, cuts, and compromises the Congress in July 1950 agreed to a program with limited guarantees for private investment, an indefinite program and a \$35 million appropriations authorization. Additional attempts to cut the program came from the Appropriations Committee—because of the need to divert funds to the Korean conflict. However in September, the bill was passed and \$35 million allocated for the program.

<sup>17</sup> "Point IV. Has U.S. Capital the Incentive To Carry It Out?" *Fortune* (February 1950), pp. 95-96.

<sup>18</sup> Statement of Austin T. Foster, chairman, Treaty Committee, National Foreign Trade Council, Inc., New York, and general counsel Socony-Vacuum Oil Co., Inc., New York. In House. International Technical Cooperation Act of 1949, Hearings, op. cit. ,p. 111.

*The alternative of a study commission*

Two proposals were offered, one in March by Representative Jacob Javits<sup>19</sup> and the other in April, by Senators Eugene Millikin and Leverett Saltonstall<sup>20</sup> for the establishment of bipartisan committees to study whether a technical assistance program was needed. Although generally regarded as delaying maneuvers, the proposals are open to various possible interpretations.

A measure of support was given to the Saltonstall/Millikin bill which would create a commission similar in functions to the Krug and Herter committees which had been established after the war to study the need for the ECA program. The proposed commission would examine all existing laws on the subject, assess the need and chart the course of a future technical assistance program, and suggest additional provisions for guaranteeing private capital and stimulating capital investment in underdeveloped areas.

Principal support for the proposal of a study commission was based on congressional recognition of deficiencies in the scientific and technical aspects of the administration's program. For instance, Senator Millikin challenged the proposition that the United States possessed the capability to supply technical assistance. He touched upon serious obstacles to social and economic development posed by factors indigenous to the underdeveloped nations. He said in part:

Do we have a surplus of technical skill available for work in connection with these foreign projects \* \* \*? How much will these programs improve the welfare of foreign countries \* \* \*? We have not begun to commence to start to study the implications of this program \* \* \*. [What will happen in the way of depressing food supplies and the harmful dislocations to communal life which will ensue from the introduction of modern technology?] \* \* \* In our programs are we going to deal from government to government, or, where it suits us to do so, are we going to short circuit and go over the heads of the local dictators and chiefs of the countries \* \* \*? \* \* \* Will the intrusion of these foreign-inspired programs and their operation on the ground accentuate the cleavages between races and classes? \* \* \* Is it not a fact that the development of resource-poor areas may create more economic and social problems than it solves?<sup>21</sup>

Defeat of the study commission proposal was insisted upon by the Administration and its congressional supporters. However, the views of the proponents of the concept appear to have had considerable validity in the light of the subsequent history of the program.

### III. THE ROLE OF TECHNOLOGY IN ECONOMIC DEVELOPMENT

During the past 20 years, U.S. foreign aid programs have taken two main forms: indirect and direct assistance. Indirect assistance, whose objective is to improve the growth potential of an entire national economy, includes such programs as—

- Removing discriminatory trade barriers;
- Eliminating tariffs to facilitate international trade; and
- Encouraging private business initiative in the underdeveloped areas.

<sup>19</sup> Representative Javits introduced his bill to create a Committee on Foreign Economic Policy to review the situation. His remarks on this proposal appear in the Congressional Record (Mar. 30, 1950), p. 4414.

<sup>20</sup> This was an amendment to S. 3304, to supplant title V with title VI. See statements of Senators Saltonstall and Millikin, Congressional Record (Amendment of Economic Cooperation Act of 1949, April 1950), passim.

<sup>21</sup> Statement of Senator Eugene D. Millikin, Amendment of Economic Cooperation Act of 1948. Consideration on the floor of the Senate. Congressional Record (May 4, 1950), pp. 6374-6375.

Direct forms of aid, whose objective is to effect prompt increases of a nation's available productive resources, include:

The provision of grants and loans;

The supply of surplus agricultural commodities; nonagricultural grants in kind; counterpart funds and military and defense support.<sup>22</sup>

Technical assistance, a major form of direct aid, is loosely defined as the diffusion of American skills and know-how. It consists of—

(1) Providing a recipient nation with U.S. technical experts to furnish advice and instruction in long- and short-range policy matters ranging from public administration to managerial organization and the development of improved rice strains;

(2) Executing demonstration projects;

(3) Providing equipment and materials for demonstration projects; and

(4) Bringing foreign nationals to the United States to receive technical training in American universities and Federal agencies.<sup>23</sup>

Almost 20 years of experience in economic assistance programs to the underdeveloped world<sup>24</sup> shows quite conclusively that the tasks of a bilateral or multilateral program for the development of a nation in transition are both numerous and complex—much more so than had been anticipated by decisionmakers in 1950.<sup>25</sup> Many constraints deriving from the political, economic, social, and technical conditions of both the donor and the recipient nation are important in shaping U.S. technical assistance programs. Each aid program must match each form of assistance, each project and program, to the particular problems faced by that nation in fostering its growth. Although the problems faced by economies in transition differ from one country to another depending upon resource potential, history, political culture, and traditions, certain impediments are common to all. The

<sup>22</sup> Study No. 1. The Objectives of U.S. Economic Assistance Programs by the Center for International Studies, Massachusetts Institute of Technology, January 1957. In U.S. Congress, Senate, Special Committee To Study the Foreign Aid Program. Foreign aid program: Compilation of Studies and Surveys, prepared under the direction of \* \* \* pursuant to S. Res. 285, 84th Cong., and S. Res. 35 and 141, 85th Cong. Presented by Mr. Green. July 1957. 85th Cong., 1st sess. S. Doc. No. 52. (Washington, U.S. Government Printing Office, 1957), p. 39.

<sup>23</sup> See Jack Baranson, *The Challenge of Underdevelopment*. In Melvin Kranzberg and Carroll W. Pursell, Jr. *Technology in Western Civilization*, vol. II (The University of Wisconsin Press, 1967), pp. 516-531. There are differing concepts of what a technical assistance program is and of what it should attempt to accomplish. For a discussion see: (U.S. Congress, Senate, Committee on Foreign Relations, *Organization and Administration of Technical Assistance Programs*, Staff Study No. 2, Subcommittee on Technical Assistance Programs, 84th Cong., 1st sess. Committee print. (Washington, D.C., U.S. Government Printing Office, 1955), p. 1.

<sup>24</sup> Since World War II, the United States has been involved in many bilateral and multilateral programs to disseminate technical knowledge and skills. Among them are its participation in the United Nations and specialized agencies, such as the United Nations Education, Scientific, and Cultural Organization, (UNESCO); Food and Agriculture Organization, (FAO); and the International Labor Organization, (ILO); etc.; the Organization for Economic Cooperation and Development, (OECD); the multilateral body whose objective is to close the technology gap between the United States and the nations of Western Europe; the Alliance for Progress, operative for the nations of Latin America; and numerous programs of direct and developmental assistance implemented through the Agency for International Development (AID); and the military assistance programs (MAP) implemented by the Department of Defense. Additional aid is provided by private U.S. business organizations, religious and philanthropic groups, and developmentally oriented foundations and business concerns.

<sup>25</sup> A study conducted for the Senate Committee on Government Operations in 1966 reviewed the operations of the Agency for International Development in Chile. Conclusions and recommendations for improvement of AID operations in Chile and throughout the world were generated. Many of these problems were overlooked in the technical assistance legislation enacted in 1950. Prime among them are: (1) The size of the U.S. assistance program must be tailored to the nation's ability to absorb an influx of funds; (2) a method must be devised for coordination of international assistance; (3) AID should utilize the past experiences and recommendations of its programs and personnel; (4) The United States must develop a means for mobilizing specialized skills in a timely manner; (5) Research is needed in rural development; (6) AID personnel should be familiar with the language and culture of the nation in which they are working; (7) An effort should be made to gage the host government's commitment to a project; (8) "Perhaps the most urgent requirement for a sound foreign assistance program is to damp expectations all around with respect to what foreign aid can accomplish." (U.S. Congress, Senate, Committee on Government Operations, *U.S. Foreign Aid in Action: A Case Study*. Submitted by Senator Ernest Gruening to the Subcommittee on Foreign Aid Expenditures (pursuant to S. Res. 182, 89th Cong.) (Washington, U.S. Government Printing Office, 1966), pp. 122-124).

achievement of self-sustaining growth requires that the extremes of wealth and poverty which exist in all less developed nations be eliminated. In addition to the accumulation of a sufficient quantity of capital savings and investment, the economic structure of the nation must be diversified so that its products can enter world markets.<sup>26</sup>

Other requirements are: the maximum development of the production resource potential of the nation—whether industrial or agricultural, or the appropriate admixture of the two; establishment of adequate communications, power and transportation systems; and the recruitment and training of a cadre of skilled manpower—in agriculture and industry, in public administration and management.

The experiences of U.S. technical assistance programs have also shown that many forms of technology utilized in the industrialized nations cannot be easily assimilated and adopted by the less developed nations without considerable modification to their particular needs and capacities. Many factors make modern technology incompatible with resources of transitional nations: It costs more than less sophisticated techniques, requires much maintenance, and is designed for large-scale production units. In addition, modern technology is capital intensive; it requires large sums of capital plus highly skilled workers, both of which are scarce in these countries. Labor-intensive production systems are usually more compatible with the primitive economic conditions of the less developed nations where there is an abundance of unskilled labor. Yet modern technological efficiency calls for automation and economies of scale. Differences in climate, topography, resource potential, level of education, culture, and the value given to a materialistic way of life, suggest that it may be necessary to export (or even to invent) a technology which is appropriate to the industrialized countries in the early stages of their developmental process, such as wooden instead of steel farm implements, hand-powered washing machines, or progression of the farmer from the hoe to the animal-drawn plow instead of to the tractor.<sup>27</sup> These differences also lead to the conclusion that special technologies appropriate to the unique circumstances of the less developed country must be developed and diffused.

In trying to get the point IV program through the Congress, the State Department gave little consideration to these obstacles to the transfer of advanced technologies. Its justification material cited only two sets of limiting factors: (1) the need to supersede the "civil disorder and extreme forms of nationalism," and (2) the long time period required for economic growth to take place.<sup>28</sup> Misled by American successes achieved in post World War II reconstruction and recovery programs in Europe, the Department held

<sup>26</sup> Barbara Ward (Lady Jackson). *Technological Change and the World Market*. In U.S. Congress, House, Committee on Science and Astronautics. Panel on Science and Technology, Ninth Meeting: Applied Science and World Economy. Proceedings before the " " " Jan. 23, 24, and 25, 1953. 90th Cong., 1st sess. (No. 1) (Washington, U.S. Government Printing Office, 1968), p. 29.

<sup>27</sup> Gerald M. Meier and Robert E. Baldwin, Professors. "Technical Assistance. In the United States and the Developing Economies." Edited with an introduction by Gustav Ranis. (New York, W. W. Norton and Co., Inc., 1964), p. 120.

<sup>28</sup> U.S. Department of State. *Point 4: Cooperative Program for Aid in the Development of Economically Underdeveloped Areas*. Prepared by the Department of State with assistance of an Interdepartmental Advisory Committee on Technical Assistance and the staff of the National Advisory Council. Department of State Publication 3719. (Washington, U.S. Government Printing Office, revised January 1950), pp. 33-34.

unduly optimistic expectations as to what U.S. technical assistance could accomplish. Congress was told that development of the underdeveloped states would take a long time, but that it would need no more assistance from the United States than a few better seeds, the introduction of fertilizer, development of an educational system, and other technical advances. Legislators were assured that annual U.S. outlays for technical assistance would never exceed the initial request of \$45 million. Absent from the prevailing theory of economic development was the understanding that to be effective, technical assistance must be coupled with substantial capital and capital goods. Little mention was made by the executive branch of the need for legislation to undertake a coordinated long-range program coupled with extensive and repeated surveys and planning. No recognition was given to the need to establish a research capability within the country to tailor U.S. technical knowledge and skills to the requirements of the developing nations; and no authority was sought to stimulate the appropriate training of assistance experts nor to provide for strict guidelines in administrative oversight and program planning. In short, the technical assistance hypothesis was presented simplistically: technology delivered to the underdeveloped society is easily grafted onto the society and economic progress follows automatically.

Initial technical assistance programs suffered from many weaknesses which later had to be rectified by subsequent legislation, by the granting of progressively larger appropriations, and by administrative reorganization. The prevalent expectation in 1950 that the technical assistance to promote economic development could be accomplished at modest cost to the United States underwent radical correction as the years went by. In 1950, \$25 million was appropriated for point IV and \$10 million was appropriated for ongoing programs of technical assistance. In 1951 and 1952 when technical assistance programs came under the jurisdiction of the Mutual Security Agency, approximately \$150 million was granted annually.<sup>29</sup> In 1967 \$200 million was spent by the Government on technical assistance activities.<sup>30</sup>

In contrast with the program chosen in 1950 for small technical assistance projects and little or no capital assistance, American foreign aid programs today recognize that economic development of the less developed world will not occur without the extension of large amounts of technical assistance as well as public capital for investment in roads, education, public health, and public works. The Foreign Assistance Act of 1961, as amended, which led to the creation of the Agency for International Development, provides for a research and development capability in technical assistance, disbursement of assistance funds on a geographic instead of a project basis, and mandatory preliminary surveys.

Congress gave little consideration to the evaluation of scientific and technical aspects of the plan. While the program envisaged (but not emphasized) by the State Department included technical as-

<sup>29</sup> U.S. Congress, Senate, Committee on Foreign Relations, Technical Assistance Programs. Hearings before a Subcommittee of the \* \* \* Feb. 17, 18, 21, 23, 24, Mar. 2, 3, 4, 1955. 84th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1955), pp. 30-31.

<sup>30</sup> U.S. Agency for International Development, Proposed foreign aid program, fiscal year 1968. Summary presentation to the Congress. (Washington, U.S. Government Printing Office, 1967), p. 296.

sistance in 18 applied science areas,<sup>31</sup> the Congress briefly looked at only seven: agriculture and forestry; mineral resources; industry; labor; health; education; and public administration.

In the extensive congressional hearings, the House called upon more witnesses, and more "scientific experts," than did the Senate committee; but most of the testimony related to political criteria and to the rationale for beginning a technical assistance program, and its effects on the domestic scene, rather than to the scientific and technical aspects. Most of the testimony came from the State Department, other Administration witnesses, and spokesmen for religious missions. (See table II.) The majority of statements inserted in the hearings came from persons interested in private capital investment or in the political aspects of the proposed program. (See table III.)

<sup>31</sup> The proposed State Department program is shown as follows:

TABLE I.—PROPOSED 1ST YEAR TECHNICAL COOPERATION PROGRAM BY FUNCTIONAL CATEGORY, ESTIMATED COSTS TO RECIPIENT COUNTRIES AND TO UNITED STATES OR INTERNATIONAL AGENCY

Category	Costs borne by United States or international agency	Costs borne by recipient countries	Total
1. General economic development.....	\$2,365,545	\$1,182,772	\$3,548,317
2. Agriculture and forestry.....	12,659,553	6,329,777	18,989,330
3. Fisheries.....	909,300	454,650	1,363,950
4. Reclamation, hydroelectric power, and flood control.....	4,515,710	2,257,855	6,773,565
5. Mineral resources.....	1,868,950	934,475	2,803,425
6. Industry.....	5,063,694	2,531,847	7,595,541
7. Labor.....	3,242,050	1,621,025	4,863,075
8. Transportation.....	3,811,950	1,905,975	5,717,925
9. Health.....	10,887,748	5,443,874	16,331,622
10. Education.....	6,153,280	3,076,640	9,229,920
11. Social security and social services.....	1,788,450	894,225	2,682,675
12. General statistics.....	600,870	300,435	901,305
13. Public administration.....	987,700	493,850	1,481,550
14. Finance.....	268,900	134,450	403,350
15. Housing.....	775,350	387,675	1,163,025
16. Communications.....	341,150	170,575	511,725
17. Hydrographic and geodetic surveys.....	640,300	320,150	960,450
18. Weather.....	199,500	99,750	299,250
Total.....	57,080,000	28,540,000	85,620,000

Source: Point Four: Cooperative Program For Aid in the Development of Economically Underdeveloped Areas (revised January 1950), op. cit., p. 81.

TABLE II.—WITNESSES, HEARINGS ON POINT 4 LEGISLATION, HOUSE AND SENATE, 1949-50<sup>32</sup>

State Department	Executive witnesses			Nongovernmental organization witnesses						
	Executive departments and agencies	Congressional witnesses	Religious mission	Private industry	Agriculture	Trade	Labor	Development Foundation	Social sciences	
House, pt. 1.....	House, pt. 1 (Agriculture).....	House, pt. 1.....	House, pt. 1.....	House, pt. 1.....	House, pt. 1.....	House, pt. 1.....	House, pt. 2.....	House, pt. 1.....	Senate (education).	
Do.....	House, pt. 1 (Federal Security Agency).....	House, pt. 2.....	do.....	do.....	House, pt. 2.....	do.....	do.....	do.....	Senate (history).	
House, pt. 2.....	House, pt. 1 (Commerce).....	do.....	House, pt. 2.....	Senate.....	do.....	do.....	do.....	Senate.....	Senate (social work).	
Senate.....	House, pt. 1 (War Information).....	do.....	do.....	do.....	Senate.....	do.....	do.....	do.....		
Do.....	House, pt. 1 (Labor).....	do.....	do.....	do.....	do.....	do.....	do.....	do.....		
	House, pt. 1 (Interior).....	Senate.....	Senate.....	do.....	do.....	do.....	do.....	do.....		
	House, pt. 2 (Economic Cooperation Administration).....	do.....	do.....	do.....	do.....	do.....	do.....	do.....		
	do.....	do.....	do.....	do.....	do.....	do.....	do.....	do.....		

<sup>32</sup> From: House, International Cooperation Act, hearings, pt. 1, 1949, op. cit.; Senate, Act for International Development, hearings, 1950, op. cit.; and U.S. Congress, House, Committee on Foreign Affairs, Act for International Development ("Point IV Program.") Hearings before the House on H.R. 5615, H.R. 6026, H.R. 6834, H.R. 6835, and H.R. 7346. Bills To Promote the Foreign Policy of

the United States and To Authorize Participation in a Cooperative Endeavor for Assisting in the Development of Economically Underdeveloped Areas of the World. Pt. 2, Jan. 12, 13, and 17, 1950. (Washington, U.S. Government Printing Office, 1950.)



It is not evident that at the time of the hearings there were very many persons with the necessary qualifications to present scientific or technical criticism or alternatives. Whether or not a search was vigorously pursued for such witnesses, they were not forthcoming. Virtually no testimony was offered to shed doubt on the Nation's ability to pursue an effective program of technical assistance to the less developed countries. No testimony was taken from executive officials actually designing the program: Haldore Hanson, Director of the Interdepartmental Committee on Scientific and Cultural Cooperation, and Jon Abbink and Isadore Lubin, who had participated in the Joint Brazil-United States Technical Mission and who were aiding Assistant Secretary Thorp in program planning.

Several reasons may be given to explain why Congress passed over the science policy aspects of this program. To begin with, the program was not recognized as involving scientific problems at all. Much of the deliberation centered on political, economic, and military considerations such as the need to contain communism, the need to expand U.S. markets, and the development of secure sources of strategic materials. Then, to silence those opposed to Government spending, the President yielded to the persuasions of those advocating that main reliance be placed on private investment and private arrangements for the export of technology. The executive branch had apparently not undertaken thorough preliminary analyses of the special needs of the underdeveloped countries. Its optimistic and somewhat superficial belief in the ability of American technicians to aid the underdeveloped countries was not challenged by the Congress, nor were the views of critics outside of the executive branch solicited.

And in 1949-50 the executive branch did not have the benefit of the science advisory apparatus it now utilizes to help formulate science policy: the Office of International Scientific and Technical Affairs in the Department of State,<sup>34</sup> the Office of Research and Analysis within the Office of Technical Cooperation and Research in the Agency for International Development,<sup>35</sup> the science attaché program in the Department of State, the Office of Science and Technology, and the President's Science Advisory Committee.

The task of Congress was complicated because it also lacked such science advisory arrangements as the several House and Senate committees relating to science, technology, research, and development; the Subcommittee on Technical Assistance of the Committee on

<sup>34</sup> A Science Advisory Committee, chaired by Dr. Oliver E. Buckley, chairman of the board of the Bell Telephone Laboratories, was established on Apr. 20, 1951, within the Office of Defense Mobilization, to advise the President and the Director of Defense Mobilization in matters relating to scientific research and development for defense. (U.S. Federal Register Division, National Archives and Records Service, General Services Administration. U.S. Government Organization Manual, 1951-52. Revised as of July 1, 1951. (Washington, U.S. Government Printing Office, 1951), p. 69.) Later in the Truman administration, it fell into disuse. (Burton M. Sapin, "The Making of U.S. Foreign Policy" (Washington, D.C., the Brookings Institution, 1966), p. 225.) The Office of International Scientific and Technical Affairs was created as the Office of the Science Adviser to the Secretary of State in 1951 upon recommendations of the Berkner report. From 1952 to 1962 it was ineffectual and nonfunctional. It was resurrected in 1958 after the launch of Sputnik I and reorganized into the Office of International Scientific Affairs (later the Office of International Scientific and Technological Affairs), in 1962 upon recommendations from the Development Assistance Panel of the President's Science Advisory Committee. (U.S. President's Science Advisory Committee. Report of the Development Assistance Panel: "Research and development in the new development assistance program," prepared for the Department of State, 1961. In U.S. Congress. House Committee on Foreign Affairs. The International Development and Security Act. Hearings on \* \* \* 87th Cong., 1st sess., pt. 3. (Washington, U.S. Government Printing Office, 1962), pp. 971-82.)

<sup>35</sup> Created in 1961 after enactment of the Foreign Assistance Act of 1961 and upon recommendations from the 1961 report of the President's Science Advisory Committee. (For information relating to the Science Offices within State and AID, see: Warner R. Schilling, "Scientists, Foreign Policy and Politics." Revised version of an article published in *The American Political Science Review* (vol. LVI, No. 2, June 1962), in Robert Gilpin and Christopher Wright, (eds.) "Scientists and National Policy Making." (New York, Columbia University Press, 1964), pp. 144-173.)

Foreign Relations;<sup>36</sup> and the Science Policy Research Division of the Legislative Reference Service of the Library of Congress.<sup>37</sup>

Congress did not call upon members of the scientific community who might have helped to shape this initial technical assistance program. Discussions of the subject appeared in some of the trade journals of the various relevant scientific groups. However, with the exception of social scientists, few other scientists and experts addressed themselves to the need to confront the problem as a whole, to forge a link between instruments of foreign assistance and the problems of economic development, to evaluate the relevant political and policy aspects of the issue, or to attempt to transmit their recommendations to the Congress.

Two interdisciplinary social science organizations were engaged in direct analysis of the problem at this time. The Public Affairs Institute of Washington, an independent research organization under the direction of Dr. Dewey Anderson published a series of eight detailed studies in 1950, prior to enactment, on the requisites of an adequate point IV program and how such a program could benefit the economy of the United States.<sup>38</sup> Members of the institute published plans for a 50-year program, costing \$600 million during the first 5 years, to be carried out largely under the auspices of the United Nations. Many of the recommendations contained in the series offered specific criticisms of the administration program.

The American Academy of Political and Social Science for 2 years carried on an examination of the proposed program; it issued two volumes of findings before enactment of the legislation.<sup>39</sup> Moreover, several sessions of the 54th annual meeting of the academy held in April 1950 were devoted to the topic of point IV.<sup>40</sup>

The Social Science Research Council was not as active as the American Academy of Political and Social Science prior to the enactment of legislation. However, it held two meetings on the "Social Science Problems of Point 4", in December 1950 and February 1951. Much of the first meeting was addressed to the problems of how social

<sup>36</sup> Established in 1954 in accordance with S. Res. 214, agreed to July 2, 1954, to "make a full and complete study of technical assistance and related programs." (In "Development of technical assistance programs," *op. cit.*, p. v.)

<sup>37</sup> Little use was made by the Congress of the Legislative Reference Service for scientific and technological information. The Congress did have the benefit of a report undertaken by the Legislative Reference Service for the House Committee on Foreign Affairs in July 1949, which summarized congressional and administration activities on the point 4 program to that date. However, it was based almost wholly on State Department justification materials, and did not include any critique of the program or recommendations regarding the proposal. (U.S. Library of Congress, Legislative Reference Service, "Point 4: Background and Program" (International Technical Cooperation Act of 1949) July 1949. Prepared for the use of the Committee on Foreign Affairs. Committee print, (Washington, U.S. Government Printing Office, 1949, 19 pages.)

<sup>38</sup> The series published by the Public Affairs Institute of Washington D.C. throughout 1950 includes: "A Policy and Program for Success," by Dewey Anderson and Stephen Raushenbush, 75 pages; "Two-Thirds of the World: Problems of a New Approach to the Peoples of Asia, Africa, and Latin America," by Harold R. Isaacs, 64 pages; "Groundwork for Action," by Morris Llewellyn Cooke with Calvin J. Nichols, Dorothy Detzer, and Peter G. Franck, 96 pages; "Engineers of World Plenty," by James Rorty, 70 pages; "People, Food, Machines," by Stephen Raushenbush, 79 pages; "Helping People Help Themselves," by Wallace J. Campbell and Richard Y. Giles, 71 pages; "Foreign Aid and Our Economy," by Seymour E. Harris, professor of economics, Harvard University, 76 pages; and "Where is the Money Coming From?" by Morris S. Rosenthal, president, Stein-Hall Co. and National Council of American Importers; vice chairman, Foreign Commerce Department Committee, of the Chamber of Commerce of the United States, 58 pages.

<sup>39</sup> Halford L. Hoskins, Ph. D., ed., senior specialist in international relations, Legislative Reference Service, Library of Congress, Washington, D.C., "Aiding Underdeveloped Areas Abroad," *The Annals of the American Academy of Political and Social Science* (vol. 268, March 1950), 251 pages; and Ernest Minor Patterson, Ph. D., ed., professor of economics, University of Pennsylvania, president, the American Academy of Political and Social Science, Philadelphia, Pa.; "Formulating a Point Four Program," *The Annals of the American Academy of Political and Social Science* (vol. 270, July 1950), 204 pages.

<sup>40</sup> See: Point 4 and Southeast Asia—Extension of Remarks of Hon. Harley M. Kilgore, Congressional Record, appendix (May 19, 1950), pp. A3794-3796.

scientists could contribute effectively in the formulation of foreign aid policies, how social scientists could make their thinking and theorizing more realistic and relevant to policy problems, and how social scientists could immediately transmit their recommendations to the Government. They proposed research in such areas as training, "cultural shock" resulting from the introduction of new technology, and research in socioeconomic and cultural information problems.<sup>41</sup> The second meeting went further into these problems, and gave particular attention to the cases of supplying technical assistance to Paraguay and Liberia.<sup>42</sup>

Other scientific groups gave less consideration to the proposed program and published less material than did the social science community before enactment of the legislation. For example, no sessions of the 1949 and 1950 conventions of the American Farm Economic Association were devoted to the problem. The only relevant article during this period in the pages of the journal of this association summarized part of the United Nations Scientific Conference on the Conservation and Utilization of Resources held in August 1949.<sup>43</sup> And the only article appearing in *Science*, the journal of the American Association for the Advancement of Science, (AAAS), treated the same topic.<sup>44</sup> Three papers were presented at the 1949 meeting of the AAAS which related to the provision of technical assistance by the United States, and these were contributed by political scientists and economists rather than physical, agricultural, or other natural scientists.<sup>45</sup>

It was not until after enactment of the legislation that a symposium devoted to the topic of "Science and International Understanding" was held, at the December 1950 meeting of the AAAS. Three papers dealt with mineral, biological, and intellectual resources.<sup>46</sup> Much of the discussion which followed treated the topic of developing resources to keep up with a burgeoning population. But while the discussion addressed the need to develop food resources and devise acceptable substitutes, no mention was made of the need for birth control or population control measures.<sup>47</sup>

<sup>41</sup> Social Science Research Council. Summary minutes: "First Conference on Social Science Problems of Point 4" (Washington, D.C., Dec. 2, 1950, mimeo), 6 pages.

<sup>42</sup> Social Science Research Council. Summary minutes: "Second Conference on Social Science Problems of Point 4" Feb. 2-3, 1951 (Washington, D.C., mimeo), 11 pages.

<sup>43</sup> G. H. Aull, L. P. Gabbard, and John F. Timmons. "The United Nations Scientific Conference on the Conservation and Utilization of Resources". *Journal of Farm Economics*, (vol. XXXII, No. 1, Feb. 1951), pp. 95-112.

<sup>44</sup> Carl N. Gibboney, Office of International Trade, Department of Commerce, Washington, D.C. The United Nations Scientific Conference for the Conservation and Utilization of Resources. *Science*. (Vol. 110, Dec. 23, 1949), pp. 675-678.

<sup>45</sup> E. S. Furniss, Jr., "Some Political Aspects of Technical Aid to Latin America"; A. R. Burns, "Economic Considerations Affecting Aid to Underdeveloped Areas"; and J. P. Shea, "The Role of Ecology and the Social Sciences in Safeguarding Programs of Technical Assistance to Underdeveloped Areas." Section K-1—Academy of World Economics. In: American Association for the Advancement of Science and Participating Affiliated and Associated Societies. General program: Sixth New York meeting. The 160th meeting of the association. Dec. 26-31, 1949. (Washington, D.C., American Association for the Advancement of Science, 1949), pp. 211-212.

<sup>46</sup> Papers presented were: Kirtley F. Mather, Harvard University, and Howard A. Meyerhoff, AAAS, "Mineral Resources and International Understanding"; Karl Sax, director, Arnold Arboretum, Harvard University, "Biological Resources in International Understanding"; and W. Albert Noyes, Jr., chairman, Department of Chemistry, University of Rochester, "Intellectual Resources in International Understanding." In: American Association for the Advancement of Science and Participating Affiliated and Associated Agencies. General program. Sixth Cleveland meeting, The 117th meeting of the association. Dec. 26-30, 1950. (Washington, D.C., American Association for the Advancement of Science, 1950), p. 99.

<sup>47</sup> William L. Laurence, "Scientists Warned on Point-Four Plan." *New York Times*. (Dec. 27, 1950), pp. 29, 34.

## IV. U.S. EXPERIENCE WITH TECHNICAL ASSISTANCE BEFORE 1950

When the point IV program was proposed to Congress, there was high confidence on the part of the Administration that the United States had the resources, the will, and the experience to accomplish it. State Department literature exuded this assurance:

A great deal of experience already has been acquired as a result of rather extensive activities \* \* \* in cooperation with other countries primarily in Latin America, and under programs of international agencies. \* \* \* The U.S. Government has knowledge from many sources of economic conditions and primary needs in the undeveloped areas of the world.<sup>48</sup>

Many such statements were offered, and accepted by Congress in the same spirit of confidence.<sup>49</sup> One notable exception among administration witnesses, who did not share the prevailing optimism, was Paul G. Hoffman who bluntly told the Congress that "you cannot export know-how." What actually took place, he said, was an exchange of technical information in order to construct workable program designs in local regions. Before this could be accomplished, moreover,

\* \* \* There has to be a good deal of preparatory work engaged in, and the more specific it is the better will be the results that ensue. \* \* \* The fewer preconceived ideas you have, the better your program is apt to be. Because out of those discussions comes a knowledge of the real needs. And then out of that knowledge you set up the project and you tailor it so that it will produce that knowledge.<sup>50</sup>

Experience of the United States with international aid to undeveloped economies had, as a practical matter, been meager. Pre-1950 economic assistance had taken two forms: Marshall plan assistance to the war-ravaged nations of Western Europe, and a number of discrete, ad hoc, and small operations mainly in Latin America. The former set of operations were not really relevant to the problem of development, while the latter were of small scope and impact.

The bulk of U.S. bilateral technical assistance activities to the underdeveloped world before 1950 was centered in Latin America and the Philippines. The two major programs were those of the Interdepartmental Committee on Scientific and Cultural Cooperation (SCC), established in 1939,<sup>51</sup> and the Institute of Inter-American Affairs (IIAA), created in 1947.<sup>52</sup>

The limitations of these programs were that they were mainly in support of U.S. political and military operations: improving the quality or procurement of rubber or other strategic raw materials;

<sup>48</sup> Point 4: "Cooperative Program for Aid in the Development of Economically Underdeveloped Areas," (rev. January 1950), op. cit., p. 15.

<sup>49</sup> See, for examples, the statements by Representative Shelley, Congressional Record (Mar. 31, 1950), p. 4537; and by Representative Holifield, in *Ibid.* (Mar. 27, 1950), p. 4138.

<sup>50</sup> Statement of Hon. Paul G. Hoffman, Administrator, E.C.A. In House, "Act for International Development," Hearings, pt. 2, op. cit., pp. 415-417.

<sup>51</sup> A 1939 bill had authorized temporary detail of U.S. employees to governments of the American Republics, the Philippines, and Liberia. (Public Law 545, 75th Cong.). In May 1939, the act was amended to authorize the President to detail persons to any foreign government requesting it. (Public Law 63, 76th Cong.) Several other measures by Congress, and the Administration, enlarged the program with particular respect to Latin America. After World War II, this small aid program was broadened to include more general educational aid abroad.

<sup>52</sup> The Institute was chartered by Nelson Rockefeller, Coordinator of Inter-American Affairs, in 1942. In 1947, with its functions expanded, it was chartered by act of Congress, and the following year it was extended for 5 years with application to Asia as well as Latin America. However, before this final change was implemented, the Act for International Development was passed.

or solving a problem such as malaria or water supply that interfered with U.S. procurement of these materials. The relevance of these small IIAA projects for the more comprehensive and ambitious point IV program is not evident. However, they were enthusiastically reviewed as evidence of the validity of the concept and the competence of U.S. administrators to employ them. For instance, regarding IIAA, the State Department said:

These programs have in effect demonstrated the practical validity of the principle of technical assistance to underdeveloped areas which under the point 4 program will be expanded in volume scope, and in area of application \* \* \*.<sup>53</sup>

Before the House Committee on Foreign Affairs, Oscar R. Ewing, then Administrator of the Federal Security Administration which had responsibility for public health and welfare measures in this country, emphasized the same point:

We have this kind of knowledge and experience in greater abundance than any other nation on earth. It is our most precious asset and, at the same time, our cheapest exportable commodity.

We in the Federal Security Agency have been engaged in large-scale programs of technical assistance in health, education, and social security for a long while. The preservation and development of human resources is our business. We deal in the very fields that are fundamental to the point 4 program. By long and extensive experience both at home and abroad, we have learned that expert technical guidance in these fields is often the key to the solution of problems which seem at first glance to be insoluble. \* \* \* In our cooperative programs with the other American Republics, in helping the less developed countries in this hemisphere to improve their health, education, and social services through advice and training of their personnel, our experts have learned a great deal. They have developed the sometimes delicate techniques of this function to a high degree. I believe our staffs are admirably equipped with knowledge, experience, and prestige for the task of developing and operating projects of technical assistance in these fields under the point 4 programs \* \* \*.<sup>54</sup>

Criticism has been expressed regarding the operations of these American programs and the subsequent consideration of them by legislators and Presidents in the fashioning of the point IV program. In his study of the major foreign assistance programs of the United States before 1950, and particularly of the technical assistance programs of the Interdepartmental Committee on Scientific and Cultural Cooperation in Latin America, Philip Glick stated that although these programs were full of inadequacies, proponents of the new technical assistance programs gave little consideration to their merits and failures:

What influence did these forerunners exert on the administration of the Government's technical cooperation program? Directly, surprisingly little. There is almost no evidence that this early experience was studied by the organizers of the bilateral program as a guide on what to do and to avoid. Only in the most general way, through vague recollection and fragmentary report, did these private pioneer efforts and similar activities in other regions of the world help to shape their governmental successors. In fact, no systematic accounts of these earlier efforts were then available for such scrutiny. But they contributed greatly to the world climate of opinion on international technical cooperation.<sup>55</sup>

<sup>53</sup> Department of State. "Point 4: Cooperative Program for Aid in the Development of Economically Underdeveloped Areas" (rev. January 1950), op. cit., p. 18.

<sup>54</sup> Statement of Hon. Oscar R. Ewing, Federal Security Administrator. In House. International Technical Cooperation Act of 1949, Hearings, op. cit., pp. 66, 68.

<sup>55</sup> Philip M. Glick. "The Administration of Technical Assistance: Growth in the Americas." (Chicago, University of Chicago Press, 1957), p. 5.

According to Glick, immediate self-interest by the United States<sup>56</sup> and lack of efficient State Department coordination of programs<sup>57</sup> precluded the formulation of integrated technical assistance projects and programs designed to promote the overall economic development of the underdeveloped nation.

In sum, the program conducted by the SCC was small, not well-coordinated and was not geared to overall economic development. Technical assistance was provided in localized instances to serve U.S. strategic and political aims. Undoubtedly, very little of this effort had direct benefit to the economies of nations where it occurred. Only \$17.7 million was spent over the total 8-year life of the SSC, and this sum was spread thinly over many projects. See table IV.

TABLE IV.—PARTICIPATION OF THE UNITED STATES IN TECHNICAL COOPERATION IN THE AMERICAN REPUBLICS THROUGH AGENCIES OF THE INTERDEPARTMENTAL COMMITTEE ON SCIENTIFIC AND CULTURAL COOPERATION FROM JULY 1, 1940, TO DEC. 31, 1948<sup>1</sup>

	Assignments of U.S. Government experts	Foreign trainees brought to the United States	Amount obligated
Cooperation in agriculture.....	885	202	\$5,698,599
Cooperation in public health.....	156	198	787,286
Cooperation in industry, labor resources, government services:			
(a) Statistical services.....	46	120	739,583
(b) Railway transportation.....	1	-----	5,979
(c) Highway transportation.....	-----	1	995
(d) Civil aviation.....	63	1,021	2,193,188
(e) Industrial training.....	-----	79	130,765
(f) Women's employment.....	9	16	75,159
(g) Labor standards.....	1	17	70,389
(h) Geologic investigations.....	117	18	832,387
(i) Mining and metallurgy.....	20	1	136,643
(j) National income and balance-of-payments research.....	2	16	42,788
(k) Industrial research and standardization.....	2	23	53,715
(l) Tariff research and administration.....	-----	8	41,767
(m) Public administration.....	-----	35	134,395
(n) Telecommunications regulations.....	-----	3	8,600
(o) Weather investigations.....	18	65	711,573
(p) Tidal observations.....	82	-----	61,524
(q) Magnetic and seismological observations.....	84	-----	157,572
(r) Fishery and wildlife resources.....	30	27	343,730
Cooperation in social welfare:			
(a) Child welfare.....	58	19	385,610
(b) Social security.....	-----	14	22,630
Cooperation in education:			
(a) Exchange of students.....	-----	<sup>2</sup> 1,744	2,563,090
(b) Exchange of professors and specialists.....	<sup>3</sup> 265	<sup>4</sup> 558	1,588,270
(c) Aid to U.S.-sponsored schools in Latin America.....	-----	-----	965,825
Total amount obligated.....	-----	-----	17,752,062

<sup>1</sup> Point 4: Cooperative Program for Aid in the Development of Economically Underdeveloped Areas (Rev. January 1950), op. cit., p. 130.

<sup>2</sup> Includes U.S. students sent to Latin America as well as Latin American students brought to United States.

<sup>3</sup> U.S. professors and specialists to Latin America.

<sup>4</sup> Latin American professors and specialists to United States.

<sup>56</sup> Neither in the work of the IIAA nor in the work of the Interdepartmental Committee had the United States yet undertaken to assist the Latin American governments in promoting economic development as a direct program purpose \* \* \*. (Ibid., p. 23). The principal objective of the Interdepartmental Committee was to maintain and improve friendly relations between the Government of the United States and the governments of Latin America. (Ibid., pp. 10-11.) Immediate self-interest on the part of the United States contributed to this thinking. U.S. personnel were at work in some tropical and jungle areas within Latin America on programs to grow rubber and extract minerals for use in the United States. Malaria control and other public health programs were necessary for their protection, and, if local food supply could be increased, fewer ships would be needed to take food to them from the United States. (Ibid., pp. 15-16.)

<sup>57</sup> According to Glick (Ibid., pp. 8-9), there was no central authority to view the program as a whole, to select particular activities for greater emphasis and others for curtailment, or to establish controlling policies or procedures for all member agencies of the SCC).

## V. IMPORTANCE OF LONG-RANGE, COMPREHENSIVE, AND INTEGRATED DEVELOPMENT PROGRAMS

It is increasingly recognized that the factual and intellectual underpinning of the point IV program was inadequate. "The available records indicate that the United States embarked on its program for economic development and technical assistance \* \* \* without the elaborate studies that had characterized the planning of the European recovery program."<sup>59</sup> Not only was the background research and planning incomplete, but there was a lack of emphasis on the need for the planning and financing of long-range and major projects, on the need to establish sound criteria for the selection of projects, and the construction of development programs on a country-by-country basis.<sup>60</sup> The early program has been characterized as "narrow and short-sighted" in conception, with "too much attention \* \* \* to the crises of the moment and not enough emphasis given to long-term improvements in societies."<sup>61</sup>

The attitude of those who framed this program seemed to be that benefits would accrue more or less automatically and comprehensively from the random application of technical knowledge which impoverished peoples were eagerly awaiting to absorb and use. For example, in presenting their case to the Congress and to the public, the State Department said:

Increasing numbers of these people no longer accept poverty as an inescapable fact of life. They are becoming aware of the gap between their living standards and those in the more highly developed countries. They are looking for a way out of their misery.<sup>62</sup>

In taking this optimistic position, the Administration neglected to account for those nontechnical and noneconomic factors which would prevent an effective grafting and diffusion of modern technology: the social inertia which would prevent the peasant or industrial worker in the underdeveloped country from perceiving the potential benefits of modern science and technology; the traditional and cultural tastes; mores, beliefs, and activities that would obstruct the acceptance of new ideas; and the cultural shock which would ensue from the introduction of foreign methods, technicians, and products.<sup>63</sup>

U.S. foreign assistance has always been recognized as inherently long range in character. As early as 1949 and 1950 the State Department acknowledged this necessary feature:

Economic development is a long-term process. Consequently, this must be a long-range program. Its duration and success will be measured in decades rather than years.<sup>64</sup>

<sup>59</sup> Harry Price. "The Marshall Plan and Its Meaning." Cited in U.S. Library of Congress. Legislative Reference Service. "U.S. Foreign Aid: Its Purposes, Scope, Administration, and Related Information." June 11, 1959. 86th Cong., 1st sess. H. Doc. 116. (Washington, U.S. Government Printing Office, 1959) p. 85.

<sup>60</sup> Charles Wolf, Jr. "Foreign Aid: Theory and Practice in Southern Asia" (Princeton, N.J., Princeton University Press, 1960), p. 59, as cited in Higgins, op. cit., p. 75.

<sup>61</sup> Hollis B. Chenery. "Objectives and Criteria for Foreign Assistance." In: "The United States and the Developing Economies." Ed. by Gustav Ranis (New York, W. W. Norton and Co., Inc.) pp. 79-91.

<sup>62</sup> Statement of Hon. Dean Acheson, Secretary of State. In Senate. Act for International Development hearings, op. cit., p. 4.

<sup>63</sup> For an excellent summary of the obstacles to the technology transfer in the less developed world based on 506 case studies throughout recent history, see: Everett M. Rogers. "Diffusion of Innovations" (New York, the Free Press, 1962), 316 p., bibliography and index. See also Melvin Kranzberg. "Comments by Melvin Kranzberg." John Joseph Murphy. "The Transfer of Technology: Retrospect and Prospect," pp. 37-47; and Edwin Mansfield. "Comments by Edwin Mansfield." Jan Kmenta. "Economic Theory and Transfer of Technology," pp. 76-80. In Daniel L. Spencer et al. "Transfer of Technology to Developing Countries." December 1966. U.S. Department of Commerce. National Bureau of Standards. Institute of Applied Technology. Defense Documentation Supply Center (December 1966), 260 pages; and Richard N. Adams. "Ethics and the Social Anthropologist in Latin America," American Behavioral Scientist (June 1967), pp. 16-21.

<sup>64</sup> "Point 4: Cooperative Program for Aid in the Development of Economically Underdeveloped Areas" (rev. January 1950), op. cit., p. 6.

The Department also recognized—although less explicitly—that the lack of knowledge about the developing countries required that the new program be evolutionary and experimental:

It is \* \* \* impossible to formulate far in advance complete plans for an enterprise of this sort. At this time it is possible to plan only for activities which will clearly be successful, and to undertake exploitative and experimental operations in some areas to gain new experience \* \* \*. This is an evolutionary program.<sup>65</sup>

However, the Department saw less clearly (or perhaps was less willing to admit to) the scale of effort required. In response to a question from Representative Battle, asking as to the size and duration envisioned for the point IV program, Acting Secretary of State James E. Webb replied:

Not a substantially larger scale program. This is the beginning of the fundamental basic policy which we accept in our position of leadership in the world. It is anticipated that it will be a continuing thing for a substantial period of time.<sup>66</sup>

Perhaps the most telling comment on the administration's easy acceptance of the point IV concept was that of John Kenneth Galbraith. First, he attacked the glibness of the concept itself:

Regretfully it is \* \* \* my conclusion that the popularity of the point IV idea was associated with a sad misunderstanding of the problem of rendering assistance to less favored peoples. During the war a new and damaging phrase, "American know-how," entered our vocabulary. A rough synonym for organizing, engineering, and mechanical experience, it has gradually assumed the concreteness of a sack of wheat. It is something that can be picked up, exported, planted in far lands where, with proper care, it will flourish to the untold benefit of the inhabitants \* \* \*. For many the charm of point 4 was in the notion that we could deliver this know-how by the plane-load to every corner of the world and at little cost to ourselves.<sup>67</sup>

Then Galbraith pictured the technical, social, and cultural obstacles bound to confront the technical assistance expert, using agriculture by way of illustration:

Success with agriculture will come only " \* \* \* after a long process of demonstration and education which, in practice, must also be combined with a good deal of adaptation to the climate, soil, and existing modes of crop or livestock culture of the country \* \* \*. The [Agricultural] Extension Service [of the United States] has always spent a good deal of its time trying to persuade the farmer to sell him—on innovations that are to his advantage. If technical advance requires such extensive educational machinery in the case of American agriculture, where farmers are well educated, alert, and on the whole, predisposed toward change, it is evident that there won't be much progress elsewhere without an equal or greater emphasis on education."<sup>68</sup>

All this contrasts with the vision of an American expert, loaded with "know-how" and USDA bulletins, disembarking on some distant airport to put his cargo at the service of an eager peasantry. If this traveler is to be useful he must have a corps of helpers for the huge task of training yet another corps of native extension workers. He must be willing to stay a long while and persuade his local recruits to forgo the fascinations of this capital (this is an especially serious problem in South America) for the full rigors of the agricultural hinterland. It will be evident that even in agriculture, where the needed component of capital is relatively small, the operation here pictured is a costly one both for the aiding country and the aided one.

<sup>65</sup> *Ibid.*, p. 7.

<sup>66</sup> In House. Act for International Development. Hearings, pt. 1, op. cit., p. 27.

<sup>67</sup> John Kenneth Galbraith. "Making 'Point 4' Work. Some Unsolved Problems in Aiding Backward Areas." *Commentary* (September 1950), p. 229.

<sup>68</sup> *Ibid.*, p. 230.

Another warning came from Kurt Weil, a consulting engineer and specialist in industrial development, who foresaw actual harm to the developing countries as a possible outcome of uncritical application of American technology. He said:

The world's economy is today endangered by too lavish an imitation of American industrial techniques. Uncritical export of U.S. know-how, notably to Asia and South America, can thwart the drive to lift living standards as symbolized by \* \* \* point 4. Point 4 can damage rather than benefit the countries it is designed to help.

Many of the plans that have been drawn up in the past by American engineers and economists for large-scale developments in Asiatic and Latin American countries have failed because they turned out to be unrealistic. They called for wholesale transplanting of American technology to those countries without a sufficient grasp of local conditions, and for too rapid progress toward mechanization in areas where tradition made speedy change impossible. [Part of the] fault is to be found in oversimplification rooted in too great an immersion in the American way of doing things. Technicians in the underdeveloped countries want to be shown why the methods of life that were good enough for their ancestors are not good enough for them. A big job of selling and of education would have to precede any such evolution in their way of doing things \* \* \*. Most of the technically backward countries have old, high cultures. It would be folly to destroy them by trying to convert these civilizations into a poor replica of life in America.<sup>69</sup>

In retrospect, the easy assumption as to the feasibility of transplanting U.S. technology to undeveloped regions is the more remarkable because of the real and evident dilemma that was presented by the social and political structures of candidates for aid. On the one hand, the United States depended for much of its support, in the effort to contain communism, on the stable institutions of developing countries—landowning groups, the military, religious leadership, and those who had developed large interests in extractive industries—mines, refineries, timbering, and plantations. New technology would leave none of these unaffected. In many instances, the change would place in jeopardy the status of the very persons most relied upon to support U.S. political objectives. The temptation must be resisted, said Galbraith, to give only such aid as suits the convenience of existing leadership:

\* \* \* If we are to aid such countries at all [said Galbraith] we must aid them where the aid counts. Above and far beyond Point 4, *we must put ourselves on the side of truly popular government with whatever pressure we can properly employ.* [Emphasis in original.]<sup>70</sup>

George Hakim, a counselor of the Legation of Lebanon in Washington and a former professor of economics, made the requirement even more explicit:

What is in fact needed in the underdeveloped countries is no less than a social revolution involving the transformation of a semifeudal, reactionary social order into a new industrial system under which the forces of production could develop and expand freely so as to raise the standards of living of the people as a whole.<sup>71</sup>

It would seem to be a reasonable proposition that a major new national program that contained such evident conflicts in purpose and impact warranted a great deal of careful study in advance of its implementation. The dilemma presented by the adverse impact of U.S. aid on those persons most dependent on the United States for

<sup>69</sup> Kurt Weil, New York consulting engineer and specialist in industrial development. "Pitfalls of Point 4." United Nations World magazine, Vol. 3, No. 9, September 1949, pp. 57-59.

<sup>70</sup> Galbraith, "Making 'Point 4' Work," *op. cit.*, p. 231.

<sup>71</sup> George Hakim, "Point 4—The Need and the Impact." *Annals of the American Academy of Political and Social Sciences*, July 1950, *op. cit.*, p. 69.

preservation of their status, as against the possible—or even probable—potential of aided groups to overthrow the status quo, this dilemma was not to be resolved by being ignored.

Even apart from these considerations, the task of aiding a national economy to grow in a healthy as well as acceptable fashion, which was known by some experts of the time to require a comprehensive and coordinated approach, appears to have been beyond both the means and the technical skills available for the program. Such an approach was not clearly spelled out until 1961 when President John F. Kennedy, in his foreign aid message, called for:

\* \* \* a carefully thought-through program tailored to meet the needs and the resource potential of each individual country instead of a series of individual, unrelated projects. Frequently, in the past, our development goals and projects have not been undertaken as integral steps in a long-range economic development program.<sup>72</sup>

## VI. EVALUATION OF ASPECTS OF THE POINT IV PROGRAM

The foregoing sections dealt with the point IV program in its totality. This section discusses briefly a number of particularly relevant subsystems needed to stimulate and support modernization and economic growth of an underdeveloped country. The examples selected are: scientific research, personnel required to work in the developing countries, agricultural productivity problems and requirements, business activity and skills, labor training and mobilization, education in modern skills generally, and the overriding aspect of the balance between population increase and developed resources.

The adequacy of plans and the depth of study in these areas seem to be crucial elements in determining the rate of progress toward point IV goals. To what extent had the Department of State examined the problems, ascertained the facts, traced the mechanisms, formulated the policies, established specific operational goals, and provided for essential interactions, in these essential areas? To what extent had the Congress been satisfied as to the adequacy of the planning in these areas? What available thinking among qualified students in these categories remained unused by the Department, and how relevant would it have been in the legislative decision process?

### *Research*

The 1950 technical assistance legislation made no provision for systematic accumulation of knowledge about the developing areas. The need for a research capability on the developing areas went unrecognized in the hearings and floor debates. The State Department offered assurance to Congress that previous and ongoing U.S. technical assistance programs, and current United Nations surveys, provided an adequate basis on which to formulate and administer the program. This position went unchallenged.

Some members of the scientific community doubted that enough preliminary work had been done, but there was no insistent call for more spadework. Surveys of the resource potential of underdeveloped areas were proposed at the MIT Mid-Century Convocation on the

<sup>72</sup> President John F. Kennedy. "Special message to the Congress on foreign aid." Mar. 22, 1961. In *Public Papers of the Presidents of the United States, John F. Kennedy*. Containing the public messages, speeches and statements of the President, Jan. 20–Dec. 31, 1961. (Washington, U.S. Government Printing Office, 1962), p. 206.

Social Implications of Scientific Progress, held in 1949.<sup>73</sup> At the United Nations Scientific Conference for the Conservation and Utilization of Resources, August 17–September 6, 1949, there was an appeal for “thoroughgoing surveys and analyses \* \* \* as a basis for planning resource developments \* \* \*.”<sup>74</sup> The need for development of new social methodologies was identified by Carleton S. Coon, who said there was an understanding as to the needs of the countries for specific improvements in public health, agricultural aid, and general education. But—“What is not clear is how.”<sup>75</sup> Then he continued:

What we need is much knowledge, much more than we now possess, and with knowledge will come an increase of good will. People will deal with people, while governments watch, supervising only as needed. Such a program is a hard one; it takes much effort, much adjustment, and much patience; but it will pay in the end. We have lost too many postwar peaces from ignorance and lack of planning.<sup>76</sup>

It was not until 1961, a full 10 years after the inception of U.S. technical assistance programs, that the U.S. Congress recognized the need for a research capability on both the transfer of technology to, and the process of economic development in, the developing countries. The Foreign Assistance Act of 1961 authorized the President:

To carry out programs of research into, and evaluation of, the process of economic development in less developed friendly countries and areas, into the factors affecting the relative success and costs of development activities, and into the means, techniques, and such other aspects of development assistance as he may determine, in order to render such assistance of increasing value and benefit.<sup>77</sup>

The Agency for International Development, which was given jurisdiction for implementing this provision, began a program of research on the underdeveloped areas in 1962. The scope of AID's current R. & D. program, listed below, points out the side gaps in present understanding and suggests how little was known in 1950.

1. Agriculture (to teach the scientific methods developed by agricultural scientists and train people to apply these methods. Research is being done on tropical soils, improving cereal crops, and tsetse fly control).
2. Public health (to organize and train personnel for health services, analyze effects of health measures on economic growth, and make nutritional studies. The main effort has been to improve malaria eradication methods).
3. Human resources (to learn about design of educational systems and improve curriculums and teaching methods).
4. Material resources (to gain knowledge of the economic, technological, and environmental factors and their relationship to development).
5. Social systems (to study the dynamics of social and cultural change).
6. Analytical studies (to develop analytical tools to appraise changes and their interrelationships, and to evaluate programs).<sup>78</sup>

Today the importance of a wide spectrum of scientific research in all relevant disciplines looms as a major task of development. According to Roger Revelle, director of the Center for Population Studies at Harvard University, neglect of research in favor of quick results on

<sup>73</sup> “Formula to Improve Neglected Areas.” *Science News Letter*. (Apr. 9, 1949), p. 238.

<sup>74</sup> Carl N. Gibboney. “The United Nations Scientific Conference for the Conservation and Utilization of Resources.” *Science* (vol. 110, Dec. 23, 1949), p. 676.

<sup>75</sup> Carleton S. Coon, curator of ethnology, University of Pennsylvania Museum. “Point 4 and the Middle East.” *Annals*, July 1950, op. cit., p. 83.

<sup>76</sup> *Ibid.*, p. 94.

<sup>77</sup> Sec. 241(a) of the Foreign Assistance Act of 1961, as amended. 22 U.S.C. par. 2201. Sec. (b) stressed the authorization of research on problems of population growth.

<sup>78</sup> U.S. Congress. House. Committee on Science and Astronautics. The Participation of Federal Agencies in International Scientific Programs: Report of the Science Policy Research and Foreign Affairs Divisions, Legislative Reference Service to the Subcommittee on Science, Research, and Development of the \* \* \*. 90th Cong., 1st sess. Committee print (serial A). (Washington, U.S. Government Printing Office, 1967), p. 42.

short range projects is a clear case of "haste makes waste." Revelle has stated:

The emphasis on speed has been one of the curses in recent years of something we may call the black box theory of economic and social development. One did not look into what was actually happening in a poor country, the real social processes and forces, but one simply injected sufficient capital investment and economic development would pop out \* \* \*. It is becoming more and more clear however that little can be accomplished until we obtain such understanding. \* \* \* The understanding required to make these changes does not now exist; it must be obtained through research.<sup>79</sup>

Dr. Revelle also states that the development of an R. & D. capability would have a double effect on the advancement of the developing world:

The first is to discover the knowledge needed to carry on assistance effectively. Here, the results of research are important. Second, research is a teaching tool, understandable across cultural differences, and neutral with respect to previous beliefs and experience. Here it is the methods of research that are important.<sup>80</sup>

### *Personnel*

During consideration of the point IV program both the President and the Congress were satisfied with the abundance of appropriate technical skill possessed by U.S. technicians to implement an effective assistance program. In his inaugural address of 1949, the President maintained that "humanity possesses the knowledge and skills to relieve the suffering" of that part of the world still living in poverty. The State Department, the primary information source of the Congress, assumed that a sufficient resource of technical manpower existed and that their eagerness to serve would be limited only by the availability of adequate compensation.<sup>81</sup> In testifying before the Senate Foreign Relations Committee, Secretary Acheson said: "I suspect we will find hundreds of good people in State and municipal governments, on farms, in schools and universities, factories, and private research organizations."

The only problem, he said, "\* \* \* is to seek out these people, give them a little extra training and persuade them to go abroad in the service of their country."<sup>82</sup>

Many members of the academic and scientific community, who were not called upon to testify, challenged the assumption that America possessed the skills and manpower needed. For instance, Francis R. Valeo, a foreign affairs specialist in the Library of Congress, wrote that it would be difficult to find technical assistance experts with the sociological background needed to be effective:

It will not be easy to find persons with the requisite technical and scientific abilities who are willing to serve abroad. If such abilities are to be utilized effectively \* \* \* they must be supplemented with an appreciation of the broad problems of underdeveloped countries. Without this attribute, regardless of their technical or scientific qualifications, participants in the program are more likely to hinder than to further realization of the objectives of point 4.<sup>83</sup>

<sup>79</sup> Statement of Dr. Roger Revelle. "Can the Poor Countries Benefit From the Scientific Revolution?" In U.S. Congress, House, Committee on Science and Astronautics, Panel on Science and Technology, Ninth Meeting: Applied Science and World Economy. Proceedings before the Committee on Science and Astronautics, Jan. 23, 24, 25, 1968. 90th Cong., 2d sess. No. 1 (Washington, U.S. Government Printing Office, 1968), p. 243.

<sup>80</sup> *Ibid.*, pp. 60-61.

<sup>81</sup> "Point 4: Cooperative Program for Aid in the Development of Economically Underdeveloped Areas." (Rev. January 1950), op. cit., p. 34.

<sup>82</sup> Statement of Secretary of State Dean Acheson. In Senate. Act for International Development, hearings, op. cit., p. 11.

<sup>83</sup> Francis R. Valeo, Analyst in Far Eastern Affairs, Legislative Reference Service, Library of Congress. "Point 4 Problems in the Far East." In *Annals* (March 1950), op. cit., p. 107.

And Haldore Hanson, then executive director of the Interdepartmental Committee on Scientific and Cultural Cooperation, stated that American technicians did not always possess the technical skills needed to implement a valuable technical assistance program:

\* \* \* The large proportion of underdeveloped countries are located in the tropical or subtropical zones. American technicians who are experienced in tropical agriculture, tropical health, and tropical forestry, to name but three fields, are far scarcer than the general supply of technicians in the United States.<sup>84</sup>

As enacted, the legislation had insufficient provisions for effective staffing; it did not provide special training programs in language, culture, and history to help develop staff and consultant competence. There was no plan for the creation of a cadre of technicians skilled in the specialized technical and scientific needs of the underdeveloped country—in tropical diseases and soil mechanics, in public administration, research in the transfer of technology, in basic education, community development and health services.

One consequence of executive and legislative miscalculation is that since their inception American technical assistance programs have been plagued by a lack of skilled and motivated personnel willing to devote some of their energies to serving abroad in a less developed country. Among the many statements made about this problem<sup>85</sup> are the conclusions of a survey of the American foreign aid program in Chile, where it was observed that the United States does not possess a cadre of skilled manpower appropriate to the needs of the developing nations:

The assumption is erroneous that the United States can provide suitable technical advisers as needed to help modernize archaic practices and build new institutional structures throughout the less developed world. This misconception leads to dangerous overcalculation within AID, in Congress, among the American people, and in host nations with respect to what the foreign aid program can accomplish.

And later—

The United States must develop means for mobilizing specialized skills in a timely manner for use in overseas technical assistance programs.

A reservoir of suitable talent on the necessary scale does not at present exist. If it is in the national interest to conduct technical assistance programs, then energetic and systematic efforts must be made to develop and maintain the special competence required.<sup>86</sup>

### *Agriculture*

One of the most important goals of the point IV program was to provide for increases in food production to compensate for the rapid rate of population growth in the less developed countries. It was hoped that American technical know-how and skills in agriculture would increase yield per acre in the developing areas. Unfortunately little recognition was given to the unsuitability of American agricultural know-how to effect this goal or to alternative ways of producing more food.

<sup>84</sup> Haldore Hanson, Executive Director of the Interdepartmental Committee on Scientific and Cultural Cooperation, Department of State. U.S. Organization for point 4. Annals (March 1950), op. cit., pp 43-44.

<sup>85</sup> See Organization and Administration of Technical Assistance Programs, op. cit., pp. 13-15, and study No. 2. Personnel for the Mutual Security Program, by Louis J. Kroeger and Associates, February 1957. In U.S. Congress, Senate. Special Committee To Study the Foreign Aid Program. Foreign Aid Program, Compilation of Studies and Surveys, prepared under the direction of \* \* \* Pursuant to S. Res. 285, 84th Cong., and S. Res. 25 and 141, 85th Cong. Presented by Mr. Green, July 1957. S. Doc. 52, 85th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1957), p. 85.

<sup>86</sup> U.S. Foreign Aid in Action: A Case Study (1966), op. cit., pp. 77, 122.

This oversight has been widely criticized. For example, in his recent review of technical assistance needs in agriculture, Roger Revelle said:

A destructive fallacy of the postwar era has been the notion that the agricultural technology of the developed countries in the temperate zone could be easily adapted for use in the poor countries of the tropics and subtropics. The standard approach for technical assistance has been: "We know how and we can show how." The fact is that we do not know how.

Western technicians can help with design of irrigation works and fertilizer plants; surveys of soil and water resources; and identification and analysis of country problems. But at least part of the technology for raising fields in each locality must be created through applied local research and this research must be continuous.<sup>87</sup>

The problems cited by Revelle were not anticipated in 1950 by the framers of the point IV program. The bulk of testimony relating to agriculture in the hearings before the House and Senate committees came from spokesmen for the Department of Agriculture. In statements before the House, Charles F. Brannan, Secretary of Agriculture, like other administration spokesmen, extolled the ability of American experts to assist their less fortunate counterparts. He also stated that the United States had a long and valuable history of aiding the underdeveloped areas and thus had much experience to bank on:

The Department of Agriculture is eager to share with Congress and others who are building this program the experience we have had in the past 10 years in exchanging technical help and know-how with Latin American countries.

Our experience to date clearly demonstrates the desirability and workability of extending this type of international cooperation to all parts of the world that are willing to receive it. As a matter of fact, the point 4 program, so far as agriculture is concerned, is a natural outgrowth of our internal program for farmers.<sup>88</sup>

Secretary Brannan's testimony recounted past successes of U.S. agricultural technical assistance programs in Latin America and elsewhere. Cited were valuable experiences gained in the discovery of desmodium in Guatemala, a plant formerly believed to be a weed with no nutritive value, and its subsequent cultivation and used as a feed for poultry. He also stressed the value of developing kenaf fiber in Cuba; rotenone roots in Peru for use as insecticides, and the advances given to other commodities such as rubber, coffee, and cacao, which returned benefits to U.S. homes and industries. Brannan's testimony ended with the observation that all of these extremely effective programs had "\* \* \* cost only about \$1,200,000 a year."<sup>89</sup> And he stated that their extension under point IV would yield a "100-to-1 return" in food production efforts in the underdeveloped world.<sup>90</sup>

Nongovernmental agricultural witnesses who testified did not challenge these contentions. Their testimony related primarily to the need to develop agricultural extension services.

Hindsight shows us that the strategy of attempting to increase yield per acre is only one answer to the problem of feeding people. Other alternatives were known and being developed in 1950. For example, an approach which was widely discussed within the agricultural community, but not treated in Congress—was the natural or synthetic production of food substances such as proteins, fats, and vitamins from algae and minerals. These programs had been widely

<sup>87</sup> Roger Revelle. "On Technical Assistance and Bilateral Aid". *Bulletin of the Atomic Scientists* (March 1968), p. 17.

<sup>88</sup> Statement of Hon. Charles F. Brannan, Secretary of Agriculture. House, International Cooperation Act of 1949. Hearings, pt. I, op. cit., pp. 43-44.

<sup>89</sup> *Ibid.*, pp. 44-45.

<sup>90</sup> *Ibid.*, pp. 59-60.

lauded at the United Nations Scientific Conference on the Conservation and Utilization of Resources, held in 1949.<sup>91</sup> And Stephen Raushenbush, who was a participant in the U.N. Conference suggested that the point IV program allocate a significant amount of resources to studying this alternative:

In addition to the presently known methods of increasing the land's productivity, there are others that may reasonably be expected during the next 50 years. One of them is the development of a cattle fodder through algae. A large amount of the now useless marsh area of the world might be used in this way. The fat production might be in the ratio of 3 to 1 in comparison with an acre of land put into peanuts or soybeans. There are also new protein and fat yeast processes, now using tropically grown molasses as a raw product. If the algae can be substituted as a raw material, the productivity of an acre of pond (plus the necessary processing plants) might be in the ratio of 20 to 1 for dry land.<sup>92</sup>

### *Business*

The private business community exerted considerable influence on the point IV decision process for two reasons: (1) The business community provided an alternative to public financing; and (2) business leaders promised that private initiative would play a valuable role in overseas development. In order to buttress their arguments, business spokesmen circulated figures to exemplify the extensive business experience they had in the underdeveloped world. Fortune magazine estimated that in 1948, \$10 billion was invested abroad by private business interests.<sup>93</sup> Time magazine stated that \$400 million had been invested annually since the end of World War II by American business. Time also stated that while the return on capital invested domestically averaged 13.8 percent, that on capital invested abroad averaged 15.6 percent.

Members of Congress repeated these assurances of business competence to take a leading role in development programs. Representative Thurmond Chatham told the House:

I have been in business all my life, and I know something about the American business system. I think I know something about technological skills, I think I know something about business knowledge, and I think I know about improvements. The American way of life is founded on the American business system. There are three classes of production throughout the world: The miner, the farmer, and the manufacturer. We have built up the American system through technical knowledge and through technical skills. There is no earthly reason why we cannot help other countries whether they be backward areas or not—these Western European countries, for instance, by giving them our technical skills.<sup>94</sup>

However, difficulties inherent in private overseas business operations which would prevent this sector from contributing valuably to the program were isolated and discussed by social scientists. Galbraith challenged the contention that the U.S. business had a history of valuable experience in foreign technical assistance.

<sup>91</sup> The following papers were contributed: F. Neville Woodward, director, Institute of Seaweed Research, Inveresk Gate, Musselburgh, Midlothian, Scotland. "Creatable Resources: The Development of New Resources by Applied Technology"; G. E. Hilbert, Chief, Bureau of Agricultural and Industrial Chemistry, U.S. Department of Agriculture. "The Contribution of Chemurgy"; J. A. Hall, Director, Pacific Northwest Forest and Range Experiment Station, U.S. Forest Service, Portland, Oreg., "Wood Fiber: Creatable Resource of Wide Utility"; Harry Lundin Royal Institute of Technology, Stockholm, Sweden, "Fat Synthesis by Micro-Organisms and its Possible Applications in the Food Industry"; A. C. Thaysen, Colonial Microbiological Research Institute, Trinidad, British West Indies, "Food Yeast in the British Empire"; and Ernst D. Bergmann, Weizmann Institute of Science, Rehovoth, Israel, "Agricultural Products as Starting Materials for the Chemical Industry." In United Nations. Department of Economic Affairs. Proceedings of the United Nations Scientific Conference on the Conservation and Utilization of Resources, Aug. 17-Sept. 6, 1949, Lake Success, N.Y. Vol. I, plenary meetings. (Lake Success, N.Y., United Nations, 1950), pp. 129-165.

<sup>92</sup> Stephen Raushenbush. "People, Food, Machines." No. 5 in the Bold New Program Series. (Washington, D.C., the Public Affairs Institute, 1950), p. 17.

<sup>93</sup> "Point 4—Has U.S. Capital the Incentive to Carry It Out?" Fortune. February 1950, p. 182.

<sup>94</sup> Statement of Representative Chatham, "Foreign Economic Assistance." Consideration on the floor of the House, Congressional Record (Mar. 31, 1950), p. 4528.

The difficulty is that the United States has almost no tradition of private investment abroad of the sort required by the point 4 program. Foreign investments have been made where, as in the case of oil, copper, iron ore, rubber, and other raw materials, there was need to develop sources of supply for American industries. In 1948, about two-thirds of American foreign investment was for oil development alone; as this declined with the completion of Middle Eastern projects, including some overdevelopment, the total volume of overseas investment has declined. There has also been a smaller though substantial investment in branch plants and sales facilities as supplements to the main stem of the American markets. All of this activity has, in effect, been subordinate to American operations.<sup>95</sup>

James P. Warburg, an economist and author on international affairs, stated that because private business is interested in making a large profit, it “\* \* \* would not be willing or able to undertake the long, patient development programs required by most of the areas in question.”<sup>96</sup> And Morris S. Rosenthal detailed those essential developmental tasks that private business would avoid:

Broadly speaking, power, transport, and the social services do not lend themselves to foreign private investment. Some American and European public utility companies have investments in Central and South America, and perhaps there are some other areas of the world in which the private enterpriser would be willing to take such investment risks. But when we think of the social services, the development of food for home consumption, the development of internal transportation facilities, and in a large measure the development of power, the risk is too great for private American investment abroad.<sup>97</sup>

### *Labor*

The development of labor as an industrializing resource in the less developed nations was a technical cooperation program proposed by the State Department in its point IV program planning brochure. Although more attention was given to the proposed labor development program than to some of the other areas, the specific requirements of a labor-training program and of the obstacles to it were not foreseen by congressional and executive decisionmakers nor by authoritative persons who testified before the Congress. Spokesmen for labor groups supported the program, especially in the face of the Communist threat, and suggested the need to export technical assistance in union organizations, management-worker relationships, and other labor rights. However, these witnesses offered no guidelines as to the type of technical assistance needed to improve labor skills or as to what contribution labor organizations could make to the promotion of labor development in the less-developed countries.

Walter Reuther, president of the United Auto Workers—CIO, promised that American labor would “\* \* \* make the necessary accommodations and adjustments from time to time \* \* \*” in order to improve trade with the other areas of the world. However the provisions he and other leaders of the American labor movement suggested to meet the needs of the worker in the underdeveloped countries were limited to enactment of the “\* \* \* appropriate minimum-wage laws and maximum-hour laws \* \* \*” to improve labor relations and the legal climate for workers.<sup>98</sup>

The Department of Labor presented testimony detailing technical cooperation programs which it planned to undertake. Assistant Secre-

<sup>95</sup> Galbraith, 1950, op. cit., p. 232.

<sup>96</sup> James P. Warburg, economist and author on international affairs. Previously Deputy Director of the Overseas Branch of the Office of War Information. “A New Look at the Economic Challenge.” *Annals* (July 1950), op. cit. pp. 28-29.

<sup>97</sup> Morris S. Rosenthal. “Point 4—Enough or Not at All.” *Annals* (July 1950), op. cit., p. 38.

<sup>98</sup> See text of Letter of Walter Reuther, president of the UAW—CIO to Mr. E. F. McDonald, Jr., president, Zenith Radio Corp., Chicago, Nov. 22, 1949. (Pp. 449-450), and foreign policy resolution adopted by the

tary of Labor, Philip M. Kaiser, said the Department considered it would be necessary to "increase labor's understanding of economic development problems and the role which a free labor movement plays in the process." For this purpose, "trade-union officials and other interested persons should be brought to the more advanced countries to learn how more industrially developed countries attempt to deal with the problem of developing constructive industrial relations.<sup>99</sup> Little recognition was given to the training requirements needed for developing the skills of workers in the underdeveloped countries.

Thus, a primary goal of the point IV program planners, and one which the Congress apparently did not question, was to export the American standards of the rights of labor to regions where they were of less pertinence—and possibly seriously premature. However, such a goal, as subsequently became evident, was only one of many technical cooperation considerations relevant for labor. The need for the training of workers in basic and special technical skills, the development of labor recruitment techniques, and the establishment of environments to motivate workers, have commanded at least an equal priority.

### *Education*

The importance of educational assistance in the point IV program was obscured by several factors: the lack of perception of significant cultural differences, the belief that rapid change would ensue, the notion that the United States possessed the appropriate technical "know-how," and the importance given to the role of private business operations in the program. It appears that Congress easily acquiesced in the State Department program, which allocated only 10.5 percent of the initial budget to educational programs.<sup>100</sup> Agricultural and health assistance received approximately 20 percent each, while funds authorized for industrial development, approximated those given to education.

Even the National Education Association did not foresee or document the essential role of education in the process of technical assistance. The only information it circulated called for a larger share of technical assistance funds to be devoted to educational programs "embracing nonschool as well as school agencies." For example:

The "rich ethnic resources" of America should be fully utilized, the report advised, recommending that talent present in our Negro citizens be sought out in working with technically undeveloped peoples, the majority of whom belong to the colored races.<sup>101</sup>

Subsequent experience with technical assistance programs has shown that one of the prime requisites of economic development is the provision of a liberal and a technical education to a significant number

CIO in November of 1949. In House. Act for International Development. Hearings, pt. 2, op. cit., pp. 443. See also William Green, president of the American Federation of Labor, Letter to Hon. John W. McCormack, President Truman's point 4 program. Congressional Record (appendix) (Mar. 31, 1950), pp. A2424-A2425.

<sup>99</sup> Statement of Philip M. Kaiser, Assistant Secretary of Labor. In House. International Technical Cooperation Act of 1949. Hearings. Pt. 1, op. cit., p. 280.

<sup>100</sup> Total program estimates equaled \$57,080,000 with education's proposed budget totaling \$6,153,280. (Table IV, proposed first year technical cooperation program by functional category—Estimated costs to recipient countries and to United States or international agency. In Point 4: Cooperative Program for Aid in the Development of Economically Underdeveloped Areas (revised January 1950), op. cit., p. 81.)

<sup>101</sup> "Educational Steps in Point 4 Program." Science News Letter (July 22, 1950), p. 63.

of persons in the underdeveloped society.<sup>102</sup> Critics of American aid programs overwhelmingly agree that early programs suffered from a lack of emphasis on education—both formal and informal.<sup>103</sup> For example, Rene Maheu, UNESCO's Director General, has suggested that development must overcome widespread social inertia in the less developed nation. This implies the need for a change in attitude, which will not occur “\* \* \* until science and technology cease to be an imported magic \* \* \* (but instead) \* \* \* become a custom of (the) people.”<sup>104</sup>

It was not until 1955 that the defects of not allocating more resources to the development of an educational system were noted by the administration and the technical assistance program was shifted to give greater priority to basic education and also public administration. Upon submitting information reviewing program shifts in technical cooperation to the Subcommittee on Technical Assistance of the Senate Committee on Foreign Relations, Mr. Harold E. Stassen, then Director of the Foreign Operations Administration, said:

We are in the process of shifting the emphasis in the program. Here you see that in the agriculture and natural resources in percentage the effort is declining. In the health and sanitation it stayed relatively in about the same importance. In education, going beyond literacy, it is expanding. This generally increased emphasis on education, including, for example, the establishment of the vocational-educational schools for crafts and occupations, the engineering schools, and the various types of professional schools, brings that less developed society along as it goes beyond the state of enough clothing for its people, into a more developed society.

At the same time we are stepping up the public administration program to endeavor to educate and train their young men to be more economic in the managing of the financial exchange of their country, the balance of payments, the budgetary processes, the kind of things that a society, as it moves away from an agricultural, less developed society, must have if it is to be stable and continue to develop.<sup>105</sup>

### *Population*

In approaching the problem of population per se, both the administration and the Congress were constrained by the existing cultural values, which in 1950 had not yet fully appreciated the growing problem of population pressures. Accordingly the views of the best qualified authorities were not brought to bear in 1950 on the question of population resource imbalance in the underdeveloped countries. This omission delayed official recognition of the need for a national policy in this field until 1963 when President Kennedy said that “we need to ‘know more about the whole reproductive cycle’ and that this knowledge should then be made more available to the

<sup>102</sup> Theodore Schultz asserts that investment in human capital is as important as investment in physical capital (Theodore Schultz, “Investment in Human Capital,” *American Economic Review* (March 1951), p. 1); Albert O. Hirschman has called for a “binding agent” or the development of a liberal enlightened stratum, which can understand and communicate with both the developed and underdeveloped sectors of society (Albert O. Hirschman, “The Strategy of Economic Development” (New Haven, Yale University Press, 1959), pp. 6-7).

<sup>103</sup> See John Kenneth Galbraith, “A Positive Approach to Foreign Aid,” *Foreign Affairs* (April 1961), p. 444.

<sup>104</sup> Rene Maheu, as cited by Carlos Chagas, Ambassador, Brazilian permanent delegate to UNESCO. *Science and Technology in Latin America*. In U.S. Congress. House. Committee on Science and Astronautics. *Government, Science and International Policy*. A compilation of papers prepared for the eighth meeting of the Panel on Science and Technology, 1967. Committee Print. (Washington, U.S. Government Printing Office, 1967), pp. 10-11.

<sup>105</sup> Statement of Hon. Harold E. Stassen, Director, Foreign Operations Administration. In U.S. Congress. Senate. Committee on Foreign Relations. *Technical assistance programs*. Hearing before the Subcommittee on Technical Assistance of the \* \* \* on Technical Assistance Programs. Feb. 17, 18, 21, 23, 24, Mar. 2, 3, 4, 1955. 84th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1955), p. 21.

world." Both the Foreign Assistance Act of 1961, as amended in 1966, and the Food for Peace Act of 1966 have special provisions for the use of U.S.-owned foreign currencies to conduct birth control research and to assist family planning programs in countries requesting such help.<sup>106</sup>

Under the constraint of existing social values, the problem of population growth presented to Congress by the State Department understated the magnitude, gravity, urgency, and seriousness of the problem of rapid population growth.

The rate of increase of population is one of the undoubtedly serious problems as far as the economic future of these areas is concerned.<sup>107</sup>

State Department information indeed revealed that population growth rates approached 3.5 percent in the underdeveloped countries,<sup>108</sup> but the impression was conveyed that the population growth rate of these nations would not be likely to exceed 2 percent per annum in the longer range future.<sup>109</sup>

The programmatic solution developed by the State Department to alleviate the perceived population problem was based on the premise that the application of technical assistance, and concomitant increases in food production and industrialization, would eventuate in a European pattern of social relations and mores. It was suggested that a middle class ethos would be developed and that persons therefore would choose to have fewer children.<sup>110</sup>

Hindsight, of course, reveals the deficiencies of this reasoning. The cultural, technical, and financial obstacles to agricultural development are so great that food-producing capability did not expand enough to keep pace with the burgeoning population. In addition, policymakers learned that cultural patterns vary widely between the developed and underdeveloped world. One cannot assume that development—whether agricultural or industrial—will produce the same cultural values and mores evidenced in Europe and other developed areas.

No evidence was presented in Congress to reveal these fallacies. In fact the position taken by the State Department, of eschewing any form of birth control, and opting for rapid economic development to alleviate the impending problem, reflected the domestic public opinion and some of the literature circulating at that point.<sup>111</sup>

<sup>106</sup> U.S. Agency for International Development. Background paper: U.S. Foreign Assistance Policy and Programs in the Field of Population and Family Planning. (Washington, D.C., mimeo, Sept. 14, 1967, n.p.) and U.S. Agency for International Development. M.O. 1612.57—Guidelines for assistance to population programs, manual transmittal letter, Sept. 15, 1967, p. 3.

<sup>107</sup> Statement of Hon. Willard L. Thorp, Assistant Secretary of State for Economic Affairs. In House. International Technical Cooperation Act of 1939. Hearings, pt. 1, op. cit., p. 21.

<sup>108</sup> Almost hidden in a chart in an appendix of its program planning material, the State Department included figures which would reveal that 25 of the 28 countries which were to participate in the point 4 program manifested an annual birth rate over 3.5 percent—an alarming rate when compared with the 1.0 percent rate of the developed countries. According to the State Department, "The birth rates refer to average annual figures for the period 1931-40. Official vital statistics were used where available, though for a number of countries these were corrected to take account of apparent underreporting of births. Birth rates were estimated from other demographic information for countries lacking official vital statistics." (Point 4: Cooperative Program For Aid in the Development of Economically Underdeveloped Areas.) (Revised January 1950), op. cit., p. 114.

<sup>109</sup> Statement of Hon. Willard L. Thorp. In House. International Technical Cooperation Act of 1949, hearings, pt. 1, op. cit., p. 21.

<sup>110</sup> Thorp, op. cit., p. 21.

<sup>111</sup> For instance, Galbraith, "In Commentary," op. cit; Stephen Rauschenbush "People, Food, Machines," No. 5 in the bold new program series. (Washington, D.C., the Public Affairs Institute, 1950), p. 11, and Morris Llevellyn Cooke with Calvin J. Nichols, Dorothy Detzer and Peter G. Frauck. "Groundwork for Action" No. 3 in the bold new program series. (Washington, D.C., the Public Affairs Institute, 1950), pp. 19-20.

However, studies circulating within the scientific community in 1950 revealed the need for population control measures in the developing countries. In 1946 the U.N. Food and Agriculture Organization calculated that it would be an economic impossibility for enough financial resources to be available and applied to food production to keep up with the projected rate of population growth.<sup>112</sup> And in a special *Annals* study devoted to requisites of an effective point IV program, John Kerr Rose, a geographer with the Legislative Reference Service of the Library of Congress, challenged the economic determinism hypothesis:

More often than not it is assumed that development will provide self-correction for the population problems faced in a majority of the underdeveloped areas. This \* \* \* is open to grave question. There is no particular reason for believing that areas of other cultures, if and when they industrialize, will necessarily fall into the 20th century Western European-United States population pattern.<sup>113</sup>

Scientific population control devices were available in the developed world in 1950. The controversy surrounding their use in both donor and recipient countries attests to their merit. And in spite of the dilemma over the use of U.S. resources to interfere in the lives of other people and other nations, anthropologists know today, and knew in 1950, that many of the cultures of the less-developed world sanctioned a variety of birth control measures including infanticide, enforced segregation of the sexes, chemical potions, and primitive prophylactic apparatus.<sup>114</sup> In their presentation of material to the Congress, the State Department might have given greater attention to the proposition that while technical assistance most certainly would lower the death rate, the economic conditions of underdeveloped peoples would not improve unless there were a concurrent lowering of the birth rate, and that artificial means might be needed to achieve this end. The study of this problem and its implication would have been warranted then, in view of its increasingly serious importance subsequently.

## VII—CONCLUSIONS

In advancing the point IV program, President Truman and his staff had identified an issue requiring legislative action: to provide technical assistance to the less-developed world. Both the Administration and the Congress proceeded to assess this need. While the State Department and other departmental representatives concentrated upon devising a suitable and financially acceptable program, the Congress assessed the political implications and financial costs of carrying it out (pp. 62-71).

However, there were many gaps in the scientific and technical information supplied to the Congress about the proposed program. Few questions were asked in the hearings to challenge the State Department's rationale and assumptions (pp. 71-75). The bulk of the 18 months of congressional decisionmaking was spent on mulling over two overriding, nontechnical issues: (1) A group of national and international political considerations directly or tangentially related to the question; (2) the financial approach to be taken, with particular

<sup>112</sup> Cited by Dennis A. Fitzgerald "World Needs and Resources" *Bulletin of the Atomic Scientists* (vol. VII, No. 4, April 1951), p. 102.

<sup>113</sup> John Kerr Rose, "Needs and Resources of the Brave New World." *Annals of the American Academy of Political and Social Science. Aiding Underdeveloped Areas Abroad*, edited by Halford L. Hoskins. (Vol. 268, March 1950), pp. 10-11.

<sup>114</sup> For instance see Peter Fryer "The Birth Controllers." (London, Secker & Warburg, 1965.)

reference to the role of private business (pp. 65-67). Partisan resistance to the program in Congress was supplemented by a resurgence of isolationism, and various issues of particularity. When the ultimate yes-no decision appeared to be in doubt, the President revived the main issue of political and military policy that had been the initial inspiration for the legislation. The companion claim—that to stress the technical assistance aspect of foreign aid would be optimal from the cost/effectiveness standpoint—had appeal in the existing context. It proved to be a persuasive justification for the new program.

In retrospect, however, the aid program as a means to contain communism by alleviating sources of unrest in developing countries has had only a qualified success. The particular emphasis of the point IV program on the export of technology has become recognized as simplistic, incomplete, and on occasion inappropriate. Congressional evaluation of the merits of technical assistance per se was not searching or resourceful (pp. 68-80). The assumption of U.S. competence in applied technology was insufficient. Attention was diverted to such perennial issues as funding, the bipartisan foreign policy, and preservation or expansion of U.S. exports.

Several other factors also diverted attention from the central issue: (1) The Administration was the major source of scientific and technical information for the Congress. While this was a new and admittedly experimental program, the Congress expected the Administration to have adequately evaluated all pertinent information in putting it together. It was not seen by either the Congress or the Administration as an important feature of a national science policy, nor as a component of international science policy; (2) the Administration showed an excessive optimism regarding the Nation's ability to engage in an effective program of technical assistance to the less developed world. This belief went unchallenged (pp. 78-84); (3) members of the relevant scientific disciplines—including social scientists, civil engineers, and public health experts—who would have supplemented the superficial technical understanding of the decisionmakers, were only mildly active in discussing the program (pp. 76-77). They held information which, if properly evaluated, might have eliminated early pitfalls to the program. However, they were not asked to contribute their comments, and did not attempt to gain a hearing.

Several alternatives were presented in the Congress to the bills sent over by the President. One alternative was to establish a commission to study the need for technical assistance, and to determine the character such aid should take. While this alternative proposal usefully raised some doubts about the scientific and technical aspects of the President's program, it was summarily condemned as a stalling maneuver, and received less serious study than it merited. Another alternative was to give responsibility for program formulation and implementation to the private business community in return for its financial participation. This approach was adopted, in part, along with a program of Government guarantees of private loans. The further alternative of tabling the legislation was rejected because the international political costs would have been too great. Accordingly, a small and relatively low-cost, partly private, program of technical assistance was selected.

The program enacted by the Congress was a modification of the administration proposals. The Congress added provisions for better oversight, more centralized direction, and a larger and more secure role for private business. However, the Congress made no substantive modification of the technical assistance program itself. It is apparent that many of the problems that surfaced in early U.S. technical assistance programs could not have been anticipated without a trial run. However, it is also apparent that many other deficiencies which had to be corrected later on by additional legislation, redirection, and funding, could have been foreseen if the Administration and the Congress had made better use of information circulating within the relevant scientific communities at the time.

It was in the scientific/technical area that caveats were issued regarding the fallability of the belief that the United States could easily and rapidly promote foreign economic development. Among the many cautions expressed by experts who were not called upon, were the observations (later to be confirmed) that the United States would not easily find a supply of qualified technicians to implement its aid programs; that economic development could not be fostered without the appropriate admixture of technical assistance and capital transfer; and that it would not be easy to graft the best of a technologically developed society onto the complex and culturally different mechanisms of an underdeveloped nation. (Pp. 81-84.)

In evaluating the program, the Congress made heaviest use of business and political witnesses, who discussed business and political issues. The State Department and other officials of the executive branch were expected to be a major source of congressional information in international science policy issues; not only did they need to have the pertinent information, but they were called upon to relate it broadly to domestic and international political objectives. What appears to have been lacking in the development of the point IV program, was the evaluation of the specific substantive aspects of the program, and its coherent integration as a practical and frugal operation. It is here that nongovernmental witnesses, experts in particular scientific fields, and critics of foreign assistance policies, can make their most signal contribution.

## CHAPTER FIVE—INCLUSION OF THE SOCIAL SCIENCES IN THE SCOPE OF THE NATIONAL SCIENCE FOUNDATION, 1945-47: A GROUNDWORK FOR FUTURE PARTNERSHIP

### I. BACKGROUND OF THE ISSUE

The purpose of this chapter is to examine the treatment of the issue, under consideration from 1945 to 1947, as to whether the social sciences should be included within the scope of the National Science Foundation (NSF).

For reasons unrelated to the issue of this study, the evolution of NSF did not reach legislative enactment until 1950. But the question as to whether the scope of NSF should include the social sciences was resolved, for practical purposes, on July 3, 1946, when a key vote in the Senate decided in favor of a permissive formula: NSF was not to be told to accept or to exclude the social sciences, but it had the option of doing either, with the unmistakable further implication that careful selectivity of projects to sponsor in this area was a must.

What were the considerations in the Congress bearing on this decision? What advice had been received, and from what sources, that helped the Congress to select this alternative? What other information was available at the time? What consequences derived from the decision?

#### *Origins of the National Science Foundation concept*

President Franklin Roosevelt had made sporadic attempts, during the depression years, to enlist the resources of the physical sciences to further national goals of economic recovery. Freedom from bureaucratic direction and assurance of unconditional support were necessary conditions of such service, however, and these the President could not provide.

Nevertheless, evidence accumulated in the 1930's as to the functional relationship between progress in basic scientific discovery and the capability to solve large national problems.<sup>1</sup> There was a further relationship, also becoming apparent, between the growth of technological application and the economic well-being of society.<sup>2</sup> However, no means had been devised—except in the special case of agriculture—for systematically exploiting the resources of basic and applied science and technology for public purposes. The scope of applicability of the scientific method for public purposes had not emerged as a serious question.

Historically, the United States had contributed few achievements in the basic sciences. Research centers mostly in Europe had led the

<sup>1</sup> See, for example: U.S. National Resources Committee. Research—A National Resource. Pt. 1. Relations of the Federal Government to Research. November 1938. Report of the Science Committee to the \* \* \* (Washington, U.S. Government Printing Office, 1938), 255 pages.

<sup>2</sup> See, for example: U.S. National Resources Planning Board. Research—A National Resource. Pt. II. Industrial Research. December 1940. Report of the National Research Council to the \* \* \* (Washington, U.S. Government Printing Office, 1941), especially p. 42.

way: by such outstanding contributions as those of Bohr and Moseley in atomic structure, Einstein in relativity, Curie in radioactivity; the Russians led in theoretical mathematics, the Germans in theoretical mechanics, Austria in medicine, Italy in electromagnetics, and so on. The genius of the United States (except for such outstanding exceptions as Henry and Gibbs), lay in the areas of applied science and technology.<sup>3</sup>

Science had not been a major preoccupation of the Congress. There was a longstanding tendency to regard scientists as a group remote from political affairs whose achievements were sometimes rewarded by the granting of patents, but whose work largely was beyond the control and whose motivations were beyond the reach of the legislators. Agricultural sciences were accorded a special status in the Morrill Act of 1863, which recognized this mundane field of research as related to the raising of the levels of skills of farmers.<sup>4</sup> In the field of science proper, congressional interest and government activities were on a modest scale. A small research effort was authorized in the National Bureau of Standards. Small programs were supported in the U.S. Geological Survey, the laboratories at ordnance arsenals, the Naval Research Laboratory, the David Taylor Model Basin, and the Naval Observatory. The quasi-governmental Smithsonian Institution was maintained with the help of Federal funds. Such longstanding institutions as the Bureau of the Census, the Bureau of Foreign and Domestic Commerce, and the Bureau of Labor Statistics, however, were not recognized as performing really scientific functions and their researches were not ordinarily identified with those of the physical science laboratory.

During World War II the physical scientists, and to a lesser extent the social scientists, were mobilized to carry on applied research and engineering development to help solve military problems. The impact of this outpouring of technology was the more notable because the depression period preceding the war (1930-39) had been characterized by small expenditures for research and a reluctance of private industry to develop and use new technology that involved capital expenditures or laborsaving economies. During the prewar period, many graduate students, unable to find employment in industry, had continued their advanced studies so that when the war broke out there

<sup>3</sup> Dr. Harold Urey, of Columbia University, whose name is associated with the discovery of "heavy water," submitted to the Senate Subcommittee on War Mobilization, Oct. 25, 1945, a table of Nobel Prize winners in the United States and Europe as follows:

	United States	Europe
Chemistry.....	4	37 (11 Germans).
Physics.....	8	39 (17 Germans).
Medicine and physiology.....	6	37 (8 Germans).

Commented Urey: "The relatively small number of Nobel Prizes awarded to U.S. citizens indicates the weakness of this country in pure science and also, by contrast, its great strength in industrial development." (U.S. Congress, Senate, Committee on Military Affairs, Hearings on Science Legislation (S. 1297 and related bills.) Hearings before a subcommittee of the " \* \* \*. Pursuant to S. Res. 107 (78th Cong.) and S. Res. 146 (79th Cong.), Authorizing a Study of the Possibilities of Better Mobilizing the National Resources of the United States, 79th Cong. 1st and 2d sess. Five parts: Pt. 1, Oct. 8, 9, 11, 12, 1945; pt. 2, Oct. 15, 16, 17, 18, 19, 1945; pt. 3, Oct. 22, 23, 24, 25, 26, 1945; pt. 4, Oct. 29, 30, 31 and Nov. 1, 1945; pt. 5, including statements submitted for the record, Nov. 1, 2, 1945; and pt. 6, Testimony of Science Talent Search Finalists, Mar. 6, 1946. (Washington, U.S. Government Printing Office (1945), p. 658.)

<sup>4</sup> The unforeseen consequences of the encouragement of scientific agriculture were the steady rise in industrial productivity of the United States as manpower left the farm. During the century following this action, farm families declined in proportion to the total population from about two-thirds to about one-twentieth. Throughout most of the period 1920 to the present, this dwindling proportion of farmers produced unmanageable surpluses of farm produce.

was a considerable pool of available scientific manpower of high quality. This pool was further augmented by an influx of refugee European scientists. This army of scientists, provided with an abundance of supporting resources, challenged by real and urgent problems, and assured of eager acceptance of worthwhile products useful in military or industrial support of the war, produced an array of novel technology that was quantitatively voluminous and strategically decisive.

Perhaps most significant of all, the war showed that it was feasible to organize a large-scale mobilization and coordination of scientifically skilled U.S. manpower to achieve a national goal. This teamwork on a national scale was attributable to a combination of circumstances: the acceptance of direction under the stress of a powerful patriotic motive, the moral issue of a war against a particularly ugly political system, the receptivity of U.S. military forces toward technological innovation, the need for weapons growing out of a decade of neglect of U.S. military development, the outstanding leadership of Dr. Vannevar Bush and his associates, and the unlimited resources that the wartime Congress and Administration were prepared to provide for any plausible scientific application that might contribute to the war effort.

From his vantage point as chairman of the Subcommittee on War Mobilization of the Senate Committee on Military Affairs, Senator Harley M. Kilgore became acquainted with the unprecedented war role of applied science and technology. The subcommittee had investigated the mobilization of scientific personnel, had surveyed wartime scientific programs, had taken testimony on the integration of science and technology into the war program, and had witnessed the rise of Government outlays on science from \$70 million in 1940 to \$700 million in 1944. As an outgrowth of this surveillance, five legislative goals were perceived as necessary by the subcommittee:

1. Government funding for research in the public interest, and especially for defense, health and medical, and basic sciences;
2. Coordination of Government-supported research;
3. Stimulation of research by private institutions;
4. Improved management of scientific information;
5. Accelerated full exploitation of the fruits of research.

A bill (S. 1297) providing for a National Research Foundation to accomplish these purposes was introduced by Senator Kilgore (for himself, Mr. Johnson of Colorado and Mr. Pepper), July 23, 1945. In this initial bill, the scope of research, as provided in section 2-a, would have been: "in fields of recognized public interest, particularly national defense, health and the medical sciences, and the basic sciences, including the social sciences."

A similar line of thought was concurrently pursued by President Roosevelt, who sought a way to consolidate the mobilization of science for public purposes to serve in the peace to follow. In a letter to Dr. Bush, November 17, 1944, he requested advice on ways in which the lessons found in the unique experiment of teamwork and cooperation in coordinating scientific research and in applying existing scientific knowledge to the solution of the technical problems paramount in war could be profitably employed in times of peace. He cited as goals for peacetime science, a fuller and more fruitful employment and a fuller and more fruitful life. There were four questions: concerning dissemination of scientific knowledge accumulated in connec-

tion with war research, the future of medical and related science, Government sponsorship of private and public research, and encouragement of talented young people to pursue careers in science.

In response to the President's request, Dr. Bush organized four study panels, each to report on one of the four issues raised by the President; a report specifying an action program was transmitted to President Truman, July 5, 1945. The Bush report, "Science, the Endless Frontier: A Report to the President on a Program for Postwar Scientific Research," concluded that a vigorous level of scientific effort under Federal sponsorship could be beneficial to national health, productivity, and defense.

The primary need was for a strong and undirected effort in basic scientific research. The United States could no longer rely on European basic research for the underpinning of its applied research programs; moreover, the research capital of past basic discoveries had been used up during the war years and needed replenishment which only the United States could undertake to provide. The report called for a national policy on science, with heavy emphasis on the need for Government support of basic research, expanded interchange with other countries of scientific information, and a vigorous program to bring more and better qualified young people into scientific careers. To implement these recommendations the Bush report proposed a national research foundation, responsible to the President, able to disburse funds to sponsor research, and consisting of divisions of medical research, natural sciences, national defense, scientific personnel and education, and publications and scientific collaboration, supported by an administrative office.<sup>5</sup>

Dr. Bush later explained that in preparing his recommendations, he had understood the President's request to encompass only the physical, biological, and medical sciences. However, upon receipt of the Bush report, President Truman enlarged the scope of its terms. In a lengthy message to Congress on reconversion, September 6, 1945, he included a section in which he urged "the early adoption of legislation for the establishment of a single Federal research agency which would [discharge six functions, of which the second was:] promote and support research in the basic sciences *and in the social sciences.*" [Emphasis supplied.]<sup>6</sup>

Dr. Bush did not altogether oppose this addition to his program. On October 15 he told the Kilgore subcommittee that he believed "that our strength is also dependent upon the extent of our knowledge of social phenomena and our ability to bring such understanding to bear wisely on the urgent problems confronting us." He urged that the question receive proper study and that the views of the social scientists be assembled.<sup>7</sup>

Because of its longstanding interest in science policy, the Subcommittee on War Mobilization—jointly with two ad hoc subcommittees of the Senate Committee on Commerce, proceeded shortly after the President's reconversion message to begin consideration of

<sup>5</sup> U.S. Office of Scientific Research and Development. "Science, the Endless Frontier," a report to the President on a program for postwar scientific research, by Vannevar Bush, Director of the Office of Scientific Research and Development, July 1945 (Washington, D.C., National Science Foundation, reprinted July 1960), especially pp. 34-40.

<sup>6</sup> U.S. President Harry S. Truman. Special message to the Congress presenting a 21-point program for the reconversion period, Sept. 6, 1945. In Public Papers of the Presidents. Harry S. Truman, 1945. (Washington, U.S. Government Printing Office, 1946), p. 293.

<sup>7</sup> Hearings on Science Legislation (S. 1297 and related bills). Pt. 2, Oct. 15, 16, 17, 18, 19, 1945, op cit., p. 800.

science legislation the message had requested. In 21 days of hearings before the end of 1945, the subcommittee accumulated 1,200 pages of testimony, exhibits, and statements relating to National Science Foundation legislation. These were followed by a preliminary report, December 21, a supplementary appendix presenting an analytical summary of the testimony, and a final report on science legislation by the subcommittee, February 27, 1946. The full Committee on Military Affairs made its report, April 9, and the Senate debated the proposal July 1-3, giving the measure its approval by a vote of 48 to 18, with 30 not voting.

A companion measure was introduced in the House of Representatives,<sup>8</sup> and was the subject of 2 days of hearings in the Committee on Interstate and Foreign Commerce. However, no House action was taken on either this bill nor on the version passed by the Senate, and the bill died at the close of the session.

Although the House bill provided explicitly for social science, the purpose of the language was explained by its author to the committee. The provision read: "Until such time as the [National Science] Board may create a Division of Social Sciences \* \* \* the initiation and support by the Foundation of the social sciences shall be limited to studies related to the programs of the division \* \* \* and studies of the impact of scientific discovery on the general welfare." According to Representative Mills: "Actually what is in the bill is an effort on my part to limit the activities of the Foundation in the field of social science." Mere omission of the words "social science," he said, would not prevent the Foundation from sponsoring research in the field at a future date. Thus, "The only way that such action can be prevented is for the committee in its discretion to place some limitation excluding social science as one of the activities of the Foundation."<sup>9</sup>

In the House hearings, Drs. Bush<sup>10</sup> and Isaiah Bowman (president of Johns Hopkins University, and a geographer by discipline),<sup>11</sup> gave cautious support for the permissive approach—allowing the proposed National Science Foundation to establish a division for the social sciences at some future time. Dr. Detlev Bronk,<sup>12</sup> soon to be President of the National Academy of Sciences, and physiologist, Dr. Homer W. Smith, an associate of Dr. Bush in Office of Scientific Research and Development (OSRD),<sup>13</sup> took a similar position.

Spokesmen for the military departments did not deal at all with the issue. The Secretary of Commerce, Henry A. Wallace, was represented by Dr. E. U. Condon, Director of the National Bureau of Standards, and vigorously supported inclusion of the social sciences in the proposed foundation.<sup>14</sup> Most of the other witnesses preferred that the social sciences be omitted entirely from the functions or organization of the National Science Foundation.<sup>15</sup>

<sup>8</sup> H. R. 6448, 79th Cong., 2d sess. Introduced by Representative Wilbur D. Mills.

<sup>9</sup> U. S. Congress. House. Committee on Interstate and Foreign Commerce. National Science Foundation Act. Hearings before a Subcommittee on the " \* \* \* on H. R. 6448, a bill to promote the progress of science and the useful arts; to secure the national defense; to advance the national health, prosperity, and welfare; and for other purposes. May 28 and 29, 1946. 79th Cong., 2d sess. (Washington, U. S. Government Printing Office, 1946), pp. 3, 24.

<sup>10</sup> *Ibid.*, pp. 11-12. However, in the exchange that followed, Representative Brown remarked that there was "a sort of antipathy against social science" in the Congress, and Dr. Bowman agreed that this was true also "of most of the scientists who testified before the Senate [Kilgore] subcommittee."

<sup>11</sup> *Ibid.*, p. 53.

<sup>12</sup> *Ibid.*, p. 72.

<sup>13</sup> *Ibid.*, p. 59.

<sup>14</sup> *Ibid.*, pp. 78, 80-81.

<sup>15</sup> Including John F. Victory, executive secretary, National Advisory Committee for Aeronautics (*Ibid.*, p. 62); George E. Folk, representing the National Association of Manufacturers (p. 67); Rev. J. Hugh O'Donnell, president of the University of Notre Dame (p. 91); and Dr. C. E. MacQuigg, of the Engineering College Research Association (p. 33).

*The decision process on NSF legislation*

The NSF concept was strongly favored by the scientific community in the United States, by the public at large, and by a considerable consensus in both Houses of Congress. The fact that it failed of enactment from 1946 to 1950 is explained by the variety of subordinate issues it raised. These issues included the patent provisions of the various bills, the issue of basic versus applied science, the possibility of alternatively resorting to tax concessions as a means of stimulating scientific research, and the question of mandatory distribution of NSF funds geographically. The most salient issue was whether the NSF should be a conventional agency of the Government, under a director responsible to the President, or an agency run by a part-time board of scientists, assisted by an agency director responsible to them.

In essence, this issue was viewed as that of scientific pursuit of new knowledge, free from "government dictation." The question as to the inclusion of the social sciences within the scope of NSF was a relatively minor one. Although it loomed large at first, it was resolved by the Senate in the debate in July 1946. While the question was again debated in 1947, the outcome was the same. The issue was whether the social sciences should be (a) explicitly included as an equal partner with the physical, the biological, and the medical sciences; (b) not included at all; (c) included, subject to narrow constraints; or (d) left to later determination by the NSF itself. Dr. Bush had recommended the fourth alternative, and the Senate concurred in his recommendation without much difficulty.

The extensive hearings in the Senate subcommittee, and the 1946 debate on the Senate floor will be discussed later on. Although the social science decision made in 1946 became a fixture of subsequent bills, the Senate bill expired with the close of the 1946 legislative session.

In 1947, after different bills had been passed by the two Houses, agreement was reached in conference on a compromise (permissive with regard to the social sciences) that would establish a National Science Foundation under the direction of a part-time board of scientists. President Truman rejected this proposal by pocket veto, August 6, on the basis of the lack of Executive control. This action he took with "deep regret" because he had "hoped earnestly" for suitable legislation; however the bill as passed would, he said, "be divorced from control by the people to an extent that implies a distinct lack of faith in democratic processes."<sup>16</sup>

Also in 1947 the President created by Executive Order a Presidential Scientific Research Board, and appointed John R. Steelman, his principal adviser, as its chairman. This Board was to undertake a study of U.S. scientific research and report its recommendations to the President on national science policy. Like the Bush study it omitted consideration of the social sciences. The report of the Steelman committee explained this omission on the grounds of their unmanageability. A statement by Dr. Bronk was cited with approval that every field of research in the physical sciences led sooner or later to new social problems, so that "competent social scientists should

<sup>16</sup> Congressional Record (Nov. 17, 1947), p. 10568.

work hand in hand with the natural scientists" to solve these problems as they arose. Continued the report:

Under these circumstances, it would have been desirable to include the social as well as the physical and biological, sciences in our investigations. The magnitude of the task and the pressure of time prevented this, although we did examine a number of instances in which physical and social scientists were working jointly on projects in the Federal Government. These relationships should be further investigated, and a survey of the program of the Government in social science areas would be useful.<sup>17</sup>

Bills were again introduced in 1948 and 1949, but not until 1950 were the two Houses of Congress able to concur in a legislative proposal which the President would approve; like most of its predecessors after July 3, 1946, it provided that the NSF might create additional divisions, presumably including one for the social sciences.

*Contemporary relevance of the social science issue*

The issue of Government sponsorship—or more precisely, NSF sponsorship—of basic research in the social sciences, quickly resolved in 1946, continues to be relevant. The intervening two decades have seen a sharpening of national problems which the 1945 Senate hearings identified as important challenges that social science research could help to solve. These problems included:

Crime	Arms control
Racial stresses	Environmental degradation
Urban stresses	Social impact of new
Poverty	technology

After its creation in 1950, the National Science Foundation made a gradual and cautious entry into the field of the social sciences. Mindful of congressional reservations about their controversial character, it restricted its sponsorship to ultrasafe lines of inquiry.<sup>18</sup>

No serious challenge of any social science undertakings of NSF has come to national attention. This caution has been rewarded by a steady growth in the scope and level of supported effort, and in December 1960, by action of the National Science Board as the statute had provided, a Division of Social Sciences was formed within NSF. In 1968, the Congress finally accepted the maturity of the social sciences, and instructed NSF to accord them equal status with the other categories of science within its purview.<sup>19</sup> However, the fundamental question remains as far from resolution in the late 1960's as in the mid-1940's: whether the scientific method can be functionally applied by a democratic society under republican institutions to assemble a body of reliable data about society itself that can be sys-

<sup>17</sup> U.S. President's Scientific Research Board. "Science and Public Policy," a report to the President by John R. Steelman, Chairman. (Washington, U.S. Government Printing Office, 1947), five volumes, see vol. I, p. viii.

<sup>18</sup> For example, the Fifth Annual Report of NSF (1955), describes the "limited program of support of the social sciences" that was approved by the Foundation in August 1954. Criteria for the projects included those areas characterized by the application of the methods and logic of science, "national interest," "convergence of the national sciences and the social sciences," and "basic research." It was administered within the existing divisions of the board, and included projects in anthropology, functional archaeology, human ecology, demography, psycholinguistics, experimental and quantitative social psychology, human geography, economic engineering, statistical design, and the history-philosophy-sociology of science (pp. 60-61).

<sup>19</sup> Public Law 90-407, approved July 18, 1968, specifies in sec. 3 that the Foundation is to "initiate and support basic research in the mathematical, physical, medical, biological, engineering, social, and other sciences \* \* \*" and towardscholarshipsandfellowships in these sciences. Sec. 4 provides that the National Science Board's executive committee shall be appointed of persons "eminent in the fields of the basic, medical, or social sciences \* \* \*." And sec. 8 adds the provision that a division of the social science is to be included in the NSF organization, thereby confirming the 1960 action of the Board.

tematically applied to the development of social inventions to meet human needs.

A long list of important social inventions had contributed to social, political, and economic progress before 1945. A random sampling of this list might include such items as—

parliamentary procedure	work simplification surveys
the Australian ballot	retirement pensions
Federal-State grants-in-aid	insurance
budgeting and accounting methods	mass public education
the census	institutional waste disposal
Government corporations	public hygiene
job and personnel classification	statistical sampling and quality control
national income and product statistics	workmen's compensation and unemployment compensation
hospitals	opinion polls
clinics	institutional outpatient care

The relationship between these inventions of applied social science and the data, theories, and principles produced by basic research in the social sciences, is analogous to that in any other field of science. Invention has often come into being empirically, without benefit of, and in anticipation of, the development of fundamental theory. In the electric storage battery, for instance, the invention was empirical and the theory came later. So, also, with the wheel and the Code of Hammurabi. In many other cases, theory pointed the way to solution of a technological or social problem, such as Albert Einstein's theory of the equivalence of matter and energy leading to the discovery of nuclear energy, or the Pavlov and Skinner theories of conditioned response and reinforcement leading to the teaching machine. In other cases, refinement of understanding led to the correction of a misconception—such as the notion that metals failed by “crystallization,” that alcohol potations were a specific for snakebite, that insanity resulted from exposure to moonlight, or that criminal tendencies could be eradicated by severe enough punishment.

Whether the invention is in technology, biology, medicine, or the social science fields, it is more likely to be relevant to the real problem if the inventor knows what the facts are. It is the function of basic scientific research to provide the facts. The issue in 1945–47 was whether the social sciences were ready to accept full partnership in a national endeavor to this end.

## II. ISSUES CONFRONTING ACCEPTANCE OF THE SOCIAL SCIENCES IN 1945

When the hearings on science legislation opened before the Senate Subcommittee on War Mobilization, October 8, 1945, the proposal of President Truman that the social sciences be included was already confronted with numerous obstacles. The social sciences tended to have unfavorable connotations for many people: as connected with socialism, authoritarianism, and improper manipulation of people; as an attempt to apply scientific methods to a field that lay beyond the reach of science; as connected with “isms” and “crackpot ideas.” The addition of the social sciences to the NSF proposal was evidently an afterthought; it had not even been considered or studied by the four

committees that collaborated in the preparation of the Bush report. The social sciences in World War II had produced no spectacular product like the atomic bomb; there was no widespread recognition of the practical results of research in social science fields. The disciplines of the social sciences were poorly structured, displaying many conflicts and contradictions in each field, between related fields, and between general scientific and lay opinion as to matters of policy and theory. Distinctions between basic and applied research in the social sciences were poorly drawn. Moreover, the disciplines were not clearly defined, either by Members of Congress, by scientists generally, or even by the social scientists themselves. In short, for the social sciences to win equal status with the physical, biological, and medical sciences in the new Foundation, as the President had suggested, would require that compelling evidence and reasoning be assembled in their support.

As this matter was considered by the subcommittee chaired by Senator Kilgore, and later as it was reviewed by the Senate, the following questions emerged:

1. Were the social sciences sufficiently mature to be vested with a public interest?

2. Were these sciences in fact really "sciences" with proper objectivity and employment of the scientific method?

3. Were the social sciences sufficiently structured as disciplines, or would their inclusion in a National Science Foundation open the door to limitless scope of meaningless projects, thus siphoning off funds from other, more significant, functions of the Foundation?

4. Had the methodologies of the social sciences been sufficiently perfected for them to be considered as capable of serious research?

5. Could researches in the social sciences be satisfactorily classified into basic and applied?

6. If in fact the social sciences lagged behind the physical sciences, was that not an added reason for encouraging an accelerated effort in the former?

7. By consulting senior men as witnesses in a mature set of physical science disciplines, and also by consulting senior men as witnesses in a less mature set of social science disciplines, was Congress able to obtain a clear picture of the potential of the latter? Would younger researchers closer to the contemporary state of the art have served better as witnesses respecting the potential social utility of the social sciences?

8. The subjects studied by social science were "controversial" while those of the physical and biomedical sciences were not; thus, would social science research be more difficult to program, elicit political opposition, and embroil NSF in controversy such as to jeopardize its existence as a vehicle for the support of the physical sciences?

9. Was it not possible to support a considerable range of research in the social sciences by calling it something else—as for example, the study of methods of improving the management of scientific information, research in the history of science, improvement in educational methods for the teaching of science, and statistical data collection concerning scientific manpower, etc.?

10. Did the social sciences present the threat that their prac-

tioners might acquire political power by the manipulation and control of the public?

11. Could the same scientific leaders coordinate and manage a program of social science research and physical-biological-medical research?

### III. LESSONS OF THE SENATE HEARINGS ON NSF BILLS

The decision to allow the social sciences a gradual admission to the NSF appears to have been taken on the floor of the Senate. The sustained interest of the Senate Subcommittee on War Mobilization in scientific and technological matters made it the logical place for the testing of NSF legislation. The hearings held in this forum, accordingly, provided most of the evidence relevant to the Senate's decision.

The content, direction, and implications of this evidence seem to support several conclusions:

That the social sciences were not accepted to equal partnership or status by scientists in the "natural science" disciplines;

That there was general agreement that the social sciences lagged, needed support, and must ultimately play a commanding role in the adjustment of society to technological advances;

That the social sciences had already made important contributions to military potency and peacetime development, although these were neither well recognized nor commonly regarded as "scientific" inventions;

That the mechanisms by which new basic scientific discoveries move forward to exploitation were not widely understood, and least of all in the social sciences;

That the very relevance of the social sciences for major social problems intensified resistance to their development.

#### *Testimony of the physical scientists*

For the most part, the physical scientists who provided the bulk of the testimony were less hostile than skeptical. Isaiah Bowman, himself a geographer and earlier a member of the Social Science Research Council, recognized the obstacles:

It is well-known that so much of human prejudice and tendency and social philosophy enter into the study of social phenomena, that there is the widest difference of opinion as to what constitutes research in many instances in the social sciences.

His view was that the proposed NSF should at first content itself with provision for the study of the social impacts of scientific discovery, and for the development of social statistics.<sup>20</sup>

Probably the bulk of the scientific witnesses would have agreed with Dr. Bush; although he recognized that "our strength is also dependent upon the extent of our knowledge of social phenomena and our ability to bring such understanding to bear wisely on the urgent problems confronting us," this resource should be approached with caution:

I am not a social scientist and cannot presume to speak for the disciplines embraced by the field of the social sciences. Men who can speak for them will appear before you. The proposed foundation should allow an opportunity for effective integration and partnership between the natural and social sciences, and I believe that this pattern should be the result of careful study by the foundation after its establishment.<sup>21</sup>

<sup>20</sup> Hearings on science legislation (S. 1297 and related bills), p. 23, op. cit.

<sup>21</sup> *Ibid.*, p. 200.

Some witnesses flatly opposed provision for social sciences in the NSF. For example, C. E. MacQuigg, dean of engineering of Ohio State University, speaking for the Engineering College Research Association and also as a member of the OSRD group that contributed to the Bush report, said that "no useful purpose will be served" by including social sciences in the proposed foundation. Its problems and its practitioners were of an altogether disparate character from "those dealing with the physical world."<sup>22</sup> In one straw vote reported to the hearing 12 scientists favored inclusion of the social sciences, 46 favored putting them in a separate agency, and 4 were opposed to any Government program of social science sponsorship or aid.<sup>23</sup> Bernard M. Baruch dismissed the social sciences in a single sentence; they should not, he said, "be included in the same setup."<sup>24</sup> Dr. Morris Fishbein, editor of the *Journal of the American Medical Association*, opposed their inclusion because of the "great danger of the use of so-called research in the social sciences for political purposes and to influence legislation."<sup>25</sup>

The suggestion that the social sciences could not be objective because of their relevance to national problems was advanced by Dr. I. I. Rabi, nuclear physicist from Columbia University. He noted that they were different, required a different kind of administration, and might jeopardize the field of science generally, although they were "a place where we need attention even more than the natural sciences." On the other hand, he said:

I am afraid of the power of this foundation, in the support of social sciences through fellowships and otherwise, to make such selections as to strengthen a preconceived point of view or a particular opinion. You see, social science comes very closely to fundamental political questions which are questions of the day, and I begin to see possibility of a Government's building up a certain body of opinion, a certain direction of thinking through that, whereas in the physical sciences I am not afraid of that simply because it is quite objective. You can prove things by experiment.<sup>26</sup>

Among those witnesses who favored the inclusion of the social sciences, Dr. F. R. Moulton, permanent secretary of the American Association for the Advancement of Science, offered the judgment that the physical sciences had been overemphasized and that "if we neglected social sciences, all the humanities that are involved in the human race living together, then the expertness in the physical sciences would not in the long run save us from war."<sup>27</sup> A poll reported by Dr. Howard A. Meyerhoff, executive secretary of the AAAS, of 192 replies to a questionnaire reflecting the views of some 400 members, indicated that 67 percent believed that the social sciences "needed support." He said: " \* \* \* all of the social scientists answering the questionnaire, and a substantial number of physical scientists believe that the social sciences should have an integral place in the program, and that they should be classified with the basic sciences."<sup>28</sup>

Most military witnesses ignored the issue entirely, but Brig. Gen. John Magruder, director of the Strategic Service Unit (the residual organization that had been the Office of Strategic Services, and was later to become the Central Intelligence Agency), made a strong bid

<sup>22</sup> *Ibid.* p. 710.

<sup>23</sup> *Ibid.*, pp. 1145-1146.

<sup>24</sup> *Ibid.*, p. 910.

<sup>25</sup> *Ibid.*, p. 496.

<sup>26</sup> *Ibid.*, pp. 998-999.

<sup>27</sup> *Ibid.*, p. 79.

<sup>28</sup> *Ibid.*, p. 92.

for support of "those systematic studies which treat of man in his relationships with his community—economics, political science, sociology, history, and geography among others." He cited the importance of strategic assessment of foreign nations, psychological warfare and morale studies, psychological testing of personnel for special service, and other aspects of intelligence. Said Magruder:

In the estimates made for the various planning agencies of the Joint Chiefs of Staff and their Joint Intelligence Committee the social scientists made valuable contributions in gaging the enemy capabilities, probable intentions, and vulnerabilities. They dealt primarily with the nonmilitary aspects of the enemy situation, and the economic, political, and geographic position with respect to his supply of strategic raw materials, manpower supply, and plants; on enemy production of aircraft, tanks, and other military supplies; on the probable durability of the enemy's political structure; and so forth. These calculations, made by a staff which in large part had come to Federal service from the social science faculties of our leading universities, contributed significantly to the overall capability studies available to the Joint Chiefs of Staff.

It was important that this capability be preserved, he went on.

Were there to develop a dearth of social scientists, all national intelligence agencies servicing policymakers in peace or war would directly be handicapped.<sup>29</sup>

The role of the human sciences in systems engineering was described by Gen. H. H. Arnold, commanding general of the Army Air Forces, who spoke of the "necessity for scientific research on human factors, in use of new equipment and the integration of research in designs, personnel selection, and training, so that by the time the equipment has become standard, standard procedures for selection and training are also available."<sup>30</sup>

Three witnesses testified as to the importance of the social sciences in fields that have since become of foremost importance in connection with national problems. One was Dr. Abel Wolman, professor of sanitary engineering of Johns Hopkins University and Chairman of the Committee on Sanitary Engineering of the National Research Council. An important part of the research in his field, he said, "\* \* \* falls over very completely in the social science field." It involved such problems as water supply, stream pollution, air pollution, the social aspect of waste, and the social aspects of the environment. He would include the social sciences in the NSF because:

I see tremendous importance in converting the results of fundamental and applied research to the uses of man. The reason I hesitate in defining how that should best be done is the criteria, the method of measurement, the whole field of research in social sciences doesn't lend itself to the concreteness that it does in natural sciences. But I certainly would not underestimate its importance because what such a foundation of science does in this field has, after all, whether we like it or not, significance not only in abstract knowledge, but significance in raising the general level of humanity, and that part of the program is a social science enterprise.<sup>31</sup>

In the field of "technological transfer," Morris L. Cooke, a consulting engineer who represented the Independent Citizens Committee of the Arts, Sciences, and Professions, favored inclusion of the social sciences in the NSF, and appeared to associate it with the achievement of a "balanced system for the sciences based on total human needs."<sup>32</sup>

Judge Ewing Cockrell, of the U.S. Federation of Justice proposed that the Foundation be given a special branch of the social sciences as

<sup>29</sup> *Ibid.*, pp. 900-901.

<sup>30</sup> *Ibid.*, pp. 345-346.

<sup>31</sup> *Ibid.*, pp. 663-674; and especially 670.

<sup>32</sup> *Ibid.*, pp. 1003-1005.

a principal charge. This would be a Division of Social Relations and Conduct and would deal synoptically with such problems as crime and arms control by deriving from the social sciences the findings relevant to social relations and conduct. In essence, he proposed a special organization of applied social science.<sup>33</sup>

*Testimony of the social scientists on NSF legislation*

The Senate subcommittee devoted 1 day—October 29, 1945—to the hearing of testimony from witnesses representing the social science disciplines. Dr. Wesley C. Mitchell, an economist and a director of research at the National Bureau of Economic Research, delivered to the subcommittee a memorandum from the Social Science Research Council that made a strong plea for inclusion of the social sciences in the NSF. It said there was a great need of new social inventions—

There is grave danger that man will find that he does not have the wisdom to guide his tremendous control over the forces of nature for his own greatest benefit. Fears exist not only that the powers of science will be misused in wars of unspeakable destructiveness, but also that impending fundamental technological innovations cannot be made without serious internal social disorders.

Scientists themselves perhaps more than the public are uneasy about potential evil uses of their inventions. It is obvious that man's inventions are in themselves of neutral character and that their value to humanity depends on the purposes which they are made to serve. The hazards to national and world interest created by new inventions cannot be evaded by checking the powers of invention even were such a proposal not too fantastic to merit serious discussion. Dependence for security and order must rather be on the improvement of the foundations of human relations.

The social sciences were ill equipped to meet the challenge of designing the accommodation to new technology:

The present inadequacy of knowledge of human relations is a source of danger which can be greatly reduced by more adequate applications of scientific techniques in the study of human problems. Social science personnel, research procedures, and facilities are underdeveloped in terms of the tasks which must be undertaken. The fact that it cannot be claimed that the social sciences have reached a stage comparable to that of some of the other scientific disciplines is considered the strongest possible reason for advancing their development by every effective means.

The statement concluded with an allusion to the essential indivisibility of science and a blunt prediction for the future.

The traditional lines of demarcation between the natural and the social sciences have little meaning when confronted with the research problems involved in the safeguarding of the human aspects of every major problem of national interest. Collaboration and cooperation among the sciences rather than an intensification of past rivalries and competitions is essential if the contemplated program is not to worsen the existing situation instead of achieving the goals set for it. The proposed research agency will be concerned with social science problems whether it so wishes or not; the only relevant and essential question is whether it will from the outset be able to deal competently with these problems.<sup>34</sup>

The position of the Social Science Research Council was seconded by Dr. Herbert Emmerich, director of the Public Administration Clearing House, who urged that the "Government should not further put out of balance the program of these disciplines by overemphasis on purely physical research."<sup>35</sup>

Speaking for the American Political Science Association, Dr. John M. Gaus, its president, called attention to the growing need for

<sup>33</sup> *Ibid.*, pp. 1074-1079.

<sup>34</sup> *Ibid.*, pp. 741, 743.

<sup>35</sup> *Ibid.*, p. 740.

studies of urban problems and noted that while the Government was already engaged in a wide range of social science studies, the question was as to how well these would be done without the assurance of a progressive improvement in the quality of trained personnel and basic information. There was a disposition to overlook the social sciences because their useful inventions and products did not appear in recognizable form. Leaders in the physical sciences were identified by their scientific products, but no comparable eminence was conferred by social inventions or products such as budget programs, personnel classification, public administration, regional planning, and many others.

Dr. Robert M. Yerkes, emeritus professor of psychobiology, Yale University, called the subcommittee's attention to the social importance of psychology which tended to link the physical to the human science involving the engineering contributions of human factors, the economic aspects of labor-management relations, the broader contribution to education, the matching of personnel to job classification, and the many contributions of the discipline to military operations. The social sciences, he said, were capable of contributing to the effectiveness of Government itself—

In Government it would seem that social science research should be of first-rate importance, for Government itself is a social science and most of the problems that cost Members of the Congress laborious days and sleepless nights are either partially or wholly psychological. For clearly enough they involve such human factors as desires, prejudices, beliefs, opinions, convictions, practical judgments. Major contributions of psychological research and of psychotechnological developments to Government appear in the methods of individual psychobiological appraisal and description which enable us to understand ourselves and others better, and in procedures for public opinion polling, which have vast potentialities of usefulness and abuse.<sup>36</sup>

Dr. Edwin G. Nourse, vice president of the Brookings Institution (and later to become Chairman of the President's Council of Economic Advisers), observed that "Every problem of utilizing the resources of nature for man's safety or material satisfaction has two halves, one technological, the other economic." But the values that were ultimately determined in the marketplace were evolved outside of his discipline—

While scientific analysis of comparative costs and returns and investigations into the nature of the economic process occupies a pivotal place in man's effort to make a good life for himself out of the rich but reticent resources of nature, the values which come to expression in the marketplace, the preferences for certain types of goods or services, the esteem in which leisure is held, and the capacity of men to combine their productive efforts in one pattern of organization or another and in response to various kinds of incentive or motivation are matters which lie outside the field of economics as such. These contributory factors must be explored by other sciences such as psychology, anthropology, political science, sociology, and their handmaiden, history. We must understand the subtle complexities of human nature as well as the precise mechanistic relations of physical nature if we are to develop the national strength that grows out of productive cooperation and avoid the disruptive struggles of group, class, racial, or nationalistic warfare.<sup>37</sup>

There was a tendency, he said later, to "exaggerate the amount of exactness that there is in the physical and biological sciences" and to "underestimate the amount of evidential value that social science techniques can get out of raw data from the economic and social fields."

<sup>36</sup> *Ibid.*, pp. 751-753.

<sup>37</sup> *Ibid.*, p. 758.

The sociological discipline was represented by Dr. William F. Ogburn of the University of Chicago. In his prepared statement he identified three ways in which the social sciences made significant public contributions. The first, and most generally recognized, was in discovering "reliable and trustworthy knowledge" about such phenomena as "social, economic, and political organizations of all kinds such as government, industry, transportation, agriculture, the press, church, family, rural communities, cities, nations, and international bodies." Secondly, "for every important mechanical invention that physical scientists make there is created a new social problem on which social scientists should work." Thirdly was the fact that social sciences were of increasing importance to national defense because "every war now is a total war and must be fought not only with munitions but also with institutions."

For examples of the social impact of inventions, he noted that the steam engine had resulted in an increase in divorce, the automobile an increase in crime, and the atomic bomb a threat to cities. "Hence, social scientists (as a consequence of these inventions) must do research on divorce, on crime, and on the protection of our cities."

The "industrial revolution," caused by steam, created cities, changed agriculture from subsistence to commercial farming, built a new economic system with many new economic organizations, destroyed social classes and created new ones, redistributed wealth, revolutionized warfare, realigned the great powers, abolished the household economy, and reduced greatly the social functions of the family. The "scientific revolution" following nuclear fission of the atom may change our society and its institutions even more.

It would be as foolish, he said, to ask the physicist to forecast the social consequences of invention as for the social scientist to outline the next procedure in nuclear fission. It would be foolish, also, to expect "off the cuff" answers from the social scientists to questions warranting extensive study and research. "If Government sponsors research in natural science, it ought also to support the study of the social changes and social problems which the natural science researches create."

He admitted that research in the social sciences was "a more recent development than research in the natural sciences" and that it was more difficult "because of the larger number of variables than are found in problems of the physical sciences."

The field of anthropology was represented by Msgr. John M. Cooper, professor of anthropology, Catholic University. His subject dealt with comparative human cultures, and could contribute to the purposes of the proposed legislation by helping to "bridge the gap between the findings of the natural sciences and our living habits," and by "helping to bring about and to maintain harmonious relationships between larger national, ethnic, and other groups of human beings." As examples of the first, he cited analysis of the factors in U.S. culture that led to acceptance or rejection of sound dietary practices, hygiene, and medicine. As an example of the second, he suggested that misunderstandings and conflicts grew out of the ignorance of the "subtle but powerful forces that underlie the working of other social systems than our own, of basic philosophies, attitudes, incentives, motives, loyalties, prejudices, and dislikes."<sup>38</sup>

<sup>38</sup> Ibid., p. 778.

*Social science views of Government witnesses*

Only a few of the administration spokesmen gave attention to the social science aspect of the NSF proposal. Secretary of Commerce Wallace said his Department's research activities embraced social as well as physical sciences and that their less advanced development was a reason for supporting them.<sup>39</sup> Dr. R. E. Dyer, Director of the National Institutes of Health, said that the Public Health Service had found it "\* \* \* impossible to study man apart from his environment."

Many problems of public health [he went on], are dependent for their ultimate solution upon greater understanding of the social and economic conditions. Geography, demography, sociology, and economics are all essential considerations in the study of disease.<sup>40</sup>

A statement submitted by P. V. Cardon, Administrator of the Agricultural Research Administration of the Department of Agriculture, gave favorable mention to the inclusion of the social sciences in NSF and noted that "for many years the Department of Agriculture and the State agricultural experiment stations have carried on social research, and investigations in this field have proved important in the solution of economic and social problems of agriculture."<sup>41</sup>

The principal Government witness on behalf of the social sciences was Watson B. Miller, Federal Security Administrator (precursor agency to the Department of Health, Education, and Welfare). He observed that social inventions were "just as real and valuable as material inventions" but were not usually recognized as inventions, and were rarely patented, or sold at a profit. Therefore these important incentives were not available to stimulate social science research. Miller gave examples of many social science inventions, and filed with the subcommittee a summary of social science research activities being carried on by his agency.

The increasing use being made of teamwork in research, Miller concluded, made it important that the various scientific resources "be integrated in such a way as to reinforce each other." For example—

When a broad human problem is approached to attempt to divide it into academic fields is often highly artificial. Suppose we are planning a coordinated attack on malaria. We would probably start with such natural science techniques as study of the mosquito, study of the germ, study of insecticides and drugs, but we would eventually get to such socio-economic problems as the ownership of mosquito-breeding waters, methods of keeping roadside and farm ditches free of weeds and obstructions, methods of house screening, methods of obtaining community cooperation, and sources of funds for the campaign.<sup>42</sup>

## IV. STRUCTURING THE ISSUE

The hearings before the Senate Subcommittee on War Mobilization provided a voluminous record of information and identified many issues and considerations that were germane to the Senate's decision on the proposed NSF. The social science issue seemed to be regarded by the subcommittee as a principal issue. Its preliminary report, December 21, 1945, included a compromise bill, S. 1720, and called attention to the fact that one of the "major recommendations em-

<sup>39</sup> *Ibid.*, pp. 140, 143.

<sup>40</sup> *Ibid.*, p. 522.

<sup>41</sup> *Ibid.*, p. 727.

<sup>42</sup> *Ibid.*, pp. 796-800, especially p. 798;

bodied in the bill" made specific provision for the social sciences. The report continued:

In recommending that the program of the Foundation include the social sciences, your subcommittee is implementing the recommendations of the President and the majority of the witnesses who testified on this subject. Not a single witness opposed the Federal support of the social sciences. A minority urged that such support be deferred or provided in a separate agency.<sup>43</sup>

In an accompanying appendix, the subcommittee provided a summary of the testimony on the various issues. Witnesses commenting on the social sciences were divided as follows: Those favoring unqualified inclusion of the social sciences in the NSF, 37; an additional 8 favored it with reservations; those favoring a separate agency for the social sciences, none. The publication devoted 13 pages to the social science issue, and remarked that "in addition to the social scientists who urged inclusion of their fields in the program of the proposed foundation, a most substantial majority of other witnesses also came out for the social sciences as essential to a national science program."<sup>44</sup> The summary included reference to the following aspects, pro and con:

#### A. POINTS IN FAVOR OF FEDERAL SPONSORSHIP OF RESEARCH IN THE SOCIAL SCIENCES

1. The lag in social science research needs to be corrected.
2. The utility of social inventions has been demonstrated.
3. The accommodation of society to the impact of new technology requires social science research.
4. Mechanisms for the exploitation of new technology involve research in the social sciences for their development.
5. Social science research provides coherence in the national defense effort.
6. The unity of all science requires that all be included in one comprehensive program of sponsorship.
7. Social science helps social change to occur by evolution rather than by revolution.
8. Social sciences help to set goals for the physical sciences.
9. The major problems confronting society have a content that is mainly in the field of the social sciences.
10. Social sciences are a stimulus to the physical sciences, and vice versa.
11. The study of the human environment cannot be separated from the study of man.

#### B. POINTS IN OPPOSITION TO FEDERAL SPONSORSHIP OF RESEARCH IN THE SOCIAL SCIENCES

1. Social science research encounters problems of objectivity (its findings may be exploited for political purposes, or used to influence legislation).

<sup>43</sup> U.S. Congress. Senate. Committee on Military Affairs. National Science Foundation, "Preliminary Report on Science Legislation, From the Subcommittee on War Mobilization to the \* \* \* Pursuant to S. Res. 107 (78th Cong.) and S. Res. 146 (79th Cong.), Authorizing a Study of the Possibilities of Better Mobilizing the National Resources of the United States," Dec. 21, 1945, print containing S. 1720, 79th Cong., 1st sess., Subcommittee Rept. No. 7 (Washington, U.S. Government Printing Office, 1945), p. 2.

<sup>44</sup> U.S. Congress. Senate. Committee on Military Affairs. "Science Legislation: Analytical Summary of Testimony," Appendix to report from Subcommittee on War Mobilization pursuant to S. Res. 107 (78th Cong.) and S. Res. 146 (79th Cong.), authorizing a study of the possibilities of better mobilizing the national resources of the United States, December 1945. 79th Cong., 1st sess., Subcommittee Monograph No. 5 (Washington, U.S. Government Printing Office, 1945), pp. 26-38.

2. Social science methods, approaches, and training of practitioners differ from those in the physical sciences.

3. Findings of social science cannot be subjected to experimental verification.

4. The scope of social sciences is limitless, and administratively infeasible to encompass in a single agency.

5. Social science is inherently controversial, and would discredit and jeopardize support for the physical sciences.

6. Social sciences are not sciences in the same sense that the physical sciences are.

In general, the tone of the preliminary report and its accompanying appendix gave the impression of an enthusiastic endorsement of the social sciences as a worthy and coequal academic partner with the physical, biological, and medical sciences in the new agency.

However, by the time the subcommittee made its final report on NSF legislation, February 27, 1946, a note of caution was evident in its attitude on the inclusion of the social sciences. While still "firmly convinced" that they should be included, and that they would be able to make "significant contributions to almost every department of government," it was also true that "these younger disciplines have not had time to perfect their specialized techniques \* \* \*."

Therefore—

With a carefully planned and administered program of support, the social sciences promise to make even more important contributions to the solution of the problems of the future. Because the specific research needs of the social sciences have not been subjected to such careful study as those of the physical and biological sciences, your subcommittee has recommended that initial support of research in these fields be limited until adequate planning studies have been completed.<sup>45</sup>

This note of caution was repeated in the report of the parent Committee on Military Affairs, in presenting S. 1850 to the Senate for its consideration. The report, April 9, 1946, gave verbatim the above quotation from the final subcommittee report.<sup>46</sup> But, in introducing the subject, the full committee finding included the statement:

The committee has rejected the proposal that the social sciences be specifically excluded from support by the new agency, because of the demonstrated interdependence of the physical and social sciences. S. 1850, however, makes special provision to assure that all social studies supported by the Foundation are in fact scientific in character.<sup>47</sup>

The provision in question was as follows:

The functions of each division [of NSF] shall be prescribed by the Administrator after receiving the advice of the [National Science] Board, except that until the Administrator and the Board have received general recommendations from the Division of Social Sciences regarding the support of research through that Division, support of social science research shall be limited to studies of the impact of scientific discovery on the general welfare and studies required in connection with other projects supported by the Foundation.<sup>48</sup>

<sup>45</sup> U.S. Congress, Senate, Committee on Military Affairs, National Science Foundation, "Report on Science Legislation From the Subcommittee on War Mobilization to the \* \* \* Pursuant to S. Res. 107 (78th Cong.) and S. Res. 146 (79th Cong.), Authorizing a Study of the National Resources of the United States," Feb. 27, 1946, print containing S. 1850, 79th Cong., 2d sess., Subcommittee Report No. 8 (Washington, U.S. Government Printing Office, 1946), p. 6.

<sup>46</sup> U.S. Congress, Senate, Committee on Military Affairs, National Science Foundation, "Report from the \* \* \* Pursuant to S. 1850, a Bill To Promote the Progress of Science and the Useful Arts, To Secure the National Defense, To Advance the National Health and Welfare, and for Other Purposes," Apr. 9, 1946, 79th Cong., 2d sess. S. Rept. No. 1136, Calendar No. 1153 (Washington, U.S. Government Printing Office, 1946), p. 8.

<sup>47</sup> *Ibid.*, p. 2.

<sup>48</sup> *Ibid.*, p. 18.

### The report explained:

The initial limitation with respect to the support of research in the social sciences has been included in the bill because none of the studies which served as a background for this legislation had considered the research needs of these fields.<sup>49</sup>

## V. THE DECISION PROCESS—SENATE AND HOUSE

The Senate took up the Science Foundation bill, S. 1850, on July 1, 1946. Senator Kilgore as floor manager, explained the need for the legislation, described the abundant support it had received in the hearings from scientists, business, labor, and other public figures, and indirectly accounted for the change in tone as between the preliminary and final reports of his subcommittee when he said:

\*\*\* After all the hearings were concluded [early in November 1945], a committee was formed, consisting of leading scientists, to study the bill. I think the committee was headed by Vannevar Bush and Dr. Isaiah Bowman as cochairmen. We met with Dr. Bowman and Dr. Bush in a conference in which all points in dispute with reference to the bill itself were ironed out, and we departed from the conference with both sides satisfied as to the details of the bill.<sup>50</sup>

However, Senator Johnson of Colorado (one of the sponsors of the bill and very much in sympathy with its purposes) took exception to the bill's provision for a division of the social sciences. Senator Kilgore explained that the sciences were inseparable, and that the bill provided merely for a study of the relevance of the social sciences for the total program. Senator Magnuson offered assurance that there was "no intention of embarking upon a vast program into the realm of the social sciences" but that some areas of research unavoidably overlapped. But Senator Johnson protested that to include social sciences made the scope of the program vague and unmanageable.<sup>51</sup>

Senator Fulbright evidently sensed an antipathy toward the social sciences which he thought might be based on a misconception with the study of the social sciences "being confused with what we commonly think of as politics, socialism, or some form of social philosophy." In attempting to clarify the issue, Senator Fulbright quoted an "able scientist" whom he had consulted the day before, who had defined social science as "one individual or a group of individuals telling another group how they should live."<sup>52</sup> This explanation was not well received and in his further explanatory statement he revealed both his own ambivalent attitude toward the social sciences and its source:

At the request of the physical scientists, we incorporated a special provision in the bill in an effort to try to prevent the Division of Social Sciences getting out of hand, so to speak. I have no fear of that, however. I only hope this provision will give some prestige to social science, that it will sort of recognize that field of study as a legitimate thing in our society, and I hope it will encourage some of our more intelligent young people to go into that field. I think it is sadly understaffed. I know there are many crackpots in that field, just as there were in the field of medicine in the days of witchcraft, but it is not something from which

<sup>49</sup> *Ibid.*, p. 31.

<sup>50</sup> Senator Kilgore's statement is taken from the Congressional Record (July 1, 1946), p. 8144. In introducing the legislation, Senator Smith explained that framing it he had had the benefit of advice from " \* \* \* Dr. Vannevar Bush, Head of the Office of Scientific Research and Development, which Office the Foundation would replace; President James B. Conant of Harvard University and H.D. Smyth of Princeton University, author of the Smyth report on atomic energy (Gerald G. Gross, "New Science Drive Beun in Congress," Washington Post, Feb. 8, 1947).

<sup>51</sup> Congressional Record, *op. cit.*, pp. 8157-8158.

<sup>52</sup> *Ibid.*, p. 8164. 4

we should back away. We have to solve the social problems one way or the other. I cannot see any harm in admitting that they are legitimate problems and giving the Board authority to devote some of its resources to that study.<sup>53</sup>

As the debate proceeded, opponents brought out further points:

The proposed foundation should initially be confined to the fields most urgently needing support, with doubtful areas deferred until the plan had been tested;

There was a danger in loading too much scope into the program;

It was uncertain as to what the social scientists would study—they could not be trusted (this attitude was in marked contrast with that toward the physical sciences, which all members agreed to assure full freedom of scientific inquiry);

The scope of the social sciences part of the program deserved further study which the Congress would not itself be qualified to conduct;

There was a danger that the Congress might find itself responsible for sponsoring “wild-eyed, so-called research” or the use of funds to further projects of “a man addicted to certain isms”;

The social sciences were not subject to close definition, were not related to the physical sciences, could not be managed by those qualified to direct research in the physical sciences, and were not favored by the physical scientists.

In an effort to expedite the decision process, Senator Smith of New Jersey offered as an amendment a substitute bill which differed from the Kilgore-Magnuson proposal in five respects: (1) control by a science board rather than an appointed administrator; (2) changed provisions for regional distribution of project funding; (3) changed patent provisions; (4) exclusion of the social sciences from the scope of the bill; and (5) modification in the timing of the scholarship-fellowship part of the program.<sup>54</sup>

In support of item 4, Senator Smith produced a letter to the President from a “Committee Supporting the Bush Report,” dated November 24, 1945, and signed by 5,000 scientists. The committee included many notable figures in the scientific community, such as its Chairman, Isaiah Bowman, and also Bronk, Conant, and DuBridge. This group said it would be a “serious mistake to include the social sciences \* \* \* at this time,” and recommended that a separate institution be provided for their support.<sup>55</sup> When the Smith amendment was rejected,<sup>56</sup> the Senate then proceeded on the following day (July 3) to take up one at a time the issues raised by Smith. An amendment by Senator Hart, of Connecticut, proposed to delete from the NSF bill the provision for a social science division, assistance to students of social science, and inclusion of the social sciences in the scope of the Foundation.<sup>57</sup> In support of his amendment, Senator Hart again referred to its omission from the Bush report, the lack of agreement as to the definition of the social sciences, the complexity and expense of administering a field of such large scope, and the lack of coherence between physical and social sciences.

<sup>53</sup> *Ibid.*, p. 8165.

<sup>54</sup> *Ibid.*, p. 8232.

<sup>55</sup> *Ibid.*, pp. 8237-8238.

<sup>56</sup> *Ibid.*, p. 8265. The vote was 24 to 39 with 33 not voting.

<sup>57</sup> *Ibid.*, p. 8349.

In defense of the bill as introduced, Senator Thomas of Utah again referred to the social impact of science, the relevance of social trends for the general welfare, the unity of all science, the military importance of the social sciences, and the need for freedom of scientific inquiry. Whereupon the Senate accepted the Hart amendment (46 to 26, with 24 not voting),<sup>58</sup> and then adopted the NSF bill (48 to 18, with 30 not voting).<sup>59</sup> The effect of the decision was to register the Senate's disapproval of any positive action toward the social sciences in the NSF bill; the proposed National Science Foundation might, at a subsequent time, expand its scope to include "other sciences" but—at least insofar as the social sciences were concerned—would do so at its own risk.

*Congressional adoption of permissive formula in 1947*

It was evidently generally believed that the Senate action in excluding the social sciences altogether from the NSF bill had been too extreme, because in the legislation introduced the following year the terms were uniformly more permissive. In the Senate, a bill was introduced (S. 526) by Senator Smith of New Jersey, and discharged by unanimous action (without hearings) from the Senate Committee on Labor and Welfare. It was taken up May 14. With respect to the social sciences, the committee recommended:

Your committee has rejected the proposal that the social sciences be included as a division of the Foundation at this time. It is cognizant of the impact of fundamental science on modern society and of the need for social-science studies. It feels, however, that the disciplines of the social sciences are not at this time sufficiently well defined to include them in a foundation designed to treat with the basic sciences. Rather, it is the opinion of the committee that the broad, collective wisdom of the Board must be relied upon to determine the time and to what extent changes shall be made in the divisional status of the Foundation; section 7(2) provides "and such other divisions as the Foundation may from time to time, deem necessary." [And also:]

Time may change the relative importance of the divisions. The foregoing clause permits the necessary flexibility and leaves to the wisdom of the Board the extent to which the social-sciences disciplines are to be explored. It may thus be said that S. 526, as amended, denies mandatory provision for the social sciences, but establishes the right of the Foundation to explore the needs of the social sciences and to determine the extent, if any, that studies in this field are necessary to support work in the other divisions.

Smith, himself, confessed that he did not favor having the NSF support research in the social sciences but was yielding to the consensus.<sup>60</sup> Toward the end of the debate on S. 526 Senator Fulbright once more attempted to persuade the Senate to have the bill give equal status to the social sciences with other fields of science<sup>61</sup> but his amendment was rejected by a vote of 23 to 63, with 9 not voting. From this point on, in both the Senate and House bills on science foundation legislation, the compromise formula as reported from the Senate Labor and Welfare Committee was uniformly followed.

In the House hearings, before the Interstate and Foreign Commerce Committee, March 16–17, 1947, the attitude toward the social sciences

<sup>58</sup> *Ibid.*, p. 8350.

<sup>59</sup> *Ibid.*, p. 8360.

<sup>60</sup> *Congressional Record* (May 14, 1947), p. 5258.

<sup>61</sup> *Ibid.* (May 20, 1947), p. 5649.

had been somewhat more friendly than in the previous year's hearings. Dr. Bush, for example, said:

In the last session of Congress there was considerable controversy over a provision in the Kilgore-Magnuson bill which would establish within the Foundation, a Division of Social Sciences. This provision was eliminated on the floor, and I believe that was a wise move. But I do think that the controversy was unfortunate. If we, as a democratic nation of free individuals are to survive, we must seek to understand the forces which affect our social organizations in order that they may be anticipated and guided in safe directions.

A large amount of research is already being devoted to various aspects of the social sciences, both by the Government and by private individuals and organizations. Much more could be done to advantage. In view of the magnitude and complexity of this field, however, it seems to me that the Foundation should fully survey it with a view toward determining those areas which could be made the subject of fruitful research under its auspices. Under H.R. 1830 [which was identical with the subsequently Senate-passed S. 526], this could be done, and I hope it will be done. But it is well to make research in the social sciences permissive rather than mandatory.<sup>62</sup>

Although some witnesses still adhered to the idea of separate support for the social sciences, Dr. Bronk continued to support the full inclusion of the social sciences;<sup>63</sup> in addition, a rather strong move in support of the permissive formula was made by a group headed by Dr. Edmund E. Day, president of Cornell University and chairman of the "Intersociety Committee on Science Foundation Legislation," representing 68 (or 75) scientific and educational organizations, and supported by the American Association for the Advancement of Science. According to Dr. Day: "It is my impression that both the natural scientists and the social scientists are prepared to go along with the provisions that are in these four educational bills which leave [the question of the social sciences division] essentially to the Foundation later to determine."<sup>64</sup> Responses from the participating societies to a questionnaire showed that 49 percent of these professional people favored specific inclusion of the social sciences in the NSF, another 48 percent favored permissive inclusion, and only 2 percent favored their exclusion. Also, 99 percent were willing to accept permissive inclusion as the solution, 94 percent were willing to accept specific inclusion (i.e., a Division of the Social Sciences), and 37 percent the exclusion of the social sciences from the Foundation altogether.<sup>65</sup>

Four of the House bills were identical with that passed by the Senate; there was also a different bill, H.R. 942, introduced by Representative Celler of New York, that would have provided for a division of the social sciences. The Celler bill did not receive favorable consideration, however, and all parties appeared to be satisfied with the decision to defer action, leaving the question of level of effort and organizational provisions in the social sciences to the Foundation itself, after it had been created. The effect of this decision, of course, was to place responsibility for decisions regarding the social sciences with the representatives of other scientific disciplines than the social sciences.

<sup>62</sup> U.S. Congress, House, Committee on Interstate and Foreign Commerce, National Science Foundation. Hearings before the \* \* \* on H.R. 942, H.R. 1815, H.R. 1830, H.R. 1834, and H.R. 2027, bills relating to the National Science Foundation, Mar. 6 and 7, 1947, 80th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1947), pp. 235-236.

<sup>63</sup> *Ibid.*, see pp. 70, 43-44.

<sup>64</sup> *Ibid.*, p. 59.

<sup>65</sup> *Ibid.*, pp. 64-65.

## VI. CONTEMPORARY VIEWS OF THE SOCIAL SCIENCE COMMUNITY

During the first 2 years of consideration of the proposed National Science Foundation, 1946-1947, communication between the social science community and the Congress was not extensive. In the 1945 hearings before Senator Kilgore's subcommittee, 1 day had been devoted to testimony by social scientists, and the 1947 hearings before the House Committee on Interstate and Foreign Commerce received testimony showing a wide consensus within the scientific societies (including both physical and social sciences) in favor of permissive or even explicit inclusion of the social sciences in the NSF. The general propositions were unquestioned that the social sciences lagged behind the physical sciences, and that new inventions in technological hardware generated problems that the social sciences were called on to solve. But the Congress was left with many uncertainties.

For example, the social sciences had not been subjected to the same scrutiny by the Bush committee as had the physical-biological-medical sciences. They were not clearly defined in scope. As the NSF concept gradually became delimited to the encouragement of basic rather than applied research, the role of the social sciences became less distinct: there was some question, for example, that research in the social sciences could even be separated into basic and applied categories or that there was any such thing as basic social science research. The existence of an array of meaningful basic research objectives in the social sciences had not been demonstrated. There was no clear characterization of the process by which basic discoveries in the social sciences led to useful results in the applied field. (Nor, for that matter, in the physical sciences either, but the dramatic hardware developments of World War II had certified as real the process in the physical sciences.)

Some of the attempts to apply the hypotheses of social science, it was held, ran counter to practical experience. There was a general sense of uneasiness that the potential—or actual—results of social science research might challenge deeply entrenched value-centered beliefs. There was also some question as to whether in the field of social studies the term "science" was applicable. For example, John M. Potter, president of Hobart and William Smith Colleges, and an historian, suggested that "when we use the term 'the social sciences,' we are expressing a more or less realizable hope, rather than indicating blood kinship between political economy and physics."

The extension of the exact methods of science into the doubtful regions of human perplexity is devoutly to be wished. But the scientific study of man's affairs is still so little advanced toward the level of our examination of physical nature that it might seem more dangerous than advantageous to set up a Division of Social Sciences within the same National Research Foundation. We probably face many more decades of tedious and disappointing study, of tentative experiment and frustrated enterprise, before the methods for the study of society can without risk be so firmly crystallized.<sup>66</sup>

Another social scientist, Alfred E. Cohn, writing in the *Political Science Quarterly*, assailed as bureaucratic and undemocratic the basic idea of a Federal foundation to support science. He criticized as generally diffuse and largely irrelevant the testimony before the Kilgore subcommittee ("\* \* \* probably not the best way of securing

<sup>66</sup> Hearings on Science Legislation (S. 1267 and related bills), op. cit., p. 939.

light on so intricate and professional a problem.\* \* \* I suggest that a better way \* \* \* is through reports." However, he found it "almost shocking" that the social sciences were not to be admitted to full partnership in the institution of which he disapproved.<sup>67</sup>

Probably the most comprehensive and systematic analysis of the issue of social science and the NSF was that of George A. Lundberg, of the department of sociology of the University of Washington. From an analysis of the testimony in the 1945 Kilgore subcommittee hearings and the 1946 debate on the floor of the Senate, he concluded that the decision to exclude the social sciences from the NSF was not based on "considered hostility or opposition;" it was, he said:

\* \* \* Simply as a reflection of the common feeling that the social and the physical sciences have nothing in common and that at best the social sciences are a propagandist, reformist, evangelical sort of cult.<sup>68</sup>

Lundberg identified as the "principal misapprehensions regarding the nature of social science, as revealed in the Senate hearings," the following: (1) Social science cannot be unbiased; (2) the social sciences are "applied," not "pure" or "basic"; (3) social science research should be controlled by a separate foundation; (4) education rather than research is needed in the social sciences; (5) the atomic bomb should frighten people into effective social organization.<sup>69</sup> He concluded that the hearings actually provided a useful rough measure of the present status of the social sciences as seen by the witnesses. These views were significant because "they are sincerely held by people of prominence and influence in science, education, and public affairs." He summarized them as follows:

1. Man and his behavior are not a part of nature that can be studied as basic, "pure," natural science; the social sciences are inherently "applied" and concerned with ameliorative and exploitive techniques in the service of whatever tribal lore happens to be current. Social science, therefore, is a nondescript category consisting mainly of reformist and propagandist ideologies and isms.

2. The methods of the social sciences are so widely at variance with those of other sciences as to make it inadvisable to attempt to administer research in the social sciences under the same organization—

(a) For fear of discrediting the other sciences; and

(b) Because people qualified to direct research in the other sciences would not be able to judge what constitutes valid or desirable social research.

(3) Social research is especially in danger of falling a victim to pressure groups or of being corrupted by the Government itself. And finally:

(4) There is always in the background of the testimony reviewed, the traditional view that, after all, we know the solution of social problems through the historic pronouncements of seers and sages, past and contemporary, and all that is needed is more education to diffuse this lore and arouse moral fervor in its behalf.<sup>70</sup>

Lundberg strongly intimated that the social scientists themselves bore a share of the responsibility for the disadvantaged status of their disciplines. To secure equality (and to justify equality) with the physical sciences they should "subject themselves to standards of the kind recognized by other scientists and by the public." They should distinguish between the true social scientist and "that vast array of camp followers, reformers, propagandists, and social workers, which today dominate even most of the professional organizations of social scientists." The social scientists (and indeed scientists generally)

<sup>67</sup> Alfred E. Cohn. "Federal Legislation in Support of Sciences." Speech before American Association for the Advancement of Science and Pi Gamma Mu. Symposium on science legislation and problems of Federal aid. Dec. 28, 1946. (Reproduced in *Political Science Quarterly*. (Vol. 62, June 1947), pp. 235, 239).

<sup>68</sup> George A. Lundberg. "The Senate Ponders Social Science." *The Scientific Monthly* (May 1947), p. 399.

<sup>69</sup> *Ibid.*, pp. 400-407.

<sup>70</sup> *Ibid.*, p. 409.

should "make up their minds regarding the proper function of scientists as contrasted with the functions of citizens." ("Many of them are firmly convinced that it is the peculiar function of social scientists especially, not only to describe reliably the costs and consequences of alternative courses of action, but also to dictate public policy.") The social scientists have been "careless of their scientific reputation in a number of ways":

Through lack of clarity or lack of intellectual integrity they have failed to make clear to the public when they have spoken as scientists and when they have spoken as propagandists and as citizens. They have posed as social scientists, and frequently claimed academic immunity as such, while actually engaging in ordinary pressure group activity. Finally, they have been careless in distinguishing between scientific research and special pleading.

Another defect was that the social scientists had failed to present examples of their research that would be accepted as "scientific" by other disciplines, although there were many of these available.

By way of corrective action in the learned society proceedings, he suggested that scientific papers in the social sciences should be carefully kept separate from papers dealing with normative questions ("It may be that the [AAAS] should have a section devoted to ethics, planning, and social policy and thus avoid the confusion which results from including these topics with the social sciences.")

Finally, he said, the nature of the scientific method should be thoroughly taught in the schools. The nature of research was not well understood. It was not considered an important function in society. It was not looked upon as an important method of solving social problems.<sup>71</sup>

A succinct and prescient lay comment on the issue, at the time, was that of Fortune magazine whose editors concluded that the proposed NSF would probably be forced into the social sciences, regardless of the apparent public antipathy toward them. "It [NSF] will have the problem of studying its own organism for the kind of policies, rotation of personnel, or other techniques it must develop to prevent the ossification that sooner or later afflicts all academies. And it will have to study the sharper and sharper impact of science and technology upon society, never before systematically investigated under a steady flow of relevant data."<sup>72</sup>

## VII. FEDERAL SPONSORSHIP OF SOCIAL SCIENCE RESEARCH AFTER 1950

A gradual improvement in the acceptance of the social sciences has taken place during the 19 years since the NSF received its statutory charter; the social sciences have enjoyed a healthy growth in numbers of students, a strengthening in their methodologies, and some increased appreciation of the functional relationship between basic research and what is sometimes called social engineering. At the same time, the opening up of the field has provided disturbing evidence of just how vast it is, and how much remains to be disclosed before the field reaches its real potential. There still remain public reservations about the field as a "science." For example, in 1967, the Honorable W. Willard Wirtz, Secretary of Labor, said:

\* \* \* The present development of research in the social sciences falls so far short of both its potential and of the imperative necessity for its infinitely larger development that I think our problem is actually one of whether there are forms for

<sup>71</sup> *Ibid.*, pp. 410-411.

<sup>72</sup> "The Great Science Debate," *Fortune* (June 1946), p. 242.

expression of the present form of the problem or even a recognition of it. \* \* \* I believe that [the] limiting factor is a very real doubt in democracy's mind as to whether it really wants any more expert advice as far as the social sciences are concerned, for this is peculiarly an area in which every single one of us thinks that he is an expert and that if he is not enough of an expert, he would rather play it by hunch than to try to find out what somebody else's expertness might imply.<sup>73</sup>

The durability of the criticism of the social sciences is illustrated by charges leveled at the field by Adm. Hyman G. Rickover, in testimony before the Senate Committee on Foreign Relations, May 28, 1968. The social sciences, he said, were jargon-ridden, vague, unconvincing, a waste of the taxpayer's money, and not a science at all:

\* \* \* Precision and dependability is possible only in regard to phenomena lacking both free will and significant individual diversity; they do not obtain in the social science field, which deals with human phenomena about which one can generalize only in a statistical sense.<sup>74</sup>

[Social scientists] always try to judge human behavior the way the natural scientist judges the behavior of atoms. Now all atoms of a similar type are alike. So you can observe regularities in their behavior and express them in the form of "laws." But no two human beings are exactly alike. Therefore, you cannot by any statistical formula predict what any given human being will do.<sup>75</sup>

I don't think our Government should sponsor such research abroad. I would go so far as to say, we ought not to sponsor it at home, either.<sup>76</sup>

The certainty with which some engineers, like Admiral Rickover, regard the laws of the physical universe as absolute, is not shared completely by the practitioners of the basic physical sciences. Physical phenomena are also probabilistic—differing from social phenomena in degree of probability rather than absolutely. As physicist R. Bruce Lindsay, of Brown University, somewhat optimistically writes in the lead article in a recent issue of *American Scientist*: "It is well known that statistical mechanics operates in terms of averages of quantities associated with the particles or molecules of an aggregate." It is not possible, for example, to fix the positions and velocities of a huge number of particles, but this is of no consequence to the physical scientist who can deduce causal laws in terms of statistical averages. But so, too, can the social scientist. The social scientist cannot, indeed, predict how the individual unit will behave, but neither can the physical scientist. And as Lindsay concludes: "What difference does it make after all? If [the fundamental theory] can predict statistical averages and these agree with experiment, what more should we ask?"<sup>77</sup>

### *Growth in social science sponsorship by NSF*

The evolution of the social science program of NSF, after 1950, was described by Dr. John T. Wilson, Deputy Director, before a subcommittee of the Senate Committee on Government Operations, in 1967. He noted that the social sciences had not been named in the act, but that the phrase, "other sciences," permitted some degree of support.

<sup>73</sup> In U.S. Congress. Senate. Committee on Government Operations. National Foundation for Social Sciences. Hearings Before the Subcommittee on Government Research of the \* \* \* on S. 836, a bill to provide for the establishment of the National Foundation for the social sciences in order to promote research and scholarship in such science, Feb. 7, 8, and 16, 1967, 90th Cong., 1st sess., pt. 1 (Washington, U.S. Government Printing Office), p. 9.

<sup>74</sup> In U.S. Congress. Senate. Committee on Foreign Relations. "Defense Department Sponsored Foreign Affairs Research. Hearings before the \* \* \*," May 28, 1968, pt. 2, 90th Cong., 2d sess. (Washington, U.S. Government Printing Office, 1968), p. 10.

<sup>75</sup> *Ibid.*, p. 39.

<sup>76</sup> *Ibid.*, p. 29.

<sup>77</sup> R. B. Lindsay, "Physics—To What Extent Is It Deterministic?" *American Scientist* (Summer 1968), pp. 93-111, especially pp. 96, 110.

Two or 3 years after the Foundation started its program [he went on], we began thinking about how to handle the problem of the social sciences. The initial attachment of psychology was in the biological-medical sciences domain, where it fits very closely to physiology, neurology, and the traditional physiological and medical areas of psychology.

The initial moves \* \* \* were to attach a part-time person to an area of activity that was called program analysis. The purpose in bringing a sociologist on the staff at that time for that particular function was that in our studies of the support of science by the Federal Government, we were turning up data that reflected support of the social sciences through the Census Bureau and through other agencies, and we needed somebody on the staff who knew what this was about and could interpret the data, so we brought Dr. Alpert over from the Bureau of the Budget part time on the program analysis activities. The other part of his time we assigned him to the Biological Sciences Division, and we began supporting physical anthropology, cultural anthropology, archeology, and areas of social science that impinged rather closely on the biological sciences.

In the Physical Sciences Division, we began a small effort in \* \* \* the history and philosophy of science. We had a staff member over in the Physical Sciences Division who was particularly interested, so we began that over there. This went on for 2 or 3 years.

Then, we finally created an Office of Social Sciences, and supported social science research per se. This, of course, came about as a result of study by the Board and in further response to the action of the Board in adopting policy that allowed us to support a broader range of social science research activities. Coincidentally, the same kind of movement was taking place in the fellowship programs for the support of graduate students. After creating what was called the Office of Social Sciences, we began supporting social psychology, anthropology, economics, sociology, and the history and philosophy, of science—generally the things that were \* \* \* scientific in character. In other words, we applied scientific methods to study the social phenomena.

This went on for a few years and we eventually created a full-fledged Social Sciences Division. It has not become as large a program, but it has full division status.

In the last couple of years we have broadened the program to include political science \* \* \*. For the total effort of the Foundation encompassing research and facilities as well as fellowships and traineeships and other educational kinds of things the figure would run about \$30 million.

In the recent past there has been \* \* \* an increasing awareness of \* \* \* problems of social import rather than social problems \* \* \*. There has been the feeling that perhaps a stronger press for work in the social sciences might lead to solutions of some of these problems of social import.<sup>78</sup>

Only a few grants and fellowships (in psychobiology, psychology, and anthropology) were extended by NSF during its first years of existence. However, in March 1953, the Foundation undertook a study of the status of the "sciences of human social behavior" to determine what should be its own position respecting research in this field. Results of this study were reported in NSF's Fifth Annual Report. The conclusion was that NSF should support a "limited program of support of the social sciences" which was approved by the National Science Board in August 1954. Criteria for the program were four:

(1) the criterion of science, that is, the identification within the social disciplines, of those areas characterized by the application of the methods, and logic of science;

(2) the criterion of national interest, namely, the assignment of highest priority to social science activities directly related to the responsibilities of the Federal Government with respect to national welfare and national defense;

<sup>78</sup> In U.S. Congress, Senate, Committee on Government Operations, Establish a Select Senate Committee on Technology and the Human Environment. Hearings before the Subcommittee on Intergovernmental Relations of the \* \* \* on S. Res. 68, to establish a Select Senate Committee on Technology and the Human Environment. Mar. 15, 16, 20, Apr. 5, 6, and 11, 1967. (Washington, U.S. Government Printing Office, 1967), pp. 133-134.

- (3) the criterion of convergence of the natural sciences and social sciences; and  
 (4) the criterion of basic research.<sup>79</sup>

Shortly before this report was completed, the Study Director for Social Science Research in NSF, Harry Alpert, noted that the extent of NSF support for the social sciences depended mainly on the social scientists themselves. He called attention to the need of social scientists to address themselves to such "strategic considerations" as those suggested by Charles Dollard, president of the Carnegie Corp., at a mid-century conference on the social sciences.<sup>80</sup> The overall goal of the social sciences according to Dollard was acceptance—

Acceptance, at least by the literate public, including scholars in other fields, of the fact that the behavior of men, like the behavior of materials, is characterized by certain uniformities and patterns which can be studied systematically, and further that the discovery of these uniformities and patterns is a matter of importance to society at large. It is important because presumably a better understanding of the springs and patterns of human behavior would help us to construct a more rational world.<sup>81</sup>

The obstacles to the achievement of acceptance were three: (1) the urgency of the problems meant that the application of results was too often premature; (2) the social scientist was forced into social contact, with many claims on his time, instead of remaining secluded to reflect on his research; (3) the social scientist was viewed with suspicion as one who would change society rather than one who sought to study it. The natural allies of the social scientists were fellow scientists in the older fields who were aware of their own long struggle to overcome resistance of society to their efforts and their findings; there were also allies in business and Government among those aware of the need for more systematic ways of achieving order and management in large human organizations.

To meet the needs of business and government, the social sciences needed to deliver their products in neat packages of completed and proved work. These customers had money to spend. If the legitimate scientists failed them, the charlatans would move in.

To meet the needs of the universities, the social sciences needed to allocate much of their time to teaching. This function was of "immense strategic importance" in winning acceptance for the social sciences.<sup>82</sup>

The demands of the physical sciences upon the social scientists were that they discipline themselves to adhere to the scientific method, the proof of hypotheses by hard data and meticulous analysis, to yield predictive findings.

To satisfy these requirements, Dollard proposed that the social sciences accelerate the sorting-out process by which the social scientists went into basic research teaching, and applied service. He urged

<sup>79</sup> Fifth annual report, National Science Foundation, *op. cit.*, p. 60.

<sup>80</sup> Harry Alpert. The National Science Foundation and Social Science Research. *American Sociological Review* (April 1954), p. 209. The Dollard paper was published in: *The Social Sciences at Mid-Century*, papers delivered at the dedication of Ford Hall, Apr. 19-21, 1951. (Published for the Social Science Research Center of the Graduate School, by the University of Minnesota Press., 1952), pp. 12-20.

<sup>81</sup> *Ibid.*, p. 12.

<sup>82</sup> He noted, for instance, that "A Congress which contained even a few men with undergraduate training in the social sciences might well have given us a very different National Science Foundation bill from the one we got" (p. 17).

restraint in the making of claims of research results, higher standards of disciplined research, patience, and humility—

The long-term contract of the social sciences with society [he concluded] is not to perform miracles but to bring to the study of man and his problems the same objectivity and the same passion for truth which have in the past given us some understanding and control of the physical world.<sup>83</sup>

#### *Present status of the social sciences*

It is evident that the NSF has moved cautiously into the social sciences. Leadership of the Foundation has been predominantly drawn from the physical sciences. The social sciences, in accordance with Dollard's formula, have been obliged to prove their validity and scientific merit to their opposite numbers in the physical, biological, and medical sciences.

That this has been a salutary process, despite some complaints from the social scientists that they were subjected to undue discrimination, is evidenced by the growing vigor and public acceptance the social sciences have achieved. In 1968, a proposal to create a separate National Social Science Foundation attracted considerable support and generated a large volume of testimonial endorsement in the Senate.<sup>84</sup> At the same time, the social sciences won final acceptance in the Congress—in the form of coequal status within the NSF along with the physical, biological, and medical sciences. This was accomplished in Public Law 90-407, approved by the President July 18, 1968, amending the National Science Foundation Act of 1950 to make mandatory a division of social sciences in NSF, and to include the social sciences explicitly within the scope of its functions.

In the same bill, the Congress in section 3(c), instructed NSF to "initiate and support scientific research, *including applied research* \* \* \*. [Emphasis added.] The earlier congressional reservations concerning the ability of the social scientists to distinguish between basic and applied research, and their capacity for restraint in the application of social theory, appear to have been removed as a result of the record of NSF performance and judicious selection of research, as well as by the achievements of the social sciences since 1950.

#### *Effect of deferred decision on the Social Sciences*

The contribution of the Congress in bringing about this strengthening in the disciplines of the social sciences appears to have been a helpful one. By making both explicit and consequential their reservations about the qualifications of these sciences for equal partnership in a national science program, the Congress increased the pressure on the social sciences to reexamine their own professional standards; at the same time, the caution expressed by Congress to the NSF to proceed slowly and in noncontroversial areas of the social sciences, resulted in a solid foundation for eventual full partnership of the social sciences in the work of the NSF.

<sup>83</sup> *Ibid.*, p. 20.

<sup>84</sup> National Foundation for Social Sciences. Hearings, pt. 1, op. cit. and pt. 2, June 2, 6, 7, 20, 21, 1967; and pt. 3, June 27, 28; July 12, 13, 1967. For testimonial endorsement in the Senate see a statement of the sponsor and a cosponsor of the bill: Senator Fred R. Harris, National Social Science Foundation: Proposed Congressional Mandate for the Social Sciences. Article from *American Psychologist*, November 1967. In statement of Hon. Gaylord Nelson on the floor of the Senate. Governmental grants for research. Congressional Record (daily edition) (Mar. 13, 1968), pp. S2739-2742.

## CHAPTER SIX—CONGRESSIONAL RESPONSE TO PROJECT CAMELOT

### I. INTRODUCTION

Project Camelot was a project in applied research in the social sciences sponsored by the Department of Defense. It was designed to study the political, economic, and social preconditions of instability and potential Communist usurpation of power in several developing countries. Public disclosure of the existence of the project, in June 1965, made front page news. Reaction to the disclosure was prompt and vociferous. Latin Americans of all political shades saw the project as related to recent U.S. troop landings in Santo Domingo; apprehensions were widely expressed that the United States intended to intervene elsewhere in the internal affairs of the sovereign States of Latin America. Members of the U.S. Congress were also outspoken in their reactions to the project, raising such questions as—

What was the Department of Defense doing?

What was the propriety of such a military invasion of the field of foreign policy research?

Why had the President permitted military operations to damage U.S. relations with a Latin American neighbor?

Why had the Department of State played no role to prevent or control activities within its jurisdiction by another Department?

During its formal assessment of Project Camelot, the Congress ordered a halt to the study and withheld appropriations for the Special Operations Research Office (SORO), the contractor performing the work for the Department of Defense under a contract administered by the Department of the Army. However, the interest of the Congress went further: the Legislature, the Administration, and the social science community apparently recognized that "big social science" (or applied social science) had become an essential fixture in government; accordingly, a mechanism was needed for the assessment of the entire relationship between the Federal Government and the social sciences.

Various uncoordinated and sporadic moves were made, before 1965, to fashion an effective relationship between Government and the social sciences—a relationship to solve problems of priority, propriety, utility, funding, and ethics.<sup>1</sup> The repercussions of the Camelot episode

<sup>1</sup> Many of these problems were scanned during congressional debates regarding the inclusion of the social sciences in the National Science Foundation. (See Chapter Five of this compilation.) Other early reviews are: Milton D. Graham, *Federal Utilization of Social Science Research: Exploration of the Problems—A Preliminary Paper*, (Washington, D.C., The Brookings Institution, August 1954), 146 pages. (Mr. Graham was formerly with the Research and Development Board, Department of Defense and with the Human Resources Research Institute of the U.S. Air Force.) See also: *The Technology of Human Behavior. Recommendations for Defense Support of Research in Psychology and the Social Sciences*. A report submitted to the Office of Science, Director of Defense Research and Engineering in accordance with the provisions of the Contract No. 1354/08. By the Research Group in Psychology and the Social Sciences. (Washington, D.C., Smithsonian Institution, July 1966) 39 pages; Ithiel de Sola Pool, et al., *Social Science Research and National Security*. A Report Prepared by the Research Group in Psychology and the Social Sciences, Smithsonian Institution, Washington, D.C. Under Office of Naval Research Contract No. 1354 (08), Task

made salient the issue of military sponsorship of foreign area research, and indeed the entire issue of the use of applied social science by the Federal Government. The purpose of this case study is to examine the role of the Congress in resolving this issue, with particular emphasis on the information used by the Congress, and the mechanisms employed to resolve the issue.

Although many Members of Congress had reservations about military research in social science questions abroad, and about the absence of coordination of such research by the Department of State, they discovered that the military initiative in this field was a natural consequence of the ability, no less than the need, of the Department of Defense to conduct such research, coupled with the lesser resources and distaste for such research on the part of the Department of State. Congressional intervention took the form of committee recommendations and appropriation cuts.

As the examination of the problem proceeded in congressional committees, it became evident that these two issues were part of a broader problem: the need to develop a coherent policy for Federal funding and utilization of social science research, and to relate it to the formation of a national science policy. This concern, demonstrated through indirect pressure and recommendations by Congress, mobilized the Department of Defense and other agencies, as well as the social science community, to assess this relationship. Thus, without attempting to prescribe a final solution, the Congress exerted its influence and considered legislation aimed at solving the sponsorship problem and formulating an administrative mechanism to deal with the broader issue. The legislative proposals took two forms: (1) to recognize the importance of Government support for basic social science research in the National Science Foundation; (2) to create a parallel National Foundation for the Social Sciences. Eventually the former expedient prevailed.

While the Congress accumulated voluminous evidence on these matters, the answers required administrative determination. The primary result of congressional investigations was that of education—the raising of many questions requiring answers; the stimulation of the executive branch to answer the questions; the motivation of social scientists to relate their researches more instrumentally to the real world; the provision of a national forum for debate on the uses of social science for public purposes; and the assurance of congressional receptivity for further contributions of these developing academic fields.

In sum, while many of the problems that arose could be solved only by the executive branch, and by the social scientists, the Congress was able to motivate these groups in a constructive way toward the solving of their mutual problems.

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No. NR 170-369, March 5, 1963. (Washington, Smithsonian Institution, 1963), 261 pages; William W. Ellis, Study Director, *The Federal Government in Behavioral Science. The American Behavioral Scientist* (vol. VII, No. 9, May 1964); Dr. George A. Miller, *An Overview of the Behavioral Sciences. A Position for the National Institutes of Health Conference Report*. (Washington, NIH, 1966), 76 pages; and other references in: U.S. Congress, House, Committee on Government Operations, *The Use of Social Research in Federal Domestic Programs. A Staff Study for the Research and Technical Programs Subcommittee of the \* \* \* 90th Congress, 1st sess.* (Washington, U.S. Government Printing Office, 1967) (committee print), four parts: I. Federally Financed Social Research—Expenditures, Status, and Objectives; II. The Adequacy and Usefulness of Federally Financed Research on Major National Social Problems; III. The Relation of Private Social Scientists to Federal Programs on National Social Problems; and IV. Current Issues on the Administration of Federal Social Research.

## II. ESTABLISHMENT OF THE ISSUE

Before the Administration of John F. Kennedy, most military applications of social science research in foreign countries were on an ad hoc basis in wartime—the study of military government in occupied territory, propaganda and psychological warfare, morale questions, and related subjects. A modest peacetime effort in applied research abroad was sponsored by the Office of Naval Research in 1946, involving a contract with Ruth Benedict and later Margaret Mead to “\* \* \* study culture at a distance” to help in the administration by the Navy of Pacific island communities.<sup>2</sup> Other peacetime applications of social science research by the Nation’s military establishment were centered on manpower, training, organization, and problems of human factors engineering in connection with weapon system development.

### *Military uses of behavioral research in foreign areas*

Early in his Administration, President Kennedy was motivated by the first Cuban crisis and other manifestations of political instability in developing countries to increase the U.S. capability in dealing with “guerrilla forces, insurrections, and subversion.” Such a capability would entail a general strengthening of military resources of anthropological, cultural, and other social science data in relevant areas of the world. In his March 28, 1961, message on the defense budget, the President said that the U.S. interests were threatened by limited guerrilla warfare such as had brought Castro to power in Cuba. To counter the threat of being “nibbled to death,” as the President expressed it, the United States needed to strengthen the capability for conventional (i.e., nonnuclear) and lower levels of intensity of conflict. It was evident that the President’s concept of warfare would generate a requirement for background material on social dynamics. Said the message:

To meet our own extensive commitments and needed improvements in conventional forces, I recommend the following: *A Strengthened capacity to meet limited and guerrilla warfare* \* \* \*. We need a greater ability to deal with guerrilla forces, insurrections, and subversion. Much of our effort to create guerrilla and anti-guerrilla capabilities has in the past been aimed at general war. We must be ready now to deal with any size of force, including small externally supported bands of men; and we must help train local forces to be equally effective.<sup>3</sup>

The Secretary of Defense, Robert McNamara, was charged with reconstructing DOD to fill this mission. It involved such changes in the DOD as the bringing in of civilians trained in systems analysis and social and behavioral sciences research and enlargement of DOD’s internal and external social research program.

The substantial increase in Defense spending for foreign area research in the social sciences contrasted markedly with the level of effort in the Department of State in sponsoring corresponding researches. The Defense social research program in 1961 amounted to \$17.17 million for psychological research and \$0.215 million for social science research. However, by 1964, Defense expenditures for psychological research had risen to \$31.1 million and for social science research had

<sup>2</sup> Luigi Petruccio. Government Sponsorship of Overseas Research. Paper presented in a symposium on “Psychology, Government, and Overseas Research” at the meeting of the American Psychological Association, Washington, D.C., September 1967. *American Psychologist* (vol. 23, No. 2, February 1968), p. 108.

<sup>3</sup> President John F. Kennedy. Special message to the Congress on the defense budget. In *Public Papers of the Presidents—John F. Kennedy, 1961*. (Washington, U.S. Government Printing Office, 1962), p. 236.

risen to \$5.7 million. In 1965, when the total Federal expenditure for foreign area research in the social sciences totaled \$30 million, the Department of State accounted for less than 1 percent of this amount.<sup>4</sup> And in 1967 while the Department of Defense spent \$13.1 million on foreign area social science research, the Department of State spent only \$1.35 million. (See the following tables:)

*U.S. Government agency obligations for social and behavioral research on foreign areas and international affairs<sup>1</sup>*

Agency	Fiscal year 1967	
	Internal breakdown	Total
Agency for International Development:		
Central research.....	\$4,451,922	
Regional bureaus.....	917,000	
		\$5,368,922
Departure of Agriculture.....		525,062
Arms Control and Disarmament Agency: Social, economic, and behavioral sciences.....		985,286
Department of Defense:		
Army.....	\$4,853,005	
Navy.....	331,762	
Air Force.....	1,946,289	
Advanced Research Projects Agency (ARPA)....	3,937,000	
International security affairs.....	1,947,632	
Systems analysis (Office of Secretary of Defense).....	90,337	
		13,106,025
Department of Health, Education, and Welfare:		
Office of Education.....	\$1,942,789	
Public Health Service.....	3,418,890	
Social and Rehabilitational Service.....	4,742,691	
		10,104,370
Executive Office of the President: National Council on Marine Resources and Engineering Development.....		561,477
National Endowment for the Humanities:		
Division of Fellowships and Stipends.....	\$506,250	
Division of Research and Publications.....	386,190	
		892,440
National Science Foundation:		
Social Science Division.....	\$5,579,850	
Economic and Manpower Studies.....	107,000	
		5,686,850
Peace Corps.....		292,829
Smithsonian Institution.....		920,231
Department of State:		
External research.....	\$125,000	
International educational and cultural exchange program:		
American research scholars.....	745,790	
Assistance to centers for research and study aboard.....	480,889	
		1,351,679
U.S. Information Agency.....		537,887
Miscellaneous programs.....		280,895
<b>Total</b> .....		<b>40,613,953</b>

<sup>1</sup> FAR Horizons (March 1968), p. 2.

<sup>4</sup> Behavioral Sciences and the National Security, Rept. No. 4, p. 6-R. In U.S. Congress, House, Committee on Foreign Affairs, Behavioral Sciences and the National Security, Rept. No. 4, together with pt. IX of the hearings on Winning the Cold War: The U.S. Ideological Offensive, by the Subcommittee on International Organizations and Movements of the \* \* \* Pursuant to H. Res. 84, A Resolution Authorizing the Committee on Foreign Affairs to Conduct Thorough Studies and Investigations of All Matters Coming Within the Jurisdiction of the Committee, Dec. 6, 1965. (Washington, U.S. Government Printing Office, 1965), p. 20.

TABLE II.—FEDERAL FUNDS FOR PSYCHOLOGICAL AND SOCIAL SCIENCE RESEARCH BY AGENCY (SELECTED)<sup>1</sup>

[In millions of dollars]

	1961		1962		1963		1964		1965		1966		1967		1968	
	Psycho- logical sciences	Social sciences														
Total, all agencies.....	50,655	44,405	61,953	79,9	96,3	102,7	103,5	127,4	100,3	165,6	107,3	177,6	124,4	209,3	124,4	209,3
Department of Defense.....	17,177	215	15,113	19,864	31,109	5,665	21,321	4,886	21,7	8,4	21,8	9,1	25,747	8,684	25,747	8,684
Department of State.....	180	6,808	6,808	1,699	1,30	3,817	3,387	3,262	1,5	1,5	1,5	1,7	1,6	1,025	1,7	1,025
AID.....	.190	6,808	6,808	1,556	.130	3,699	3,699	.238	.4	.2	.18	.39	.125	.400	.39	.400
Peace Corps.....					.325	.230	.352									
Arms Control and Disarmament.....			.161	.355	2,069	1,359	1,610	3,2	1,9	.034	1,605	.190	2,083			

<sup>1</sup> U.S. National Science Foundation, Federal Funds for Science (Surveys of Science Resources Series); Federal Funds for Research Development and Other Scientific Activities, volumes 1961-68. (Washington, U.S. Government Printing Office.)

*The rise and demise of Project Camelot*  
*Administration activities*

Project Camelot was assigned in 1964 to the Special Operations Research Office (SORO) of The American University, under contract to the Department of the Army. In 1958 SORO had received an Army contract to prepare area handbooks describing the social and cultural conditions in the areas of possible future operations for military guidance. Under the direction of Secretary of Defense Robert McNamara, SORO's mission was expanded to include research studies on nonconventional warfare, civic action, and counterinsurgency. In late 1963, SORO staffers and officers of the Office of Research and Development of the Department of the Army identified a need to measure and forecast the causes of revolutions and insurgency in the underdeveloped areas of the world and to prescribe ways to cope with potential instability. The concept was presented to the DOD staff in May 1964.<sup>5</sup> In the summer of 1964, the Subcommittee on Behavioral Sciences of the Defense Science Board (DSB), the Department of Defense's scientific advisory group, was asked by the Chairman of the DSB to assess the limited warfare and counterinsurgency behavioral sciences program of DOD with particular reference to development in Southeast Asia.

The report of the subcommittee, composed of prominent social scientists and DOD personnel, cited deficiencies in both the state of the art and the inventory of quantifiable data "\* \* \* of the internal, cultural, economic, and political conditions that generate conflict between national groups." It proposed an in-depth program to mitigate an asserted lack of understanding with respect to all the developing nations of Asia, Africa, and Latin America.<sup>6</sup> During its investigation, the Panel recommended that SORO and the Army start work on the project in the summer of 1964.<sup>7</sup> SORO was given \$6 million for a 3-4 year project and Rex Hopper, a Latin American area specialist was chosen to be director.<sup>8</sup> In its report of January 1965, the DSB Subcommittee recommended that funds be substantially increased to provide for the shift of SORO operations from the library to empirical field research—however, it warned that close supervision be exercised over the project.<sup>9</sup>

Although neither the State Department, the Department of Defense, nor SORO have released all of the details surrounding the demise of Project Camelot, the story is pieced together as follows:

The project was not classified. In August of 1964, the first of a series of reports on the project was released by SORO. It stated that library work was being completed to select those nations which "\* \* \* show promise of high payoffs in terms of the kinds of data required."<sup>10</sup>

<sup>5</sup> Behavioral Sciences and National Security, hearings, op. cit., pp. 17-19.

<sup>6</sup> Defense Science Board, Subcommittee on Behavioral Sciences. Research in the Department of Defense on Internal Conflict and Insurgency in the Developing Countries. Final report of the \* \* \* Jan. 30, 1965 (Washington, Office of the Director of Defense Research and Engineering, 1965), pp. vii, viii, xi.

<sup>7</sup> George Lowe, "The Camelot Affair." Bulletin of the Atomic Scientists (May 1966), p. 47.

<sup>8</sup> Kalman H. Silvert, "American Academic Ethics and Social Science Research Abroad." American Universities Field Staff Reports Service. West Coast South America Series (vol. XII, No. 3, July 1965), p. 2.

<sup>9</sup> Research in the Department of Defense on Internal Conflict and Insurgency in the Developing Countries, op. cit., p. 11.

<sup>10</sup> Irving Louis Horowitz, "The Life and Death of Project Camelot." Trans-Action (November/December 1965), pp. 4-10.

Work on structuring the research design began; that part which was completed apparently was acceptable to the Department of State as not being detrimental to U.S. foreign policy. In December of 1964, a document describing Camelot was mailed to a select list of social science scholars around the world to solicit their participation in the project. The document clearly identified DOD as a sponsor.<sup>11</sup> It contained a preliminary list of countries which would be studied; Chile was not listed.<sup>12</sup>

Prof. Hugo Nutini, a Chilean by birth and a naturalized American who taught sociology at the University of Pittsburgh, was engaged by SORO to survey the suitability of Chile as a possible case study, and to enlist the participation of Chilean social scientists. On his second trip to Chile, in April 1965, Nutini called upon Raul Urzua, a sociologist with the Chilean Catholic University, who had worked with Nutini at UCLA.<sup>13</sup> According to the report of Ercilla, a Chilean news magazine, Nutini erased from the working papers he brought with him all references to DOD sponsorship and represented the project as being funded by the National Science Foundation. He was also reported to have made excessive claims as to the extent of participation in the project by U.S. leaders of the academic social science community.<sup>14</sup> He subsequently wrote to Alvaro Bunster, Secretary General of the University of Chile, repeating these assertions. Bunster expressed doubt regarding the objectivity and sponsorship of the project to Ricardo Logos Escobar, of the School of Law, who told Bunster he had received a copy of a memorandum about the project from Johan Galtung, a distinguished Scandinavian sociologist teaching at UNESCO's Latin American Faculty of Social Sciences. Galtung had received the memorandum from Rex Hopper, who asked him to participate in the project and to attend an advisory meeting to be held at The American University in the summer of 1965.<sup>15</sup>

George Lowe, who has studied the Camelot episode, said that Bunster became convinced that the project was "political in nature," and "constituted a grave threat against our sovereignty." Meeting with Nutini, the Chileans showed him the memorandum from Hopper; Nutini denied knowing anything about the military connections of the project.<sup>16</sup> The Chileans then wrote a note of protest to the *Latin American Review of Sociology*.

Chilean leftists promptly seized the issue and denounced the "Pentagon plot" against constitutional governments in Latin America.<sup>17</sup> It was then announced that a select committee of the Chilean Chamber

<sup>11</sup> The document stated: "The U.S. Army has an important mission in the positive and constructive aspects of nation-building in less developed countries as well as a responsibility to assist friendly governments in dealing with active insurgency problems." (*Ibid.*, p. 4.)

<sup>12</sup> Countries selected were: Argentina, Bolivia, Peru, Venezuela, Egypt, Iran, Turkey, Brazil, Korea, El Salvador, Guatemala, Mexico, Paraguay, Colombia, Cuba, Dominican Republic, Indonesia, Malaysia, Thailand, Greece, and Nigeria. (*Ibid.*, p. 4.)

<sup>13</sup> Silvert, *op. cit.*, p. 5.

<sup>14</sup> He was reported to have said, without foundation, that Seymour Lipset and Robert K. Merton (two outstanding U.S. social scientists) were project members. (Silvert, *op. cit.*, p. 5, citing *El Mercurio*, Santiago de Chile, July 2, 1965, p. 23.)

<sup>15</sup> Irving Louis Horowitz, "The Rise and Fall of Project Camelot." In Irving Louis Horowitz, ed. "The Rise and Fall of Project Camelot: Studies in the Relationship Between Social Science and Practical Politics." (Cambridge, the MIT Press, 1967), p. 12.

<sup>16</sup> Lowe, *op. cit.*, p. 45.

<sup>17</sup> Henry Raymond, "United States Is Due To Drop Study of Latin Insurgency." *New York Times* (July 8, 1965).

of Deputies would investigate the project.<sup>18</sup> This announcement prompted Ralph Dungan, U.S. Ambassador to Chile, to cable Washington to find out something about the project. The first U.S. news story appeared on June 27, 1965, in an article in the Washington Evening Star, citing the Dungan inquiry.<sup>19</sup>

### *Congressional reaction*

Congressional reaction swiftly followed the publication of the news report. Senator Eugene McCarthy asked William Fulbright, chairman of the Senate Foreign Relations Committee, to hold a hearing on the matter. He charged that the Army "has intruded itself into the field of foreign policy without authority," and seemed to have bypassed the Department of State "which properly has the role of implementing U.S. foreign policy."<sup>20</sup> Hearings on the incident were also requested by some members of the Senate Appropriations Committee, and the House Appropriations Committee, which had just cut the DOD research budget. The House committee had reported that—

Some of the areas of study being pursued in behavioral sciences \* \* \* appear not to offer any real promise of providing useful information. Other studies appear to be concerned with trivial matters on which intelligent people should not require studies in order to be informed.<sup>21</sup>

Little information about the project was forthcoming from either the DOD or the Department of State. However, State, which had not objected to the project, apparently sought to quiet the criticism surrounding its failure to keep in touch with the DOD, and to coordinate the demise of the project with DOD.<sup>22</sup> The developments that took place between State, DOD, the President, and the Congress have not been fully disclosed.

Hearings were held, beginning on July 8, 1965, by the Subcommittee on International Organizations and Movements of the House Committee on Foreign Affairs, which had previously studied the problem and whose past displeasure with DOD incursions into foreign area research had had no apparent impact. But whether because or in spite of this concession, the Congress was able to exert pressure on the Administration to terminate the project, and to improve coordination between State and DOD operations.

As an answer to the criticism of its project, the DOD, on July 1, 1965, released a "task statement" explaining that data to be used in the study would come primarily from materials in libraries and archives; and the next day, as an answer to the alleged lack of coordination between State and DOD, DOD announced that "\* \* \* all Army surveys in foreign countries would henceforth be subject to the

<sup>18</sup> "Pentagon Silent: 'Camelot' and the Critics," Latin American Times (July 1, 1965). On Dec. 17, 1965, the Chilean Select Chamber of Deputies unanimously approved a 318-page report drawn up by the select committee which concluded that the Camelot plan "was an attempt against the dignity, sovereignty, and independence of states and peoples and against the right of the latter to self-determination." ("U.S. Interference Is Charged in Chile," New York Times, Dec. 18, 1965), p. 14.

<sup>19</sup> Walter Pincus. "Army-State Department Feud Bared by Chile Incident: Diplomats See Pentagon Political Study As an Invasion of Foreign Policy Field." Washington Star (June 27, 1965), pp. A-1, A-8.

<sup>20</sup> Walter Pincus. "McCarthy Calls for Probe of Army's Project Camelot." Washington Star (June 30, 1965), p. A-10.

<sup>21</sup> Pincus, *Ibid.*, p. A-1.

<sup>22</sup> An example of this objective was the failure of SORO to begin July 1, 1965, scheduled distribution of its new quarterly journal Conflict, which was described as "Designed to explore a major preoccupation of U.S. political and military planners. This is the anticipation, prevention, or resolution of tensions within countries which adversely affect international peace or the national interests of the United States." (Walter Pincus. "Camelot Probe Fended Off." Washington Star (July 9, 1965), p. A-5.)

approval of the countries concerned.”<sup>23</sup> On July 7, 1965, one day before the House hearings were to open, the New York Times reported that the DOD insisted that “\* \* \* the State Department had been fully consulted about the project,” and that Secretary of Defense McNamara and other officials were undertaking a “top level” review “\* \* \* to determine whether the study should still be held \* \* \* and what new arrangements, if any, should be made for coordination of the study with the State Department.”<sup>24</sup> The following day, DOD announced that Secretary McNamara had ordered the cancellation of Project Camelot. The cancellation was ascribed to DOD’s misgivings about the “technical feasibility of this type of research,” and the “practicality of officially sponsored research on other nations which had been “verified by the reaction to news of the project.”<sup>25</sup>

### *Congressional Inquiry*

#### *DOD’s need for foreign area social science data*

When hearings on Camelot opened before the Subcommittee on International Organization and Movements of the House Committee on Foreign Affairs, July 8, 1965, there were four interlocked questions with which the committee was to deal. These were:

1. Did the military security of the United States require a knowledge of the social and cultural factors contributory to political instability in developing countries?

2. Could such knowledge be acquired on a meaningful basis so as to yield results on which program action decisions of the military services could be based?

3. What responsibilities for acquiring such knowledge properly belonged with the Departments of Defense and State, how should such responsibilities be properly allocated, and how could the interests, responsibilities, and research programs of the two departments be coordinated?

4. As a practical matter, since Project Camelot had been the source of vigorous protest, it had little hope of surviving; the relevant question was whether it had come about as a result of a genuine need and, if so, what alternative means might be found for meeting the need in a way that would be more acceptable at home and abroad?

In 3 days of open and closed hearings (July 13–14, August 4), the subcommittee heard testimony from 10 witnesses from Defense, State, and SORO. The subcommittee was particularly well equipped by previous investigations to deal with the problem at hand. On some of the questions, indeed, it had already formed an opinion which the 1965 hearings on Camelot would simply reinforce. As the chairman, Representative Dante B. Fascell, stated at the opening of the hearing:

In a report which the subcommittee issued last year, we drew attention to two major points which have a direct bearing on today’s inquiry: First, we stressed the importance of behavioral research to the effectiveness of our foreign policy \* \* \*. Second, we worried that as a consequence of the overriding requirements of our military security, too much of our research, conducted in the field

<sup>23</sup> Walter Pincus. “Pentagon Plan to Clear New ‘Camelot’ Studies.” Washington Star (July 2, 1965).

<sup>24</sup> Richard Eder. “Project Under Review.” New York Times (July 8, 1965).

<sup>25</sup> Walter Pincus. “Sudden Pentagon Order Kills Camelot Project.” Washington Star (July 8, 1965), pp. A-1, A-8.

of foreign affairs was directed to military ends. We cautioned about possible overmilitarization of our foreign affairs research, and as a result possibly even of our foreign policy.<sup>26</sup>

The survival of Camelot itself as a viable project was not in question; it had been canceled the day before the hearings began. Prof. Irving L. Horowitz has explored the rationale of its termination and concludes:

Those negative toward the military used the occasion to criticize the Defense Department's sponsorship of types of research based on intervention into the affairs of other nations, while those negative toward social science used the occasion to note the ineffectual and impotent character of social science vis-a-vis the smooth operations of big diplomats. Project Camelot was thus caught in a pincer maneuver, and it could neither extricate itself nor rely on its associates to "save" itself.<sup>27</sup>

Nevertheless, to the subcommittee, the broader question of the military usefulness of applied research in the social sciences was still of concern. Did such research yield valid results? How could the results of such research be used? Was the Army the proper agent to do this? At various points in the hearings these questions recurred:

\* \* \* If we have a political problem in one of our States, we don't send out a military man or economic aid, but people who know about politics \* \* \*.

\* \* \* When you come to try to create a model of a developing society for purposes of predicting what is going to happen in that society or for purposes of trying to figure out what kinds of things can be done to affect decisionmaking, and the social processes, I do not see the Army is in the game.

\* \* \* Ultimately our goal for these nations is the development of mature economic systems predicated on their own sovereignty. When we are working with these nations to help them, it seems to me it ought not to be the military that is providing the main thrust for this, and the research that is involved ought not to be flowing from the military.

\* \* \* Is there someone in the operational end [of the Army] who has the professional competence to [understand the substance of SORO area handbooks]? Unless you happen to be a psychologist or a cultural anthropologist or some other kind of behavioral scientist, I don't see how an operations man could evaluate this.<sup>28</sup>

The witnesses abundantly described the evolution of Camelot, its funding, its activities, and its relevance for the Army roles and missions. With respect to this last item, Lt. Gen. William W. Dick, Jr., Chief of Research and Development, Department of the Army, explained:

This model that we hope to develop by a project such as Camelot would \* \* \* allow the prediction of social unrest of the kind which would lead to riots or the kind that could lead to outright insurrection. [And then:] If we knew it, we would undertake planning so that if the American Army were to be sent into this country under this set of conditions, or another, we would have determined where the troops are from, would have better prepared them to operate, and determined who would support them. We have to make long-range plans if our future operations are to be successful. \* \* \* This would help us to predict potential use of the American Army \* \* \*.<sup>29</sup>

However, the hearings convey an unmistakable dissatisfaction on the part of the subcommittee, both as to the validity of social science data for applied purposes, and in particular as to the military usefulness of such data.

<sup>26</sup> "Behavioral Sciences and the National Security," Hearings, op. cit., p. 1.

<sup>27</sup> Horowitz, ed., op. cit., pp. 20-21.

<sup>28</sup> "Behavioral Sciences and the National Security," Hearings, op. cit., pp. 39, 17, 36, respectively.

<sup>29</sup> *Ibid.*, p. 39.

*The conduct of foreign area research by the Department of State*

The subcommittee gave considerable attention to the question, featured in many news stories, as to the existence of a "feud" between the Departments of State and Defense over the conduct and coordination of foreign area research in the social sciences.<sup>30</sup> The chairman invited the comment of Secretary Rusk on the circumstance that the "bulk of research in foreign areas and foreign populations is being conducted by our Military Establishment \* \* \*" while the Department of State " \* \* \* continues to shy away from any significant employment of this type of research."

We have been told [continued Representative Fascell], that the absence of an effective State Department role in social science research may be attributed to two factors: Expectations of congressional nonsupport, and prejudice on the part of some persons within the Department against this type of research as such \* \* \*. I hope that you, Secretary Rusk, will help to clarify these issues and correct any misimpressions that I may be harboring.<sup>31</sup>

The Secretary conceded the discrepancy between Defense and State outlays for such research but offered no estimate as to a proper division of responsibilities. He also implied that the Congress had a functional role in establishing this division—

We have difficulty in getting budgets in the Department of State for research or even in the Disarmament Agency, for research. One percent \* \* \* of the total Government research budget in this field is Department of State. We have not been in any sense in a dominant position here.<sup>32</sup>

There were various indications that coordination between State and Defense needed strengthening, with respect to the area of mutual interest represented by Camelot. According to one news story, Secretary Rusk had urged the chairman of the Senate Foreign Relations Committee not to respond to Senator McCarthy's request for hearings on Camelot because he (Rusk) and Secretary McNamara were work-out a system " \* \* \* which would guarantee that diplomats are kept up to the date on all overseas defense research projects."<sup>33</sup>

Another evidence of interdepartmental discord was the press account that the State Department was familiar with Camelot all along, but deficient in its efforts at review and monitoring. A State Department aide, Pio Uliassi, was in fact a part-time member of the Camelot core planning group—according to this report—and he along with representatives of the Bureau of Intelligence, of State, had participated in all of the briefings held by SORO and the National Academy of Sciences on the project. The Foreign Area Research Coordination Group, a voluntary foreign area social science research group established by Federal agencies in 1964 and chaired by the State Department, had also participated in the SORO briefings; held reservations about the project, but had no authority to suggest changes and reportedly was only considered as an observer. Other material has since come to light which shows that SORO had not informed either the Department of Defense nor the Department of State that it had

<sup>30</sup> One news story, convincing in its direct quotations, described a critique of Camelot that had been circulating within the Department of State, which called the project "naive and sometimes alarming." According to this source, the document challenged the idea that social science research was yet able to " \* \* \* arrive at generalizations about complex social matters that are abstract enough to have serious theoretical significance and \* \* \* immediate practical utility." (Lowe, *op. cit.*, p. 40, and Pincus, June 27, 1965, *op. cit.*, pp. A-1, A-8.)

<sup>31</sup> "Behavioral Sciences and the National Security," Hearings, *op. cit.*, p. 106.

<sup>32</sup> *Ibid.*, p. 117.

<sup>33</sup> Walter Pincus, "Camelot Probe Fended Off. Washington Star (July 19, 1965), p. A-5.

contracted with Nutini to send him to Chile to undertake preliminary investigations about the suitability of the country as an object of study for this project.<sup>34</sup>

Throughout the hearings several questions recurred, without receiving satisfactory answers: Was the Department of State familiar with Camelot? Did Camelot have State's endorsement? Was there an adequate mechanism operating between the two Departments to evaluate possible adverse consequences abroad of such research? In view of the conflicting series of reports, according to Robert Nisbet, most members of the subcommittee viewed Camelot as "\* \* \* a sad consequence of the dispersed, unfocused, and inadequate role of the behavioral sciences in the Federal Government."<sup>35</sup>

### III. DETERMINATION OF ALTERNATIVES AND ENLARGEMENT OF THE SCOPE OF THE ISSUE

#### *Foreign area research coordination*

The absence of effective coordination by the Department of State of social science research conducted abroad by other departments was conclusively shown by the hearings. Secretary Rusk told the subcommittee that the FAR Coordination Group had no authority to request agencies to conduct particular tasks or studies, and was specifically forbidden by its terms of reference to "veto or to direct the research of any agency." Its primary function was to improve communication, "both among contract research administrators and substantive research specialists in Government."<sup>36</sup> General Dick was asked by the chairman if he thought there was need for such a coordination mechanism, "that determined in advance the priority and the broad policy applications for the Defense Department" and that in fact there was not in existence such a mechanism. He agreed that no such mechanism existed, and that a group to perform this function "would be very valuable."<sup>37</sup>

On August 2, while the hearings were still in progress, the President instructed Secretary Rusk to establish review procedures to insure that federally sponsored foreign area social science research could not damage U.S. foreign relations. While testifying to the subcommittee, on August 4, 1965, Rusk announced the formation of a Foreign Affairs Research Council to "\* \* \* formulate policy for departmental action with respect to Government-sponsored research bearing on foreign affairs \* \* \* [and to] \* \* \* determine [State] Department needs for foreign area research." He also announced that DOD would "\* \* \* designate an office within [DOD] to cooperate closely on research matters." And he added that State had also "moved to strengthen the interagency Foreign Area Research Coordination Group."<sup>38</sup>

#### *Subcommittee concern for the relationship of the social sciences and the Federal Government*

The Fascell subcommittee report, issued December 6, 1965, reflected the dilemma faced by Congress in solving the Camelot problem and the

<sup>34</sup> Horowitz, ed., op. cit., pp. 14-15; Lowe, op. cit., p. 45, citing a "Fact Sheet," issued by SORO, June 28, 1965; and "Behavioral Sciences and the National Security," Hearings, op. cit., p. 53.

<sup>35</sup> Robert A. Nisbet, "Project Camelot: An Autopsy," *The Public Interest* (fall 1966), p. 46.

<sup>36</sup> "Behavioral Sciences and National Security," Hearings, op. cit., p. 110.

<sup>37</sup> *Ibid.*, p. 64.

<sup>38</sup> *Ibid.*, p. 107.

issue of DOD sponsorship of foreign area research. First, it showed that while the Congress objected to DOD sponsorship and wanted State and AID to increase their foreign research programs, it realized that DOD was best qualified to do such research and could do no more than recommend that DOD and State effectuate structural reforms geared toward greater coordination of review:

(All recommendations here and below are summarized.)<sup>39</sup>

It found that foreign area social science research was of significant value to the foreign (military and political) objectives of the country and should be continued; that such research include significant components of economic and social research designed to develop democratic political institutions; that there was an imbalance between State's and DOD's research program (while \$30 million was spent in behavioral sciences research, State spends less than 1 percent); that State and AID should expand their programs; but that in order to conduct its mission, particularly with respect to fighting Communist subversion, that DOD should continue to engage in a social science research program.

The report also showed that the committee was dissatisfied with interagency rivalries and was pleased to see greater efforts toward coordination, but felt that they were not sufficient:

The report cautioned against interdepartmental rivalry, citing leaks about Camelot which originated in the State Department; cited the establishment of the Foreign Affairs Research Council, and suggested that State should take further steps to "upgrade the work of the Foreign Area Coordination area research tasks."

The committee evidently realized that these steps could not solve the basic problems regarding military sponsorship of foreign area research, and further recommended that a general assessment of the social science relationship with the Federal Government was needed:

[There is] no single focal point within this growing governmentwide effort for a sustained and fruitful collaboration with private scholars and the academic community.

The committee recommended that the executive branch should take further steps to put its own house in order, including the creation of an Office of Behavioral Sciences Advisor to the President (Representative Gross did not concur in this recommendation); and the convocation of a White House conference on the behavioral sciences " \* \* \* to examine our national effort in these fields, and to bring to bear upon Government policy the knowledge, the experience, and the insights of the leading social scientists of our country."

*Assessment of the social science/Federal Government relationship  
Congress*

As noted above, criticisms made by the Fascell subcommittee were somewhat ambivalent concerning DOD sponsorship of foreign area social science research. A few recommendations were made, and the executive branch took preliminary steps to meet them. No legislative proposals were made by members of the committee. (One proposal, however, was introduced by Representative Paul Findley, not a member of the committee, for establishment of a "Hoover-type commission to bring U.S. sponsored foreign research projects under control.")<sup>40</sup>

<sup>39</sup> "Behavioral Sciences and National Security. Report, op. cit., pp. 4R-10R.

<sup>40</sup> Representative Findley made a statement on the floor of the House, stating that the President's creation of a FAR Council " \* \* \* gives no hope for improvement;" he called for creation of the commission, which would be composed of foreign policy specialists and Government representatives. (Statement of the Honorable Paul Findley, Hoover-type commission is needed on foreign research projects. Congressional Record (Aug. 16, 1965), p. 19732).

The issue did not receive much attention on the floor in either the House or the Senate. The only evidence of congressional interest in 1965 came from some members of the Senate Foreign Relations Committee, in the context of discussion of DOD appropriations on the floor. A few weeks after the announcement of the President's order for the Department of State to begin reviewing projects for political sensitivity, Senator Fulbright delivered a severe critique of the issue on the floor of the Senate. He saw Camelot as an unwarranted incursion by DOD into the formulation and implementation of foreign policy, and questioned the value of behavioral sciences research in general. His major contention was that the DOD, by its foreign policy activities, was impeding the natural course of events of social change in developing countries:

I am personally concerned with such projects as Camelot because I believe there lies beneath the jargon of "science" in which these studies abound, a reactionary backward-looking policy opposed to change. Implicit in Camelot, as in the concept of "counterinsurgency," is an assumption that revolutionary movements are dangerous to the interests of the United States and that the United States must "be prepared to assist," if not actually participate in measures to repress them. It may be that I am mistaken in this interpretation; if so, I would be greatly reassured to have convincing evidence to that effect.

As to the value of federally sponsored social science research in particular and social science research in general, he said:

All too often, it seems that research is used by Government agencies either for prestige and growth purposes; or as a substitute for positive decisionmaking. This is both an unhealthy and a costly trend \* \* \*.

What was needed was assessment of this research by an existing Senate committee or by a specially created group:

But I am hopeful that before long the appropriate Senate committee, or a special committee, will undertake a thorough study of all our Government's research programs.<sup>41</sup>

Senator Wayne Morse was even sharper in his disapproval of the alleged DOD intervention in internal affairs of a sovereign neighbor, and in the need for executive and legislative view of such research.<sup>42</sup>

Senator Fred Harris, who had just been made chairman of the Subcommittee on Government Research of the Senate Committee on Government Operations, announced in the same discussion that one task of his subcommittee would be to assess "the operations of the entire Government research program carried on by all agencies of Government \* \* \*" and suggested that his committee would review the social science program.<sup>43</sup>

Senator Harris did not hold hearings in 1965 on the issues raised. However, examination of the Project Camelot incident and its implications continued. The Senate Appropriations Committee released a report concurring with the House recommendations that the DOD behavioral sciences program be reduced by \$1.5 million, eliminating Project Camelot. Other DOD sponsored foreign area research projects

<sup>41</sup> Statement by Senator J. W. Fulbright on Department of Defense research in foreign policy matters. In Department of Defense Appropriations, 1966. Consideration on the floor of the Senate. Congressional Record (Aug. 25, 1965), pp. 20905, 20906.

<sup>42</sup> *Ibid.*, p. 20922.

<sup>43</sup> *Ibid.*, p. 20924.

were canceled<sup>44</sup> or questioned by foreigners and Americans alike.<sup>45</sup>

### *Social science response*

The initial response of social scientists to the disclosures about Project Camelot was decidedly *ad hoc*, ambiguous, and, in the main, not very helpful to decisionmakers desiring to solve the problems of Government-sponsored social research. Herbert Blumer, a sociologist at Berkeley, has said that the initial " \* \* \* response of social scientists to Camelot has been \* \* \* surprisingly mild and nonchalant."

I infer from a large number of conversations which I have had that many social scientists never even heard of the affair. Of those who did, seemingly more regarded it with passing interest merely as an odd and momentarily exciting event even such as might appear anywhere in the news columns \* \* \*.

Social scientists who expressed themselves on the issue saw nothing wrong with DOD sponsorship and only criticized operational mistakes. Blumer continues:

Their criticism of it—when they had any—were confined to condemning certain decisions and action in the administration of the project, as showing poor judgment or mismanagement. For them, the lesson to be learned from the Camelot affair was that of being careful not to get into trouble—to do such things as employing tactful and discreet workers, establishing good lines of communication within the project, maintaining good relations with embassy officials, avoiding involvement in "cloak-and-dagger" activities, and being diplomatic in inter-agency fights.<sup>46</sup>

Several reasons explain the relaxed social science response: many social scientists were working for the Government and for the DOD; they felt that the military had been the major and best source of Federal support for social science research. Thus, when a response did come it favored continuing DOD support. Some social scientists even suggested that social scientists, by virtue of their relationship with DOD, could "educate the U.S. Army so that future interventions in other countries might be more intelligent and benign."<sup>47</sup> Strongest support along this line came from Alfred de Grazia, a political scientist at Columbia, and editor of the *American Behavioral Scientist*. He asserted that the project should not have been canceled. He gave his reasons in rhetorical form: major points are summarized below:

1. Is it not true that since 1940, the Army, Navy and Air Force have contributed incomparably more to the development of the pure and applied human sciences than the Department of State?
2. Is it not true that the State Department might on dozens of occasions have sought much more extensive research and intelligence facilities than it has actually sought or employed?
3. Is it not reasonable that the Armed Forces mission in respect to insurgency should include research on areas where revolution might occur?

<sup>44</sup> Also canceled in July 1965 was a USIA survey of public opinion in Pakistan. (USIA Cancels Survey Opposed by Pakistan.) (Washington Post, July 27, 1965, p. A-14.) And on July 22, U.S. Ambassador to Brazil, Lincoln Gordon, obtained the cancellation of a U.S. Army project in that country. It was designed to study "ways of influencing social and political change and the subversive techniques which permit Communists to take advantage of such situations in developing countries." (Walter Pincus, *Pentagon Research in Brazil Is Blocked by U.S. Envoy*, Washington Evening Star (July 24, 1965), p. A-3.)

<sup>45</sup> On July 18, 1965, Argentine leftists announced they were determined to cancel U.S.-Argentinian cultural exchange and technical assistance programs financed by private foundations. (Subversion Study Stirrs Argentines, *New York Times*, (July 18, 1965), p. 19); John Goshko, *Other Research Handicapped by Latin Ire Over Camelot*, Washington Post (Aug. 9, 1965), p. 1-A. Some leftists segments in Colombia later objected to another SORO-DOD project, Project Simpatico, designed to study the effectiveness of military civil action programs in that country. The project was later cleared by both U.S. and Colombian governments. (Simpatico Issue Stirrs Colombians, U.S. Study Project Arouses Criticism in Legislature, *New York Times* (Feb. 6, 1966), p. 32.)

<sup>46</sup> Herbert Blumer, *Threats from Agency-Determined Research: The Case of Camelot*. In Horowitz, ed., op. cit., pp. 153-154.

<sup>47</sup> Letter to the editor from a group of social scientists at Washington University. *American Sociologist* (August 1966), p. 208.

4. Are Cuba and Santo Domingo, Lebanon and Vietnam and other cases too, going to stand as historical proof that the Army can send men in to be killed but cannot help anyone go in to forestall by preventive understanding the occasion of killing?

5. Is "clearance" so vital to an Ambassador that a large, important project should be destroyed for want of it?

6. Is it wise for any agency to seek to get a few more research funds by invidious comparisons with the worthy research efforts of another department of government?<sup>48</sup>

The bulk of the social science response came after the State Department's promulgation of procedures for review of federally sponsored foreign area research in November 1966. But, as Blumer points out, the major concern of social scientists related not to the scientific integrity of the study, but to the " \* \* \* consequences of the affair affecting the status of the social sciences \* \* \*."

#### CONSTRUCTIVE CRITICISM

Under the stimulus of this attack, other social scientists began to charge censorship (although they had been influential in securing exemption of NSF, NIH, Fulbright-Hays, and NDEA grants from State Department review). Apprehension was voiced that the "social sciences might suffer a loss in their share of Federal support of research," or that the influence of the social sciences in Federal circles might be lessened.<sup>49</sup> Others asserted that military sponsorship should be avoided lest access be closed to important areas of foreign data.<sup>50</sup> Instances were cited of the cancellation of independently financed and other foreign area researches and the establishment by many foreign countries of their own clearance procedures. Collaboration with native scholars was reported to be damaged, and it was charged that "anti-militaristic" sentiments in foreign countries put American social scientists at a disadvantage.<sup>51</sup> Senator Fulbright's contention that the American and foreign military could not and should not play the role of a modernizing force in the underdeveloped countries found support.<sup>52</sup> Blumer himself was highly critical of the Camelot episode which he saw not as an issue of academic freedom to conduct applied research, but as an encroachment by government on the integrity and objectivity of social science. He was indignant with those members of his profession who did not share these views:

A similar obtuseness to questions of scientific integrity is to be noted in the case of social scientists operating in some capacity as representatives of their disciplines. Scarcely any references to the Camelot affair are to be found in the professional journals in social science, and where made, the discussion did not perceive the occurrence as threatening fundamental precepts of scientific study. More disquieting is the absence of items in the official proceedings of the various social science societies to suggest that such bodies saw anything in the Camelot incident that was ominous to fundamental ideals of scientific study. One must

<sup>48</sup> Alfred de Grazia, *Government and Science* \* \* \* An Editorial, *American Behavioral Scientist* (vol. IX, No. 1, September 1965), p. 40.

<sup>49</sup> Blumer, *op. cit.*, p. 155.

<sup>50</sup> Elinor Langer, *Foreign Research, CIA Plus Camelot Equals Troubles for U.S. Scholars*, *Science* (vol. 156, June 23, 1967), pp. 1483-84; and Dale L. Johnson, Department of Sociology, University of California, who wrote the *American Sociologist* that his own research had been denounced in the Chilean Chamber of Deputies. (August 1966), pp. 206-207.

<sup>51</sup> John Walsh, *Social Sciences: "Cancellation of Camelot After Row in Chile Brings Research Under Scrutiny."* *Science* (vol. 144, Sept. 10, 1965), pp. 1211-1213.

<sup>52</sup> Marshall Sahlins, *The Established Order: "Do Not Fold, Splindle, or Mutilate."* In Horowitz, ed., *op. cit.*, p. 76.

conclude, I think, that social scientists by and large are only mildly aroused by the Camelot affair and that they showed very little official concern with the implications of the episode for the integrity of scientific study.<sup>53</sup>

There were also technical criticisms that acceptance of Project Camelot had been "scientifically irresponsible," that its research design was weak, and overly ambitious. Robert Nisbet suggested that the attitude of responsible social scientists to Army recruiters for the project should have been: "Your objective is your business and no doubt admirable from the point of view of the Army; as behavioral scientists we desire to be of such help as we can but everything we know \* \* \* suggests the monumental, possibly catastrophic, unwisdom of such a project."<sup>54</sup> Some social scientists charged that the "merging of policy goals \* \* \* and scientific questions \* \* \* made objective research unlikely."<sup>55</sup>

Eventually social scientists began to offer constructive criticism. George Blanksten, a Latin American area specialist at Northwestern University stated that in his estimation neither the DOD nor the State Department was the appropriate sponsor of foreign area research. He urged his colleagues to evaluate the creation of a new Federal agency to support such research.<sup>56</sup> Kalman Silvert, an esteemed Latin American area specialist, attributed the Army's need to do such research to the fact that Latin American studies had not received the importance they merit in American universities:

There is no need to belabor this point with multiple examples. I suggest merely that it is time for rigorous and realistic thinking about Latin American studies, instead of the unprofessional surrender to stereotypes and status which has helped to hinder the growth of research as well as the reading and evaluation of what already exists.<sup>57</sup>

He illustrated this point with evidence that the top 10 prestige schools in political science do not have one senior man who is a Latin American specialist. Some of his colleagues echoed this sentiment and said that "the professional societies are in the vast majority composed of social scientists who do not themselves work in Latin America and, therefore, may not feel any great sense of outrage or urgency about the particular details of Camelot."<sup>58</sup> Others stated that it should be the responsibility of professional associations to develop their own code of ethics for social science research. This topic came up at the 1965 meeting of the International Studies Association, which was devoted to the examination of the project and of State Department activities. William Marvel, president of Education and World Affairs, stated:

We might actually decide that this is the time for a real mobilization of the concerned community, that it is time for the scholars to put their own house in order as a surer, more honest, and much more effective approach than to rely on the hope of inculcating in Government agencies the sensitivity and sophistication that we would like to see there.

Maybe it is a code of ethics or a statement of best practices that would be a first step. Maybe in the social sciences we need the functional equivalent of the Hippocratic Oath. Whatever form it takes, the major requirement is the elimination of deception, whether self-deception, or the deception of others \* \* \*

<sup>53</sup> Blumer, *op. cit.*, pp. 153-154.

<sup>54</sup> Nisbet, *op. cit.*, p. 52.

<sup>55</sup> For instance, see: John Friedman, "Letter to the Editor," *Science* (Dec. 31, 1965), p. 1771.

<sup>56</sup> George I. Blanksten, "Letter to the Editor," *American Behavioral Scientist* (October 1965), p. NS-12.

<sup>57</sup> Silvert, *op. cit.*, p. 19.

<sup>58</sup> Letter to the Editor. *American Sociologist* (August 1966), pp. 207-8.

making sure that reality and appearance are reasonably in accord for the research scholar \* \* \* making certain that if we must serve two masters—the Government agencies and also the canons of our own profession—we have our own priorities clear \* \* \* that we are not posing as something which, at the moment, we are not.<sup>59</sup>

Eventually many social scientists began to see the broader implications of the project—the civic and scientific responsibilities of social scientists and their relationship to the formation of public policy. Gabriel Almond warned that “big social science is on the way and that the United States and the world had better be ready for it.”<sup>60</sup> Sahlins posed questions which his colleagues should begin to tackle:

Who can or might distort the purposes of this research for his own political ends? Which interest groups can be made to see their research as in their own interest? To what extent can one risk acceptance of their support without destroying the basis of the research itself? How can the researchers balance their own sense of traditional scientific morality against the tactics of those who will see this morality as a weakness and exploit it to the limits dictated by their own political purpose? Is it at all possible to conduct even the most basic and nonapplied research using real world events as data without some risks of the results being taken over and used by “bad guys”?

He added that “Such questions seldom if ever get asked \* \* \*” by social scientists.<sup>61</sup>

### *The Administration responds*

#### DOD AND NAS

In order to implement the President’s directive that the Department of State review federally sponsored foreign area social science projects and weed out those detrimental to foreign policy objectives, a Foreign Affairs Research Council was established within the Department of State. It was chaired by Thomas L. Hughes, Director of the Bureau of Intelligence and Research of State, and composed of 14 other senior State Department officials. The Council then met with the Bureau of the Budget and other Federal agencies, and attended a meeting of the Social Science Research Council, to secure advice on establishing criteria and review procedures for federally sponsored research in foreign areas.

In September of 1965, Donald MacArthur, Deputy Director of Defense Research and Engineering, DOD, agreeing that the impact of DOD’s foreign social science operations on foreign policy had to be examined, asked Frederick Seitz, president of the National Academy of Sciences, to establish a committee to assess and advise on foreign area and social science research. That same month, the Advisory Committee on Government Programs in the Behavioral Sciences was established in the National Research Council. DOD funded the project and was joined several months later by the Russell Sage Foundation. The foundation suggested enlarging the scope of the committee’s task to include problems which had been enumerated by the Fascell committee in its report: “ways in which the behavioral sciences can become a more effective instrument of Government,” and “ways in which the Government can contribute most productively to the growth

<sup>59</sup> William Marvel, president, “Education and World Affairs.” Remarks. Background (vol. 9, No. 3, November 1965), pp. 182–3.

<sup>60</sup> Lowe, *op. cit.*, p. 47.

<sup>61</sup> Sahlins, *op. cit.*, p. 116.

of the behavioral sciences.”<sup>62</sup> The committee was chaired by Dr. Paul Young, of the Rockefeller University, and Gene Lyons, a political scientist at Dartmouth was chosen to be executive secretary.

#### STATE DEPARTMENT

On November 18, 1965, the Foreign Affairs Research Council released its list of criteria and procedures for review. Projects covered included all grants and contract research of all Federal agencies. Exempted from review were in-house social research and work done under NSF, NIH, the Fulbright-Hays and National Defense Education Acts. Also exempted were “grants made by operating agencies—that is, grants which leave to the recipient academic institution full autonomy in the selection of scholars, areas, and methods \* \* \*.” The only criterion established for cancellation of a project was “\* \* \* the purpose of avoiding adverse effects upon U.S. foreign relations.” It encompassed: potential of the project for being exploited by opposition parties; vulnerability to attack by foreign nationals because of agency sponsorship; classification; and research techniques (library research is recommended by the State Department).<sup>63</sup>

#### *Other responses in the “Advisory Community”*

On May 7, 1966, the realignment of SORO at The American University was announced. The office henceforth would be known as the Center for Research in Social Systems (CRESS), and would confine itself to preparing the country and area handbooks for the Army. All other DOD contracts would be screened for propriety by the university and a panel of outside advisers. In addition, CRESS would try to establish closer ties with the university and the academic world.<sup>64</sup>

Two other NAS committees were formed. While not a direct reaction to Project Camelot, they were established in part because of the reaction that came after that issue to search for improvement of the relations between the Government and the social science community.

The Behavioral and Social Science Committee was established under COSPUP (the Committee on Science and Public Policy), in January 1967. COSPUP had previously conducted reviews of the needs of the physical and natural sciences. The tasks of this committee are to assess the opportunities and needs of the social and behavioral sciences and to relate them to a national policy for strengthening and developing the behavioral and social sciences. Funded by NIH, NSF, and the Russell Sage Foundation, the committee has polled social scientists in academia and industry, to get some data on the “social science enterprise.” Its report will be published in September 1969.

The third NAS Committee to be formed after Project Camelot was the Committee on International Relations in the Behavioral Sciences, established in late 1966. Several factors stimulated establishment of this committee: (1) the relative weakness of international social sciences; (2) the need for encouragement of cross-national and cross-

<sup>62</sup> “Reports of Committees, Division of Behavioral Sciences, National Academy of Sciences—National Research Council.” 1968, Washington, National Academy of Sciences—National Research Council, mimeo, 1968, p. 12.

<sup>63</sup> Procedures for Department of State Review of Government-Sponsored Foreign Affairs Research. Released by the Department of State, Nov. 18, 1965; State Department Review of Research; Research Council Activities: A Summary. FAR Horizons (vol. 1, No. 3, May 1968), p. 7.

<sup>64</sup> Richard Eder. “School Limits Ties to Army Project.” New York Times (May 8, 1966), p. 30.

cultural research, freed from political hindrances; (3) the need to give the social sciences additional prestige; and (4) to improve communication between American and foreign social scientists. In its first report, issued to the Department of State in 1967, recommendations were contained regarding improvement of UNESCO's social science activities.

#### IV. CONGRESSIONAL RESPONSE

##### *Fascell bills—Toward a national social science policy*

On June 6, 1966, 6 months after release of the subcommittee report, Chairman Fascell introduced 3 bills based on its recommendations. The major purpose of the bills, he said, was to initiate a dialog between the Government and academia on the topic of social science research.

I hope that interested individuals—the Congress, in the executive branch of our Government, and in the private sector—will take up these bills, study them, and offer us their views and comments.<sup>65</sup>

The three bills reflected Fascell's concern not only with foreign area research, but also the need for Congress and academia to concern themselves with assessment of the problems of the relationship of the social sciences to the Government. The first, H.R. 15457, would establish a committee to plan for a White House Conference on the Social and Behavioral Sciences. The second, H.R. 15458, would establish an Office of Social Sciences in the Executive Office of the President, whose staff would be taken from and modeled after the Office of Science and Technology and whose purpose was to “\* \* \* develop \* \* \* a national policy for the promotion of basic research and education in the social and behavioral sciences”; to evaluate Federal social and behavioral sciences research programs; and to advise the President on coordination of Federal social and behavioral sciences research. The third bill, H.R. 15459, would establish a National Social Science Foundation, whose purposes would be to initiate and support basic research in the social and behavioral sciences; provide financial support to behavioral scientists; serve as an information exchange between American and foreign social scientists; evaluate the status and needs of social sciences; undertake a registry of social and behavioral scientists; and report to the President on priorities of Federal funding in social and behavioral sciences.

##### *National Science Foundation*

Congressman Fascell's bills gave the social sciences greater visibility, and stimulated discussion both inside and outside of the Government on the social science relationship with the Federal Government. Mr. Fascell had proposed the creation of a new agency—a National Social Science Foundation—both to solve the problems of military sponsorship of foreign area research, and also to improve Federal funding and utilization of the social sciences. An alternative proposal, not specifically designed to treat the foreign area research problem, but to treat Federal funding and recognition of the social sciences, was being examined by the Congress when Rep. Fascell's proposals were introduced. This alternative was amendment of the National Science Foundation.

<sup>65</sup> Dante B. Fascell, *Behavioral Sciences and the National Security*. Remarks upon introduction of H.R. 15457, H.R. 15459. *Congressional Record* (June 6, 1966), p. 11687.

In 1964, the Subcommittee on Science Research and Development of the House Science and Astronautics Committee began a review of the National Science Foundation, with the intention of introducing legislation to improve the agency. In 1965, a report reviewing the history and problems of the Foundation was issued by the subcommittee.<sup>66</sup> The subcommittee then held extensive hearings, with physical, natural and social scientists, and Federal officials to gather information on the points raised in the report.<sup>67</sup> It then prepared an analytical summary and resurveyed its witnesses to clarify points raised in the hearings.<sup>68</sup> Subsequently, a report outlining legislative and administrative changes needed in NSF was issued on December 30, 1965.<sup>69</sup>

Of the many recommendations made for amending the NSF legislation, three are of importance to this study. The committee recommended that the words "social sciences" be expressly added to the types of scientific activity that NSF supported. (NSF had supported some social science research since 1956, and especially after creation of the Division of Social Sciences in NSF in 1960, but such support was justified, according to the original legislative mandate, under the terms "other sciences.") The stated intent of the committee was to "emphasize congressional interest in and desire for increased support in the social sciences." It also recommended that NSF be given "permissive" authority to support applied research " \* \* \* if such research were directed toward a major national problem \* \* \*;" and responsibilities in support of international scientific research and activities.<sup>70</sup> The recommendations were incorporated in H.R. 13696, introduced on March 16, 1966, by Emilio Q. Daddario, chairman of the subcommittee. Additional hearings were held;<sup>71</sup> and a clean bill was introduced.<sup>72</sup>

#### *NSF information assessed*

The NSF amendment received unanimous approval from witnesses regarding inclusion of the social sciences. William Carey, Executive Director, Bureau of the Budget, said his agency "believes there is a great potentiality for attacking many of the problems of a changing society [and would] welcome greater viability for social sciences research within the framework of the Foundation \* \* \*." Herman Pollack, acting director of international scientific and technological affairs, Department of State, said he welcomed the change and suggested that such research also be devoted toward achievement of in-

<sup>66</sup> U.S. Congress. House. Committee on Science and Astronautics. *The National Science Foundation: A General Review of Its First 15 Years. A Report of the Science Policy Research Division, Legislative Reference Service, Library of Congress, to the \* \* \*.* May 1966. 89th Cong., 2d sess. (Washington, U.S. Government Printing Office, May 1966.)

<sup>67</sup> U.S. Congress. House. Committee on Science and Astronautics. *Government and Science: Review of the National Science Foundation. Hearings before the Subcommittee on Science, Research and Development of the \* \* \* vol. I.* June 23, 24, 25, 29, 30; July 1, 6, 7, 8, 13, 14, 15, 20, 21, 22, 27, 28, 29; August 3, 4, 5, and 19, 1965. (No. 6.) 89th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1965), 838 pages.

<sup>68</sup> U.S. Congress. House. Committee on Science and Astronautics. *Government and Science: Review of the National Science Foundation. Hearings before the Subcommittee on Science, Research and Development of the \* \* \* vol. II.* 89th Cong., 1st sess., 1965. (No. 6.) (Washington, U.S. Government Printing Office, 1965), pp. 839-1494.

<sup>69</sup> U.S. Congress. Committee on Science and Astronautics. *The National Science Foundation: Its Present and Future. Report of the Subcommittee on Science, Research, and Development of the \* \* \* 89th Cong., 1st sess. Serial M. Committee print.* (Washington, U.S. Government Printing Office, 1966), 118 pages.

<sup>70</sup> *Ibid.*, p. 112, 106.

<sup>71</sup> On Apr. 19, 20, 21, 1966. U.S. Congress. House. Committee on Science and Astronautics. *Amending the National Science Foundation Act of 1950 To Make Improvements in the Organization and Operation of the Foundation, Report (to accompany H.R. 5404), Mar. 6, 1967. 90th Cong., 1st sess. Report No. 34.* (Washington, U.S. Government Printing Office, 1967), 55 pages.

<sup>72</sup> H.R. 14838, May 3, 1966.

ternational scientific and technological progress. Dr. Eric A. Walker, Chairman of the National Science Board "strongly supported the provision."<sup>73</sup> Dr. Leland J. Haworth, director of the National Science Foundation, concurred with the amendment and added (Summary):

The foundation should not be confined to the natural or physical sciences; NSF support for the social sciences has been consistently increasing and growing at a rate greater than that of the other social sciences. Government participation in social science research should increase and NSF should play a significant role in that increase.<sup>74</sup>

Dr. Pendleton Herring, president of the Social Science Research Council, suggested that the base of social science support should be broadened, and added that the social sciences should also be represented on PSAC and the National Science Board.<sup>75</sup> He also stated that significant interdisciplinary relationships are developing between the social and other sciences and that significant changes "in spirit" of the NSF would take place ensuring the social sciences more support from that agency.<sup>76</sup>

### *National Foundation for the Social Sciences*

#### *Objectives*

Senator Fred R. Harris had maintained a keen interest in the problems of foreign area research and the social sciences and the Federal Government. Upon his return to the Senate in 1966, to begin his first full Senate term, Harris suggested that Congress investigate expenditures for foreign area social science research; that it take an interest in establishing better mechanisms for review of research; and that the Congress "\* \* \* provide for 'civilizing' all types of contract research being done in foreign countries."<sup>77</sup>

Although the Congress was considering the NSF amendments bill, and the Departments of State, Defense, and the National Academy of Sciences, and various segments of the social science community were busy with their assessments, Senator Harris decided that the problem of Federal support for social science research might be solved with the creation of a new National Foundation of the Social Sciences. Under Senator Harris' chairmanship, his subcommittee opened hearings into the matter of "Federal Support of International Social and Behavioral Research" on June 7, 1966. This was the first of four hearings held on the matter throughout 1966 and 1967.<sup>78</sup>

<sup>73</sup> Amending the National Science Foundation Act of 1950 \* \* \* H. Rept. No. 34, op. cit., p. 15.

<sup>74</sup> The National Science Foundation: Its Present and Future: op. cit., p. 52; Government and Science: Review of the National Science Foundation, Hearings, pts. 1 and 2, op. cit., pp. 917-1295.

<sup>75</sup> Government and Science Review of the National Science Foundation, hearings, pt. 1, op. cit., pp. 879-880.

<sup>76</sup> The National Science Foundation: Its Present and Future, op. cit., p. 51.

<sup>77</sup> Senator Fred R. Harris. Project Simpatico. Remarks on the floor of the Senate. Congressional Record (Feb. 7, 1966), pp. 2185-2193, esp. pp. 2186-2187.

<sup>78</sup> U.S. Congress, Senate, Committee on Government Operations, "Federal Support of International Social Science and Behavioral Research." Hearings before the Subcommittee on Government Research of the \* \* \* June 27, 28; July 19 and 20, 1966. 89th Cong., 2d sess. (Washington, U.S. Government Printing Office, 1967), and U.S. Congress, Senate, Committee on Government Operations, National Foundation for Social Sciences. Hearings before the Subcommittee on Government Research of the \* \* \* on S. 836, "A Bill To Provide for the Establishment of the National Foundation for the Social Sciences in Order To Promote Research and Scholarship in Such Sciences." Pt. 1, February 7, 8, and 16, 1967; Pt. 2, June 2, 6, 7, 20, and 21, 1967; and Pt. 3, June 27, 28; July 12 and 13, 1967. 90th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1967), 809 pages.

In his opening statement to the committee in the 1966 hearings, Senator Harris stated that he had twin objectives, both of which would be attained with the creation of a National Foundation for the Social Sciences (NFSS). The first was to solve the DOD social science research problem by creating a mechanism which would "civilianize research":

We want to be sure that the proper procedures are being followed to prevent damage to our national image, as has occurred on occasion in the past, when such research projects evoked criticism in the host country. We want to be certain that proper administrative procedures are being followed as well. Since much of the research is done under the auspices of the Defense Department, we want to see if it would not be better to "civilianize" such research through a new or existing agency.

And the second was to provide additional Federal support for social science research in general:

I personally do not feel that the Federal Government has been as interested in the social sciences and in the stimulation of social science research as it should be. And I also believe that statutory changes are required to bring about greater emphasis on the social sciences domestically and to improve social science research and its administration abroad.<sup>79</sup>

*Testimony received*

Senator Harris' major intention in holding the hearings was apparently to explore the issue and to gather data to substantiate his contention that while passage of the Daddario NSF bill was needed, its passage would not solve the major problems of military sponsorship and Federal funding and utilization of social science. (No action was taken on the similar Fascell proposal, which died in the House Education and Public Welfare Committee at the close of the 1968 session. Senator Harris did not introduce his bill for creation of a NFSS until October 1966, after the first set of hearings was complete.) His bill, when introduced in October (and the same bill, S. 836, introduced the following session),<sup>80</sup> included provision that the proposed foundation conduct research; accept contracts from defense agencies, that is, the CIA and DOD; screen projects for political sensitivity; and serve as a subcontractor for the military agencies funding social science research.

Senator Harris had charted a large task for the newly formed subcommittee. The issues he wanted treated in the hearings had been carefully developed by his staff. In this first set of hearings Senator Harris heard the testimony of 16 social scientists, many of whom were the directors of the major professional organizations of the relevant disciplines—political science, anthropology, sociology, and psychology. Before their appearance he sent them a prepared list of questions that he wanted answered. The major topics related to level of effort and best form of Federal support for social science; ways to maximize the utility of social science research in the solution of national problems; Government stimulation of the development of the social sciences as scientific disciplines; and ways to insure propriety of Federal support for foreign area social science research.<sup>81</sup>

<sup>79</sup> Federal Support of International Social Science and Behavioral Research, op. cit., pp. 1, 71.

<sup>80</sup> Introduced Feb. 6, 1967. Cosponsored by Senators Mansfield, Tydings, Monroney, McCarthy, Gruening, Kuchel, Edward Kennedy, Robert Kennedy, Muskie, Hatfield, Hart, Fulbright, Yarborough, McGee, Mondale, Bayh, Inouye, and Nelson.

<sup>81</sup> In testimony of Robin Williams, Jr., secretary of the American Sociological Association. In Senate. Federal Support of International Social Science and Behavioral Research, op. cit., pp. 140-145.

Senator Harris' hearings did not serve his purpose of presenting a strong argument for the proposed foundation. The Bureau of the Budget opposed his proposal, as did many of the social scientists who testified that they would prefer the NSF proposal or that they would wait to see the recommendations of the NAS Committee on Government Programs in the Behavioral Sciences. Nevertheless, the hearings on the bill had positive results:

To elevate the status of the social sciences in Federal science policy structure by bringing the issue of the social sciences and public policy into the Congress, and to create a more hospitable attitude toward social sciences as worthy of support;

To provide a national forum for social scientists to discuss their problems—this was the first time social scientists had testified *en masse* before Congress on disciplinary matters;

To stimulate social scientists to assess systematically the problem of Federal sponsorship and to begin a dialog between social scientists and the Congress;

To inform the Congress with respect to the utilization of the social sciences;

To present proposals for reform of Federal mechanisms and to raise many questions deserving of answer;

To recognize that the social sciences have many problems in common with the physical and natural sciences and to suggest that a place should be found within the Federal science policy-making structures for social sciences;

By virtue of the wealth of valuable testimony received and not digested in the subcommittee of Congress, to demonstrate the mechanisms that had to be developed both within the Congress and the Administration to provide for a continuing assessment of the social science/Federal Government relationship.

A complete analysis of the information presented in the hearings held by the Subcommittee on Government Research is not necessary; a few illustrations will serve to justify the assertions made.

For instance, Dr. Arthur Brayfield, executive director of the American Psychological Association, presented a history of the relationships between psychology and the government and gave a run-down of the association's lobbying efforts in Washington. Anthropologists illustrated their contributions to Federal programs, especially in Peace Corps training and field operations. Dr. Brayfield and Pendleton Herring of the Social Science Research Council presented a typology of the disciplines in the social and behavioral sciences. Social scientists eagerly responded to the Senator's queries for information about the types of research for which additional support was needed. For example, Kalman Silvert, president of the Latin-American Studies Association and professor of government at Dartmouth, suggested that social scientists could best assist Federal programs if additional attention were given to research in:

- (1) General problems of social change;
- (2) Social problems of economic development;
- (3) Problems of social integration;
- (4) Application of theoretical categories to data gathered to further elaborate general sociological theory.<sup>82</sup>

<sup>82</sup> *Ibid.*, pp. 56, 88-89, 69, and 229-231, respectively.

## FEDERAL SUPPORT OF SOCIAL SCIENCES

The committee also heard testimony about Federal support for the social sciences. Senator Harris was interested in ascertaining the consensus within the disciplines regarding increases in the level of Federal funding and geographic distribution. Carl Pfaffmann, former chairman of the Divisional Behavioral Sciences, NAS, citing NSF study figures, presented an overview of Federal support for various disciplines, gave a rundown of the differences between the physical and natural sciences vis-a-vis the social sciences, and concluded that expansion of " \* \* \* the educational as well as research support programs of the NSF, HEW, and others in the social sciences is clearly indicated."

The adequacy of trained manpower, if social scientists were to extend their services to Government as well as to teaching and research, was also considered. Dr. Henry Reining, dean of the School of Public Administration, University of Southern California, among others, suggested that the Government needs might be met by direct contact with universities as institutions, rather than by hiring teachers away from them. Alex Inkeles, of Harvard, suggested that commercial organizations might be effectively equipped to conduct social science research on a large scale. Dr. Brayfield proposed that teachers of social science had an obligation to train their students in skills needed to conduct research effectively for the Government, including instruction on problems of overseas research and development of a code of social science ethics. Dr. Gabriel Almond, of the American Political Science Association, noted the ambiguous motivation of social scientists whose personal preference might be for "autonomous" research but also might need to consider the availability of sources of funds for sponsorship of research—military sponsorship, sometimes without restrictive conditions could be attractive.<sup>83</sup>

## FOREIGN AREA SOCIAL SCIENCE RESEARCH

Stephen T. Boggs, Executive Secretary of the American Anthropological Association, identified the problems faced by social scientists doing field work in the developing countries:<sup>84</sup>

[Charges by foreign nations that social science research serves as a screen or cover for collection of intelligence];

[The widespread impression that social scientists were representatives of the American Government trying to implement policies controversial in the developing world];

[Charges of neocolonialism—that American social scientists conducted research in various countries, obtained voluminous quantities of data and never gave indigenous social scientists the chance to utilize their own researchers].

Most of the social scientists who testified about the need for procedures to insure propriety of federally sponsored foreign area research suggested that the State Department was not prepared to handle this task. Dr. Almond said that while the State Department procedures for review were an improvement, the State Department really did not understand the nature and value of social science research.

I think the Department of State has a record of on the whole being unduly skeptical and unduly slow in stimulating and in carrying on social science research that has a direct bearing on the foreign policy interests of the United

<sup>83</sup> *Ibid.*, pp. 124–127; 103, 190–191, 60 and 108–109, respectively.

<sup>84</sup> *Ibid.*, pp. 72–76.

States. They are a conservative, humanistic institution, dominated by a foreign service which is trained largely in the law, in history, in the humanistic disciplines. They believe in making policy through some kind of intuitive and antenna-like process, which enables them to estimate what the prospects of this and that are in this or the other country.

I believe they are a backward agency, as far as their relationship to science is concerned.

\* \* \* I wish the Department of State was more familiar, more receptive to some of the possibilities of social sciences than it now is. I think it has a real handicap in bringing to bear one, which could only come out of some change, it seems to me, in the fundamental culture of the Department of State.<sup>85</sup>

#### ADMINISTRATIVE MECHANISMS

Many suggestions were offered for the development of mechanisms to improve the performance of the social sciences in Government service. Dr. Inkeles offered several alternatives summarized below:

Establishment of a high-level and maximally independent national research "institute" modeled after the National Institutes of Health or Brookings to " \* \* \* undertake research on foreign areas and international affairs."

Significant expansion of the budget of the NSF for research on foreign affairs. Congressional appropriations of grants to universities to establish semi-permanent centers for social science research.

Establishment of a " \* \* \* separate and relatively independent fund grants agency which would not itself do research, but would rather have prime responsibility for fostering the growth, within universities and research institutes, of our national capability" for foreign areas research.

Creation of a Federal Grants Commission on International Studies, modeled after the University Grants Commission in Great Britain, to distribute block grants to universities for foreign area research.<sup>86</sup>

Other recommendations for improvement of executive formulation of a policy for the social sciences, some of which would later be issued by the Advisory Committee on Government Programs in the Behavioral Sciences of the National Academy of Sciences were heard, and are summarized below:

Creation of a social science panel in PSAC, and expansion of PSAC to include at least two social scientists.

Creation of a Federal Council on the Social and Behavioral Sciences.

Improvement of the relationship of social sciences and public policy by " \* \* \* increasing the staff for each Senator and Member of the House by hiring a full-time social scientist assistant.

\* \* \* Expanding the Social Science Division of the National Science Foundation.<sup>87</sup>

And solutions were proposed for solving some of the difficulties of foreign area social science research:

\* \* \* Provide the top-level policy and decisionmakers in the Government departments or agencies most heavily involved in international activities with direct, immediate, and continuing access to behavioral scientists by establishing staff positions for such scientists at an appropriate level of responsibility.

\* \* \* Given the nature of the State Department's mission, given the increasing interest in the social and behavioral sciences \* \* \* it would indeed not be amiss to consider for appointment (to the office of Scientific Adviser to the Secretary of State), a well-known and distinguished behavioral scientist.

\* \* \* Have the review of [foreign] research proposals done by panels of consultants—as is now done at the National Science Foundation and the National Institutes of Health—who are capable of evaluating the capabilities and skills of proposed personnel as well as the designs of the research.

<sup>85</sup> *Ibid.*, p. 114.

<sup>86</sup> *Ibid.*, pp. 184-187.

<sup>87</sup> *Ibid.*, pp. 213, 165, 247, and 59-60, respectively.

\* \* \* Encourage some form of international social science council or association to facilitate cooperation among the scientists in various countries.

\* \* \* Provide foreign service officers with additional training in the social sciences.<sup>88</sup>

#### RESPONSIBILITIES OF SOCIAL SCIENTISTS IN POLICYMAKING

One result of Senator Harris' hearing was to illustrate the dilemma faced by social scientists in making recommendations for public policy. Kalman Silvert outlined to Harris the ideal contributions of a social scientist to policymaking. To paraphrase his comment :

He should generate data ; order and analyze data ; interpret them and relate interpretations to a body of social science theory ; and then indicate the costs and benefits of various alternatives.<sup>89</sup>

Silvert added that the present limits of the state of social science research prevent social scientists from making such contributions. The objectives of scientific inquiry demand that social scientists not involve themselves in the application of their findings. Accordingly he called for the training of a new breed of social scientists, to translate the findings of social science into material "usable for those persons who have to make decisions inside Government."

#### THE PROPOSAL FOR A SOCIAL SCIENCE FOUNDATION

The proposal for a National Foundation for the Social Sciences also received much attention in the hearings and in the press. Some of the social science witnesses who appeared in the first set of Senator Harris' hearings favored creation of the Foundation. (The great majority of statements heard in favor of the proposal came, however, in the second set of hearings on the bill, when individual social scientists testified.)

##### *Pro*

Those favoring creation of the Foundation gave a variety of reasons. Gabriel Almond said that the Foundation should be created because the NSF does not support "speculative moral and legal" questions which are very important in social science research :

I believe the time has come when the establishment of a National Social Science Foundation ought to be seriously considered. I say this, not out of any criticism of the record of the National Science Foundation, but only to stress that the needs and the characteristics of the human and social sciences are somewhat different from those of the hard sciences. I would feel more comfortable myself if the principal Government support for the social sciences came from an agency which gave some representation to history and the more speculative, moral and legal disciplines than is true of the National Science Foundation.<sup>90</sup>

James Robinson, a political scientist, stated that NSF would never find it possible to support research on policy.<sup>91</sup> Irving Louis Horowitz said that because they are in incipient stages of growth, the social sciences need a big push, and this would be attained only with the creation of a separate foundation :

Social scientists would feel like stepchildren to a parent organization. I doubt where they would be content with that kind of rearrangement on a longrun basis. \* \* \* Social scientists are now in the process of flexing their muscles.

<sup>88</sup> *Ibid.*, pp. 59, 59-60, 59, 145, and 59, respectively.

<sup>89</sup> *Ibid.*, pp. 226-227.

<sup>90</sup> *Ibid.*, p. 11.

<sup>91</sup> National Foundation for Social Sciences, Hearings, op. cit., p. 714.

They are growing very rapidly. I think the formation of a National Foundation for the Social Sciences in fact would help that process, would accelerate that growth.<sup>92</sup>

*Con*

Those opposed to creation of the Foundation, primarily executive department and agency officials, the Bureau of the Budget, natural and physical scientists, and some social scientists, especially those who had worked for the Government, gave a variety of reasons:

(1) The solution of national problems requires a unified attack by all scientists working in concert; artificial barriers should not be created:

The interrelationships between the physical, biological, and social sciences are so extensive and fundamentally significant that it would be an unfortunate error to fail to take advantage of the opportunities for their improved coordination already so well initiated in the administration of the National Science Foundation and the National Institutes of Health. In illustration of the need for cooperation between the biological and the social sciences, it is no secret that the social sciences today are environmentally biased and that they very much need to increase their attention to the biological bases of human behavior.<sup>93</sup>

\* \* \* It would be inadvisable and unlikely for the mission-oriented agencies to surrender research programs directly related to their agency missions to organizations unfamiliar with the requirements and without direct responsibility for application of the results.<sup>94</sup>

(2) Social scientists would learn scientific objectivity and quicken the pace of solution of methodological problems, if they worked with natural and physical scientists.<sup>95</sup>

(3) Creation of the proposed NFSS should await results of the NAS studies.<sup>96</sup>

(4) NSF has experience and established relationships with the social science community; social sciences would profit from support for education and training (provisions for such support were not included in Harris' original bill).<sup>97</sup>

(5) The proposed foundation would not solve the problems of military sponsorship and ethics.<sup>98</sup>

## V. CONSEQUENCES OF CAMELOT FOR GOVERNMENT SOCIAL SCIENCE

### *Military-sponsored foreign area research*

In its first assessment, the Fascell hearings in 1965, Congress heard DOD and SORO witnesses. The committee decried military sponsorship of foreign area research, but did not legislate explicitly on this issue. It could do no more than recommend that DOD and State put their houses in order. Some administrative actions taken in response to the committee's recommendations were effective, others were less so. It is evident that despite congressional calls for "civilianizing" foreign area social science research, national security considerations did, and will continue to, command congressional and administrative support for DOD's sponsorship of such research.

### *State Department response*

Although the subcommittee recommended that State increase its component of social science research, State's share has gone down, while DOD's has remained stable or increased. (See table II, p. 130.)

The committee also directed that State and DOD effect better co-

<sup>92</sup> International Social Science and Behavioral Research, Hearings, op. cit., pp. 242-250.

<sup>93</sup> Donald Young, Chairman, NAS Advisory Committee on Government Programs in the Behavioral Sciences, *Ibid.*, p. 132.

<sup>94</sup> Leland Haworth, NSF, In National Foundations for Social Sciences, Hearings, op. cit., p. 100.

<sup>95</sup> Don Price, In *ibid.*, p. 395.

<sup>96</sup> Fred Haviland, Institutional Social Science and Behavioral Research, op. cit., p. 154.

<sup>97</sup> Pendleton Herring, *Ibid.*, p. 112.

<sup>98</sup> Donald MacArthur, DOD, In National Foundation for Social Sciences, Hearings, op. cit., p. 229.

ordination of review so that the conduct of research would not conflict with the foreign policies of the country. Such efforts have only had a partial success. The State Department's FAR Council was established and its procedures promulgated; projects are reviewed for political sensitivity, but the review process has been challenged and criticized by social scientists who assert that State is not equipped to review, and that the review of projects (eliminating those with adverse political effects) tends to leave only those that are scientifically worthless and intellectually uninteresting.<sup>99</sup>

The Foreign Area Research Coordination Group began to assess sponsorship and operational problems with the National Academy of Sciences Advisory Committee on Government Programs in the Behavioral Sciences. Late in 1967, the group issued a set of guidelines which member Federal agencies<sup>100</sup> are voluntarily to follow in contracting for social science research. Guidelines include the recommendations that sponsors should be publicized, author should have full publication privileges, and that every effort should be made to keep classified research out of the university.<sup>101</sup> These guidelines, too, have been criticized. They apply only to contract work with universities, which may do classified work (in the national interest); they do not apply to grants or to contracts with individuals or with nonacademic institutions; they are voluntary and unpoliced; they do nothing to remove foreign suspicions that all American social science research is a covert intelligence-gathering operation.<sup>102</sup> And above all, they are challenged as being negative and as not providing for any review of the scientific merit of research projects or for coordination of Federal foreign area social science research activities.

#### *DOD response*

DOD's research program has continued to be the subject of some congressional protest against military sponsorship of foreign area social science research. But the costs of not continuing it have been too great, and the military has prevailed, with Congress assenting. (Congress has also discovered that many social scientists themselves are ambivalent toward military sponsorship, and that some prefer DOD to State on the grounds of available funds, experience in using social science technology, blanket congressional authorization, and the need to conduct such researches for the purpose of national security.)<sup>103</sup>

While the DOD's budget for social science research remained substantially level, the Department and the National Academy of Sciences assessed sponsorship and utilization problems. The results of these assessments suggest that the DOD will continue to exercise research leadership in the foreign area research disciplines.

<sup>99</sup> Dael Wolfe, "Social Science Research and International Relations." *Science* (vol. 151, Jan. 14, 1966), editorial.

<sup>100</sup> AID, CIA, Arms Control and Disarmament Agency, Department of Agriculture, Health, Education, and Welfare, Labor, State, and Defense (ARPA, ODD R. & E. International Security Affairs, DIA, Air Force, Army, Navy); NASA, National Endowment for the Humanities, NSF, USA, Executive Office of the President; and as observers, NAS and the Peace Corps.

<sup>101</sup> The guidelines were issued by State on Dec. 19, 1967, "Foreign Area Research Guidelines Adopted." Department of State Bulletin, Jan. 8, 1968, pp. 55-59. (Containing Department of State announcement, press release 297, Dec. 19, 1967.)

<sup>102</sup> D. S. Greenberg, "Social Science: Federal Agencies Agree To End Covert Support." *Science* (vol. 159, Jan. 3, 1968), pp. 64-66.

<sup>103</sup> In his recent critique of military sponsorship of foreign area social science research, Horowitz has given the following reasons to explain why the DOD is "No. 1" in foreign area social science research: The scope of congressional appropriations, blanket congressional appropriations for DOD, DOD's national security need. (Irving Louis Horowitz, "Social Science Yogis and Military Commissars." *Transaction* (May 1968), p. 32.)

Under the direction of John Foster, Director of Defense Research and Engineering, and Donald MacArthur, Deputy Director (Research and Technology), Defense Research and Engineering, the DOD has conducted several internal and external assessments of its social science research program.<sup>104</sup> In July of 1967, the Defense Science Board and the National Academy of Sciences held a conference to address themselves to Chairman Foster's call to determine "high-payoff" areas of social science research for the DOD. The report of this study was released in November 1967 for comment. The premise of the report was that research programs should be continued and increased because the Department must " \* \* \* wage not only 'warfare' but 'peacefare' as well."<sup>105</sup> The DOD did not immediately accept all of the recommendations of the Board. However, in a speech made in November 1967, Donald MacArthur said the DOD concurred in the recommendations that DOD should continue with Project Themis (to develop educational centers of excellence while at the same time providing DOD with research); Project 100,000 (to train delinquents to be good soldiers); and with other manpower training, human engineering and psychological programs. He also stated that DOD would find particular value in the recommended "high pay-off" area of continuing foreign area social science research:

Another area of importance to national security planning is obtaining broader and more accurate information on the social, psychological, and economic characteristics of nations throughout the world. Research in this area is fragmented and inadequate in both theory and methodology. Increased understanding of attitudes, beliefs, motives, group affiliations, channels of communications, social-political organizations, and leadership structures are needed, as well as the process of change in social-cultural patterns. One important concern, within the broader field of social change, is the specific problem of the consequences of technological innovations in developing societies.<sup>106</sup>

And on November 2, 1967, John Foster reiterated DOD's need to support classified research on university campuses because—

We need to advance knowledge and push technological limits in those fields of science and engineering that are relevant to long-range defense problems.

We must assist in assuring that the national effort in graduate education and research in these fields is adequate to the defense needs of our country.<sup>107</sup>

He continued that all basic research supported by DOD at universities would be unclassified; but DOD support to universities for "exploratory research" might be increased or contracts with individuals instead of universities might be used for classified work. To

<sup>104</sup> On Jan. 6, 1967, John S. Foster requested that the Defense Science Board undertake "(1) a detailed review of each of ARPA's on-going projects in the behavioral sciences both basic and applied, to determine whether or not the work being performed is of direct relevance to DOD and whether or not the description of that work as given in Project Plans is adequate; and (2) a similar review of on-going projects in the military departments." (Memorandum from John S. Foster, Jr., to the Chairman, Defense Science Board, App. A.) In Report of the Defense Science Board Task Group on the Behavioral Sciences, May 8, 1968. (Washington, D.C., Office of the Director of Defense Research and Engineering, p. 9.) Much of the assessment remains to be completed; the first report, May 8, 1968, dealt with information exchange and the relevance of research. With respect to the latter, the Defense Science Board recommended that DOD make sure of the utility of contract research to the DOD mission before it funds a project (p. 7). Donald MacArthur requested the NAS study of the Advisory Committee on Government Programs in the Behavioral Sciences in 1965.

<sup>105</sup> Report of the Panel on Defense Social and Behavioral Sciences, July 5-14, 1967. Defense Science Board-National Academy of Sciences Berkshire Summary Study (Williamstown, Mass. (1967)), p. 7.

<sup>106</sup> Donald M. MacArthur, Current Emphasis on the Department of Defense's Social and Behavioral Sciences Program. (Invited address presented at the meeting of the Division of Engineering Psychologists, American Psychological Association, Washington, D.C., September 1967.) *American Psychologist* (vol. 53, No. 2, February 1968), pp. 105, 107.

<sup>107</sup> John S. Foster, Jr., On the Relationship Between the University and the Department of Defense, Nov. 2, 1967. In *Academic Research: Foster Defends DOD Support in Universities*. (vol. 158, Nov. 24, 1967), pp. 1032-4.

avoid any potential escalation of international tensions, foreign area research reports would continue to be reviewed before publication.

*The social sciences and the Federal Government*

Although the effort to realign the balance of sponsorship of foreign area social science research had only qualified success, important results were achieved in dealing with the problems of fashioning a coherent relationship of social science to the Federal Government. Here the influence of Congress was reflected in: (1) Congressional action to give the social sciences full recognition in the National Science Foundation, and (2) congressional influence in motivating the administration and social scientists to undertake an assessment of the problems that had to be solved before a better relationship could be established.

*The proposal to create a National Foundation for the Social Sciences, and amendment of the National Science Foundation*

Hearings on the Senate version of the bill to amend the National Science Foundation were held in 1967 by Senator Edward Kennedy, in the specially created Subcommittee on Science of the Senate Committee on Labor and Public Welfare. After additional legislative action, the bill became Public Law on July 18, 1968.<sup>108</sup> There was considerable support for passage of the bill. The proposal had been in the legislative hopper for 2 years: the committee had heard extensive supporting testimony from over 40 witnesses; and subsequently presented thorough analyses in justification for organizational changes. In passing the bill, the Congress apparently agreed with the subcommittee report, that the administration would not by itself take steps to modernize the NSF and that it would require legislative initiative.<sup>109</sup> The two bills (amendment of the NSF and creation of a NFSS) may have been considered in part as alternatives. In supporting the NSF amendments in the Senate hearings, Senator Harris urged that—

\* \* \* The enactment of section 3(a) [for including the social sciences within the authority of NSF] does not by any means obviate the tremendous need for speedy enactment of S. 836 \* \* \*.<sup>110</sup>

It is also evident that Rep. Daddario and Dr. Haworth, Director of the NSF, judged that the NSF amendments bill would solve many of the problems identified by Senator Harris. For instance, on January 17, 1967, in response to questions of the Reuss subcommittee investigation of domestic social science research, Dr. Haworth said that NSF had not taken a stand on the Harris bill. He added that he personally saw great value in bringing the social sciences into the closest possible contact with the natural sciences through interdisciplinary research projects and collaboration between specialists.<sup>111</sup>

<sup>108</sup> U.S. Congress, Senate, Committee on Labor and Public Welfare, National Science Foundation Act Amendments of 1968, Hearings before the Special Subcommittee on Science of the \* \* \* on S. 2598 and H.R. 5404, to amend the National Science Foundation Act of 1950 to Make Changes and Improvements in the Organization and Operation of the Foundation, and for Other Purposes, Nov. 15 and 16, 1967, 90th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1967), 196 pages.

<sup>109</sup> The National Science Foundation: Its Present and Future, op. cit., pp. xi-xii.

<sup>110</sup> National Science Foundation Act Amendments of 1968, hearings, op. cit., p. 135.

<sup>111</sup> The Use of Social Science Research in Federal Domestic Programs, pt. 4, op. cit., p. 117.

Rep. Daddario never testified explicitly on the pros and cons of passage of the Harris bill. On August 2, 1966, after the first set of Harris hearings had begun, Rep. Daddario inserted into the Congressional Record a statement and editorial of Dael Wolfe, of the American Association for the Advancement of Science. He said he was " \* \* \* pleased to note that Dr. Wolfe agrees with the recommendations made by the Science and Astronautics Committee \* \* \* that improved support for the social sciences can be accomplished to a considerable extent by the existing National Science Foundation. The creation of a new agency for this function, he believes, is not warranted."<sup>112</sup> And on November 16, 1967, while testifying before the Kennedy subcommittee, Rep. Daddario, in comment on the provisions of the Harris bill that the proposed NFSS conduct its own research, suggested as an alternative that mission-oriented agencies should " \* \* \* do a great deal of \* \* \* [social science] research in order to maintain their own capability to perform their mission objectives \* \* \*."<sup>113</sup>

The proposal to create a National Foundation for the Social Sciences still has not been reported out of the subcommittee. Apart from a possible division on the proposal within the social science disciplines themselves, several factors might explain why the bill has not moved. The NSF proposal was never debated as an alternative to the NFSS bill, but may have been regarded as such. If so, then passage of the NSF amendments and the agency's subsequent creation of a panel to review Federal support and utilization of social science research may have diminished the urgency of passage of the NFSS bill. In addition, Members of Congress may have considered some of the criticisms made of the NFSS proposal. For instance, Congressman Daddario suggested that a NFSS that sponsored policy research would encounter opposition from mission-oriented agencies already supporting relevant research programs.

A companion bill for a NFSS was introduced in the House on July 1, 1968, by Representative Donald Fraser.<sup>114</sup> This bill incorporates several changes which Representative Fraser evidently felt were needed to resolve problems cited in the Senate hearings, such as—

(1) Inclusion of provision for the Foundation to support social science education and training (sec. 6(1));

(2) Inclusion of provisions giving the Foundation authority to conduct surveys of the state of the social sciences (sec. 6(5)); and

(3) Elimination of the original section 7, which would have allowed NFSS to undertake research for administrative agencies on a reimbursable basis.

These changes appear to bring the objectives and structure of the proposed foundation for the social sciences closer to the revised NSF authority and raise the question as to the contribution of further legislation.

<sup>112</sup> Dael Wolfe, Government Support for Social Science, *Science*, (July 29, 1966). In Extension of Remarks of the Honorable Emilio Q. Daddario, Government Support for Social Sciences, Congressional Record, Appendix (Aug. 2, 1966), p. A4064.

<sup>113</sup> Senate, National Science Foundation Act amendments, Hearings, Nov. 16, 1967, op. cit., p. 120.

<sup>114</sup> H. R. 19242.

*Congressional stimulation of administration and legislative assessment of the problem*

Congressional objectives for fashioning an improved relationship of the social sciences with the Government are also reflected in activities by the executive branch and the social science community.

*Social science response*

Statements on the ethical responsibilities of the social scientist doing research for the Government have been issued by universities and professional groups. Most of the statements hold that universities and individual social scientists should not do classified research, except under conditions of extreme threats to national security; that sponsorship should be known; that author should retain publication rights; and that review should be performed by the peer group instead of the Government.<sup>115</sup>

However the most valuable contributions of social scientists are from activities which go beyond solving the practical and ethical problems of doing classified and military sponsored research. Social scientists have increasingly come to assess their responsibilities to policy formation. For instance, at a conference on ethical issues in the social sciences, held by the National Institutes of Health, social scientists concluded that:

We cannot avoid the fact that how we spend [increasing sums of Federal research money given to us] is no longer simply a scientific problem, but also a public problem and a political issue. [We may want to maintain free scientific inquiry] but we can be certain that the behavioral sciences will be used increasingly both in the formation and execution of public policy. We may like or dislike the ivory tower—it makes little difference for changing social reality has destroyed the wall.<sup>116</sup>

*Administration response*

The executive branch took steps to comply with some of the congressional recommendations and hearings for reorganization of the formulation of social science policy.

For instance, in February 1968, President Johnson expanded the President's Science Advisory Committee by appointing Herbert Simon, the first social scientist ever to be appointed to that group.<sup>117</sup> And on February 1, 1968, the NSF announced the establishment of a Special Commission on the Social Sciences. Members of the Commission, will address themselves to: (1) Analysis of mechanisms needed to improve Federal Government utilization of the social sciences; (2) analysis of the collaboration needed between social and

<sup>115</sup> For instance, see: Murray Schumach, University of Pennsylvania Clarifies Policy on Secret Research Contracts, New York Times (Sept. 9, 1966); Ethics and Social Science Research, edited by Leonard Reissman and Kalman H. Silvert, American Behavioral Scientist (vol. 10, No. 10, June 1967); Ethical Problems of Political Scientists, Political Science, Newsletter of the American Political Science Association (vol. 1, No. 1, winter 1968), pp. 5-15.

<sup>116</sup> Gresham M. Sykes, Feeling Our Way: A Report on a Conference on Ethical Issues in the Social Sciences. (Sponsored by the National Institutes of Health, Summer 1966.) The American Behavioral Scientist (June 1967), pp. 8-11.

<sup>117</sup> Formerly Chairman of the Board of Social Science Research Council and Chairman designate of the Division of Behavioral Sciences of the NRC, and currently professor of industrial administration and psychology at the Carnegie-Mellon University. (PSAC appointments, Science (February 1968), p. 861.)

other "hard" scientists; and (3) analysis of NSF and Federal program needs in the social sciences.<sup>118</sup>

A notable reaction to the Camelot affair, and to congressional criticisms of it is the report of the joint NAS-DOD-Russell Sage Foundation-sponsored Advisory Committee on Government Programs in the Behavioral Sciences, released in September 1968. The conclusion regarding the lack of Federal coordination for the formulation of social science policy appears to echo congressional views on this matter:

Behavioral science activities in departments and agencies generally have evolved in response to program needs, with little systematic attention to overall requirements and direction within the framework of Federal science policies. For all intents and purposes, there is no central forum for dealing with common problems of behavioral science or for giving top-level support to policies designed to strengthen the behavioral sciences as an instrument of policymaking and program operations.<sup>119</sup>

The committee recommended that the Office of Science and Technology be given the responsibility for formulating policies for the social sciences; that mission-oriented agencies establish long-range policies to better utilize social science knowledge and that they employ more social scientists; that the Office of Science and Technology and the State Department draw up long-range objectives for foreign area behavioral sciences research; that a social scientist be included on PSAC, that NSF increase its programs in support of the social sciences (the committee recommended that a separate National Foundation for the Social Sciences not be created at this time), and that a National Institute for Advanced Research and Public Policy be created to bring together Government officials and social scientists to formulate long-range programs to solve social problems.<sup>120</sup>

### *Conclusion*

In the Camelot episode the Congress was concerned with two problems: (1) Military sponsorship of foreign area social science research, and (2) establishment of an administrative mechanism to solve problems of funding, ethics, and priority in social science research. Several congressional committees assembled much information on various alternatives to resolve these two related problems. In addition, the interest in this episode helped to stimulate a broader inquiry and evoked a considerable literature on the relationship between the Federal Government and the social science community in the utilization of the social sciences for Government purposes.

Although military sponsorship of social science research encountered little explicit endorsement and much criticism, it was also found hard to replace: Both strategic and tactical planning needed to be based on

<sup>118</sup> Dr. Orville G. Brim, Jr., president of the Russell Sage Foundation was elected chairman. See: NSF Special Commission on the Social Sciences Appointed. National Science Foundation news release. (Feb. 1, 1968), pp. 1-4. (NSF 68-107.)

<sup>119</sup> National Academy of Sciences-National Research Council. Advisory Committee on Government Programs in the Behavioral Sciences. "The Behavioral Sciences and the Federal Government." (Washington National Academy of Sciences-National Research Council, September 1968), p. 78.

<sup>120</sup> *Ibid.*, pp. 4-16.

the kind of factual and conceptual inputs that the social sciences alone can provide.

Criticism was also directed at the State Department as being too negative and lacking in initiative for developing long-range goals exercising coordination of foreign area research of other Government agencies. Research by the State Department in the social sciences, like the Department's interest in science more generally, was said to be at a minimum. It became apparent that an assessment of the relationship between the social sciences and the Federal Government needed to be institutionalized within both the executive and legislative branches. Effective use for Government purposes of the social sciences, the Camelot episode showed, requires concentration of control, legislative reforms, and detailed programing.

## CHAPTER SEVEN—CONGRESSIONAL CONCERN WITH THE DECLINE AND FALL OF MOHOLE

### I. BACKGROUND OF THE MOHOLE ISSUE

Early in 1957 there arose in the scientific community an imaginative proposal to explore through the earth's crust to the heavy underlying layer by drilling. Although this feat was judged infeasible from a continental drilling site, it seemed more likely to be feasible in the deep ocean, where the crustal depth was much thinner. This proposed undertaking was called Project Mohole, from the scientific term "Mohorovicic Discontinuity," signifying the interface between the crustal surface and the mantle beneath it.

Preliminary experiments with a newly developed technology of offshore drilling in deep water from a dynamically positioned (un-anchored) floating drilling rig were successful. However, the technological difficulty presented by the more ambitious goal of penetrating in even deeper water to reach the mantle through some 6 miles of overburden, was vastly larger than that overcome in the initial experiments. Some of those who entertained this ultimate goal do not appear to have assessed it realistically. It was gradually revealed to require a much larger organization, considerable further development in the state of the drilling art, and investment in a large floating platform capable of maintaining stability and life support during a 2½-year drilling campaign. The alternative approach of proceeding step by step to deeper penetrations was not favored, perhaps in part because of the persistence of a belief that Russian and U.S. scientists were engaged in a race to reach the mantle. In the latter stages of the project, the emphasis began to shift somewhat from that of a one-time project to a broader program, involving planned use of the large drilling platform, and other rigs, to conduct an exploration of more general scope into the ocean floor.

After considerable investigation, some investment in the development of drilling technology, and an initial outlay for work on the platform, the National Science Foundation abandoned the project at the instruction of the Congress. The instruction took the form of an explicit denial of further funds for the Mohole project.

This chapter examines the sources of information provided to the Congress concerning the latter stages of the project. The decision to terminate it, taken in the summer of 1966, was preceded by a substantial volume of testimony from the scientific community, almost all in support of the project. However, the termination was foreshadowed by expressions of dissent from several disaffected scientists, mostly on the grounds that the project had not been permitted to evolve on a deliberate, step-by-step basis, and that a legitimate scientific quest for important new information had been supplanted by a try for a spectacular stunt.

*The situation facing the earth sciences in 1957*

Among the developments that had led in 1950 to congressional adoption of the proposal for a National Science Foundation, perhaps the most persuasive was the achievement of nuclear fission explosions—the atomic bomb. The decisive effect of atomic weapons in the war with Japan had afforded a convincing demonstration of the relevance of science to national military power. The continued successes in atomic physics in the early 1950's heightening the promise of commercial electric power from fission and yielding a practicable fusion or hydrogen bomb, confirmed the wisdom of the Congress in sponsoring a national scientific effort. The steadily growing budget of NSF provided sustained expansion in the support for the classical sciences—physics, chemistry, astronomy, and biology and medicine. However, less support was being extended to the earth sciences—geology and geophysics. Proposals for research projects in these latter fields offered incremental rather than seminal results—the extension of known data, rather than the breaking of new ground. Much of the national effort in the earth sciences was conducted in-house by the U.S. Geological Survey, emphasizing prosaic programs of geological mapping. Under these circumstances, a broad-gage proposal for a truly spectacular undertaking in the field of earth sciences had a compelling attractiveness for members of the earth science disciplines.

Much of the national activity in applied research in the earth sciences was sponsored by the petroleum companies, relative to the exploration for new sources of oil in the ground. Following World War II, there had been a substantial increase in exploratory drilling, worldwide, and many new oilfields had been discovered. However, during the late 1950's, the abundance of proved petroleum reserves, coupled with a recession in industrial activity in the United States, occasioned a retrenchment in exploratory activity on the part of the oil companies. Many of the petroleum scientists trained in the exploratory arts were searching for teaching posts or other occupations.

Lessened support for earth scientists and the low level of scientific innovation in the earth sciences contrasted markedly with such other fields as medicine (in which the Salk vaccine had been only one of several nationally recognized breakthroughs), and atomic science. After the Soviet Union's initial successes with earth satellites, in the fall of 1957, the sciences relevant to the "space race" received a great forward impetus. Even as the United States redoubled the effort to catch up with the U.S.S.R. in rocketry, and to preserve the threatened lead in nuclear weaponry, the search went on for additional fields of science in which to win new national prestige. This lesson was not lost on the earth scientists. To some of them, the Mohole proposal appeared as an opportunity for improved stature and recognition, and a stimulus to recruitment of new talent, as well as a dramatic new direction in fruitful scientific exploration.

*Evolution of Project Mohole*

The origin of the Mohole concept had a somewhat frivolous tinge. Science fiction had often dealt with the topic of penetrating through the earth's crust. To engage the serious consideration of the idea by the scientific community became the task of a pseudosociety called "AMSOC." This was the "American Miscellaneous Society," an after-hours gathering of highly qualified scientists with an appreciation of

the preposterous. AMSOC had been started in 1952 by two geophysicists, staff members of the Office of Naval Research (ONR). Its organization was nonexistent, its purpose was entertainment, and its membership casual. It was an unlikely, and possibly unfortunate, choice of an organization to sponsor and promote a scientific spectacular.

The Mohole idea itself was voiced at a panel meeting of NSF to review some 60 proposals for research projects in the earth sciences. Although technically meritorious, the proposals were criticized as breaking no new ground. At the meeting, Walter Munk, of Scripps Institution of Oceanography, suggested that projects were needed that would be "really fundamental to an understanding of the earth." Moreover, they needed to accomplish such other objectives as: to "arouse the imagination of the public" and "attract more young men into our science." According to Harry H. Hess, chairman of the geology department of Princeton University, who was also present, Munk offered as an example of such a project "\* \* \* That we drill a hole through the crust of the earth. I [Hess] took him up and said let's do it; let's not drop it here, and we did go on."<sup>1</sup> Apparently it was Hess who suggested that the idea be turned over to AMSOC to implement. In its own casual and frivolous way, the American Miscellaneous Society had become identified with such far out undertakings as bringing Antarctic icebergs to Los Angeles to supplement the city water supply. Despite the group's reputation for this kind of "thinking big," it had respectable qualifications in the earth sciences. The NSF Panel meeting was in March 1957. In April, Munk was host at his home in La Jolla, Calif., to a meeting of AMSOC in which a more formal organizational character was assumed in order to advance quite seriously the Mohole concept. In due course, the group shed its nonconformist facetiousness,<sup>2</sup> obtained the sponsorship of the National Academy of Sciences, applied for a \$30,000 grant from NSF for a feasibility study and received from NSF a grant of half that sum. At this point AMSOC took on the full time services of Willard Bascom, as executive secretary.<sup>3</sup> Bascom's enthusiasm and energy moved the project forward at a more rapid pace.

The original AMSOC proposal had been merely for the drilling of a hole to Mohorovicic Discontinuity. In an article in *Science* magazine, coauthored by Arthur Maxwell, of the staff of ONR, and Gordon Lill, chairman of AMSOC and also on the ONR staff, the cost of the achievement was estimated at not more than \$5 million.<sup>4</sup> The following month, AMSOC's executive committee proposed a budget of \$14 million for the project. Earlier, in the April 1959 issue of *Scientific American*, Bascom had defined his concept of the total project as consisting of a preliminary technological development phase, a trial drilling phase, a reassessment based on actual field trials, and then

<sup>1</sup> As quoted in: Daniel S. Greenberg. *The Politics of Pure Science*. (New York, New American Library, 1967), p. 174.

<sup>2</sup> Reflected in its disciplinary subgroupings, which have been described as "Etceterology, Phenomenology, Calamitology, Generalology, and Triviology." (*Ibid.*, p. 172.)

<sup>3</sup> Bascom, a mining engineer and geologist had received his training (no degree) from Colorado School of Mines, had been a research engineer in oceanography at the University of California, joined the staff of the National Academy in 1954, and had been U.S. delegate to the IGY Conference on Oceanography in Sweden. He was also serving as executive secretary on two Academy committees—meteorology and maritime research. (Greenberg, *op. cit.*, p. 178.)

<sup>4</sup> G. G. Lill and A. E. Maxwell. *The Earth's Mantle*. *Science* (May 22, 1959, vol. 129, No. 3360), pp. 1407-1410.

the ultimate objective of a hole to the mantle. Bascom also clearly envisioned not one hole to the mantle but several, at several different locations.<sup>5</sup>

Thus, by late spring, 1959, the NSF was engaged in funding an earth science project originating with those responsible for reviewing earth science projects submitted to NSF. The proposal was submitted to NSF under the aegis of the National Academy of Sciences, responsible by charter for providing advice to agencies of the Government. The project itself was under the direction and management of an academy committee (AMSOC), organized on an ad hoc basis for the purpose, with members drawn from both the academic and the Government communities.<sup>6</sup>

The funding was provided by NSF and the technical direction was supplied in part by a full-time executive secretary (later "technical director") of AMSOC and in part by the committee itself that met occasionally and sometimes adopted policy positions on the project that differed from those of its full-time staff. Such a loose-knit organization would be tolerable for a small and short-lived project, a policy review, or an evaluation of a proposal; it was clearly unsuited for the direction of a long-term, difficult, costly, and exceedingly complex undertaking. The enthusiasm and optimism of Bascom are revealed in these early stages of the project; although his words convey a technically precise description of the difficulties (as well as of the scientific gains) of the project, emphasis was on feasibility rather than obstacles.

Moreover, the role of the NSF in the undertaking was not unequivocal. Although instructed in its charter not to operate its own laboratories, the Foundation seemed to be skirting close to the edge of this forbidden territory. Not only was the project conceived in its chambers; later on, the project was to be placed in the hands of a commercial organization paid by the Foundation and acting under its technical instructions.

### *Mohole's administrative growing pains*

With NSF funding, AMSOC prepared its feasibility report on Project Mohole, issued in September 1959.<sup>7</sup> It noted that there were places where the "Moho" was only about 31,000 feet below the surface of the ocean—the ocean being some 15,000 feet deep. At one such location, the Clipperton Island area in the Pacific Ocean, the Moho was reported

<sup>5</sup> Willard Bascom, *The Mohole*. Scientific American (April 1959, vol. 200, No. 4), pp. 41-49.

<sup>6</sup> Members of AMSOC at this time included:

Gordon G. Lill, Chairman; Geophysics Branch, Office of Naval Research, Washington, D.C.

George Colchagoff, Air Force Research and Development Command, Andrews Air Force Base, Md.

Maurice Ewing, Lamont Geological Observatory, Columbia University, Palisades, N.Y.

William B. Heroy, The Geotechnical Corp., Dallas, Tex.

Harry H. Hess, Department of Geology, Princeton University, Princeton, N.J.

Harry S. Ladd, U.S. Geological Survey, Washington, D.C.

Arthur E. Maxwell, Geophysics Branch, Office of Naval Research, Washington, D.C.

Walter Munk, Scripps Institution of Oceanography, La Jolla, Calif.

Roger Revelle, Scripps Institution of Oceanography, La Jolla, Calif.

William W. Rubey, U.S. Geological Survey, Washington, D.C.

Joshua I. Tracey, Jr., U.S. Geological Survey, Washington, D.C.

Leonard S. Wilson, Office of the Chief of Research and Development, U.S. Army, Washington, D.C.

Willard Bascom, Technical Director.

<sup>7</sup> National Academy of Sciences-National Research Council, AMSOC Committee, "Drilling Through the Earth's Crust: A Study of the Desirability and Feasibility of Drilling a Hole to the Mohorovicic Discontinuity." Conducted by the AMSOC Committee, Sept. 1, 1959. (Washington, National Academy of Sciences-National Research Council, 1959, publication 717), 18 pages plus appendix.

to be only 28,100 feet deep. The study identified the many scientific potentialities of the project, described the types of measurements that should be made, and developed the concept of dynamic positioning of a drilling ship in deep water. The objective was described as a series of holes into the ocean floor, "Culminating in one that pierces the Mohole and samples the mantle." The project was divided conceptually into three sets of tasks: Phase I would be to modify an existing drilling ship for deep water operations, and to core as deeply as possible using existing technology; phase II would be the design and construction of a new ship, assembling best possible equipment, shakedown tests, and then hole to the mantle; phase III (which would overlap the two other phases) would include continuous inspection of cores, analysis of samples, and preparation of reports. Cost estimates were regarded as realistic for phase I (using a maximum of contributed and surplus material). For this phase an outlay of \$2.5 million was forecast. AMSOC candidly stated that costs of phase II could only be guessed at because "an estimate of the cost of phase II depends on what is found out in phase I." The best guess at that time as to the total cost was \$15 million.<sup>8</sup>

The first test of the Mohole concept, in March–April 1961, under the loose organization of AMSOC direction and NSF funding, was signalingly successful. An offshore drilling ship, *Cuss I*, was equipped with a stabilizing system of outboard powerplants and propellers, and brought to a succession of drilling sites between Los Angeles and Guadalupe Island, off the coast of Baja California. After a brief learning period at La Jolla, the drilling team in its final demonstration lowered its drill pipe through 11,672 feet of seawater, and drilled 601 feet into the ocean floor.

A triumphant report on the completion of the phase I test program<sup>9</sup> was issued in April 1961. The necessity for an organizational revamping was already apparent.<sup>10</sup> AMSOC was told by the NAS May 22, 1961, to disassociate itself and NAS from any management obligations for Mohole, and the AMSOC chairman, Gordon G. Lill, promptly agreed that AMSOC should "concern itself with matters of scientific policy, engineering review, and budget."<sup>11</sup> From this point on, AMSOC and its technical staff busied themselves with papers, studies, and detailed questions of hardware and design. The decision function was taken up by NSF.

At this point some of the complications resulting from the "make-shift" organization of Mohole phase I began to appear. AMSOC recommended to NSF that phase II be performed under contract by a qualified industrial or academic organization, and that the contractor should be committed under the contract to take the technical staff of AMSOC into its own organization. The Mohole budget recommendations prepared by AMSOC also reflected ambiguities. Although the staff of AMSOC had called for an "intermediate" drilling ship, the committee itself had apparently been responsive to an expression of

<sup>8</sup> *Ibid.*, p. 18.

<sup>9</sup> National Research Council. "Experimental Drilling in Deep Water at La Jolla and Guadalupe Sites." The AMSOC Committee of the Division of Earth Sciences (Washington, D.C., National Academy of Sciences-National Research Council, 1961, Publication 914), 179 pages.

<sup>10</sup> Testimony of Willard Bascom, Director, Project Mohole. In U.S. Congress, House Committee on Merchant Marine and Fisheries. "Oceanography 1961—Phase 2." Hearing before the Subcommittee on Oceanography of the \* \* \* on Project Mohole. May 22, 1961, 87th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1961), p. 103.

<sup>11</sup> Greenberg. *Op. cit.*, p. 184.

urgency from the President's Scientific Advisory Committee (PSAC), and proposed that work proceed at once on the "ultimate" drilling vessel.<sup>12</sup>

On July 27, 1961, a bidders' briefing was held at NSF to launch the competition for the contract to manage the Mohole project. Bids were received September 11, and a review procedure undertaken. On February 28, 1962, NSF Director Waterman announced the selection of Brown & Root, of Houston, Tex., to execute the project. The task for which the contractor was engaged was described in the contract as follows:

The contractor will plan, manage, supervise, perform, and/or coordinate all activities and furnish or procure all services, material, and facilities necessary for the drilling, sampling, and logging of a hole through the crust of the earth for scientific purposes, at a site to be selected in collaboration with the National Science Foundation.

As later paraphrased in 1963 by Dr. Haworth, who replaced Dr. Waterman as Director of NSF, the task encompassed five stages, as follows:

- (a) The accomplishment of an engineering plan and cost study after conducting appropriate research and development covering the various aspects of the work;
- (b) Site services and recommendations;
- (c) Developing, producing, manufacturing, procurement, and testing of components, instrumentation, and systems required for the job;
- (d) Recommendations for a selection and procurement of a drilling platform; and
- (e) Conduct of the drilling operations and provision of necessary logistics for a period of up to 4 years to carry out the scientific programs.<sup>13</sup>

A major study<sup>14</sup> of the design of an "intermediate" drilling vessel was completed by the AMSOC technical staff, April 30, 1962. In it, the AMSOC staff announced that they had left the Academy to form a new corporation, Ocean Science & Engineering, Inc., under the leadership of Willard Bascom.

Progress of Mohole under the management of Brown & Root was slower than had been anticipated. (In May of 1961, Bascom had told a House subcommittee: "Within 5 years we can reach the Moho." At the same hearing, an NSF official spoke of "3 to 5 years" as his own estimate.) Between the time the contract became firm and its termination at the end of August 1966, the contractor had prepared designs and placed a construction contract for the "ultimate" drilling platform; an initial drilling site had been chosen; estimated acquisition costs of the system had begun to near \$100 million; important improvements had been made in drilling technology; but the capability of the system to perform the ultimate mission still remained in doubt and

<sup>12</sup> Based on an account by Greenberg. *Op. cit.*, p. 186. Comments Greenberg: "Why this top-level advisory body [PSAC] should have felt urgency in this matter is not clear, but technological spectacles—such as the manned lunar program suddenly announced by Kennedy a few months earlier—had become a highly effective technique for providing a financial uplift for all fields of science and technology, and possibly PSAC regarded Mohole as a master key for opening the treasury to all the earth sciences. In any case, both the White House and AMSOC's own drilling panel said the 'ultimate' ship should be the next step."

<sup>13</sup> Testimony of Dr. Leland Haworth. In U.S. Congress, Senate, Committee on Appropriations, Independent Offices Appropriations, 1964. Hearings before a Subcommittee of the \* \* \* Pt. II, 88th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1964), p. 2308.

<sup>14</sup> National Research Council, AMSOC Committee, "Design of a Deep Ocean Drilling Ship." (Prepared by) the technical staff of the AMSOC Committee, Division of Earth Sciences. (Washington, D.C., National Academy of Sciences-National Research Council, 1962, Publication No. 984), 172 pages.

unproved. During this period, especially in the Senate, criticisms were voiced concerning the selection procedure employed by NSF that had chosen Brown & Root to manage the project. The contract itself was closely reviewed. The evidence of a "race to the mantle" was increasingly suspect.<sup>15</sup>

Unfavorable effects on the image of the Mohole project as a venture in "pure science" probably resulted from such developments as (a) the intense commercial competition for the contract, with its attendant (and probably inescapable) allegations of political influence; (b) the metamorphosis of the accomplished ocean drilling team under Bascom from an Academy of Sciences staff group into a commercial company; (c) the conflict among leading scientists over the time phasing of the project (the "intermediate" versus the "ultimate" drilling vessel controversy); and (d) the infirmity of cost estimates and estimates of time to completion, regardless of whether these reflected changes in the scope of the project, or improved appreciation of the difficulties of the first penetration to the Mohole.

The Mohole episode provided instructive lessons as to the importance of unified control, clear-cut objectives, and effective management of a large science project sponsored by the Government. It illustrated the hazards of departing from established policy and procedures in order to "get on with the job." In particular, it showed that the rather casual management exercised by a research team unified by a common enthusiasm for a scientific quest provided a poor foundation for expansion into a major system development project.

#### *Issues raised by the Mohole episode*

A fundamental issue involved in the Mohole project was as to the allocation of funds for a large project in basic research—particularly in competition with other claimants for research sponsorship. The scientific rewards of the Mohole project were unquestioned, and the more notable because they were widely distributed among oceanography, paleontology, physical geology, and geophysics. However, as projected costs rose steadily from the very beginning, there was no basis at any point for a firm decision as to how much (conjectural but highly probable) scientific information justified the (indeterminate but increasing) level of funding.

Another issue concerned the goals of the project. From the first, the purpose had combined scientific discovery with scientific spectacular. It was evident that a more modest drilling program, with more holes, geographically dispersed, to lesser depths, would yield much new information at much less cost. The dramatic achievement of a hole drilled all the way to the mantle, while sure to yield information of great scientific interest, would probably raise more questions than it answered; much of its attractiveness lay in its spectacular character. To secure reliable information about the mantle and the zone above it would probably require several holes at different locations. Since each drilling would take 2 to 3 years, the cost of combining (a) urgent

<sup>15</sup> According to Greenberg, op. cit., Edward Wenk, Jr., Chief of the Science Policy Research Division of the Legislative Reference Service, Library of Congress, "after conversations in Moscow with high-level Soviet science administrators," had concluded that there were no Soviet plans to drill explicitly to the Mohorovicic Discontinuity. (P. 177n.) Greenberg adds: "All along there had never been anything but the flimsiest evidence of Soviet interest in a Mohole project, but this did not prevent the proponents of Mohole from projecting the impression of a frantic race with the Russians."

achievement of a spectacular with (b) protracted data collection employing a large and expensive tool for scientific research, began to reach disturbing levels.

Related to the question of purpose was that of management. If the emphasis was to be on the collection of scientific data, then the location of drilling sites—and their number—became of paramount importance. Management decisions in the development of project hardware would need to optimize for flexibility, transportability, low cost of maintenance, and orderly provision for analysis of specimens and data. If the emphasis was to be on a spectacular achievement, then the design and use of the drilling system needed to be coordinated to the extremely difficult task of drilling a single hole to the mantle. Moreover, the frequent reference in the contemporary literature to the possibility that the Russians would be first to reach the mantle placed a premium on haste. Achievement of a platform and technology adequate to reach the mantle in an environment of urgency boosted the costs. It called for too large an element of engineering design risk—too large an extension beyond the state of the art all at once. When it became evident that to maximize its scientific yields the costly drilling platform would need to be kept in operation for some 20 years, the life operating costs were seen to exceed a quarter billion dollars, to be added to the acquisition cost of the drilling system.

Then there was the confusion inherent in the generation of conflicting technical guidance from AMSOC, the contractor, the Office of Science and Technology, the Academy leadership, and the NSF itself. The AMSOC scientists were concerned with maximizing the scientific returns from the drilling. The contractor understandably sought to confine the project as nearly as possible to a straight forward engineering task. Meanwhile, OST was concerned over the international and prestige aspects of success or failure of the project, particularly if there was indeed a race on. The Academy leadership was concerned to preserve the prestige of science, free from controversy, and therefore sought to mediate the issue with least tension. The NSF was divided in its sympathies among all these conflicting views; it sought to sustain the impetus of an important project in earth sciences but at the same time to support orderly progress in all other fields of science it was sponsoring.

A lesser issue, but one that tended to obscure the more fundamental questions, was as to the preservation of the “purity” of a scientific project when the very large costs of the undertaking compelled resort to an “industry oriented” approach. In the selection of a management contractor for the Mohole project, NSF had been guided by such considerations as: demonstrated competence in managing large marine engineering construction, and relative disinterest in the extraction of petroleum from the ocean floor. The contrast between the comparatively low cost, makeshift performance of the phase I experiment by AMSOC and the more elaborate, commercially organized, and very expensive project managed by Brown & Root under the technical direction of NSF, tended to place the latter at a disadvantage—in effect tarnishing the political image of the project as the contrast widened.

*Relevance of the Mohole experience for the future*

Clearly there are many lessons and many unanswered questions that derive from the Mohole episode. If the resources the United States is prepared to invest in basic scientific research are limited, as they are bound to be, then it seems necessary to assure that they are not prematurely committed to wasteful projects that the decisionmaking process in the United States judges should be terminated before they become productive. It also seems essential that criteria should be available to enable sound and lasting judgments on the allocation of funds as between big basic science projects and small projects, as between projects in basic research to advance knowledge and projects in applied science that are intended to contribute specific social advantages.

Among the questions to be considered are: What were the changes in circumstances as between 1961-63, when the Mohole project was acceptable to the Congress, and 1966, when it was not? If the issues had been properly structured, and pertinent evidence on the issues had been made available in 1963, would the project have been terminated then instead of being continued until 1966? Any of the large projects in basic scientific research, such as particle accelerators, the International Biological Program, the space program, research in meteorology, oceanographic research, and various projected uses of the national laboratories, might invite the same start-and-stop sequence that occurred with the Mohole project. The importance—for both scientific progress and frugal use of resources—of sustained effort on scientific programs seems unmistakable. What provisions for scientific advice, consultation, and analysis, available to the Congress, would assure that congressional approval and acceptance were sustained throughout each incremental stage of each major project? On this point, there seems to be a relationship between two comments on Mohole. One of these, that appeared in *Fortune* magazine, in April 1964, was that: “\* \* \* If publicly aided basic science is to flower, it must be shielded from operational interference by any sustaining governmental agency.” [And also:] “Clearly we still have no formula for sound handling of a big science project financed by Government.”<sup>16</sup> The other comment was that in a report by the Comptroller General, April 23, 1968, which suggested:

\* \* \* Major research and development projects involving totally new or exploratory concepts would be conducted in a number of sequential phases. Each phase would represent a specifically limited agency commitment whereby it would be determined:

Whether the project objectives could be met;

What means would be necessary to attain these objectives; and

Whether the objectives would be worth the costs involved before a contractual commitment was made for the procurement of the necessary equipment and the actual operation of the project.<sup>17</sup>

In its rejoinder to this report the National Science Foundation observed that “this suggested approach \* \* \* would not have brought about any decrease in the estimated cost of this project.” Nevertheless, the sequential approach would have had the advantage of maintaining a closer working relationship between those responsible for managing

<sup>16</sup> “Mohole Regress Report.” *Fortune* (April 1964), p. 106.

<sup>17</sup> U.S. General Accounting Office, “Administration of Project Mohole by the National Science Foundation.” Report to the Congress by the Comptroller General of the United States. (Washington, D.C., GAO, Apr. 23, 1968), 45 pages plus appendixes.

the project and the Congress which had the ultimate responsibility for its approval and funding. Instead, the point was made known very belatedly that—

The prime contractor and, to the best of our knowledge, the National Science Foundation, did not recognize at the time the contract was executed that phase I did not provide a sound basis for proceeding with phase II. Recognition that the problems faced in the two phases were dissimilar came later. Members of the former AMSOC technical staff were employed by the prime contractor as consultants, as soon as possible, for the purpose of passing on the knowledge gained from their experience in phase I. It then became apparent that the publicized successful phase I operation did not contribute to resolving the many complex engineering problems of phase II.<sup>18</sup>

It is still contended by NSF and by Brown & Root that construction and use of an intermediate drilling ship, as recommended by AMSOC and its technical staff, would not have reduced the total cost of the project, and perhaps would not have accelerated the achievement of the ultimate goal. But the experience that would have been gained with such an intermediate drilling vessel would have—

Enlarged scientific knowledge of the ocean floor and its various layers;

Defined the technological problems of deeper drilling;

Enabled the testing of specific new drilling components and techniques; and

Increased the confidence level of those responsible for technological and political decisionmaking, in the ability of the United States to achieve the ultimate goal.

In broader and more general terms, the advantages of the kind of approach recommended by the General Accounting Office would include—

More orderly development of technological capability and minimization of engineering risk:

Orderly production of basic research data yielding opportunities for continuous exploitation through applied research and technological development throughout the evolution of the program;

Solid demonstration of the merits and socially useful contributions of research to satisfy the political decisionmakers as to the advantages to the United States of a large-scale, costly, and sustained research effort in the earth sciences;

Training of needed personnel in the many skills required as the project (or program) expanded, with consequent expansion in the manpower with skills in related applied fields; and

Avoidance of the element of cost inherent in a crash program constantly tending to exceed the state of the art.

In short, equipped with a better store of information, and more substantial political support, the NSF would presumably have been in a stronger position to present to the Congress a realistic set of cost estimates, more reliable estimates of the time required for the sequential stages of the ultimate goal, and a more tangible and more extensive set of statements as to the probable scientific and technological yield of the program.

<sup>18</sup> Letter from William M. Rice, project manager, Brown & Root, Inc., to General Accounting Office, August 11, 1967. In *Ibid.*, p. 57.

It is also relevant to note that the task is still to be accomplished and the assessment of its scientific merit in 1966 is still valid. The technology required to achieve the task has now been more clearly defined. The alternative or intermediate drilling program, although not identified with the Mohole project, is well underway. The scientific opportunity of the ultimate goal remains to be exploited. The funds expended in the first assault on the Moho are a minor fraction of the cost that will be paid when the project is ultimately carried to completion. What would seem to be required at this point is a dissociation from the scientific goal of exploring the earth, of those unfortunate aspects that led to congressional disenchantment with the project as it existed in 1966.

## II. THE CASE IN CONGRESS

The Mohole issue evolved gradually. It is difficult to identify the point at which the rising dollar costs of the project—in effect—began to be regarded as excessive in relation to the anticipated benefits. The early successes of the project were greeted with universal enthusiasm. On scanty evidence, the existence of a race with the Russians to “inner space” was posited. Important additions to scientific knowledge and drilling technology were acknowledged and the promise of great further rewards recognized with enthusiasm. The initial impetus of the successful first experiment in deep water drilling—almost certainly overvalued to the detriment of the program as a whole—carried the project well into the next phase before the rising costs compelled reassessment. The highest echelons of the scientific community gave Mohole their strong endorsement, and the only area of technical dissent concerned its rate and sequencing.

### *Possible congressional response to AMSOC first feasibility report*

It is interesting to speculate on what might have been the response of the Congress to the issuance in 1959 by AMSOC, through the National Academy of Sciences, of the first feasibility report of Project Mohole. This report said the project was feasible, acknowledged that it would be a spectacular achievement as well as an arduous undertaking, and characterized the important scientific returns it would provide. What directions might have been taken in a congressional examination of the issue at that early point? Granted, the little evidence and the many imponderables obscured the precise magnitude of the costs. But would it have been worthwhile to consider at the outset whether the United States attached value to spectacular scientific accomplishment, and if so, in what proportional relation to other goals of society? Precisely what value do scientific spectacles provide? If a scientific spectacular is decided upon, then how is it to be held in proper proportion—in allocating public resources relative to the less exciting business of making things work better in the cities, the national economy, trade, commerce, transportation, health, poverty, and the myriad of other public problems to which science offers hope of contributing to solutions? On what criteria, and from what sources might the members of AMSOC, the National Academy of Sciences, the leadership of NSF, or the Congress itself, have derived guidance on such questions as these?

It is not evident that any such sources could have been found in 1962; or is there any such source available today. Project Mohole, like Topsy, "jest grewed."

It is a persuasive idea that any scientific innovation, in its earliest stages, cannot hope to marshal congressional support—cannot meet the tests of a pragmatic society. Freedom of basic scientific inquiry implies freedom to transcend the limitations of the "practical mind," of traditional experience, sometimes even of traditional values. Presumably it was this precise reasoning that led the Congress to create the National Science Foundation in the first place—to give infant ideas and concepts enough of a chance of life to test their potential worth and significance.

If so, then perhaps it is unnecessary—even undesirable—for the Congress to attempt to provide criteria of social worth for science projects in their earliest stages. Such a conclusion, however, does not dispose of the question; it merely postpones it. At what point in the evolution of an inherently vast scientific program, which the Congress will be asked to fund, should the congressional decisionmaking apparatus become involved? When does it become too late to turn back?

*Congressional assessment following phase I success of Mohole*

Upon completion of their successful demonstration of the feasibility of deepwater drilling, early in 1961, AMSOC began the difficult task of converting itself from an operational team into a technical advisory committee. The NSF, having funded much of the initial experiment, now began to accept responsibility for initiating the next stage of the program. The questions to be resolved at this point were:

The maximization of the scientific yield of a project to be conducted in the name of science; i.e., establishment of the priorities;

The administrative formula required to manage the continuation of the program;

The programming of follow-on work;

The development of a realistic assessment of the costs, technical difficulties, and time required for the total program.

All these questions were interdependent. Decisions as to the "next step" depended on a realistic evaluation as to the difficulty of achieving the ultimate goal. The scientific rewards of various approaches needed to be related to alternative estimates of costs. The time required to achieve the ultimate objective depended on such considerations as the priority to be accorded the physical feat as against the acquisition of scientific information. Even in the acquisition of scientific information, it was necessary to determine priorities—as between extensive drilling to obtain more knowledge about the total crustal structure, and intensive drilling to obtain a first set of data regarding the sub-crustal composition and structure. (This last was uncommonly difficult because the opportunities for acquiring scientific information in this unexploited area were so vast that almost any effort would be scientifically rewarding. The great wealth of opportunity made selectivity difficult.)

In the appropriations hearings in the House of Representatives, shortly after completion of the initial deep water drilling experiment,

testimony was presented by Dr. Waterman, Director of NSF, Dr. Robertson of his staff, and Dr. Rubey, oceanographer at the University of California at Los Angeles and a member of AMSOC. The request for Mohole funding, by NSF, was for \$1 million for the fiscal year 1962. The justification language said, in part:

\* \* \* To continue a program of research in the geology and geophysics of the deeper layers of the earth by drilling in the ocean floor. The ultimate objective of this program is to obtain samples of actual materials from the deeper layers of the earth's crust and from the mantle, which lies beneath the crust and constitutes the bulk of the earth. Cores from such depths would provide invaluable information on a number of critical questions in geology and geophysics.

[The program just completed] will provide the scientific and technical data required in preparation for drilling to much greater depths \* \* \*.

The funds requested for fiscal year 1962 will provide for the evaluation of the information obtained in the initial phase and for engineering studies and design work required to construct or modify a drilling barge and equipment capable of drilling in water 15,000 to 20,000 feet deep and of penetrating the floor of the ocean by 15,000 to 30,000 feet.<sup>19</sup>

In reply to a question, Dr. Waterman briefly summarized the initial accomplishments of the program. Dr. Rubey elaborated further on this subject, noting that the work just completed "opens up a tremendous new picture for oceanography." The question was then addressed to Dr. Rubey as to "what is the next step?" To which he replied:

The immediate plan is to look over the data that were obtained to try to design a barge that will be able to handle more drill stem and pipe. The plans are for a ship that can drill to the Mohole.

That would be the plan for this next year, with money also being spent in the meanwhile trying to pick the best place for a deeper drilling, a site for the Mohole that would not be too deep.<sup>20</sup>

At this point, Dr. Waterman interposed: "\* \* \* We are now engaged in finding out what the next step should be." This next step was a "serious one." There were many technical problems, such as the limitations of materials for deep drilling. He then invited Dr. Robertson of the NSF staff to enlarge on this point. Dr. Robertson said there were "two roads we might take in parallel."

One is more drilling in deep water, relatively shallow drilling \* \* \*. This will give us a great deal of interesting geological information \* \* \*. On the other hand, we have to push ahead at the same time to plan for the very deep drilling \* \* \* to get down into the mantle \* \* \*.

Our budget for this \* \* \* contemplates primarily getting on with the engineering studies relating to the very deep drilling.

Another direction the program is taking is that people who have been thinking about oceanographic ships now feel that there should be a certain number of oceanographic ships with a drilling capability built in. I believe we are going to get a proposal in the near future for [another] oceanographic ship [containing] built into it, a center well and so on, for drilling in water up to 20,000 feet deep, and drilling 2,000 feet below the bottom.

Dr. Robertson estimated that the "cost to go 15,000 feet" would be "something like" \$15 or \$20 million. At this point in the program, NSF had spent \$1,570,000. The budget for 1962 called for the apporportion-

<sup>19</sup> U.S. Congress, House Committee on Appropriations, Independent Offices Appropriations for 1960, Hearings before the subcommittee of the \* \* \*. 87th Cong., 1st sess. pt. 2. (Washington, U.S. Government Printing Office, 1961), p. 444.

<sup>20</sup> Ibid., p. 445.

ment of the requested \$1 million for Mohole among five categories of effort. (See table.)

	<i>Fiscal year 1962 amount</i>
(1) Conduct of engineering studies necessary for the modification of the barge to be used as the drilling platform-----	\$300, 000
(2) Final site surveys-----	200, 000
(3) Design, development, and acquisition of certain logging devices and other scientific equipment-----	300, 000
(4) Scientific studies of logs and samples from phase I-----	100, 000
(5) AMSOC committee staff and panel work-----	100, 000
Total -----	<sup>1</sup> 1, 000, 000

<sup>1</sup> Ibid., p. 447.

Separate hearings on Mohole were conducted by the House Subcommittee on Oceanography of the Committee on Merchant Marine and Fisheries, under the chairmanship of Representative George P. Miller, May 22, 1961. The purpose of the hearing, according to the chairman, was “\* \* \* to ascertain whether legislation of a helpful nature will be necessary, whether specific funding authorization will be useful, or whether any other matter developed by the hearing requires the support of the Congress.”<sup>21</sup>

Much of the hearing was taken up by a detailed account by Willard Bascom about the *Cuss I* drilling voyage. In concluding his account, he made a number of points:

The most important asset the United States has in this new technology is the competence and unique knowledge possessed by the small team of men [who carried out the deep water drilling experiment].

A great many problems remain to be solved before we can design a ship capable of drilling to the Moho \* \* \*. This means we must have an experimental ship to try out ideas and develop equipment. [He went on: “To those who say ‘Why not immediately build a ship to drill the Mohole?’ I answer, ‘We do not know enough yet.’”]

Simultaneously with some of this [development] work, we will begin the design of the Mohole drilling ship and place on order the long leadtime equipment. Within 5 years we can reach the Moho.

[Finally, in a delicate allusion to the “race” he said: “If a modest sum of money is provided, we can put the United States far ahead in the exploration of the oceans.”]<sup>22</sup>

In response to the questions that followed his presentation, Bascom identified four sets of values of the Mohole project: (1) Geophysical discoveries, (2) geological studies, (3) oceanographic engineering, (4) drilling technology. He estimated that actual drilling to reach the mantle could start in 3 years, and that the cost of doing the complete job of reaching the Moho—assuming that a suitable Navy hull would be available as the drilling platform—would be on the order of \$15 million, although he qualified this estimate as being very time-dependent.<sup>23</sup>

Paul S. Bauer, consultant to the subcommittee, asked Bascom: “What does the project need to get the most done in the shortest time?” Without directly answering the question, Bascom cited the need for strengthened organizational arrangement, immediate funding, and authorization to proceed with the next phase of the project. On the question of suitable organization, he concluded:

<sup>21</sup> Oceanography 1961—Phase 2. Hearings, op. cit., p. 101.

<sup>22</sup> Ibid., pp. 104–105.

<sup>23</sup> Ibid., pp. 105–106, 121, 122.

I have been with the Academy [of Sciences] for some 7 years. I am a very loyal fan and supporter of the Academy. I would like to stay on there. It has been a very pleasant association. However, there are certain philosophical difficulties in whether or not the Academy should become an operating organization. I think the Academy doesn't want to be, but they are willing to be persuaded to it in some circumstances.

I think the Science Foundation doesn't want them to "operate," and, of course, the Foundation is not an operating organization either. So the question is how does one set up to support our group of people in the best possible manner. My second choice, if we cannot stay at the Academy, is that we either affiliate with some existing nonprofit corporation or form a new one to go ahead and do this job. I think it would be probably a real mistake to go to any other course.<sup>24</sup>

Following Bascom's testimony was that of Dr. William A. Benson of NSF. He assured the committee that his agency would "make every effort to get the necessary funds for proceeding with the Mohole project as expeditiously as possible." The Foundation was studying the problem of management, but had come to no firm conclusion. There was indeed a controversy as to the next step. He himself favored the intermediate ship, because it could be put to good use after it was built and tested. Funding was not a problem. As to the timing of the completion, he concurred in Bascom's estimates.<sup>25</sup>

The concluding witness, Dr. Roger Revelle, reported to the committee concerning the "wave of excitement and enthusiasm there is among scientists all over the country and in many fields in this proposal to drill into the interior of the earth."<sup>26</sup> It was an outstanding achievement:

We have done this. We have drilled through roughly 100 times as much water as any oil company has ever drilled through before, and we have drilled into the bottom about 10 times as far as any oceanographer has ever done before. This was done on the very first attempt. I think this is quite an accomplishment.<sup>27</sup>

After graphically describing the possibilities for the discovery of important scientific information, he concluded:

As far as I am concerned, I would divide the drilling into two parts. I think it is quite essential that we get to the Moho. This is a very high priority project for a variety of reasons, not the least being that it demonstrates the scientific and technical competence of the United States.

I think it also important that we drill a lot of holes through the sediments. I would like to see several hundred holes \* \* \*.

What I would like to see us do is divide this project very shortly into two parts, one essentially an oceanographic program of exploring the ocean by drilling, as well as by the geophysical methods; secondly, an engineering program designed specifically to develop the techniques and the technology, the know-how, to gain the experience, which will enable us to get down into the mantle of the earth.<sup>28</sup>

Dr. Revelle's estimate as to the time required to reach the mantle was 3 years: "\* \* \* 1 year with this intermediate drilling ship and then a year to put everything that has been learned into the big drilling ship and then 1 year more to do the drilling." His estimates to the cost was between \$20 and \$25 million.<sup>29</sup>

The requested \$1 million was granted by the House, and concurred in without further comment by the Senate. No effort was made to prescribe the organizational form the project should assume. The technical question as to priority of research emphasis, Congress had been

<sup>24</sup> *Ibid.*, p. 123.

<sup>25</sup> *Ibid.*, pp. 124-127.

<sup>26</sup> *Ibid.*, p. 127.

<sup>27</sup> *Ibid.*, p. 128.

<sup>28</sup> *Ibid.*, p. 134.

<sup>29</sup> *Ibid.*, p. 135.

assured, was under study. All witnesses were agreed that the task of reaching the mantle was difficult and expensive, but all were confident it was feasible, within at least 5 years. Possibly spokesmen for the petroleum drilling industry might have expressed a more pessimistic assessment of the feasibility question. Several years later, a petroleum geologist, Dr. Frank B. Conselman, in a letter in *Science* magazine, wrote with asperity on this matter. The achievement by AMSOC, he said, had been a "stunt" which "in all probability could have been accomplished by private enterprise in less time, with less expense, and with infinitely less fanfare." He suggested that it would "\* \* \* take more than press releases and self-serving propaganda to effect the transition between a wine-breakfast inspiration and an extremely difficult if not virtually impossible engineering accomplishment."<sup>30</sup>

While these two sets of hearings in 1961 identified many of the problems that later became troublesome, they were not judged by either the witnesses nor the committees as sufficiently serious to warrant specific action at that time. A sense of urgency overcame any latent inclination to defer further technical decisions until the promised studies had been completed. If the witnesses turned out later to have been unrealistically sanguine, at least their knowledge and experience in the subject at hand was collectively as adequate as could be expected. Even more important, it was all mutually consistent, with few hints of contradiction. Uncertainties remained, but the impression left by the witnesses was that these could be resolved in due course by careful, objective, deliberative processes.

#### *Congressional review following Mohole contract placement*

The decisions made in the early part of Mohole's second phase controlled its destiny to the end. The decision to emphasize the spectacular rush to the mantle imposed a need for an accelerated program. The difficulty in achieving the goal imposed the need for a contractor with special skills in an unprecedented kind of marine construction. Both of these requirements added to the cost of the ultimate achievement.

As soon as NSF had received its appropriation for the fiscal year 1962, the Foundation promptly began the process of selecting a contractor to manage the second phase of Mohole. The growing magnitude of the prospective undertaking underscored its attractiveness as a contract, and some 80 organizations were represented at the initial bidders' briefing session, July 27, 1961. Members of Congress took a considerable interest in the proceedings that followed; this was an occasion of doldrums in the aerospace industry, and many large companies were searching at the time for new market areas as opportunities for diversification. Among the companies that entered the competition for the Mohole contract were Aerojet-General Corp., General Electric, General Motors Corp., Melpar, Litton Systems, Inc., General Dynamics, Texas Instruments, and Minneapolis-Honeywell, as well as a number of oil companies. Among the not-for-profit corporations in the competition were the University of California, System Development Corp., Cornell Aeronautical Laboratory, and Battelle Memorial Institute.

Subsequently, NSF received 12 proposals. After a protracted screening process, Brown & Root of Houston was chosen as the contractor. This choice elicited adverse comment from some Members of Con-

<sup>30</sup> Dr. Frank C. Conselman. Letter to the editor. *Science* (vol. 143, 1964), p. 994.

gress. In particular, Senator Thomas H. Kuchel, of California, asked the Comptroller General of the United States, by letter of March 30, 1962, to inquire into this contract award. In response, an 18-page analysis was prepared by the General Accounting Office and transmitted June 18. It observed that in the initial screening process, NSF had used criteria and weights comparable to those used by other Government agencies in selecting contractors for research and development projects when the primary emphasis was on "the managerial and technical qualifications of prospective contractors." The fact that Brown & Root and the other bidders had included cost estimates in their proposals should not be regarded as of commanding importance. It was doubtful that "meaningful estimates of cost could have been developed for a research project such as Mohole \* \* \*." The policy factors considered in the final evaluation were legitimate and germane. Accordingly, the GAO report concluded, "we are unable to conclude that the award to Brown & Root was not in the public interest." Nor had the GAO scrutiny of the award procedure revealed evidence of abuse or misuse of NSF's contracting authority.<sup>31</sup>

Senator Gordon Allott, of Colorado, also interested himself in the Mohole contract and conducted an extensive interrogation of Director Waterman of NSF during Senate appropriations hearings in 1962.<sup>32</sup> However, the main thrust of his inquiry on this occasion concerned the contract award procedure rather than the technical aspects that underlay it—and in the last analysis controlled both the magnitude of the task, the magnitude of the cost, and the uncertainties confronting the contractor and NSF.

Although the Congress, on the basis of its own investigations and that of the GAO, found no reason to intervene in the contract between NSF and Brown & Root, the impression was apparently widespread that the selection process was tainted.<sup>33</sup>

#### *The intermediate versus the ultimate drilling vessel*

Brown & Root disclosed the preliminary design for the ultimate Mohole drilling platform in the spring of 1963. It called for a large structure (279 by 234 feet surface area) costing on the order of \$40 million to build. It would achieve the stability required for the climactic drilling task of reaching the Mohole. But it would do so at considerable cost in mobility and ease of transiting—it could not pass through the Panama Canal, or enter many of the principal harbors of the world. It was too large to be drydocked. It could move at only 10 knots. Its annual operating cost was estimated at \$9 million (later \$13 million). The large size and sophisticated design only anticipated the tooling to be installed on the platform for the ultimate drilling: more development work would be required to complete the design of the drilling system.

<sup>31</sup> Letter to Hon. Thomas H. Kuchel, U.S. Senate. Reproduced in: U.S. Congress, Senate, Committee on Appropriations, Independent offices appropriations, 1963. Hearings before the subcommittee of the \* \* \* on H.R. 12711, making appropriations for sundry independent Executive Bureaus, Boards, Commissions, Corporations, Agencies and Office, for the fiscal year ending June 30, 1963, and for other purposes. 87th Cong., 2d sess. (Washington, U.S. Government Printing Office, 1962), pp. 1388-1394.

<sup>32</sup> *Ibid.*, pp. 1371-1426.

<sup>33</sup> For example, Greenberg, *op. cit.*, in comment on the GAO report to Senator Kuchel, observed that "\* \* \* whether or not the selection was in the public interest, its appearances were so suspect that, in addition to the growing confusion over objectives, Mohole now bore the stigma of being involved in a questionable political deal." The effect, he added, was to bestow on Mohole a "detrimental political image," p. 191.

The submission of the Mohole platform design only served to intensify the opposition by Dr. Hedberg<sup>34</sup> and some of his AMSOC associates. The cost of acquisition and maintenance of the platform threatened to absorb resources that they would prefer to see employed in a wider range of less ambitious drilling.

Although up to 1963 AMSOC appears to have been ambivalent on the question of whether the emphasis of Mohole should be on reaching the mantle or exploiting the technology of submarine drilling to acquire scientific information, the underlying purpose was undoubtedly the latter. The spectacular aspect of the former goal appears to have been accepted as necessary to win popular support and funding for the scientific purposes—especially as reinforced by the notion of an international competition. However, as the cost of the spectacular continued to mount, the prospect dwindled of achieving commensurate scientific information. To many members of the AMSOC committee, the prospective scientific yield of Mohole appeared to be limited to that to be acquired incidental to the drilling of one deep hole. Accordingly, by late 1963, Dr. Hedberg was motivated to develop and present his case that Mohole's objectives should be redefined, and its programming changed. Although he made clear that he spoke only for himself, he described his views, as substantially those of the other members of AMSOC and, indeed, widely held.

As matters stood, at the end of October 1963, most of the AMSOC committee members were in opposition to the plan of NSF and Brown & Root for the immediate construction of the ultimate Mohole platform. The issue became paramount in hearings before two congressional committees, and substantially the same testimony from many of the same witnesses was presented at each. One was the House Subcommittee on Oceanography (October 31, November 12, 1963); the other was the Senate Appropriations Subcommittee on Independent Offices Appropriations (October 28, November 1).

Before both committees, Dr. Hedberg presented his case for an intermediate drilling program. Said Hedberg of Mohole:

\* \* \* This project can readily be one of the greatest and most rewarding scientific ventures ever carried out \* \* \*. It can just as readily become instead only a foolish and unjustifiably expensive fiasco if there is not insistence that it be carried out within a proper concept and in a well-planned, rigorously logical and scientific manner. There must be insistence that it not be allowed to degenerate into merely another costly publicity stunt. [His aim and AMSOC's was to keep the project] on a sound and rational basis which will give to science and engineering and to this country a maximum return in value received for dollars spent \* \* \*. I would far rather see this project killed where it now stands than to see it carried out in a manner not worthy of its potentialities or in any way which will not insure that the country gets its maximum money's worth \* \* \*.<sup>35</sup>

The belief that a science spectacular was needed to win popular support, according to Dr. Hedberg, was erroneous.

<sup>34</sup> Dr. Hollis D. Hedberg, a vice president of Gulf Oil Co. and part-time professor of geology at Princeton, had become chairman of AMSOC Dec. 9, 1961. He was also president of the American Geological Institute and a past president of the Geological Society of America.

<sup>35</sup> Independent Office Appropriations, 1964, op. cit., pp. 1637-38; U.S. Congress, House, Committee on Merchant Marine and Fisheries, Mohole project, Hearings before the Subcommittee on Oceanography of the \* \* \* June 25; Oct. 29, 30, 31; Nov. 7, 12, 1963, 88th Cong., first sess. Serial No. 88-14. (Washington, U.S. Government Printing Office, 1963), pp. 39-40.

It is my opinion [he said] that there is a steadily growing ground swell of informed public opinion rising against the thought of a poorly planned, foolish, and extremely costly attempt to unnecessarily "shoot the works" by trying to drill an ultradeep hole to the mantle before we have anywhere near enough information on the rocks above the mantle to know intelligently what we are doing \* \* \*. The initial false glamour of the Mohole idea is wearing off in the face of realities, and I am sure the informed public now finds a much greater appeal in a broad, sensible program of crustal investigation carried on at a moderate rate rather than a crash Mohole stunt.<sup>36</sup>

Moreover, there were sound technical reasons why the intermediate "experimental-exploratory stage" should not be bypassed. An intermediate drilling vessel should be built and tested because of—

(1) The greater mobility of such a smaller vessel and its ability to move readily from one ocean to another;

(2) The lesser delay involved in its construction and the consequent advantage of earlier returns of data;

(3) The need for experience with a moderate-depth drilling vessel in order to decide what should be the final character of the ultimate vessel;

(4) The advantage of having further experience available for utilization in the design and construction of drilling equipment;

(5) The need for continuing investigation of alternative and supplementary sites during the long interval in which the ultimate vessel will be tied up on its initial Mohole effort, estimated at maybe 2 or 3 years;

(6) The overall long-range economy to the project which it could effect in terms of results obtained for money expended; and

(7) The fact that such an intermediate vessel would find immense and continuing service in the long-range national investigation of ocean crustal sediments which is quite certainly to be anticipated after the immediate objectives of the Mohole project have been fulfilled.<sup>37</sup>

The information that would be acquired from the operation of an intermediate drilling vessel would be meritorious in itself, as well as essential to the proper planning of the ultimate Mohole project:

(1) The information to be obtained from a number of strategically located, moderate depth, oceanic holes is essential to the proper choice of the best location for a Mohole.

(2) The information from such holes is essential background for adequate interpretation of the results of a Mohole when drilled.

(3) The information which can be obtained from any one of the moderate depth holes will be, at this stage in our knowledge, a contribution to science and national prestige at least equally as great as may be expected from penetration of the Mohole, and can be attained much earlier and more certainly.

(4) The drilling of moderate depth holes in oceanic waters will furnish invaluable experience in vessel design and drilling techniques for use in ultimate Mohole drilling, which may very conceivably mean the difference between success and failure in attaining the ultimate objectives of the project.

(5) Experience and knowledge gained in preparatory drilling may well result in overall long-range economy and reduction in costs for the project as a whole.

(6) The more easily accomplished initial moderate depth holes will provide definite insurance for the success of the project, regardless of success or failure to reach the Moho, by the early attainment of other goals of major importance.

(7) The program of the intermediate stage approach is in harmony with the broad framework of the project as previously approved by Congress.<sup>38</sup>

Hedberg criticized the "narrow and oversimplified concept" that had developed of the project. The geology of the earth had been misrepresented; in reality the picture was infinitely more complicated and confused. Not one hole but many holes of various depths and at various locations were needed to reveal the true situation. He did not think it made sense to "strain wildly for a single deep hole to the mantle"

<sup>36</sup> Mohole project, Hearings, op. cit., p. 45.

<sup>37</sup> Ibid., pp. 44-45.

<sup>38</sup> Ibid., pp. 44-45.

without first learning something about the upper layers and where best to drill. It might not even be possible—

We have really no assurance that the rock character at depth is such that it will stand open in a hole to Moho depths and temperatures, or that a hole to the deep mantle will even be possible. We hope that such holes will be eventually attainable \* \* \*.<sup>39</sup>

In short, what he recommended was—

\* \* \* that the Mohole project be carried forward only by a route which involves as an initial and integral part of the project an adequate preparatory stage of moderate depth, experimental exploratory oceanic drilling \* \* \* by a mobile vessel of moderate drilling depth capacity \* \* \*. We believe this is the sane, logical, and economical approach which will not only provide the best promise of an eventual successful sampling of the deep mantle but will also provide a maximum return in national scientific prestige through its early contribution of numerous discoveries in the suboceanic sediments and deeper crust of equal or even greater scientific importance, prior to a possible eventual Moho penetration. We believe that this approach offers positive assurance of a successful project, whether or not the Moho is attainable \* \* \*.<sup>40</sup>

Dr. Hedberg was supported in the Senate hearing by Lewis Rupp (Captain, U.S. Navy, retired) chairman of AMSOC's naval architecture panel. He said that he had advocated the intermediate vessel as "an ideal tool for continued investigations of ocean sediments and intermediate crustal layers after completion of the pre-Mohole development and exploration phase." The alternative of going directly to the design of the ultimate vehicle entailed highest cost and engineering risk. He concluded:

Even at this date, I firmly believe that the public and the scientific community would be best served by carrying out a two-ship program.

Immediate investment in a modest intermediate vessel, with deferral of construction of the ultimate vehicle until some of the development problems are better defined, would not only save the public considerable dollars, serve the scientific community more fully with earlier concrete results, but also minimize the risk of a major fiasco.<sup>41</sup>

Dr. Leland J. Haworth, who as Director of NSF presented the administration's position on Mohole, saw merit in both shallow drilling and the ultimate program, and suggested they be performed in tandem: moreover, the intermediate drilling was a necessary preliminary to the ultimate hole. "The only controversy with respect to this intermediate drilling program," he said, "is whether or not that drilling should be done with an intermediate ship or whether it should be done with the final ship."<sup>42</sup> He noted that some, but not all, members of AMSOC regarded survey drilling to the third layer (i.e., intermediate depth) as having "a higher scientific priority than penetration to the mantle, which is now conceived by them as an ultimate, long-range objective rather than an immediate, high-priority goal."<sup>43</sup> In order to derive his recommendation for a course of action, he expressed the following chain of reasoning:

1. It had been a mistake to consider the Mohole project as a single action, in cost and time. The facilities to achieve the ultimate goal would thereafter be used continuously and indefinitely for scientific purposes.

<sup>39</sup> *Ibid.*, p. 45.

<sup>40</sup> *Ibid.*, p. 46.

<sup>41</sup> Senate. Independent offices appropriations, 1964, op. cit., pp. 1654-1655.

<sup>42</sup> *Ibid.*, p. 2334.

<sup>43</sup> *Ibid.*, p. 2335.

2. It would be preferable, and he was exploring the possibility of arranging, to have a "full-time operating scientific institution, such as a university, an institute, or a national laboratory directly responsible for the program." ("Neither the National Academy nor the National Science Foundation is, or in my opinion should be, such an operating organization \* \* \*.")

3. There was general agreement as to the need for an intermediate drilling program. ("It is well recognized by all concerned that so difficult a task as this will require the gaining of experience through the performance of successively more difficult tests, learning, improving, and augmenting the equipment as the work proceeds.")

(4) The question had been complicated by the fact that such an intermediate ship would later become available for other unrelated tasks.

(5) The alternatives, as Dr. Haworth saw them, were:

(a) To build the ultimate vessel, equip it with the ultimate drilling system, and "proceed as expeditiously as possible in an attempt to pierce the mantle." Any preliminary drilling at intermediate depth would be principally to acquire experience and develop technique.

(b) To build the ultimate vessel, and perform shallow and intermediate drilling for an extended period for scientific purposes before committing the vessel for 2 or 3 years to the mantle-penetration task.

(c) To complement the large vessel by a small vessel to do the shallower types of drilling, without encountering any of the problems or providing any experience relevant to the engineering, design, or technique problems of the deep penetration job.

(d) To design and construct an intermediate vessel equipped qualitatively to do everything expected of the ultimate vessel though not capable of as deep penetration, and to use experience gained with it to provide design and operational guidance for the ultimate vessel.

(e) Finally, one might "proceed directly to build the ultimate vessel hull but not equip it initially with the ultimate equipment designed to drill the Mohole proper." Its initial equipment would be for intermediate drilling, guided by scientific considerations and general drilling, while learning the art. The ultimate hole could be deferred as long as desired.

(6) It was unfortunate that "in parallel with the work of Brown & Root, there was not a continuous drilling program directed both at the development of equipment and techniques and at acquiring useful scientific information, including data bearing on the site selection question."

(7) "\* \* \* Research and development carried out by Brown & Root and their subcontractors have reached the stage where further progress toward the ultimate Mohole ship would be seriously delayed by the intervention of an intermediate ship."

The course he would recommend, he said was (e). His reasons were:

This course of action would (1) provide a very stable platform for the intermediate or "experimental" drilling program, permitting full attention to be given to the problems inherent in the actual drilling; this advantage is strongly emphasized by the AMSOC Drilling Panel; (2) provide a facility for inter-

mediate and deep drilling for scientific purposes; (3) provide from the beginning a vessel capable of supporting the ultimate equipment required for the mantle penetration, thus avoiding the necessity of constructing two expensive vessels for the deeper drilling; (4) give assurance to all concerned that piercing of the mantle remained a firm objective not contingent on a later decision to build a second full-scale vessel; (5) in my opinion, minimize the cost of the mantle piercing program.

In addition, he was prepared to recommend a "supplementary drilling program not part of Project Mohole, utilizing a much smaller vessel of, say, 5,000 or 6,000 tons." This would be used for "drilling in the unconsolidated sediments and into the immediately adjacent rock." It would require a modest capital investment, of the order of \$1 million.<sup>44</sup>

The recommendations of Dr. Haworth before the Senate hearing were supported by testimony from William B. Heroy, Chairman of the Panel on Drilling Techniques of AMSOC. He favored the "crustal program" but believed that it should not be considered as an integral part of the whole project. Both should proceed on their own merits. He said:

I believe that the Mohole project should go forward as vigorously as possible, not as an "engineering stunt" but as a highly important and challenging scientific program. The geology of the earth beneath the sea may well prove to be as complex and varied as that upon the continent. A Mohole vessel will, like a cyclotron or a radiotelescope, be an apparatus that should be useful for many years in the investigation of the vast submarine areas.<sup>45</sup>

In the House hearing, Dr. Haworth was supported by a delegation from Brown & Root, whose principal spokesman was Dr. William H. Tonking, deputy project manager. Dr. Tonking summarized the technical progress that had been achieved in the design of the drilling platform, the drilling system, other major components, and site selection. He set the cost of the total program at \$68 million and forecast its completion by September 1969. As to the controversy over intermediate ship or intermediate drilling program, he said the plan was to "walk before we run, but we think that we can do this with one vessel rather than with two." Subsequently, he added:

The time to accomplish the prime objective, as reflected in our critical path planning, is controlled by the design, construction, and operation of the Mohole platform. Any delay in this plan would prolong the accomplishment of this prime objective. If an intermediate ship were added to the program and designed and constructed concurrently with the Mohole platform, costs would be considerably higher and time to reach the mantle would not be shortened.<sup>46</sup>

The alternatives described by Dr. Haworth had also been considered, early in 1963, by an advisory panel organized by Dr. Waterman at the suggestion of the White House. This Panel, under the chairmanship of Dr. E. R. Piore, a vice president of IBM and formerly a member of AMSOC, was asked to review NSF plans for the second phase of Mohole. A principal purpose of the panel was to help resolve the controversy over the intermediate versus the ultimate drilling vessel.<sup>47</sup> The preliminary findings of the Panel, expressed in a memorandum for the chairman of the National Science Board and dated July 18, 1963, was presented to the Senate committee by Dr.

<sup>44</sup> *Ibid.*, pp. 2358-2364.

<sup>45</sup> *Ibid.*, p. 2372.

<sup>46</sup> House, Mohole project, Hearings, *op. cit.*, pp. 107-160, especially pp. 131-132.

<sup>47</sup> Other members of the committee were Drs. Francis Birch, Jacob P. Den Hartog, John D. Isaacs, A. B. Kinzel, Konrad B. Krauskopf, and William W. Rubey.

Haworth. It said that "the Panel feels strongly that the Mohole program should be prosecuted with great vigor, and that funds should be made available now for the construction of the necessary drilling vehicles." The Panel "unanimously" agreed that an intermediate drilling vehicle should be constructed "promptly," but that "this should in no way impede the design and construction of the final vehicle by Brown & Root."<sup>48</sup>

It is evident that by the end of 1963 the scientific community had dropped the idea of a race to the mantle, in favor of a more cautious, deliberate, reasonably paced, and hopefully less costly program of broader scope. The sense of urgency still pervaded NSF and the contractor. Although Dr. Haworth evidently appreciated the force of the AMSOC appeal for a broad-based program of scientific investigation, he still gave priority—or perhaps was committed—to the initial goal of Mohole. A modest program of ocean sediment drilling, proposed by NSF, failed to win approval of the Bureau of the Budget for 1965, while the NSF was authorized by the Bureau to proceed with its construction plans for Mohole.

The immediate outcome of the two hearings was that the Mohole project, including the ultimate drilling platform, received the green light. The President's 1964 budget message contained an item of \$25 million for its continuation. On the other hand, the review brought no major change in organization of the project. AMSOC as a source of formal criticism and policy recommendations had been eliminated.<sup>49</sup> And Mohole itself would thereafter remain vulnerable to the charge that it represented a priority for the science spectacular, at the expense of a scientific program.

#### *NSF interrogation by Subcommittee on Science, Research, and Development*

A different approach to the acquisition of program information on Mohole was explored by a subcommittee of the House Committee on Science and Astronautics. A letter was sent to the Foundation, July 17, 1965, over the signature of Representative Emilio Q. Daddario, chairman of the subcommittee, presenting more than 100 questions as to various aspects of the NSF program, policies, organization, and funding. In one section, National Research Programs of NSF, there were six questions directed at the Mohole project. Five of the questions sought information about Mohole's objectives, accrued and expected benefits, status, platform construction progress, technical problems and their solutions, the prospect of follow-on activity, expected completion, and cost data.

The response, transmitted by Director Haworth August 16, 1965, made clear that NSF was increasingly regarding Mohole as a continuing activity rather than a race to the mantle. While the reaching of the mantle was the "most difficult objective" of the project—

we consider this Project as but one aspect of a program with a much broader aim of exploring the sea floor by deep drilling in as many of the world's oceanic regions as possible \* \* \*.

Placing the program in its proper perspective, we may state that the Mohole project will lead the way toward opening the deep portions of the earth to the direct scrutiny and analysis of scientists.

<sup>48</sup> Senate, Independent offices appropriations, 1964, op. cit., pp. 2376-2377.

<sup>49</sup> On Jan. 18, 1964, the committee voted unanimously to disband.

In addition to the scientific advantages of the program (which the reply discussed at some length), there were many engineering benefits: the various possible uses of the stable platform to place equipment on the ocean floor and recover it, to track satellites, and to perform heavy work at sea; various components developed in the project would be of direct value to the petroleum industry.

With respect to organization, the subcommittee had asked concerning the "Foundation's plans and prospects for having scientific guidance of the project moved outside of the Foundation." The response to this question was of considerable interest because in his testimony in 1963, Director Haworth had indicated his intention to try to arrange for management of the program by some academic institution or research institute. However, at this time he added merely that this was still his intention. There were two groups that had expressed interest: JOIDES (Joint Oceanographic Institutions for Deep Exploration of the Sea) comprised of Columbia University, the Woods Hole Oceanographic Institution, the Scripps Institution of Oceanography, and the University of Miami; and GURC (Gulf Universities Research Corporation) comprised of the University of Houston, Rice University, University of Texas, Florida State University, Louisiana State University, Southern Methodist University, and Texas A. & M. University. The JOIDES group had indicated that it would not be interested in taking over the project until the Mohole platform had been operationally demonstrated. There had been one informal and unofficial visit to NSF by representatives of GURC.

As to the cost of the program, it was now possible to provide a firmer set of estimates. Bids had been received from four shipyards, and the apparent low bidder, National Steel & Shipbuilding Co., of San Diego, had offered a bid of \$29,967,000 to construct the platform. The "total estimated cost of the prime contract prior to drilling is \$77 million." (This was an increase of between \$25 and \$30 million over cost estimates in 1964.) Operational cost estimates were now set at \$11 million annually. (In 1964, the figure had been \$9 million.)

The cost summary of the project to date (apparently to the end of the fiscal year 1964) included:

Phase I-----	\$1, 810, 000
Phase II—Funds allocated:	
Fiscal year 1962-----	1, 594, 490
Fiscal year 1963-----	3, 289, 100
Fiscal year 1964-----	7, 977, 338
Fiscal year 1965-----	24, 699, 300
Total -----	37, 560, 228

NSF had paid out \$1,410,228 for advisory services; the remainder had been allocated to Brown & Root, of which \$22,459,872 remained uncommitted.

A separate question from Representative Daddario to NSF concerned the report of the Piore panel. Had it ever been released? What were its recommendations? Were they implemented? The answer was that no written report was ever transmitted or formalized. The "urgent points made by Dr. Piore's committee" were:

That work be performed with an "intermediate" drilling unit before construction of a drilling system having full depth capability;

That it was acceptable to conduct intermediate drilling from a platform having adequate size and power supply to accept and operate full depth drilling equipment;

That Mohole be made part of a "well-planned national effort in submarine geology" that would also include shallow drilling in ocean sediments;

That NSF organization to manage the project be strengthened;

That a suitable (presumably academic or research institutional) organization be selected to assume responsibility for scientific operations.

Said NSF:

All of the most urgent points made by Dr. Plore's committee were taken into consideration in arriving at the plan for the project now being followed.

*Congressional action to terminate the Mohole project*

On May 10, 1966, the House of Representatives received the report of Representative Joe L. Evins, chairman of the Subcommittee on Independent Offices Appropriations. Concerning Mohole he said:

The subcommittee recommended—and the full committee approved—we are deferring of further appropriations for Project Mohole at this time. This is a very costly project with marginal and questionable benefits—a project of low priority.

In view of the world situation and the pressures and demands on our budget—priority funding—the committee feels that this is not the time to expend huge sums of money to dig a hole.

The cost of the Mohole project has already greatly exceeded the original estimate and promises to increase still further. Current estimates are that the Mohole project will cost somewhere between \$80 and \$115 million.

Over a period of a decade the costs would be half a billion dollars. No funds are included in the bill for the Mohole project.

Certainly this is one project that can be deferred.<sup>50</sup>

Only a few members demurred at this action reported by the new subcommittee chairman.<sup>51</sup> Several members from Hawaii, where much of the new drilling would have taken place in the Mohole project, expressed regret at the loss to science that would result from the termination. There were regrets also that the program was being scrapped after so much effort had been invested in it. World interest had been aroused and would now be disappointed. Several references were made to the drilling program of the Soviet Union. However, it was evidently true, as Representative George P. Miller, chairman of the Committee on Science and Astronautics, observed, that the Mohole program had "no champion."

But it is important [he said]. It is a part of earth sciences, and the earth sciences are a neglected field of science, and only now are we beginning to understand and take cognizance of them and what they amount to.<sup>52</sup>

Representative Evins responded that his subcommittee was indeed interested in science. But "in the opinion of many competent observers, this project is a giant boondoggle." If it was not stopped, the cost would rise to a half billion dollars over the next 20 to 30 years, "before it [is] completed." There were several other marine core drilling programs, including the JOIDES program, that showed great promise of scientific rewards at less cost. Therefore, he concluded, "I think \* \* \* we can save this \$20 million now and a half billion dollars by terminating this contract."<sup>53</sup>

<sup>50</sup> Statement on H.R. 14921, Independent offices appropriation bill, 1967, Congressional Record (May 10, 1966), p. 9727.

<sup>51</sup> Representative Evins had assumed the chairmanship of the subcommittee upon the death of Representative Albert Thomas of Texas, in January 1966.

<sup>52</sup> Congressional Record, *Ibid.*, p. 9746.

<sup>53</sup> *Ibid.*, pp. 9746-9747.

The House apparently agreed. No separate vote was taken on the Mohole cut and the appropriation bill was passed by a vote of 296 to 82 with 54 not voting.<sup>54</sup>

An effort was made to restore the cut in the Senate. The Subcommittee on Independent Offices Appropriations held 2 days of hearings on Mohole (May 25 and June 13), at which some 8 witnesses testified in support of the project. Many Members of the Senate gave testimony or communicated expressions of support, and a number of State Governors sent letters of support. On May 25, 3 technical witnesses from outside the Government made presentations. They were:

Prof. Harry H. Hess of Princeton University.

Dr. George P. Woollard, president of the American Geophysical Union and director of Hawaii Institute of Geophysics.

Dr. Grover E. Murray, chairman, U.S. National Committee on Geology, Gulf Universities Research Corp., and also representative and past president of the American Association of Petroleum Geologists, professor of geology at Atlanta State University, vice president of Louisiana State University, and president-elect of Texas Technical College.

Professor Hess, who had been present at the inception of the Mohole project, enumerated its many scientific and practical benefits. In response to a question from Senator Allott, he admitted to a share of responsibility for the early miscalculation as to its cost. ("We were scientists and not engineers, and we took rough guesses at what the cost of this sort of project would be." Also, "'\* \* \* We were largely doing it on a shoestring or trying to \* \* \*')<sup>55</sup>

The second technical witness was Dr. G. P. Woollard, whose academic affiliations were nearest to the proposed Mohole drilling site, and who accordingly had a special professional interest in the project. He reviewed the geological aspects of Mohole, referred—as did most of the other witnesses—to the possibility of Russian achievements in deep drilling, and suggested that knowledge of the mantle might contribute to an understanding of earthquakes, improve the detection of illicit nuclear tests, and help to establish U.S. claims to mineral rights on the Continental Shelf. The availability of a stable floating platform in deep water would also have important "direct" benefits for oceanographic research.<sup>56</sup>

Dr. Grover E. Murray described Mohole as a scientific and engineering project "of the very highest order of priority to the earth scientists of the United States whose responsibility it is to maintain and to locate new reserves of minerals and natural resources of all kinds." The Mohole platform would be beneficial, he said, in furtherance of oceanographic research that, in turn, had important implications for national availability of essential industrial materials, and would contribute to meet the food requirements presented by the population explosion.<sup>57</sup>

<sup>54</sup> *Ibid.*, p. 9760.

<sup>55</sup> U.S. Congress, Senate, Committee on Appropriations, Independent Offices Appropriations for Fiscal Year 1967. Hearings before the subcommittee of the \* \* \* on H.R. 14921, Making Appropriations for Sundry Independent Executive Bureaus, Boards, Commissions, Corporations, Agencies, Offices, and the Department of Housing and Urban Development for the Fiscal Year Ending June 30, 1967, and for Other Purposes, Pt. 2, May 24, 1966—June 14, 1966, 89th Cong., 2d sess. Pt. 2. (Washington, U.S. Government Printing Office, 1966), pp. 1245—1253, especially p. 1250.

<sup>56</sup> *Ibid.*, pp. 1253—1267.

<sup>57</sup> *Ibid.*, pp. 1268—1277.

Testimony of administration witnesses opened on June 13. In anticipation, Dr. Haworth had sent a letter to the subcommittee chairman, Senator Warren G. Magnuson, June 1, in which he urged that the House reduction in NSF funding be restored. The letter said in part:

I strongly recommend that the Senate support a continuation of Project Mohole, an important and unique scientific effort which the House action would, in effect, force us to cancel. My recommendation is endorsed by the Bureau of the Budget, the President's science adviser, the National Science Board, and a number of outstanding geologists and geophysicists with whom I have recently consulted. Most of the major technical and engineering problems associated with this project have now been solved or are about to be solved, and we are now moving ahead with excellent prospects for successful conclusion and with relatively firm estimates of cost.<sup>68</sup>

In his prepared statement to the subcommittee, Dr. Haworth reviewed the kinds of information that would be obtained by drilling through the earth's crust and on into the mantle—

1. A better age determination for the earth.
2. A determination of the age and origin of the ocean basins and their contained sea water.
3. A better understanding of how the earth-moon system came into being.
4. An understanding of the distribution of the chemical elements in the earth, which in turn bears on the origin of the sun and perhaps other stars.
5. An understanding of the origin of continents and whether or not they are drifting about on the earth's surface.
6. Knowledge of the mantle's composition and the origin of magnetic and gravity anomalies that have been discovered beneath the sea.
7. A better understanding of the origin of life and the carbon cycle with which it is closely connected.<sup>69</sup>

He enumerated the many scientific and technical purposes that could be served only by deep drilling. With respect to the JOIDES program, Haworth said it was a complementary program to obtain samples from shallow depths. He noted:

There seems to be a mistaken impression in some quarters that this program would be a satisfactory substitute for Project Mohole. Although complementary, they are, in fact, dissimilar in objectives. In contrast to Project Mohole, which is aimed at drilling for many thousands of feet in hard rock, the ocean sediment coring project is directed at securing cores from the relatively soft layers of sediment just below the ocean bottom. These cores will involve penetrations ranging from a few hundred to a few thousand feet, depending on the hardness of the material. The platform and the drilling and station-keeping equipment are not designed for the longtime drilling required for very deep drilling in hard rock, nor will there be any capability for hole reentry when it is necessary to withdraw the drill stem and casing. The samples obtained from the ocean coring project will permit important studies of the history of the oceans but will yield little or no information regarding the deeper crustal rocks, and the mantle will of course, not even be approached.<sup>69</sup>

In reviewing the costs of the Mohole program, Haworth said the total acquisition cost of the fully equipped drilling platform was now estimated at \$85.6 million, with annual operating costs of about \$13 million. About \$21 million would have been spent by the close of the fiscal year 1966. Forecast requirements for Mohole funding were:

	<i>Millions</i>
Fiscal year 1967-----	\$19.5
Fiscal year 1968-----	18.5
Fiscal year 1969-----	13

<sup>68</sup> Letter reproduced in *ibid.*, p. 1492.

<sup>69</sup> *Ibid.*, p. 1631.

<sup>69</sup> *Ibid.*, p. 1636.

He noted that because of its size, the Mohole project had been "the subject of almost continuous review." However, there was, in fact, little new to be said of it—most of the formal testimony was a rehash of earlier statements except for the new and larger funding requirements.

Dr. Hornig, the President's science adviser, assured the subcommittee that "We consider Mohole a major ingredient in our national effort on ocean science and deep ocean engineering \* \* \*."<sup>61</sup> Dr. Frederick Seitz, President of the National Academy of Sciences, appealed for restoration of the Mohole project which he said was "still regarded as a soundly conceived scientific program. It has continued to receive the support and interest of those most qualified to judge the merits of work in this field." Dr. Seitz made this comment in the context of a policy recommendation concerning support of science in wartime. Noting that the House had related the proposed appropriation cut to the need for economy "to recoup some of the expenditures for the Vietnamese war," he urged that—

The challenges presented to our Nation today because of world tensions and conflicts should cause us to redouble our efforts in the pursuit of good science and engineering and not to blunt them. It is notable that during World War II when the Soviet Union was fighting for its life as an independent nation it took important steps to protect work in basic and applied science behind its frontlines.

The success of the leaders in accomplishing this goal explains in substantial measure why the Soviet Union was able to have a fission bomb by 1949 and a hydrogen or fusion bomb about the same time as we.

It also explains in part why they were able to launch an earth satellite substantially before we did. Science and its applications represent the lifeline of our Nation, to the future.<sup>62</sup>

The remaining legislative history of Project Mohole is brief. The Senate Appropriations Committee restored the Mohole funding to the bill as reported. The Senate passed the amended bill August 10, by a record vote of 82 to 2 with 16 not voting,<sup>63</sup> after a proposed amendment by Senator Allott to delete the Mohole provision had been rejected by a vote of 46 to 37 with 17 not voting.<sup>64</sup> The bill went to conference. In the conference committee, Senator Magnuson, chairman of the Senate delegation, agreed that if the House should sustain the cut by a record vote the Senate conferees would agree to the cut. On August 18, the House voted (108 to 59) to sustain the cut.<sup>65</sup> The Senate on August 24 agreed to recede from the Mohole amendment<sup>66</sup> and to accept the conference report.<sup>67</sup>

### III. CONCLUSIONS

Undoubtedly Mohole must be accounted a failure. After many brave words about securing supremacy for the United States in the exploration of "inner space," and investing some \$36 million in the enterprise, those responsible for managing and supporting the project

<sup>61</sup> *Ibid.*, p. 1535.

<sup>62</sup> *Ibid.*, pp. 1771-1772.

<sup>63</sup> Independent offices appropriations, 1967. Remarks on the floor of the Senate. Congressional Record (Aug. 10, 1966), p. 18095.

<sup>64</sup> *Ibid.*, p. 18093.

<sup>65</sup> Independent executive agencies and the Department of Housing and Urban Development appropriations, 1967. Remarks on the floor of the House. Congressional Record (Aug. 18, 1966), p. 19065.

<sup>66</sup> Independent offices appropriations, 1967. Conference report. Discussion on the floor of the Senate. Congressional Record, (Aug. 24, 1966), p. 19637.

<sup>67</sup> *Ibid.*, p. 19635.

abandoned the effort. If Russian scientists elect to take up the task it will be without the stimulus of U.S. competition.<sup>68</sup>

Of course, Mohole had many beneficial side effects. It generated a tremendous volume of educational values—through hundreds of technical papers, books, and articles about deep ocean drilling, and informative testimony in congressional hearings. There seems to be no doubt that additional students have been attracted into the earth sciences—oceanography, seismology, geophysics, geology, and others. Vigorous programs, supported by NSF, are currently underway in both shallow and deep water drilling. In particular, the JOIDES program, that Dr. Haworth so carefully distinguished from Mohole, is now beginning more and more to resemble the original AMSOC plan for a series of “intermediate” drillings.<sup>69</sup> While there is slim prospect that any drilling ship or platform now available can reach the earth’s mantle, a persuasive case could be made that events are in motion toward that goal.

Many factors contributed to the failure of Mohole. The initial motivating concept passed too readily from science program to spectacular project. The initial AMSOC committee and staff, called upon to convert itself from a resourceful operational team into a policy consulting group, was not equal to the disciplinary restraint of the advisory function. The NSF was apparently not fully qualified to manage such a major undertaking, and, once loaded down with a restricting contract, found itself unable to enlist a suitable academic management to assume the burden of managing an enterprise in which so many commitments had been made in advance. The synthetic pressure of urgency imposed by the fictional “race to the mantle” compelled NSF to place the Mohole phase II contract prematurely. NSF felt compelled to select a commercial engineering manager rather than pursuing the more deliberate and time-consuming course of encouraging the formulation of an academic consortium to plan, develop, and execute a comprehensive and balanced program of scientific exploration and research, mainly centered on exploitation of the new capability for deep ocean drilling. The contractor selection procedure itself left nagging uncertainties. The disagreement among scientists as to the intermediate versus the ultimate vessel, complexly linked to the issue of many holes versus one hole, weakened the confidence of the Congress in the scientific basis of the project, as well as in its management and the prospective results. The contract requirements compelled the contractor into the design of a ponderous and inflexible platform that would be costly to operate

<sup>68</sup> Although the much-cited Soviet competition during the active life of the Mohole project lacked sufficient substance to be credible, Soviet drilling programs are continuing. According to *Business Week* “\* \* \* Soviet geologists are urging that an attempt be made to drill through the volcanic rock in the Kurile Islands, off Japan, where the earth’s crust is said to be relatively thin.” The account continues: “The Kurile venture might produce the first scientific evidence concerning the earth’s mantle. Penetration of this interior layer \* \* \* could conceivably provide a key to the riddle of how and when the earth began.” (Dig-we-must project, Soviet style, passes 3-mile mark in search for geological data. *Business Week* (Mar. 25, 1967), p. 118).

<sup>69</sup> See: Jonathan Eberhart. *Drilling Under the Sea*. *Science News*. (Aug. 10, 1968, vol. 94), p. 143. “More than 60 holes will be drilled during the 18-month voyage, and although none of them will penetrate as far into the crust as would have the 4-to-5-mile Mohole (the deepest will reach about 25,000 feet), some may originate in 20,000 feet of water, more than a mile deeper than the Mohole site.” See also: *Scientists Launch Coring Program To Explore Deep Ocean Sediments*. *Ocean Industry*. (November 1967), p. 32; *Deep Sea Drilling Project: Something for Everyone*. *Ocean Industry* (August 1968), p. 5; Tjeerd H. van Andel. *Deep-Sea Drilling for Scientific Purposes: A Decade of Dreams*, *Science*, (June 28, 1968, vol. 160), p. 1419.

and excessively specialized for the broad range of secondary research purposes claimed for it. The extreme difficulty of achieving with a high probability of success the ultimate goal contracted for, inexorably raised the costs. The freedom with which unauthorized predictions of costs were offered to Congress and the public by unqualified persons, or with insufficient evidence, added to the unfortunate impression of steeply rising costs of the project. The absence of experienced contract management, with its skills in tight cost control, and the apparently relaxed attitude toward unnecessarily high standards of designs for services and facilities, also added to the costs.<sup>70</sup> Dr. Haworth's admission that further exploratory deep ocean drilling should have proceeded concurrently with the evolution of the Mohole project and its hardware confirmed the earlier error in scheduling of the research plan. The subsequent sponsorship by NSF of such drillings, may have diluted the support for the central Mohole project. And finally, to the very end, Mohole remained—in the eyes of the Congress and the public—a project rather than a program. It was one drilling platform to drill one hole, instead of a comprehensive research program into the ocean floor.

To be sure, there were extenuating circumstances. A confusion as to objectives is an unavoidable aspect of every scientific research program of large scope in a new and unexploited area. It is merely that, for NSF, the Mohole project was the first such task to challenge it. The urgency with which the project was pressed in the early stages merely intensified its problems. Then, too, NSF had not been able to develop a program of full exploitation of deep-water drilling. This was in part because of its manner of doing business. The contractor had a narrowly defined engineering task and had no interest in making it more complicated; NSF itself dealt in science "grants" which depended upon the interests of the academicians proposing researches. As Senator Allott said :

As a matter of fact, the National Science Foundation was never meant to handle a project of this kind. They are not equipped to do it, and I honestly think \* \* \* that that is part of the reason why this particular project has become such a calamity.<sup>71</sup>

The role of the Congress in helping to secure the orderly and business-like development of a major project can be a commanding one. If, as Representative Miller said, Mohole was an "orphan" insofar as committee support was concerned, the project also lacked the advantages of sustained continuity of congressional committee and committee staff scrutiny. The development of an expertise in the congressional orbit would have enabled the generation of progressively more searching questions. The absence of adequate, objective, scientific, and technical guidance of the project would, in all probability, have come to the attention of the Congress, and greater pressure exerted on NFS earlier

<sup>70</sup> In comment on the GAO final report on Mohole (Administration of Project Mohole by the National Science Foundation, op. cit.), a letter by William M. Rice, project manager for Brown & Root, is appended, pp. 57-59, which states: "[The Mohole platform] was to be absolutely safe, reliable, redundant, multipurpose, self-propelled, typhoon resistant, hurricane proof, with deluxe VIP and scientist quarters, spacious university-oriented onboard laboratories, all in accord with passenger ship rules, best U.S. Navy and Marad practices, and having USCG, USPHS, and ABS approval."

<sup>71</sup> Congressional Record (Aug. 24, 1966), p. 19636.

to correct this deficiency. Many other questions do not appear to have been searched out. Some of these are:

Who was responsible for determining whether the Mohole platform and drilling system were within the state of the art, and on what basis was the decision made?

What was the proper rate of progress on such a large scientific task, and what criteria determined this?

If this project (or program) was aimed at securing national scientific prestige for the United States, how should this intangible be weighted against other more concrete values and costs? How was it to be exploited? Was there a genuine need for haste?

In retrospect, there would seem to have been a need for an appropriate committee of Congress, and a staff conversant with the details of the project, to have explored:

The scientific, technological, and social significance of full exploitation of the deep ocean drilling capability;

The military significance of the evolving project;

The national implications of oceanography, as affected by the newly developed, deep ocean drilling capability;

The application of all available criteria of the national interest to establish the concept for the sort of "tool" that would best serve the many potential national purposes;

An evaluation of the difficulties to be encountered in the program.

Finally, the funding of the project seems to have been the crucial question. It was the sole means by which the Congress exercised control over the project. As a political device of control, the appropriations process is powerful, but not selective. (The management of appropriations could terminate the project, but could not assure it the kind of management needed for its success.) Such a control mechanism is least compatible with respect to the management of basic research. Fortune magazine hit at one aspect of this when it stated: "Clearly, we still have no formula for sound handling of a big science project financed by Government." Also, "\* \* \* if publicly aided basic research is to flower, it must be shielded from operational interference by any sustaining governmental agency."<sup>72</sup> Another aspect is that identified by D. S. Greenberg: "The very nature of basic research makes it difficult to promise anything more than the probability of a payoff, but this perhaps makes it all the more important to demonstrate that this uncertain process will at least be conducted with prudent concern for the taxpayers' money."<sup>73</sup>

For the Congress to decide among the priorities to be assigned various basic research projects in competition with other uses of national resources requires basic objective assessment of the technical values of each project. In the final Senate appropriations hearings on Mohole, Senator Magnuson described the quandary facing congressional decisionmakers on this matter:

I think the question we have to ask is, Are we going to try and limit the amount of research within the capabilities of the country, as far as the Federal

<sup>72</sup> "Mohole Regress Report," op. cit. (April 1964), p. 106.

<sup>73</sup> D. S. Greenberg. "Mohole: Senate Is Asked To Restore Funds." *Science* (vol. 153, July 1966), p. 39.

Government is concerned? Then what are the priorities \* \* \*? What will give us the best results for the future, in the long run, considering such things as the spin off? It is difficult to get guidance in this field \* \* \*. Well, we tried. The Science Foundation tried. The National Academy tried. However, there is intense competition between all segments. The trouble is there is too much competition between scientists themselves, as to just what project they consider best. They want their own project. Our job is to determine what is the best overall.<sup>74</sup>

Moreover, the priorities do not remain constant. In the earliest stages the opportunities for scientific discovery and technological development are not as evident as they later become. Again quoting Senator Magnuson:

\* \* \* We don't seem to receive much help from the scientific community on the question of priorities \* \* \*. We don't receive much help in determining priorities from the agencies.

They all want their projects, and then soon it mounts up, and we get very little guidance as to priorities within what the country is capable of spending in the research field. It would be my reaction that if the scientific community had advised you in the beginning as to the priority on Mohole, they would have placed it, perhaps, not as high on the list as they might today.

I think that once it has moved along this far, and the earth scientists and the physicists have seen some of these spin-off benefits developing, the priority has risen.<sup>75</sup>

Unfortunately for the Mohole supporters, their belated efforts to substantiate the scientific merit of the project were inadequate to the purpose. Some progress had been made in overcoming the impressive technical difficulties, but the prospective cost made the project politically unacceptable.

<sup>74</sup> Senate. Independent offices appropriations for fiscal year 1967, op. cit., p. 1276.

<sup>75</sup> Ibid., pp. 1275-1276.

## CHAPTER EIGHT—THE TEST BAN TREATY: A STUDY IN MILITARY AND POLITICAL COST-EFFECTIVENESS

### I. INTRODUCTION

The President sent the Limited Nuclear Test Ban Treaty to the Senate, requesting its consent to ratification, on August 8, 1963. Lengthy hearings were held before two committees and after 3 weeks of debate, the Senate consented, by a vote of 80 to 19, September 24. This study examines the testimony of witnesses and the expressed positions of participants, in the process of Senate deliberation on this issue.

Opponents of the treaty placed great emphasis on its assertedly adverse consequences for the national security. A salient issue was whether the treaty should be permitted to slow the rate of the arms race, on the assumption by opponents that the United States could otherwise continue to gain disparately in military potency vis-a-vis the U.S.S.R. Treaty supporters held that although the United States possessed—and needed—superior military strength, there was no necessity for its indefinite further enlargement. They repeatedly pointed out that national security was dwindling for both the United States and U.S.S.R. even while the military strength of both countries continued to grow.

Although the test ban treaty was recognized by a number of its supporters as primarily political in its effects, the Senate gave little consideration to its domestic or international political significance. This was partly because of the great emphasis placed by opponents on the military aspects of the treaty, and partly because the Administration provided insufficient ammunition with which to delineate and analyze the political factors involved. The underlying issue which confronted the Senators in the treaty debate was whether to accept detente with the Soviet Union. This issue, never made explicit, appears to have been decided in the affirmative. The role of public opinion, although strongly expressed, was addressed less to detente than to the issue of radiation hazards from nuclear tests. However, this latter issue does not appear to have been as salient in the Senate debate as it was in the press or in public opinion; many of the technical witnesses who appeared to testify regarding the treaty offered assurances that radiation hazard, despite a number of specific instances of actual damage or local concentration, had been overemphasized.

#### *Issues and consequences of the treaty*

While the Limited Nuclear Test Ban Treaty of 1963 was under consideration by the U.S. Senate, it was being represented by its supporters as a symbol or precursor of many other agreements in the grand march toward a world in which unruly force was replaced by law, and conflict by cooperation. It was, they said, and had always been a fore-

most element of U.S. nuclear policy. At the same time, opponents of the treaty were describing it as a trap, a diplomatic defeat at the hands of the Soviet Union, and a unilateral sacrifice of nuclear supremacy by the United States.

Once the treaty had been ratified and made effective, it produced merely a slight slowing down of the arms race, and a modest easing of tensions between the Soviet Union and the United States. Even as to nuclear proliferation, supporters of the treaty had hoped it would deter new entrants to the group of nuclear-armed nations; yet it did no more than lend slight rigidity to a status quo. Established nuclear powers continued underground nuclear tests; the French continued to prepare for atmospheric tests of thermonuclear devices; the Chinese Communists maintained their quest for an initial nuclear capability; yet, the treaty may have influenced other nations with a nuclear potential to abstain from developing and testing.

The test ban treaty was the subject of 2 extensive sets of committee hearings and 3 weeks of debate on the Senate floor. The purpose of this study is to examine the evidence assembled by the committees, to discover what the Senators were told, and what they themselves said, were the important features of the treaty. What were the claims made for it? What was said in opposition? What criteria did supporters and opponents apply? What were the risks and gains alleged for it? What kinds of world were postulated to measure the treaty against?

#### *Obstacles to acceptance of the treaty*

The hurdles in the way of approval by the Senate of the treaty can be enumerated in 5 broad categories: political aspects involving the prestige of the Senate itself, military factors, scientific factors, aspects growing out of the adversary role of the Soviet Union to the United States, and factors posited by public opinion in the United States.

Before a treaty may be ratified by the President, it must receive the approval of two-thirds of the Senators present at the vote. Had the Senate divided on the issue on strict partisan lines, a bare two-thirds vote in favor could have been mustered.<sup>1</sup> However, a number of Democrats were known to be unsympathetic to the treaty, or at least in doubt, so that bipartisan support would almost certainly be required for its approval by the Senate.<sup>2</sup> Dissatisfaction was expressed with the draftsmanship of the treaty,<sup>3 4</sup> as well as resentment toward the implication that because nearly 100 States had already signed the treaty the Senate should not seek to amend it.<sup>5</sup>

<sup>1</sup> Composition of the Senate at the time of the vote stood Democrats 67, Republicans 33. The late Senator Clair Engle, a Democrat from California, was gravely ill and unable to be present.

<sup>2</sup> An appraisal of the attitude of the Senate toward the treaty, published by the Federation of American Scientists, Newsletter (XVI, June 1963), p. 4, identified nine Democrats as probably opposed, of whom all but two did in fact vote against the treaty, and eight as needing "encouragement," of whom two later voted against the treaty.

<sup>3</sup> For example, Senator Bourke B. Hickenlooper (Republican, of Iowa), observed that the "President has no authority to bind this country under the treaty until he has received the advice and consent of the Senate. That makes the Senate at least an equal partner in responsibility" (Congressional Record (Sept. 23, 1963), p. 16838).

<sup>4</sup> Thus, Senator Karl E. Mundt (Republican, of South Dakota), professed himself "amazed and disappointed at the loose and ambiguous language which was used in the drafting of this treaty" (Congressional Record (Sept. 23, 1963), p. 16810).

<sup>5</sup> Said Senator Mundt: "We should develop a procedure that would not bring us into the discussion after 96 other countries sign it and widely publicized reports have been circulated announcing these ceremonial signatures. Then the administration comes to us for advice and consent? Oh, no. They come to us for consent and threaten us with the dire consequences of a negative vote. We are not asked for any advice until after the fact and our constitutional rights and duties are downgraded and ignored by such an unwise and unfortunate procedure in exercise of our treaty-ratifying responsibilities and authorities." (Congressional Record (Sept. 23, 1963), p. 16829.)

Military factors presented a second category of obstacles. The treaty would limit an activity related to atomic weapons on which was based the military strength of the United States. The weighty importance of this subject demanded most careful deliberation. Those who assigned paramountcy to overwhelming military superiority over a potential adversary would brook no inhibition upon methods of achieving it. Those who believed the treaty gave an adversary unequal opportunities for increasing his military strength might also with reason oppose it. The military strength of the United States relative to that of the U.S.S.R. was itself in question, on the basis of assertions as to the unreliability of U.S. intelligence estimates.<sup>6</sup> Further uncertainties were imposed by the security classification of military and technical information relevant to the issue.<sup>7</sup>

The third category of obstacles, in the area of science and technology, somewhat overlapped the military area of concern—with particular reference to uncertainties as to the capability of the adversary, technical questions as to the precise limitations resulting from the treaty, and questions as to the relative effect of these inhibitions upon both sides. Opposition also lay in the cherished belief that science knew no limits, and that no treaty should be permitted to constrain the freedom of science. There were also obstacles inherent in the uncertainty as to the importance of the hazard of radioactive fallout and in the unfamiliar nature of the field of nuclear science generally.<sup>8</sup>

The fourth category of obstacles involved various aspects of the adversary relationship between the United States and the U.S.S.R. It was almost an act of faith to believe that the Soviet Union was fixed and unchanging in its determination to destroy the United States and its system of organization, and that accordingly any treaty beneficial to the U.S.S.R. was automatically disadvantageous to the United States.<sup>9</sup> The Soviet Union could not be trusted.<sup>10</sup> Only by some form of verifying inspection could the United States safely enter into an agreement with the U.S.S.R. on a matter of such gravity.<sup>11</sup>

With respect to the fifth category, although public opinion was not opposed to approval of the treaty, yet in two respects public opinion did constitute an obstacle. One was that the public opinion, as measured

<sup>6</sup> Senator Margaret Chase Smith (Republican, of Maine), who later voted against the treaty, complained: "I am disappointed in the suggestion made by some proponents of the treaty that the only way in which the appropriate data can be acquired is to engage in an all-out nuclear war with the Soviet Union" (Congressional Record (Sept. 20, 1963), p. 16740). Senator Smith had reference to the "widespread conflict of opinion and disagreement among the military specialists and nuclear scientists over the probable military consequences to us if the treaty is ratified."

<sup>7</sup> See p. 229. See also p. 196, footnote 13.

<sup>8</sup> The hearings and interim report of the Preparedness Investigating Subcommittee of the Senate Armed Services Committee, chaired by John Stennis (Democrat, of Mississippi), dealt extensively with the military and scientific factors. See pt. IV.

<sup>9</sup> Senator J. William Fulbright (Democrat, of Arkansas), chairman of the Foreign Relations Committee, in his book "Old Myths and New Realities" (New York, Random House, 1964), discusses this point at some length in specific reference to the test ban treaty. He observed: "The attribution of an unalterable will and constancy to Soviet policy has been a serious handicap to our own policy" (p. 60). Also, "A stigma of heresy has been attached to suggestions by American policymakers that Soviet policy can change or that it is sometimes altered in response to our own." (Idem.)

<sup>10</sup> In the words of Senator Harry F. Byrd (Democrat, of Virginia), "There is nothing in Soviet history which would serve as a basis for faith that the Kremlin would enter into a treaty with us at this time and keep it if they did not think it would serve their objectives to our disadvantage" (Congressional Record (Sept. 19, 1963), p. 16650).

<sup>11</sup> In the words of Senator Smith: "A sound posture on arms control and disarmament must be based on a strong on-site inspection control." In a letter to the author, Sept. 2, 1964.

in the polls, was profoundly mistrustful of the Soviet Union.<sup>12</sup> The other was that the communications received by Members of the Senate urging approval of the treaty tended to be couched in excessively emotional language and to support the treaty almost entirely on the basis of the fear of fallout, which testimony had not authenticated technically as an issue. This apparent attitude of the public led some opponents of the treaty to conclude that if possessed of the more substantive facts about the effects of the treaty, the public might have reversed its verdict.<sup>13</sup> Related to the general question of public opinion is the question of whether the adoption of the treaty might induce a relaxation of vigilance against the threat of Communist expansion. This concern, which General Maxwell discussed under the term of "euphoria" as a long-term threat to sustained military preparedness, caused anxiety also among Members of the Senate.<sup>14</sup>

*Considerations favoring approval of the treaty*

In each of these 5 areas, however, there seem to have been countervailing factors that satisfied an adequate majority of Senators that the treaty could be safely and wisely approved. Thus, in respect to the political role of the Senate, the long history of consultations with the Senate by the administration before and during the negotiations, the respectful tone of the President's statements and communications on the subject of the treaty as he strove to build nonpartisan support for it, and perhaps also the political acceptance by the Senate itself of the Russell amendment, gave reassurance that senatorial prerogatives were duly preserved and acknowledged.

The assertedly adverse military aspects of the treaty were most strongly stressed by the leading opponents of the treaty. Yet there were important military points in favor of the treaty, such as the authoritative opinion expressed by the Secretary of Defense that the treaty would prolong the existence of U.S. technological superiority and obstruct nuclear proliferation.<sup>15</sup> Of great importance was the support given the treaty by the witnesses representing the Department of Defense, and especially by the Chairman and members of the Joint Chiefs of Staff.<sup>16</sup> The fact that this approval was explicitly

<sup>12</sup> One article on this subject, by Sidney Draus with Reuben Mehling and Elaine El-Assal, "Mass Media and the Fallout Controversy," *Public Opinion Quarterly*, XXVII, No. 2 (Summer, 1963), pp. 191-205, concludes from an examination of a population of 236 persons that (p. 205) "Radioactive fallout itself is perceived as so devastating that when in addition there is a basic conflict among the scientists to whom one looks for authoritative clarification, it is small wonder that no reduction of anxiety was found despite knowledge, media exposure, etc." Another study, by Hazel Gaudet Erskine, "The Polls: Atomic Weapons and Nuclear Energy," *Public Opinion Quarterly*, XXVII, No. 2 (Summer, 1963), pp. 155-190, noted that (a) the public seemed reluctant to endorse atmospheric testing, even after the Soviet Union resumed it, (b) that women were more concerned with fallout than men were, (c) that under President Kennedy's administration, Democrats were slightly more opposed to tests than were Republicans, but that (d) public attitudes were conditioned by a deep suspicion of the Soviet Union.

<sup>13</sup> In a letter to the author, Sept. 2, 1964, Senator Stennis wrote: "I am reasonably confident that the public in general did not have a full appreciation of the technical and military problems involved in the consideration of the treaty. Even in the most favorable circumstances it is impossible to convey to the public adequate information which will provide for a full understanding of a subject as complex as this. The problems involving security classification made this situation more difficult."

<sup>14</sup> For example, Senator Wallace F. Bennett (Republican, of Utah), told the Senate that the "greatest risk the treaty will create is the effect it will have on our attitude. In the end, our hope for peace may actually be set back. We are being warned against 'euphoria,' but that is only a pleasant sounding word which few people understand. Even before the treaty has been approved, words are being written and spoken about the great relief we will feel. We are being encouraged to make plans to spend, on peaceful programs, the money we are told will be saved because of the relaxed tensions." (Congressional Record (Sept. 23, 1963), p. 16844.)

<sup>15</sup> See footnote 12.

<sup>16</sup> See pp. 213-215.

conditioned on specific safeguards, which the Preparedness Investigating Subcommittee endorsed for implementation, and on which administration action was vigorously initiated even before the treaty was reported out of committee, lent weight and substance to the approval of the senior military officers.<sup>17</sup>

The scientific and technical obstacles to approval were countered by assertions as to the marginal value of further atmospheric tests, assurances as to the continuing utility of underground tests, and explanations that progress toward goals deemed important in military technology did not require tests at all.<sup>18</sup> Science, a preponderance of technical witnesses maintained, had significant limitations in the development of both offensive and defensive weaponry.

Factors favorable to the treaty were of 2 general kinds: One had to do with the mutual benefits to both the United States and the U.S.S.R.; and the other concerned ways in which the treaty was considered to benefit the United States at the expense of the Soviet Union. Of mutual advantage were the reduction of tension, control over proliferation of nuclear weapons to other States, the slowing of the arms race, reduction of radioactive fallout, and establishment of a basis for further arms negotiation.<sup>19</sup> Inferred as of benefit to the United States were the expectations that the treaty would promote a division between the Soviet Union and the Chinese Communist regime, and encourage pluralism within the Soviet Union itself.<sup>20</sup>

Mention has already been made of the fact that the fifth category of obstacles—in the area of public opinion—was essentially indirect, with the direct effect being in favor of adoption of the treaty. In the eyes of the general public, the overriding issue appeared to be that of radioactive fallout and the hope that the treaty would eliminate this threat. Other notable advantages were considered to be the lessening of tensions, slowing of the arms race, reduction in the possibility of atomic warfare, reduction in the costs of military preparedness, and progress toward disarmament.<sup>21</sup>

Apart from the question as to whether or not the limited nuclear test ban treaty was generally desirable to both the United States and the U.S.S.R., it is possible that both its substantive benefits and the military risks were overstated.<sup>22</sup> Nevertheless, the treaty contributed a number of positive gains. In its effect on the public in the United States, the treaty undoubtedly reduced both the existence and the fear of radioactive fallout. Senate consideration of the issues surrounding

<sup>17</sup> Speaking in favor of the treaty, and on the subject of these safeguards, Senator Henry M. Jackson (Democrat, of Washington) said: "In light of the testimony that has been given and the understandings that have been reached with respect to the policy of the administration in safeguarding the national interest \* \* \* I believe that the Senate may prudently give its advice and consent to ratification." (Congressional Record (Sept. 13, 1963), p. 16082.)

<sup>18</sup> The testimony of Dr. Harold Brown, Director of Defense Research and Engineering, before both the hearings before the Foreign Relations Committee and the Preparedness Investigating Subcommittee was especially telling on these matters. (See p. 217.)

<sup>19</sup> See pp. 208-209.

<sup>20</sup> On this point see U.S. Congress, Senate, Committee on Foreign Relations, "Report on the Nuclear Test Ban Treaty," on Executive M, 88th Cong., 1st sess., Executive Report No. 3, Sept. 3, 1963 (Washington, U.S. Government Printing Office, 1963), pp. 25-26.

<sup>21</sup> See page 196n. However, in his letter to the author, Senator Stennis wrote: "Most of my mail indicated only a superficial knowledge of the issue—militarily, politically, or scientifically."

<sup>22</sup> In a discussion with the author, Feb. 10, 1965, Urie Bronfenbrenner gave it as his experience that citizens of the Soviet Union assigned greater beneficial significance to the treaty than did U.S. citizens. Professor Bronfenbrenner, a social psychologist at Cornell University, has been a frequent visitor to the Soviet Union in order to study aspects of Soviet culture and mores.

the treaty may have enlarged public understanding of these issues, and helped to form a national consensus on the important and difficult task of arms control in a nuclear-armed world.

The demonstration that formal agreement on an arms control issue is possible between the United States and the Soviet Union may perhaps have communicated to the people in both countries a recognition that conflict and cooperation are not necessarily incompatible, and that additional elements of cooperative behavior may be introduced for mutual benefit.

*Assessment of the process of approving a weapons treaty*

The process of gaining domestic acceptance of an accommodation with the Soviet Union on matters of arms control is enormously complex, difficult, intellectually exhausting and highly interdisciplinary. It is a process that if repeated too frequently would become an intolerable burden on legislators and officials of the Government. But despite the myriad of obstacles and burdens in the process, the outcome also demonstrated that the process was feasible.

An important result of the treaty's acceptance by the Senate in accordance with the constitutional processes of the United States, is that for the first time since the development of atomic weapons an arms control issue had passed through not only the previously impassable hurdle of international negotiation with the Soviet Union, but also the previously untested gantlet of domestic acceptance. As a result of the latter accomplishment, many important criteria of future arms agreements between the United States and nuclear states in an adversary relationship were identified and established. Precedents and procedures have also been established for the process which future arms agreements must follow, once they have surmounted the hurdle of international negotiation.

The process of advice and consent in the matter of a treaty involving control of nuclear weaponry was intellectually demanding. Many different academic disciplines were called upon to present testimony regarding them. Doctors, biologists, geneticists, and radiologists were called on for opinions concerning the dangers of radioactive fallout. Professional military people, physicists, nuclear physicists, engineers, and mathematicians were asked to give their views on present and future relationships regarding warheads, delivery vehicles, and communications systems. International lawyers and diplomatists were invited to express judgments on questions of historical obligations under treaties or concerning diplomatic recognition. The scope of the treaty extended to electro-magnetic phenomena, seismology, blast mechanics, military intelligence, security classification, systems engineering, sensors, ordnance reliability, military intelligence, and probably others. By going into all these matters, the hearings provided an exhaustively educational experience for those who sat in judgment.

It is understandable that in the face of an issue of such ranging scope, individual Senators searched for simplifications. Was the treaty beneficial to the United States or was it not? Would it or would it not advance the cause of peace? Was it or was it not true that Communists understood only the language of force? Was a treaty with a Communist adversary meaningful or not? Was public opinion for or against the treaty? Did or did not, the preservation of U.S. world leadership require acceptance of the treaty? As all Senators were aware, no

matter how complicated the issues and how wide the scope of the effect of the treaty, the ultimate decision had to be "yea" or "nay" on the question of consenting to the treaty—with or without some further qualification that would also require a "yea" or "nay" vote.

## II. BACKGROUND OF THE ISSUE

President Kennedy's leadership was a major factor in persuading the American people and the U.S. Senate to accept the limited nuclear test ban treaty. From the moment of his accession to office, the President persistently searched for a way to curb nuclear tests, not only because he considered a test ban desirable in itself but also because he regarded it as the first step toward the larger objective of world disarmament.

### *Status of nuclear tests in 1961*

President Kennedy inherited from his predecessor a moratorium on nuclear testing, by informal agreement with the Soviet Union, that had prevailed since late in 1958. (However, see note, p. 200.) For two years, negotiations to formalize the moratorium had failed for want of agreement on a satisfactory means of verification. The Soviet Union had also resisted an alternative American proposal to ban atmospheric tests on the asserted principle that it would legitimize tests excluded from the ban. The negotiations were also complicated by various technical developments, one of which was the "big hole" decoupling theory, which held that large underground nuclear explosions could be successfully concealed from a remote seismic detection system. This theory, propounded by Dr. Albert Latter of the Rand Corp. in 1959, appears to have been confirmed by tests with high explosives later in that year.

### *President Kennedy's search for a test ban agreement*

During his first year in office, President Kennedy made repeated references to his wish to conclude a nuclear test ban treaty. In his first message to Congress he declared: "It is our intention to resume negotiations prepared to reach a final agreement with any nation that is equally willing to agree to an effective and enforceable treaty."<sup>23</sup> On sending Ambassador A. H. Dean to Geneva, March 14, 1961, as head of the United States delegation to the Conference on the Discontinuance of Nuclear Tests, the President expressed a hope that new test ban proposals the delegation were to take with them "will be accepted and that the negotiators will be able to proceed with all appropriate speed toward the conclusion of the first international arms control agreements in the nuclear age."<sup>24</sup> In his message to the Congress, May 25, on "Urgent National Needs," he described a treaty banning nuclear tests as the "first significant but essential step on the road to disarmament."<sup>25</sup> Other expressions of his intense concern to achieve a test ban agreement were contained in a diplomatic letter to President Sukarno of Indonesia and President Keita of Mali,<sup>26</sup> in an address before the United Nations General Assembly,<sup>27</sup> in a joint communication with

<sup>23</sup> State of the Union message, Jan. 30, 1961, reproduced in "Documents on Disarmament, 1961," p. 19.

<sup>24</sup> *Ibid.*, pp. 33-34.

<sup>25</sup> *Ibid.*, p. 158.

<sup>26</sup> *Ibid.*, of Sept. 13, p. 427.

<sup>27</sup> *Ibid.*, of Sept. 25, pp. 469-470.

Prime Minister Nehru of India,<sup>28</sup> and somewhat more extensively in an interview with editor Adzhubei of *Isvestiya* (who was also Premier Khrushchev's son-in-law) at which he remarked that "one of the first things that I did on becoming President was to commit the United States to an earnest effort to achieve a satisfactory agreement with the Soviet Union on the cessation of nuclear tests." He went on:

I had hoped that this would be one area where we could make real progress. It would lessen the contamination of the air, it would be a first step towards disarmament, and I felt that if we could achieve an agreement in this area, we could then move on to the other areas of disarmament which required action.<sup>29</sup>

The foregoing are no more than an illustrative sampling of the President's numerous expressions in favor of a test ban treaty. However, two events occurred that postponed achievement of agreement on this matter until the final months of his tragically abbreviated term of office. The first was resumption of nuclear tests by the Soviet Union; the second was the Cuban crisis of October 1962.

### *Collapse of the test moratorium*

When the Soviet Union, August 30, 1961, abruptly announced resumption of nuclear tests,<sup>30</sup> the President with Prime Minister Harold Macmillan of the United Kingdom offered a proposal to Premier Khrushchev "that their three governments agree, effective immediately, not to conduct nuclear tests which take place in the atmosphere and produce radioactive fallout."<sup>31</sup> (Such tests would be self-revealing and would require no elaborate detection apparatus or the other complications of onsite inspections.) When Premier Khrushchev rejected the proposal, September 9, the President and Prime Minister reaffirmed "the readiness of the United States and the United Kingdom to negotiate a controlled nuclear test ban agreement of the widest possible scope."<sup>32</sup>

President Kennedy reacted to the continuing series of Soviet nuclear tests, late in 1961; he indicated, November 2, that the United States was assessing the technical importance of the Soviet tests and might need to resume atmospheric tests, also. Nevertheless, he said, "We will continue to be ready to sign the nuclear test treaty which provides for adequate inspection and control."<sup>33</sup> His position was echoed, November 8, by an urgent appeal in a United Nations General Assembly resolution for the conclusion of a test ban treaty among the nuclear powers.<sup>34</sup>

<sup>28</sup> *Ibid.*, of Nov. 9, p. 584.

<sup>29</sup> *Ibid.*, p. 650.

<sup>30</sup> Both the abruptness of the announcement and the fact that the Soviet Union exploded from 30 to 50 nuclear devices in tests during the rest of 1961 were later to occasion deep disapproval by Members of the Senate, who considered these actions as a form of "surprise abrogation." The elaborateness of the Soviet test sequence was also interpreted (probably with justice) as evidence that the Soviet Union had planned the termination of the moratorium long in advance, during the period while Soviet negotiators were exchanging test ban proposals with the other national delegations to the Eighteen Nation Disarmament Committee at Geneva. This too was taken as an evidence of the Soviet Union's bad faith. However, it should also be noted that the moratorium had been terminated as of Dec. 31, 1959, by President Eisenhower in a White House press release, Dec. 29. Thus, the "moratorium" inherited by President Kennedy was *de facto* but not by either explicit agreement or unilateral declaration. While considering the United States "free to resume weapons testing," the President promised that resumption would not take place without advance notice. The United States would also continue its "active program of weapon research, development and laboratory-type experimentation" ("Documents on Disarmament, 1945-59," II, pp. 1590-1591).

<sup>31</sup> "Documents on Disarmament, 1961," p. 351.

<sup>32</sup> *Ibid.*, p. 404.

<sup>33</sup> *Ibid.*, p. 567.

<sup>34</sup> *Ibid.*, p. 578.

The Soviet Union issued a statement in connection with the resumption of the Geneva negotiations, November 28, 1961, in which something quite similar to the test ban treaty of 1963 was proposed. It was a proposal—

\* \* \* *To conclude immediately an appropriate agreement on the discontinuance of nuclear tests in the atmosphere, under water and in outer space* [italic in the original], that is, in these environments where the implementation of control is not fraught with any serious technical difficulties.<sup>35</sup>

The Soviet proposal was accompanied by a draft agreement that proposed a voluntary uninspected moratorium on underground tests until a system of control could be agreed upon. (The Soviet proposal was accordingly denounced by Ambassador Dean, who assailed the “sheer effrontery” and “colossal hypocrisy” of the Soviet Union in making the proposal in view of that nation’s pledge of August 28, 1959, “never to be the first to resume nuclear weapons tests, \* \* \*” and the breach of this pledge in September 1961.)<sup>36</sup>

*Impetus to détente after Cuban missile crisis*

Discussions throughout 1962 and up to April of 1963 on the cessation of nuclear tests centered upon the negotiation of a comprehensive ban treaty that would provide an inspection arrangement affording an acceptable minimum of assurance to the United States that the Soviet Union was not evading it, and at the same time requiring minimum invasion of the cherished national privacy of the Soviet Union. Progress in the negotiations was interrupted, however, in early autumn of 1962, by the Cuban crisis over the sending of Soviet nuclear missiles, troops and military technicians to support the Castro government. The dangerous level of tension produced by this confrontation of nuclear powers was followed in 1963 by an opposite reaction. Premier Khrushchev later told Norman Cousins, editor of the *Saturday Review* and an official of SANE, that “after Cuba” he considered the opportunity for more cordial relations between the United States and the Soviet Union was improved.

The one area on which I thought we were closest to agreement was nuclear testing [said Khrushchev], and so I went before the Council of Ministers and said to them :

“We can have an agreement with the United States to stop nuclear tests if we agree to three inspections. I know that three inspections are not necessary, and that the policing can be done adequately from outside our borders. But the American Congress has convinced itself that onsite inspection is necessary and the President cannot get a treaty through the Senate without it. Very well, then, let us accommodate the President.”

The Council asked me if I was certain that we could have a treaty if we agreed to three inspections and I told them yes. Finally, I persuaded them.<sup>37</sup>

The offer referred to by the Premier in his talk with Cousins had been made in a letter to President Kennedy, December 19, 1962, not long after the easing of the Cuban crisis. It offered Soviet acceptance of a comprehensive test ban treaty calling for three unmanned seismic stations on Soviet soil and two or three onsite inspections of “suspicious” earth tremors annually. Wrote Khrushchev :

You and your representatives, Mr. President, refer to the fact that, without a minimum number of onsite inspections, it would be impossible for you to persuade

<sup>35</sup> *Ibid.*, p. 662.

<sup>36</sup> *Ibid.*, pp. 665, 669.

<sup>37</sup> Norman Cousins, “Notes on a 1963 Visit With Khrushchev,” *Saturday Review* (Nov. 7, 1964), p. 21.

the U.S. Senate to ratify [sic] an agreement on the cessation of testing. This condition, as we understand it, ties your hands and is preventing the signature of a treaty which would enable all of us to turn our backs forever on the nuclear weapons proving grounds. Very well; if this is the only obstacle to agreement, we are prepared to meet you on this point in the interest of the noble and humane cause of ending nuclear weapons tests.<sup>38</sup>

*Divisions of opinion on test ban scope*

It seems likely that by early 1963 there were divisions of official opinion in both the United States and Soviet Union on test ban questions. The evidence of Premier Khrushchev's statements to Norman Cousins appears to indicate that there were two schools of thought in the Soviet leadership, one willing to tolerate a small but yet astonishingly unprecedented invasion by an external authority, and the other against anything of the sort. In the United States the differences extended all the way from those who wanted no test ban at all to those who were prepared to advocate a cessation of nuclear tests with little or no assurance against covert violation.

At about this same time (February 10) a Republican "Committee on Nuclear Testing," chaired by Representative Craig Hosmer of California, ranking Republican member of the Joint Committee on Atomic Energy, issued a report questioning the value to the United States of any test ban treaty whatsoever, denying the capability of existing sensors to detect remote nuclear detonations, and urging that data concerning these capabilities be made public to stimulate free and open discussion of the entire issue. The report opposed any moratorium on nuclear testing in view of the past unhappy experience with such an arrangement.<sup>39</sup>

President Kennedy strongly preferred a comprehensive test ban treaty. But to some persons, including some of those in leadership roles in the President's own party, this was going too far. A strong body of opinion had arisen in opposition. One leading opponent, Senator Thomas J. Dodd (Democrat of Connecticut), chairman of the Internal Security Subcommittee,<sup>40</sup> delivered a painstaking analysis of the comprehensive test ban issue to the Senate, February 21, in which he said that the United States had gone from one concession to another (he identified 10 of these), that the problem of inspecting a closed society (the U.S.S.R.) was central to the test ban issue, and that scientific opportunities inherent in nuclear technology should be sought unhindered as long as "mutual security based on mutual confidence" remained out of reach.<sup>41</sup>

At the beginning of April 1963, prospects for a test ban treaty of any kind looked dark. France had exploded a nuclear device in the Sahara, March 18. Senator Dodd's warning against bargaining away U.S. nuclear superiority under an unenforceable treaty had been placed before the Senate. The Soviet Union was at odds with the United States over numbers of onsite inspections. The Joint Chiefs of Staff were thought to be dissatisfied with the degree of safeguards

<sup>38</sup> "Documents on Disarmament, 1962," II, p. 1241.

<sup>39</sup> "Administration in Center of Test-Ban Crossfire," Congressional Quarterly Fact Sheet (Feb. 27, 1963), pp. 7-9.

<sup>40</sup> Or more correctly, "Subcommittee To Investigate the Administration of the Internal Security Act and Other Internal Security Laws, to the Committee on the Judiciary."

<sup>41</sup> "The Nuclear Test Ban Negotiations and the Quest for Peace," Thursday, Feb. 21, 1963, reprint supplied by the office of Senator Dodd. 40 pages.

the administration was prepared to seek.<sup>42</sup> The Republican Conference Committee on Nuclear Testing had reservations as to the desirability of any test ban treaty. It is not surprising that the President told his press conference, April 24, that "I am not overly sanguine about prospects for an accord," that he told his press conference, May 8, "I'm not hopeful, not hopeful," and that a sense of desperation was evident in his press conference of May 22, when he said "We're still hoping," but "unless we could get an agreement now, I would think the chance of getting it would be comparatively slight."<sup>43</sup>

*Indications of United States and Soviet Union détente*

Still the President persisted. On April 1, the United States and United Kingdom jointly submitted a recapitulation of their position on the essential features of a comprehensive test ban treaty to the 18-Nation Disarmament Committee.<sup>44</sup> A mild thaw was occasioned by the Soviet Union's acceptance, April 5, of the American proposal for a direct teletype link between the two seats of government.<sup>45</sup> On a less-formal level of negotiation, the President took advantage of a planned visit with Premier Khrushchev, granted to Norman Cousins, to ask the editor of the Saturday Review to explore the possibilities for progress toward a test ban treaty privately. According to Cousins:

President Kennedy, knowing I was to see the chairman, had asked me to try to clarify the Soviet misunderstanding of the American position on the test ban. If the chairman construed the American position on inspections to mean that we actually did not want a treaty banning such testing, then that interpretation was in error.<sup>46</sup>

In his interview with Cousins, Khrushchev complained that he "was made to look foolish" before his Council of Ministers. He still wanted a treaty. He felt he had been misled as to the position of the United States. The Chinese, he said, had predicted that if he offered the United States three inspections they would counter by demanding six, and so on. Events had seemed to confirm the correctness of the Chinese assessment: the United States did not want a test ban treaty. However, Khrushchev concluded his phase of his conversation with Cousins by saying:

But you can tell the President I accept his explanation of an honest misunderstanding and suggest that we get moving. But the next move is up to him.<sup>47</sup>

Responding to this invitation, the President joined with the Prime Minister in a letter to Khrushchev "in an effort to see if we could develop some means by which we could bring this matter to a climax and see if we could reach an accord \* \* \*."<sup>48</sup> When Khrushchev's reply to this initiative was inconclusive, another joint proposal from the Anglo-American Powers was delivered in Moscow, May 31.<sup>49</sup>

<sup>42</sup> According to Earl H. Voss, in a study that appeared during the test ban hearings in the summer of 1963 "The Joint Chiefs of Staff were reliably reported to have objected to many of the major concessions made by the United States in 1962-63," "Nuclear Ambush, the Test Ban Trap" (Chicago, Henry Regnery Co., 1963), p. 484.

<sup>43</sup> "Documents on Disarmament, 1963," pp. 181, 183, 194.

<sup>44</sup> "Documents on Disarmament, 1963," p. 141.

<sup>45</sup> *Ibid.*, p. 160. This was an agreement in principle. A detailed technical agreement was signed between the two Governments June 20.

<sup>46</sup> Cousins, *op. cit.*

<sup>47</sup> *Ibid.*, p. 58.

<sup>48</sup> President's news conference of Apr. 24, cited above.

<sup>49</sup> "A Chronology of Disarmament Developments, 1963," p. 8.

The response to the second joint proposal formed a part of the President's speech at The American University, June 10. This speech was regarded at the time as something of a milestone in Soviet-American relations. It was widely acclaimed in the United States as an enlightened attempt toward the construction of a viable world. It was credited with breaking the tense relations between the United States and the Soviet Union out of the frozen mold of intransigence.<sup>50</sup> It was "printed in full in both Pravda and *Isvestiya* and evoked enthusiastic reactions from Soviet citizens in all walks of life."<sup>51</sup> It was the subject of a lengthy interview by the editors of *Pravda* and *Isvestiya* with Premier Khrushchev.<sup>52</sup> According to John McNaughton, Assistant Secretary of Defense for International Security Affairs, the "speech at American University was really the thing that opened the door to agreement, as I see it."<sup>53</sup> In it the President addressed himself to the immediate question of the test ban negotiations. It was one major area "where the end is in sight—yet where a fresh start is badly needed \* \* \*." He then announced that "high-level discussions will shortly begin in Moscow looking toward early agreement on a comprehensive test ban treaty." And also: that the United States would not conduct nuclear tests in the atmosphere so long as other states did not do so. Here, too, he called for a realistic attitude. No treaty, he said:

However much it may be to the advantage of all, however tightly it may be worded, can provide absolute security against the risks of deception and evasion. But it can—if it is sufficiently effective in its enforcement and if it is sufficiently in the interests of its signers—offer far more security and far fewer risks than an unabated, uncontrolled, unpredictable arms race.<sup>54</sup>

#### *Guidelines for the treaty negotiations*

The process of negotiation needed to be conducted in such a way and to produce such a result as to maximize support in the Senate for the product. The President hoped to negotiate a comprehensive test ban agreement. However, this ambition ran counter to a Senate draft resolution, introduced just 2 weeks before the President's American University speech by Senator Dodd, with Senator Humphrey, and co-sponsored by 26 Democratic and six Republican Senators (34 in all).<sup>55</sup> The Dodd resolution, after taking note of the danger of radioactive fallout, the failure to achieve a satisfactory treaty banning tests in all environments, and the technical and political difficulties of achieving a comprehensive test ban treaty, stated—

That it is the sense of the Senate that the United States should again offer the Soviet Union an immediate agreement banning all tests that contaminate the atmosphere or the oceans, bearing in mind that such tests can already be monitored by the United States without onsite inspections on Soviet territory \* \* \*.<sup>56</sup>

No Senate action was taken on this resolution. However, its considerable sponsorship showed that a comprehensive test ban without satis-

<sup>50</sup> Richard P. Stebbins, "The United States in World Affairs, 1963," Council on Foreign Relations (New York, Harper & Row, 1964), p. 25.

<sup>51</sup> Urle Bronfenbrenner, "Allowing for Soviet Perceptions," *International Conflict and Behavioral Science*, editor Roger Fisher (New York, Basic Books, Inc., 1964), p. 176.

<sup>52</sup> "Documents on Disarmament, 1963," p. 222.

<sup>53</sup> Interview with the author, July 15, 1964.

<sup>54</sup> "Remarks of the President at American University, Washington, D.C., June 10, 1963," Office of the White House Press Secretary (as actually delivered), 7 pp. mimeographed.

<sup>55</sup> Of these, the late Senator Estes Kefauver (Democrat, of Tennessee), died suddenly during the summer, the late Senator Clair Engle (Democrat, of California), was incapacitated by a stroke and was unable to vote, and Senator Frank J. Lausche (Democrat, of Ohio), after cosponsoring the resolution, and later agreeing to report the treaty itself out of the Foreign Relations Committee without amendment or reservation, apparently had a change of heart and voted against final Senate approval of the treaty.

<sup>56</sup> Mimeographed text supplied by Senator Dodd's office.

factory provision for inspection would encounter serious opposition. Nevertheless, the American team of negotiators that went to Moscow in July carried instructions to seek, if possible, agreement on a comprehensive ban. Only when it became apparent that the Soviet Union would not accept a comprehensive agreement with the requisite inspection provisions, did the American team turn to the limited ban as an alternative. In this decision, the negotiators were guided both by communications from the White House and from the British Government, which was extremely anxious to complete an agreement of some substantive nature.<sup>57</sup>

However, the outlook for the treaty in the Senate was still not completely assured. Acquiescence was needed from those Senators who placed heavy emphasis on military assessment of the consequences of the treaty for the national security; from those concerned with protecting the viability of U.S. research in nuclear science; and from those primarily interested in the consequences of the treaty for the whole edifice of American foreign policy. Support of Senate Republicans was indispensable. On one hand, the President could rely on the favorable votes of those Senators most deeply anxious about radioactive fallout, and from those most eager for progress toward ending the arms race. On the other hand, the President could expect certain opposition from those to whom almost any agreement with the Soviet Union constituted softness. He could also expect opposition from those whose concept of national security was exclusively in terms of overwhelming military power. To achieve the necessary two-thirds vote, the President needed to enlist the acceptance, if not the affirmative support, of the Joint Chiefs of Staff. He needed the support of the atomic energy community and the still broader scientific community; and of the academic fraternity in the fields of international affairs and diplomacy. He assuredly needed a mobilization of public opinion at large.

#### *Completion of the negotiation process*

The negotiations themselves were handled smoothly, quickly, with few complications. Effective direct communication was maintained between the American negotiators and the White House throughout. The device of having three "depository governments" would enable states not recognizing or recognized by one depository to file acceptance of the treaty with another. The question of inspection was eliminated by excluding tests that could not be detected from outside of states. The problem of distinguishing between weapons tests and experiments in peaceful uses of atomic explosions was resolved, less happily, by extending the ban to cover "any other atomic explosion" in the forbidden environments of air, space, and water. This expedient left a loose end which was to be the subject of much discussion by the Senate and which lingered as a point of uncertainty after the treaty was ratified.

The negotiators arrived in Moscow July 14. Discussions continued from July 16 to July 25. The principals were W. Averell Harriman, Under Secretary of State for Political Affairs (United States); Lord Hailsham, Lord President of the Council and Minister of Science (United Kingdom); and A. A. Gromyko, Minister of Foreign Affairs

<sup>57</sup> This account is based on the interview already referred to with John McNaughton, who went, as general counsel of the Department of Defense, as a member of the U.S. negotiating team.

(U.S.S.R.). The treaty was agreed to and initialed July 25. The President announced the agreement in a radio-television address the evening of July 26.

In announcing that agreement had been reached on a test ban treaty in Moscow, the President claimed for it four advantages: it would reduce world tensions, reduce radioactive fallout, help prevent nuclear proliferation, and limit the arms race. The United States should remain ready to resume atmospheric tests so as to minimize any advantage to (and thus deter) an adversary from surprise abrogation. It would be necessary to maintain detection systems to render cheating as difficult and unrewarding as possible (and thus to deter it). The President expressed hope that the document would be the subject of "a historic and constructive debate." It would involve military, scientific, and political experts, but it must not be left to them alone. He hoped that "all of you will take part in that debate, for this treaty is for all of us."<sup>58</sup> In this way the President openly solicited public expressions of opinion to the Members of the Senate.

The treaty was formally signed in Moscow, August 5, by Gromyko; Dean Rusk, Secretary of State; and Lord Home, Principal Secretary of State for Foreign Affairs. The presence at the treaty-signing ceremony of Senators Humphrey, Pastore, Aiken, and Saltonstall symbolized the important role of the Senate in the conduct of American foreign policy.

The treaty was reported to the President by Acting Secretary of State George W. Ball, August 8, and was transmitted to the Senate by the President the same day. At this point, the center of activity shifted to the Senate.

### III. THE TEST BAN TREATY HEARINGS

The Limited Nuclear Test Ban Treaty was referred to the Committee on Foreign Relations, chaired by Senator J. William Fulbright. Because of the technical aspects and military implications of the treaty, he invited members of the Committee on Armed Services and the Senate members of the Joint Committee on Atomic Energy to sit with his committee during the hearings.<sup>59</sup> A complication was introduced by the circumstance that a separate set of hearings<sup>60</sup> had been initiated by the Preparedness Investigating Subcommittee of the

<sup>58</sup> "Documents on Disarmament, 1963," pp. 250-257.

<sup>59</sup> The hearings were held according to the following schedule: During the week of August 12: Dean Rusk, Secretary of State; Robert S. McNamara, Secretary of Defense; Dr. Glenn T. Seaborg, chairman of the Joint Chiefs of Staff; and John A. McCone, Director of the Central Intelligence Agency (in executive session). During the week of August 19: Members of the Joint Chiefs of Staff (including Gen. David M. Shoup, Commandant, U.S. Marine Corps); Dr. Edward Teller, formerly director of Lawrence Radiation Laboratory; Dr. Robert Strausz-Hupe, director of the Foreign Policy Research Institute, University of Pennsylvania; Dr. Harold Brown, director of Defense Research and Engineering, Department of Defense; Dr. Norris E. Bradbury, director of Los Alamos Scientific Laboratory; Dr. John S. Foster, Jr., director of Lawrence Radiation Laboratory; Dr. Willard F. Libby, former chairman of the Atomic Energy Commission; Adm. Lewis L. Strauss, U.S. Navy (retired), former chairman of the Atomic Energy Commission; Harold E. Stassen, President Eisenhower's Special Adviser for Disarmament; and Norman Cousins. Also various public witnesses. During the week of August 26: Dr. Herbert F. York, former director of Defense Research and Engineering; Dr. Marshall D. Shulman, Fletcher School of Law and Diplomacy, Tufts University; Arthur H. Dean, formerly U.S. representative to the Eighteen Nation Disarmament Committee; Dr. George B. Kistiakowsky of Harvard University and formerly scientific adviser to President Eisenhower. Also a number of public witnesses.

<sup>60</sup> "On Military Aspects and Implications of Nuclear Test Ban Proposals and Related Matters." Beginning May 7, the subcommittee had heard testimony from Adm. George W. Anderson, Jr., Chief of Naval Operations; Gen. Curtis E. LeMay, Air Force Chief of Staff; Maj. Gen. Robert H. Booth, Chief, Defense Atomic Support Agency; William C. Foster, director, and Dr. Franklin A. Long, assistant director, U.S. Arms Control and Disarmament Agency, and Leland Haworth, Commissioner, Atomic Energy Commission.

Senate Committee on Armed Services before the negotiations were begun on the test ban treaty. After the treaty had been initialed, the subcommittee, under the chairmanship of John Stennis, resumed its hearings having thereafter a substantive focus for its questions.<sup>61</sup>

*Complications of hearings in two committees*

As a consequence, the Administration had to prepare testimony simultaneously for two different hearings. The arrangement was made more awkward in that the Committee on Armed Services had been invited to sit with the Committee on Foreign Relations. Priority attention by Government witnesses was given to the hearings of the latter committee because the treaty had been referred to it for action. The effect of this priority was that some witnesses were not able to appear before Senator Stennis' subcommittee at all, others had to schedule appearances inconveniently, and security review of the lengthy and sensitive testimony tended to be delayed. Senator Stennis complained several times about the "treatment" his subcommittee received. On the other hand, Senator Fulbright expressed some dissatisfaction with the action of the Preparedness Subcommittee in invading a field that he considered the prerogative of his own committee.<sup>62</sup>

The approaches by the two Senate bodies differed. The Foreign Relations Committee heard some 20 major witnesses, most of whom favored the treaty. The Preparedness Investigating Subcommittee heard 13 witnesses, in August, balanced roughly half for and half against. The questions addressed to witnesses before both committees were extensive, thorough, searching, and detailed. A somewhat friendlier attitude prevailed toward the treaty in the Foreign Relations Committee, but both sets of hearings produced extremely informative testimony. The scope of the Foreign Relations Committee was the broader—as it included consideration of such issues as the effect of the treaty on the NATO Alliance, the meaning of treaty language, the Sino-Soviet split, the interests of the non-nuclear States in the treaty, and the propriety of the use of nuclear explosives for peaceful purposes under the treaty. The subcommittee confined itself to the military (or national security) aspects of the treaty. The effect of this difference in scope was that prepared statements and responses to questions in the committee balanced military risk with political advantage; while in the subcommittee, attention was centered on military risk and technical disadvantages or limitations regarding the development of weapons and defensive systems that would result from the treaty.

When the question of approving the treaty was finally decided on the Senate floor, September 24, only 2 of the 17 members of the Committee on Foreign Relations (Long of Louisiana and Lausche), voted against it. Seven of the 17 members of the Committee on Armed Serv-

<sup>61</sup> In the resumed hearings, the following witnesses appeared between Aug. 1 and Aug. 27: Dr. John S. Foster, Jr.; Dr. Norris E. Bradbury; Dr. Edward Teller; Gen. Maxwell Taylor and the other members of the Joint Chiefs of Staff; Gen. Thomas S. Power, commander of the Strategic Air Command; Gen. Bernard A. Schriever, commander of the Air Force Systems Command; Dr. Harold Brown; Admiral Anderson (then U.S. Navy (retired)); Gen. Nathan F. Twining, U.S. Air Force (retired), former chairman of the Joint Chiefs of Staff.

<sup>62</sup> The conflict in scheduling between the two committee hearings is illustrated by the fact that on the opening day of the Foreign Relations Committee hearings, the Secretary of State presented testimony in the morning (10 to 12:05) and in the afternoon (2 to 4:45), while the Preparedness Subcommittee heard from Dr. Teller all afternoon (2 to 5:30). Both witnesses were important figures and chanced to be expressing strongly differing points of view. Members of the Preparedness Subcommittee, invited to attend both sets of hearings, had to choose between them.

ices (Chairman Russell, Stennis, Byrd of Virginia, Thurmond, Byrd of West Virginia, Smith and Goldwater), 3 of the 9 Senate members of the Joint Committee on Atomic Energy (Russell, Bennett, and Curtis) and 4 of the 7 members of the Preparedness Investigating Subcommittee (Chairman Stennis, Thurmond, Smith and Goldwater) opposed the treaty. There is at least some inference in the differences in divisions among the several committees that it reflected their differential exposure to evidence regarding the treaty and its possible consequences.

*Testimony of the Secretary of State*

In his brief opening statement to the Foreign Relations Committee hearing, Secretary Rusk delineated the general plan of the treaty, after explaining its historical background. Like other witnesses who followed him, he stressed the decline in national security that accompanied the nuclear arms race.

It is against this prospect, which the world must frankly face, that the Senate is asked to consider the present treaty. If there may be marginal risks in it, they are far less in my opinion than the risks that will result if we accept the thought that rational man must pursue an unlimited competition in nuclear weapons.<sup>63</sup>

The Secretary noted that article I of the treaty contained the fundamental obligation—a prohibition of nuclear tests except underground. He defined an “underground test” as one in which “the radioactive debris remains within the country where the explosion takes place.” The treaty did not “affect the use of nuclear weapons in war.” It would, however, restrict nuclear explosions for peaceful purposes as they would be indistinguishable from tests. Still, he contended, much useful work could still be done on the Plowshare project. Concerning article II of the treaty, he noted that the amendment process involved a veto which he regarded “as essential to the security interests of the United States.”<sup>64</sup> With respect to article III, providing for “ratification and accession,” he assured the committee that no regime, by the act of subscribing to that treaty, would be able to “gain recognition by parties to the treaty that do not now recognize it.”<sup>65</sup> Article IV of the treaty entitled any signatory to withdraw unilaterally, upon 3 months’ notice. Said the Secretary: “Under the treaty, we alone will decide whether extraordinary events have occurred and whether they jeopardize our supreme national interests.” In such an event withdrawal under the 3 months clause might be necessary. But if the Soviet Union started to test in violation of the treaty, “the United States could, if it chose, consider itself released from its reciprocal obligation and could resume testing without delay.”<sup>66</sup>

Secretary Rusk then identified “concrete gains” that the treaty offered. These were: a slowing-down of the upward spiraling nuclear arms race, an inhibition upon the proliferation of nuclear weapons

<sup>63</sup> U.S. Congress, Senate, Committee on Foreign Relations, *Nuclear Test Ban Treaty*. Hearings on Ex. M, 88th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1963), p. 13. The treaty banning nuclear weapon tests in the atmosphere, in outer space, and underwater, signed at Moscow on Aug. 5, 1963, on behalf of the United States of America, the United Kingdom of Great Britain and Northern Ireland, and the Union of Soviet Socialist Republics.

<sup>64</sup> *Ibid.*

<sup>65</sup> *Ibid.*, p. 14.

<sup>66</sup> *Nuclear Test Ban Treaty*. Hearings, *op. cit.*, p. 18.

to additional countries, and a reduction in "radioactive pollution of the planet." But the most important advantage of the treaty was what it might symbolize.

\* \* \* If the promise of this treaty can be realized, if we can now take even this one small step along a new course, then frail and fearful mankind may find another step and another until confidence replaces terror and hope takes over from despair.<sup>67</sup>

As to the proposition that the Soviet Union was not to be trusted, he replied that he did not believe "an agreement of this sort can rest upon the element of faith and trust." Fortunately, he said, "We will know if there are significant violations of this treaty, we will be free to do whatever is necessary in our own security, and I would think that this is not a matter of trust."<sup>68</sup> He added that the withdrawal clause had been written into the treaty at the request of the United States: the Soviet Union did not require one "simply on the thesis that sovereignty permits the denunciation of a treaty in any event."

The question of the "minimum deterrent" versus "superior strategic force" was raised by Senator Jackson, who asked whether Secretary Rusk believed the United States could afford a position of "parity or equality with the Soviet Union in nuclear weapons technology and systems?" The Secretary replied:

Senator, I believe that the United States must maintain overall nuclear superiority with respect to the Soviet Union. This involves primarily the capacity to demonstrate that regardless of who strikes first, the United States will be in a position effectively to destroy an aggressor.<sup>69</sup>

A point of major importance was as to the role of the Department of Defense in the formulation of foreign policy. The issue was first raised by Senator Stennis who noted that no military adviser had participated in the treaty negotiations. This was "just unthinkable" to Stennis who asked: "Why did you not take someone or send someone?"<sup>70</sup> On the other hand, Senator Morse invited the Secretary to clarify the relationship of the Department of Defense to treaty-making, and expressed gratification "that you did not take a member of the Joint Chiefs of Staff to Moscow, for, I think, the symbolism of it would have been most unfortunate." The Secretary explained that although participation in the actual negotiation was the function of the Secretary of State under the direction of the President, nevertheless—

The Defense Department and the Joint Chiefs of Staff, by statute, have responsibility both for advice and action in the security field and, necessarily, security and foreign policy tend to merge in very important respects, so I think, perhaps, Senator Morse, this division could not be made completely mutually exclusive here on this particular point.<sup>71</sup>

In concluding, the Secretary said the President had given Under-Secretary Harriman daily instructions during the negotiation of the treaty, and the President had the "benefit of the full advice of the Joint Chiefs of Staff before giving such direction." He did not believe that there had been any change in the purpose of the Communist movement, "whether in the Soviet Union or in mainland China, or anywhere else, to communize the rest of the world." He agreed that it was a difficult problem to try to move toward an important act of

<sup>67</sup> *Ibid.*, p. 20.

<sup>68</sup> *Ibid.*, pp. 26-27.

<sup>69</sup> Nuclear Test Ban Treaty. Hearings, op. cit., p. 45.

<sup>70</sup> *Ibid.*, p. 42.

<sup>71</sup> *Ibid.*, p. 57.

peace while remaining mindful of the hazards remaining. And he offered a note of hope to Chairman Fulbright:

I think that there is steadily developing in the Soviet Union something roughly comparable to a public opinion. The question is whether it will develop fast enough to have a decisive influence on policy in great matters of crisis, but I think there is no doubt that there is a strong demand in the Soviet Union for attention to some of these great unfinished tasks of their own society, just as there is here in our country.<sup>72</sup>

*Testimony of the Secretary of Defense*

The second witness, Robert S. McNamara, Secretary of Defense, dealt with military areas in which he judged the treaty to be advantageous or disadvantageous to the United States. The Secretary concluded that on balance the military effect of the treaty favored the United States. He recalled that he had earlier testified that "the United States has nuclear superiority." Military strength had also been increased in the sub-nuclear categories.

I mention this strength [said McNamara] because I regard as essential to our national security the maintenance of a military posture such that we can absorb any initial surprise attack and strike back with sufficient power to destroy the aggressor. My assessment of the proposed treaty is made from that point of view—from the point of view of what is best for the security of the United States.<sup>73</sup>

The Secretary then took up four areas of concern. In the first of these, concerning high-yield (tens of megatons) weapons, the Soviet Union appeared to be technologically superior to the United States, as measured by the standard of yield-to-weight ratio. The treaty would preclude further developments in this area. However, "the apparent Soviet technological advantage at the upper end of the yield spectrum has resulted from a considered decision by the United States not to concentrate effort in this field \* \* \*."

In intermediate and low-yield nuclear weapons, the United States "appears to be clearly superior in yield-to-weight ratios." This superiority enabled the United States to develop and deploy large numbers of long-range and intermediate-range ballistic missiles; to develop "relatively small warheads which would be used to assure penetration by saturation of sophisticated and very elaborate ballistic missile defenses;" to achieve such desirable characteristics of missiles as dispersal, mobility, and hardening; to equip missiles with decoys; to achieve salvo launches; and possibly to arm a future ABM.<sup>74</sup>

The Secretary questioned the military effectiveness of very high-yield weapons because it was difficult and costly to give them the desirable military characteristics he had ascribed to the smaller-yield weapons of the United States. Several small weapons, directed at military targets, he said, "can achieve a higher confidence of kill" so that "for a given resource input we achieve higher target destruction with our smaller systems."<sup>75</sup>

The second area of concern was the survivability of the deterrent system of the United States. Here, the U.S. position was secure. "Our missile force is deployed so as to assure that under any conceivable Soviet first strike, a substantial portion of it would remain in firing condition." He was satisfied with the extent of hardening of Minute-

<sup>72</sup> *Ibid.*, pp. 59-79.

<sup>73</sup> *Ibid.*, p. 98.

<sup>74</sup> *Ibid.*, pp. 99-100.

<sup>75</sup> *Ibid.*, p. 101.

man missiles and command/control facilities; also, many Polaris submarines at sea, and strategic aircraft aloft or dispersed, would survive a first strike.<sup>76</sup>

As to the third area, the anti-ballistic-missile system, or ABM, he did not judge the Soviet Union to hold any advantage.

The ABM system which we are now designing will provide us with a high confidence of achieving a low miss distance, a short distance between intercepting missile and the incoming warhead. At such miss distances, the ABM warhead designs which we now have or can develop through underground testing will provide a high probability of killing Soviet warheads even if they incorporate advanced technology far beyond what now exists.

In the other required characteristics of an ABM system—reaction speed, missile performance in accelerating, traffic handling capacity, and capacity for decoy discrimination—further progress was dominated by factors unrelated to nuclear testing.

With respect to his fourth area of concern, the Secretary said that U.S. weapons “have and will continue to have” capability to penetrate enemy defenses. There were some marginal uncertainties. Vulnerability of an incoming warhead to the blast effect of an exploding ABM warhead could not be fully tested underground. Also, “We have not, and we believe that the Soviet Union has not, explored by full-scale high altitude tests the vulnerability of reentry vehicles to blast.”

But, regardless of the design of any Soviet ABM system, in view of the warhead improvements we can make under the treaty, of the massive U.S. force available to saturate their defenses, and of the array of penetration aids which are being developed and will continue to be developed and improved, by underground testing where necessary, the United States will continue to have the capability, and most importantly, the Soviets will know that we will continue to have the capability—to penetrate and to devastate the Soviet Union if a retaliatory blow is required.<sup>77</sup>

The Secretary next examined the possibility of Soviet “cheating” by means of clandestine tests, concluding that such “would clearly not be a simple, easily concealed, high-confidence operation.” To deter surprise abrogation, it would be “firm national policy” to retain a “readiness to test in every relevant environment.”<sup>78</sup>

In conclusion, the Secretary summarized the military advantages of the treaty as “retarding the spread of nuclear weapons,” and affording an opportunity, at minimum risk, “to test the sincerity of Soviet protestations about their desire to explore more sweeping arrangements for preserving the peace.” The one serious danger he perceived in the situation was the “risk of euphoria.” Progress in arms control arrangement with the Soviet Union depended “critically” on the preservation of the military strength of the United States, and on the condition of mind that would maintain that strength.<sup>79</sup>

The question of the role of the JCS was raised again with Secretary McNamara as it had been with Secretary Rusk. In response, he said: “I presented my statement to the Chiefs for word-by-word approval but it is based on hours of discussion.”<sup>80</sup> In response to a question by Senator Russell, Chairman of the Armed Services Committee, as to whether there were plans, “if we go into the area of disarmament and

<sup>76</sup> *Ibid.*, p. 102.

<sup>77</sup> *Ibid.*, pp. 103–104.

<sup>78</sup> *Ibid.*, p. 107.

<sup>79</sup> *Ibid.*, pp. 108–109.

<sup>80</sup> *Ibid.*, p. 114.

reduction of arms, to have military people available for consultation?" the Secretary responded:

Absolutely. The Chiefs have met on literally hundreds of occasions in the last 2 years to consider the proposals that have been under study during that time and I am certain if disarmament proposals are considered by our Government in the next 2 years that it will require similar action on their part.

They consider these both separately and also during sessions with me and with the President. Their advice is absolutely essential as a foundation for proper consideration of any proposals dealing with our military forces.<sup>81</sup>

As to the "degree to which the military have been kept informed and consulted with reference to the treaty," the Secretary explained:

I believe they have been both thoroughly informed and frequently consulted on the subject matter of the treaty. Over a period of years this was the custom of the previous administration and I think it has not only been carried on but I believe furthered by this administration.

As a matter of fact, in May of this year General Taylor, the Chairman of the Joint Chiefs of Staff, was added formally and officially to the Committee of Principals which is the organization in the executive branch which reviews proposals such as this before they are finally presented to the President.

This was more a formal move than one of substance because prior to that time both he and his predecessor, General Lemnitzer, during my period in the Department, and I think it was true prior to the time I was in the Department, accompanied the Secretary of Defense to the meeting of the Committee of Principals.

But in order to insure there was no misunderstanding about the importance of the role of the military advisers, the Chairman was formally added to the committee in the month of May of this year.<sup>82</sup>

Asked whether the JCS in giving subsequent testimony to the committee would be under administrative constraint, the Secretary said there were no such instructions, "either on this treaty or on any other subject." The JCS, he went on, "have the right and the responsibility [by law] to appear before the appropriate congressional committees to express their views at their own initiation when they believe that actions are being taken contrary to our national security." Moreover, "they have that right by practice in my administration of the Department."<sup>83</sup>

Secretary McNamara was also invited to comment on a speech by Senator George McGovern, who had urged a reduction in defense expenditures on the ground that an asserted excess of nuclear weapons and delivery systems (which he called "over-kill" capability) had already been achieved so that still more force was unnecessary. The gist of his reply was that the term "over-kill" seemed to be propagandistic and was technically unsound. A nation whose strategy involved accepting an attack and then responding must assume that a substantial portion of its arsenal will be destroyed before it is used. It must accordingly have an excessive inventory to be sure that enough of its weapons survive an attack to be able to deliver a punishing second strike.

#### *Testimony of the Chairman of the AEC*

Dr. Glenn T. Seaborg, Chairman of the U.S. Atomic Energy Commission, stressed the need for continued readiness to test, in order to deter surprise abrogation,<sup>84</sup> called for a vigorous program to utilize nuclear explosives for peaceful purposes (the Plowshare program),

<sup>81</sup> *Ibid.*, p. 111.

<sup>82</sup> *Ibid.*, p. 119.

<sup>83</sup> *Ibid.*, p. 202.

<sup>84</sup> *Ibid.*, pp. 208-209.

and expressed confidence that under the treaty the program could be carried on to encompass a wide variety of interesting experiments.<sup>85</sup> The danger of radiation from radioactive fallout, he said, was far from posing a danger, but it could easily become one with unrestricted testing.<sup>86</sup> Senator Russell inquired if it was correct to calculate the relative blast effect of an atomic bomb as the cube root of the yield; Dr. Seaborg agreed that it was "approximately correct."<sup>87</sup> He gave assurance that the AEC would maintain readiness to conduct atmospheric tests, would carry on a strong program of underground testing, and would maintain strong and healthy laboratories.<sup>88</sup> He assured Senator Russell that it would be possible to complete an "antimissile missile" without further atmospheric testing, and that, in fact, "We already have a number of warheads that are eligible for this purpose \* \* \*."<sup>89</sup>

In the course of Dr. Seaborg's testimony, the chairman of the committee introduced into the record a letter from Dr. I. I. Rabi of Columbia University, reporting a survey he had conducted of 35 Americans who were Nobel Prize winners, all of whom recommended approval of the treaty.

*Testimony of the Chairman of the JCS*

Gen. Maxwell Taylor, Chairman of the JCS, told the committee that "the broader advantages of the test ban treaty have led the Joint Chiefs of Staff to conclude that it is compatible with the security interests of the United States and we support its ratification."<sup>90</sup> The JCS, General Taylor said, had focused their analysis "on this particular treaty at this particular point in time." They had established four criteria of acceptability relative to the national security, which are paraphrased as follows:

1. Limitations on U.S. testing would be unacceptable in any militarily important area of nuclear weapon technology in which the Soviet Union had or could achieve a significant advantage.
2. A test ban treaty would be unacceptable if the Soviet Union could conduct clandestine testing that would have seriously adverse effects on the relative balance of military power.
3. Withdrawal from the treaty should be uncomplicated—permitted without delay in event of treaty violation or if national interests were imperiled.
4. If criteria (1) and (2) were not completely met, the treaty must convey compensatory advantages elsewhere.<sup>91</sup>

The JCS recognized that the Soviet Union led the United States in the technology of high-yield nuclear weapons, but lagged somewhat in low-yield weapons. In the ABM field, progress did not depend on nuclear testing. In tactical nuclear weapons, the United States was "probably ahead." They concluded:

<sup>85</sup> *Ibid.*, pp. 210–211.

<sup>86</sup> *Ibid.*, p. 214.

<sup>87</sup> *Ibid.*, p. 215. The significance of this exchange may not have received full recognition. It signified that the destructive power of a 100-megaton bomb was only about 1.7 times as great as that of a 20-megaton bomb, and only 4.6 times as great as that of a 1-megaton bomb. In view of the great weight penalty of the larger yield bomb (since yield and weight are about in direct proportion), its military advantage as a weapon of destruction is doubtful.

<sup>88</sup> *Ibid.*, p. 222.

<sup>89</sup> *Ibid.*, p. 217.

<sup>90</sup> *Ibid.*, p. 275.

<sup>91</sup> *Ibid.*, p. 272.

As to net superiority in ability to inflict damage on the enemy, the JCS consider that the United States at present is clearly ahead of the U.S.S.R. in the ability to wage strategic nuclear war, and is probably ahead in the ability to wage tactical nuclear war, whereas the Soviets have developed a substantial midrange ballistic missile capability.<sup>92</sup>

As seen by the JCS the treaty presented a number of specific military disadvantages, to one side or both. The United States would be unable to overtake the Soviet lead in high-yield weapons. The Soviets would be able to overtake the United States in low-yield tactical weapons. Neither side could achieve as effective characteristics of an ABM system, although both sides could probably develop one. Rate of acquisition of scientific knowledge of weapons effects would be slowed. Proof tests and environmental tests of weapons would be halted. Clandestine tests might give the Soviets further advantages, although such advantages were considered a "relatively minor factor in relation to the overall present and probable balance of military strength if adequate safeguards are maintained." Safeguards were particularly important to minimize the advantage of the Soviets might gain from a surprise abrogation. Accordingly, the JCS recommended four sets of safeguards. These were:

(a) The conduct of comprehensive, aggressive, and continuing underground nuclear test programs designed to add to our knowledge and improve our weapons in all areas of significance to our military posture for the future.

(b) The maintenance of modern nuclear laboratory facilities and programs in theoretical and exploratory nuclear technology which will attract, retain, and insure the continued application of our human scientific resources to these programs on which continued progress in nuclear technology depends.

(c) The maintenance of the facilities and resources necessary to institute promptly nuclear tests in the atmosphere should they be deemed essential to our national security or should the treaty or any of its terms be abrogated by the Soviet Union.

(d) The improvement of capability, within feasible and practical limits, to monitor the terms of the treaty, to detect violations, and to maintain our knowledge of Sino-Soviet nuclear activity, capabilities, and achievements.<sup>93</sup>

General Taylor concluded his formal presentation by expressing an apprehension that a state of "euphoria" might "reduce our vigilance and the willingness of our country and of our allies to expand [expend?] continued effort on our collective security."<sup>94</sup> He assured the committee that the JCS had been consulted during the development of the treaty, and during the Moscow negotiations he himself had served as intermediary to keep them informed and to express their views to the White House. He acknowledged that the Soviet Union was not to be trusted. He assured the committee that the United States would not observe the treaty if it were not in the national interest (but would observe the 90-day waiting period before withdrawing from it), that the JCS saw nothing in the treaty to prohibit the use of nuclear weapons in warfare, and that the limitation upon the proof-testing of systems was probably the hardest condition for them to accept.

Mr. McCone, Director of the Central Intelligence Agency, then went before the committee in executive session, to discuss classified matters concerning what Secretary Rusk had earlier described as the "high degree of confidence" in U.S. ability to detect "any violations" of the

<sup>92</sup> *Ibid.*, p. 273.

<sup>93</sup> *Ibid.*, pp. 274-275.

<sup>94</sup> *Ibid.*, p. 276.

treaty.<sup>95</sup> In his testimony, McCone "unqualifiedly endorsed this treaty, with the four [JCS] provisos \* \* \*." <sup>96</sup>

*Testimony by opponents of the treaty*

The main opposition to the treaty in the Foreign Relations Committee hearing was supplied by Dr. Teller. He was impressed with the unpredictability of nuclear science, the unreliability of intelligence, and the importance of peaceful uses of nuclear explosives which he said the treaty would hamper. He regarded unrestricted tests as beneficial to the United States: in his view the Soviets were "ahead" in numerous categories of development involving nuclear testing, an ABM system was feasible, the treaty would not halt nuclear proliferation, and because testing in outer space could not be policed it should therefore be permitted. He feared the test ban would impair relations with allies of the United States and prove generally a source of instability. He said: "The reason that I am worried about this treaty is because I believe that this treaty is a step not toward peace but rather a step away from safety, possibly a step toward war."<sup>97</sup> Indicating that intelligence had been wrong in estimating when the Soviet Union would achieve a nuclear capability, that Soviet preparations for the surprise abrogation of the test moratorium had not been anticipated, that the Russian sputnik had been a surprise, and that it was generally difficult to glean intelligence from a police state, he concluded: "On the basis of the past performance of our intelligence, we cannot be comfortable and we cannot say that we know what the Russians know."<sup>98</sup> As to the ABM, he said: "A few years ago I firmly believed that missile defense was hopeless. I am now convinced that I was wrong."<sup>99</sup> With respect to Plowshare, Teller said:

We can make harbors, we can make sea level canals, we can deflect rivers, we can throw off overburden from deep deposits, deep mineral deposits and increase our wealth and the wealth of other nations. We can do it in a very clean way. We can do it in such a way, I believe, 2 years from now it will be possible to make an explosion that will have made a crater and land in this crater as soon as the dust has settled, in 15 minutes, without exposing ourselves to more radiation than we have taken year in and year out in our laboratories. All this can be done. But there will be some measurable radioactivity, and this treaty prohibits the deposition of any radioactivity outside the territory of the United States.<sup>100</sup>

The future of nuclear development, said Teller, was unpredictable, and the—

\* \* \* development of a rapidly moving field such as that of atomic energy, is completely beyond my predictions. I have made the historical introduction to demonstrate to you by the surprises of the past that surprises must be expected in the future.

They might be in offensive or defensive weapons, and would surely be in peaceful uses.<sup>101</sup> In Teller's judgment, the "Russians have worked much harder" and "are already ahead" in nuclear development.<sup>102</sup> While it was true that the treaty might have "exacerbated the Sino-Soviet difference," he saw no other way "in which this treaty might retard or disturb the Communists."

<sup>95</sup> *Ibid.*, p. 19.

<sup>96</sup> Statement by Senator Mansfield, *ibid.*, p. 490.

<sup>97</sup> *Ibid.*, p. 418.

<sup>98</sup> *Ibid.*, p. 422.

<sup>99</sup> *Ibid.*, p. 420.

<sup>100</sup> *Ibid.*, pp. 426-427.

<sup>101</sup> *Ibid.*, p. 435.

<sup>102</sup> *Ibid.*, p. 448.

On the contrary, by driving a wedge between us and our allies, I see how this treaty might facilitate the further expansion of communism.<sup>103</sup>

Dr. Robert Strausz-Hupe, of the University of Pennsylvania, analyzed the treaty in terms of the relationship between a free society and a Communist or closed society. He expressed fear that the treaty might weaken the NATO alliance. The 90-day withdrawal provision of the treaty, he believed, unduly favored an unscrupulous state that did not honor it, and might give rise to endless uncertainties—or even worse, to lags in the response by an open society to suspicion of treaty violation by a closed society. Another weakness of the treaty in his view was that it set a precedent for uninspected arms agreements. And finally, the goal of tension reduction was of dubious merit in dealing “with an opponent who seeks world domination \* \* \*.”<sup>104</sup> Accordingly, he recommended that the Senate accede to the treaty, but only subject to stipulations involving assertion of the right to use nuclear weapons in war, to transfer them to allies at any time, to instant abrogation if necessary; also, stipulations asserting the inspection principle, assurance of nonrecognition of the East German regime, and the need for periodic reports of various kinds.<sup>105</sup> In the absence of any of these, he advocated rejection of the treaty.

#### *Technical support for the treaty*

A principal technical witness for the Administration was Dr. Harold Brown, Director of Defense Research and Engineering and earlier director of Lawrence Radiation Laboratory, Livermore, Calif. Dr. Brown systematically analyzed the effects of the test ban treaty upon various categories of weaponry and concluded that, if fully observed, it would “actually improve somewhat the position of the United States vis-a-vis the Soviet Union \* \* \*.” Moreover, he said, “I do not believe that the Soviets can impair to an important degree our strategic superiority.”

Having satisfied myself as completely as is humanly possible that the proposed treaty cannot substantially impair our strategic superiority if we take the steps which we can to continue our nuclear developments and remain prepared, and that indeed it could enhance our strategic superiority compared with unlimited testing, I find the arguments for it on broader grounds persuasive, and I fully support its ratification.<sup>106</sup>

It was true, Dr. Brown conceded, that the Soviets had bested the United States in the “upper end of the yield spectrum” because of a “considered decision by the United States not to concentrate effort in this field.” The attention to smaller yield devices had facilitated the development of ICBM and IRBM weaponry by the United States. Moreover, “with our present knowledge and further underground testing we can continue development of relatively small warheads which would be used to assure penetration by saturation even of sophisticated and very elaborate ballistic missile defenses.” In weapons effects tests, the United States appeared to be generally ahead of the Soviet Union (a point that Dr. Teller disputed). Effect of weapons against hardened missile sites was determined more by accuracy of delivery system than by yield of warhead. Similarly, com-

<sup>103</sup> *Ibid.*, p. 454.

<sup>104</sup> *Ibid.*, p. 515.

<sup>105</sup> *Ibid.*, p. 517.

<sup>106</sup> *Ibid.*, pp. 541–542.

mand and control systems of the United States were being hardened, so that vulnerability of these was not a factor.<sup>107</sup>

In knowledge of the effect of high altitude nuclear bursts on communications blackout, radar blackout, and nuclear weapons vulnerability, Dr. Brown said, the United States and the Soviet Union were comparable. Both countries would be able to "design around our uncertainties." Also in ABM development, efforts of the United States "are comparable in magnitude and in success with those of the Soviets." Dr. Brown did not consider Soviet development of a 100-megaton bomb of crucial significance:

The actual military worth of 100-megaton weapons to the United States is not clear either to the military or technical authorities in the Defense Department. Their possible effects could not have been thoroughly explored by the Soviets in their development tests. We are sure that two or three smaller bombs are equally or more effective against important military targets than one of the large Soviet bombs.<sup>108</sup>

The various possible modes of "cheating" under the treaty, he judged, were not worth the effort, or would run serious risk of detection, or both: "attempted violation carries high risks of detection wherever there is significant motivation for violation."<sup>109</sup> Both the United States and the Soviet Union needed more information to develop satisfactory defense postures in weapons effects on hardened sites and ABM development. However, "preventing a war is far more important than any knowledge that you might get."<sup>110</sup>

On the other hand, if they cheat as much as they can, and if they prepare a surprise under the treaty and abrogate it, if there is a surprise abrogation, I think that they may gain some small and temporary military advantage. I think that is the worst that can happen, and in my view that is not a serious argument against the treaty.<sup>111</sup>

Following Dr. Brown's appearance, the committee took testimony from Dr. Norris E. Bradbury, Director of the Los Alamos Scientific Laboratory, and from Dr. John S. Foster, Jr., Director of Lawrence Radiation Laboratory, both AEC installations. Bradbury favored ratification of the treaty. He declared that in the nuclear arsenal of the United States "every weapon delivery system which can effectively use a nuclear warhead has one \* \* \*." It was true that in yield-to-weight ratio of the "very largest multimegaton weapons" the Soviet Union "appears to have concentrated more effort than has the United States." It had been a matter of policy on the part of the United States not to build such large-yield warheads but it could be done. He stressed the importance of the development of delivery systems over warheads and confirmed assertions by earlier witnesses that testing was not a consideration in the development of missiles or an ABM system. He saw no great risk in the halting of research in underwater nuclear explosions. ("We certainly have much more experience in underwater testing area than any other country.")<sup>112</sup> The same situation existed with the study of blackout phenomena, the radio interference effects in a nuclear explosion environment. Underground testing continued to be necessary to the security of the United States, and the JCS safe-

<sup>107</sup> *Ibid.*, p. 529.

<sup>108</sup> *Ibid.*, pp. 531-532.

<sup>109</sup> *Ibid.*, pp. 531-532.

<sup>110</sup> *Ibid.*, p. 544.

<sup>111</sup> *Ibid.*, pp. 574-575.

<sup>112</sup> *Ibid.*, p. 581.

guards were also necessary to deter the Soviet Union from abrogating.<sup>113</sup> Dr. Bradbury also said it was possible to test “without undue difficulty” weapons with yields up to one megaton underground.<sup>114</sup> “I suspect we are probably ahead of Russia in warheads.” Underground testing would enable virtually every area of weapon development to continue. “The only area where we have to rest upon our current knowledge is in this area of blackout phenomenology.”<sup>115</sup>

Dr. Foster was less assured than Dr. Bradbury as to the acceptability of the treaty. Without atmospheric tests, he said, “I doubt that we can develop and maintain the requisite skill in the important area of the effects of nuclear weapons.” Of greatest importance was the fact that the treaty prevented proof tests of warheads and weapon systems.

Missile systems for offense or defense [said Foster] are extremely complex, yet must function not only under the ideal laboratory conditions in which they are usually tested, but also under the most adverse conditions—those of nuclear war.<sup>116</sup>

In this connection Dr. Foster attached particular importance to problems of blackout and penetration—and to actual tests of proposed solutions. He expressed apprehension “that in an expanding technology vigorously pursued, there frequently result abrupt increases in scientific knowledge—rapidly reflected in military capability—which could upset the balance of power.”

The proposed treaty would limit not only our knowledge of the actual state of Soviet military development, but would also restrict our knowledge of what may even be technically possible \* \* \*. Thus, from purely technical-military considerations, the proposed treaty appears to me disadvantageous.<sup>117</sup>

Surprise abrogation by the Soviet Union, he thought, constituted a greater hazard for the United States than did clandestine tests.<sup>118</sup> Moreover, because of the closed and secret nature of the Soviet society, the treaty would favor the Soviets if rough parity in weapons capability prevailed in the two countries.<sup>119</sup>

The testimony of Willard F. Libby, a former chairman of the Atomic Energy Commission, was cautiously in support of the treaty. Said Libby: “In summary, I think on the whole I probably would favor the treaty, but I would have to see the latest on the 100-megaton problem and have Plowshare reassurance before doing so.” The problem of maintaining the laboratories was “largely a matter of funding.”<sup>120</sup>

#### *Legal and political considerations, pro and con*

Adm. Lewis L. Strauss (U.S. Navy, retired), another former chairman of the Atomic Energy Commission, was more critical. Judging that “early ratification of the treaty now appears probable,” he urged upon the committee “two Senate reservations and four actions” to reduce the risk of the treaty to the United States. The reference in the treaty to “or any other nuclear explosion” should be clarified to permit employment of nuclear weapons at any time to defend the United

<sup>113</sup> *Ibid.*, p. 582.

<sup>114</sup> *Ibid.*, p. 587.

<sup>115</sup> *Ibid.*, p. 601.

<sup>116</sup> *Ibid.*, pp. 614–615.

<sup>117</sup> *Ibid.*, p. 616.

<sup>118</sup> *Ibid.*, p. 617.

<sup>119</sup> *Ibid.*, p. 619.

<sup>120</sup> *Ibid.*, p. 641.

States or any other nation against armed aggression, and that in such action the "three months" waiting period should not apply; also the use of nuclear explosions for peaceful engineering at home or abroad should be preserved regardless of the treaty. Three of his suggested legislative actions concerned measures to maintain the nuclear research laboratories in a high state of readiness and competence. The last called for immediate reports by the President to the Congress of any seeming violation of the treaty.<sup>121</sup>

Harold Stassen, who had served as President Eisenhower's Special Adviser on Disarmament, recommended Senate approval of the treaty as serving "the best interests of mankind," as a factor to inhibit the spreading of nuclear weapons to additional states, and as an encouragement to successful resolution of a divided Germany.<sup>122</sup> The Soviet Union, he noted, had abided by both the Austrian Treaty and the Antarctic Treaty.

Norman Cousins, editor of the *Saturday Review*, whose role in paving the way for the reopening of the test ban negotiations has already been described, also recommended approval of the treaty. While acknowledging that the Soviet Union had not abandoned its objectives of world communism, he observed that the Soviets had chosen to pursue them on the "nonmilitary battlefield."<sup>123</sup> Second, he judged that Khrushchev had chosen between rapprochement with the Chinese Communists and with the United States: the test ban treaty symbolized his decision. National security depended more on control of force than on accumulation of more force.<sup>124</sup>

A hearing of public witnesses occupied the committee on Friday, August 23. An analysis of the 19 public witnesses in the hearings<sup>125</sup> shows that five were opposed to ratification of the treaty and 14 favored it. A reasonable expectation might have been that the public witnesses favoring the treaty would have been mainly concerned with the beneficial consequences of a test ban for reducing radioactive fallout in the environment. Considerable attention had earlier been given to the rising levels of radioactivity caused by nuclear tests, and in particular to the apparently exponential rate of increase in intensity of such dangerous isotopes as strontium 90, or iodine 131. However, six witnesses made only slight reference to this hazard and three made none at all. Three cited it as a major issue and two addressed themselves to radiation as the foremost advantageous aspect of the treaty. Among the professional witnesses, on the other hand, while there was general agreement that any increase in level of radioactivity was undesirable and potentially harmful, the issue was judged to have been grossly exaggerated.

After hearing the public witnesses the Foreign Relations Committee on Monday, August 26, called upon Dr. Herbert York, chancellor of the University of California at San Diego and previously Director of Defense Research and Engineering. He concurred in testimony given earlier by Harold Brown: that, in accuracy and reliability, a number of small-yield weapons were preferable to a single large-yield weapon; that it would be better to improve payload capability of delivery vehicles than to improve yield-to-weight ratios of warheads;

<sup>121</sup> *Ibid.*, pp. 676-677.

<sup>122</sup> *Ibid.*, pp. 699-700.

<sup>123</sup> *Ibid.*, p. 707.

<sup>124</sup> *Ibid.*, p. 709.

<sup>125</sup> *Ibid.*, pp. 725-758, 879-966.

that the ABM problem was probably insolvable, so that attention should instead be concentrated on deterrence by attack capability; and that it would not be possible to forecast with scientific precision the nature of a future attack upon the United States. Concurring with Dr. Brown, he noted that "ever since shortly after World War II, the military power of the United States has been steadily increasing; over the same period the national security of the United States has been rapidly and inexorably diminishing."<sup>126</sup> Dr. York believed that for this paradoxical dilemma there was "absolutely no solution to be found within the areas of science and technology."<sup>127</sup> Both the United States and the Soviet Union were unilaterally capable of inflicting damage on the other, and on each side the capability was growing, although the United States has "always been way ahead of them in this matter."<sup>128</sup> The effect of the test ban treaty would be merely to retard slightly the rate at which the national security is diminishing.

On the question of the possible effectiveness of an alleged deployed ABM system in the Soviet Union, Dr. Brown, in response to a question by Senator Lausche, had earlier replied: "All I would want to say in open session is that there is evidence of possible anti-ballistic-missile activity. I do not believe that there is a completed anti-ICBM installation." Dr. York saw no merit in the ABM concept:

Senator LAUSCHE. Would you mind expressing an opinion as to why Red Russia deployed an ABM system if it is not the effective one that they think they have?

Dr. YORK. Yes. Some of their scientists or engineers sold them a bill of goods. That happens here, too.<sup>129</sup>

#### *Analysis of political impacts of the treaty*

The testimony of Dr. Shulman, of the Fletcher School of Law and Diplomacy, dealt with the question as to why the Soviet Union was interested in a test ban treaty at the given time, and the import of this time-related situation for the United States. Internally, he said, the Soviet system was then preoccupied with "shortcomings in the economy," a reshuffling of second-tier leadership, and ideological adjustments among Soviet intellectuals vis-a-vis the regime.

Externally, the Soviet Union was confronted with two sets of problems—one in relation to other States in the Communist bloc, and the other in relation to non-Communist States. The former set related mainly to the ideological dispute between an intransigent "Stalinist" faction led by Communist China which took exception to the more flexible concept held by Soviet Russia of "peaceful coexistence." Other divisive problems attributable to the "increasingly complex imperial structure" of the Soviet Union and its system of Eastern European satellites were also generating economic strains and political tensions in Eastern Europe.

The second set of problems, involving those States external to the Communist bloc, was characterized by diminution of prospects of success for achievement of Communist expansionist goals.<sup>130</sup> Soviet leadership appeared to have concluded that the test ban would contribute to the favorable resolution of these problems. As perceived by

<sup>126</sup> *Ibid.*, p. 761.

<sup>127</sup> *Ibid.*, p. 762.

<sup>128</sup> *Ibid.*, p. 768.

<sup>129</sup> *Ibid.*, p. 571.

<sup>130</sup> *Ibid.*, p. 793.

the Soviet leadership, the effects of the test ban could be expressed as (in paraphrase) :

1. A reduction in international tensions without rendering the Soviet Union "vulnerable to a Chinese charge of 'capitulation to the imperialists'."

2. Exploitation of the Soviet "peace" issue, causing the Chinese to appear to be the "war" faction within the Communist bloc.

3. The resultants of the reduced tensions between East and West would cause reduced pressure by the West, promote divisions within NATO, reduce stimulus for appropriations and mobilization of military resources by the West, inhibit Western reliance on the nuclear deterrent, and tend to expand long-term opportunity for economic and political detente with the West.

The consequences of these actions for the United States, as Shulman analyzed them, would be (in paraphrase) :

1. Soviet acceptance of the "noninevitability of war." From the American point of view this would be a desirable shift.

2. Although military superiority of the United States over the Soviet Union remained essential, "measures which we may take in the unilateral pursuit of security which call into question our intentions may have the effect of diminishing our security, if they serve to intensify adversary action or preparations, particularly in research and development which may lead to destabilizing technological advances." The treaty dramatizes the fact that the Soviet-American interaction is a "limited adversary relationship," extremely serious but neither total nor absolute. Our security is interlocked and makes possible some kinds of mutually advantageous safeguards.

3. The Soviets have come to a sober realization of the advantages of arms control or "partial measures."

4. "\* \* \* There is a substantial amount of interaction between Soviet policy and our own, and \* \* \* the condition which has most favored the evolution of Soviet policy in the direction of moderation has been a firm resistance to Soviet probes, combined with demonstrated political and economic vitality on the part of the non-Communist nations."<sup>131</sup>

Shulman warned that the Soviet-American relationship contained dangers if the Western alliance were permitted to deteriorate or appear as less than a solid front, and also if a sense of "euphoria" resulted in reduced vigilance on the part of the military forces and the support of them.<sup>132</sup>

Arthur Dean, who had served as chairman of the delegation to the Nuclear Test Ban Conference at Geneva in 1961, as chairman of the U.S. delegation to the Eighteen Nation Disarmament Conference at Geneva until December 31, 1962, and as a member of the U.S. delegation to the United Nations and the 16th and 17th General Assemblies, told the committee that he favored approval of the treaty but urged continued efforts to achieve agreement on a comprehensive test ban.<sup>133</sup>

The concluding technical witness, Dr. Kistiakowsky of Harvard, endorsed particularly the testimony of Harold Brown, and stressed the inherent lag of ABM technology relative to offensive missile tech-

<sup>131</sup> *Ibid.*, pp. 795-799.

<sup>132</sup> *Ibid.*, p. 800.

<sup>133</sup> *Ibid.*, p. 845.

nology. He saw greater risk in continued unrestricted testing than from the treaty. As to the issue of whether testing in outer space (prohibited under the treaty) could be conducted clandestinely with advantage, he suggested that solar flares would confuse the results from such tests.<sup>134</sup>

In the questioning that followed his prepared statement, Dr. Kistiakowsky took specific exception to Dr. Teller's assertion that the Soviets led in ABM development and stressed instead the importance of maintaining a retaliatory capability.<sup>135</sup> Without the treaty, he said, both the United States and the Soviet Union might pursue the development and testing of very high-yield weapons, other nations would embark upon nuclear weapons programs involving atmospheric tests, radioactivity in the atmosphere would increase, and the only outcome would be war.<sup>136</sup> He discounted the importance of the limitation imposed by the treaty upon the Plowshare program.<sup>137</sup>

The point at which Dr. Kistiakowsky appeared, in the light of his senior position as a scientist and presidential adviser, and the extent to which his testimony rebutted that of Dr. Teller (often explicitly), suggests that he had been called upon to counteract the very considerable effect of Dr. Teller's testimony.<sup>138</sup>

#### *Hearings before Preparedness Investigating Subcommittee*

The separate test ban hearings conducted before the Preparedness Investigating Subcommittee, under the chairmanship of Senator John Stennis, were begun May 7, 1963, and continued through August 27. They filled two volumes, of which the first dealt mainly with policy regarding the earlier comprehensive test ban proposal.<sup>139</sup>

The hearings held by the Preparedness Subcommittee after the treaty had been submitted to the Senate for approval, August 8, duplicated much of the matter presented before the Foreign Relations Committee. Because the subcommittee limited its scope to the military aspects of test ban matters—and the treaty—choice of witnesses before it tended to emphasize active and retired military officers. (See table.) The tenor of the questioning was also distinguished by a more military flavor.

<sup>134</sup> *Ibid.*, p. 857.

<sup>135</sup> *Ibid.*, pp. 859–860.

<sup>136</sup> *Ibid.*, p. 863.

<sup>137</sup> *Ibid.*, p. 870.

<sup>138</sup> Examples of the concern shown by treaty supporters for the statements by Teller are abundant throughout the hearings. It is likely that a concerted effort was made to establish as weighty an accumulation of informed professional opinion as possible to counteract the statements by Teller, for future use in the debate on the Senate floor. For example:

Senator HUMPHREY (to Dr. Brown): "Finally, did Teller have access to information that is not available to you?" p. 578.

Chairman FULBRIGHT (to Dr. Bradbury): "Have you read, had a chance to read, Dr. Teller's testimony?" *Ibid.*, p. 584.

Chairman FULBRIGHT (to Dr. York): "I don't like to deal with personalities but he (Teller) was the most effective witness and he testified all day with a very large attendance and obviously made a large impression upon the committee and through the television on the country." *Ibid.*, pp. 763–764.

Chairman FULBRIGHT (to Dr. Kistiakowsky): "On the basis of your past professional contact with Dr. Teller, who is undoubtedly the leading opponent of this treaty in the scientific field, could you tell us the reasons, in your opinion, for Dr. Teller's dogmatic and very positive judgment with regard to agreements to control nuclear weapons tests?" *Ibid.*, p. 860.

<sup>139</sup> The Senate hearings were in two volumes, pts. 1 and 2: U.S. Congress, Senate, Committee on Armed Services, *Military Aspects and Implications of Nuclear Test Ban Proposals and Related Matters. Hearings before the Preparedness Investigating Subcommittee, 88th Cong., 1st sess.* (Washington, U.S. Government Printing Office, 1964). Pp. 1–390 dealt with test ban matters generally and with the comprehensive test ban. Beginning on p. 391, and continuing through p. 540 of the first volume and all of pt. 2 (pp. 541–981, exclusive of the index), the testimony received by the subcommittee related specifically to the Limited Test Ban Treaty.

*Table I. Table of witnesses**Witnesses appearing before both Foreign Affairs Committee and Preparedness Investigating Subcommittee*

Dr. Norris E. Bradbury, Director, Los Alamos Scientific Laboratory.  
 Dr. Harold Brown, Director of Defense Research and Engineering.  
 Dr. John Foster, Director, Lawrence Radiation Laboratory.  
 Gen. Curtis E. LeMay, U.S. Air Force, Chief of Staff.  
 Adm. David J. McDonald, U.S. Navy, Chief of Naval Operations.  
 Gen. Maxwell D. Taylor, Chairman, Joint Chiefs of Staff.  
 Dr. Edward Teller, University of California.  
 Gen. Earle G. Wheeler, U.S. Army, Chief of Staff.

*Witnesses heard only by Preparedness Investigating Subcommittee*

Adm. George W. Anderson, U.S. Navy (retired), formerly Chief of Naval Operations.  
 Adm. Arleigh Burke, U.S. Navy (retired), formerly Chief of Naval Operations.  
 Gen. Thomas S. Power, U.S. Air Force, Commander, Strategic Air Command.  
 Gen. Bernard A. Shriever, U.S. Air Force, Commander, Air Force Systems Command.  
 Gen. Nathan F. Twining, U.S. Air Force (retired), formerly Chairman, Joint Chiefs of Staff.

*Military opposition: The theory of maximum deterrence*

Gen. Thomas S. Power, U.S. Air Force, Commander of the Strategic Air Command (SAC), declared at the outset of his testimony that: "I am not in favor of the test ban treaty." He enumerated many details of operational missiles with nuclear warheads in the arsenal of his command that had not been proved out. "We have never completely tested any of the nuclear weapons in SAC's arsenal," he declared. "We are dealing with the security of the United States, and if facts can be obtained I want to have them."<sup>140</sup> General Power proceeded to outline a comprehensive philosophy probably shared by many opponents of the treaty. He said, in part:

We could not be in the position of talking with confidence that we could prevent a thermonuclear war unless we were strong, and we basically got our strength through these weapons and through testing. I just feel that the surest way to prevent war—and that is my goal, and I feel very strongly about it—is to have overwhelming strength so that it is ridiculous for anybody to even think of attacking the United States. That is what it has been in the past, and that is what it is today.

It has unpleasant features, yes, but the surest way in my opinion of preventing a thermonuclear war is to have overwhelming strength, and I think this is the one area in which we can beat anyone.

I think our science, our economy, and everything else can help us win this race. We have won it in the past, and I think we can continue to win it. But it takes the will to do it. That is an off-the-cuff summation about how I feel about it.<sup>141</sup>

General Power said it was important to test the survivability of hardened missile sites under actual missile attack.<sup>142</sup> He discounted the "overkill" theory and remarked that "not every bomb is going to arrive at the target." The purpose was to "make this thing so sure

<sup>140</sup> *Ibid.*, pp. 779–780.

<sup>141</sup> *Ibid.*, p. 782.

<sup>142</sup> *Ibid.*, p. 785.

that it will deter anyone" and thus prevent war.<sup>143</sup> Disarmament, he said, was "a proven concept to get you into a war."

In other words, you have an aggressor, and he never attacks unless he has a victim, somebody whom he can attack and get a profit out of it. He looks for a weak nation, a nation that disarms itself.<sup>144</sup>

Adm. George A. Anderson, Jr., made two appearances before the Preparedness Subcommittee. His first appearance was June 26, when as Chief of Naval Operations, he spoke on behalf of the JCS to oppose the comprehensive test ban proposal of the United States. His second appearance, on Friday, August 23, was shortly after his retirement from active duty at which time his statement was "strictly personal." First, he noted that both the United States and the Soviet Union enjoyed certain advantages which the treaty would tend to perpetuate. There was "far less risk" under the limited ban than there had been under the proposed comprehensive ban because "we are not placing unwarranted reliance on trust to avoid violations or depending upon inadequate inspection measures in this regard."<sup>145</sup> He recommended that the Senate clarify the conditions under which "general and complete disarmament," as mentioned in the treaty preamble, would be feasible; he also called for clarification of such treaty terms as "any other nuclear explosion," "territorial waters," and the definition of underground test.<sup>146</sup> With respect to safeguards, he endorsed the views of the JCS, and urged—

\* \* \* that the possible consequences of this treaty are so vital to our national security, yet so uncertain in the light of known Soviet objectives that, in addition to the foregoing, it should be the sense of the Senate in connection with ratification to require the Joint Chiefs of Staff to make frequent and periodic reports to the Secretary of Defense, to the President, and to the appropriate committees of the Congress of their continuing assessment of the military balance of power and the military risks to our national security.<sup>147</sup>

Subject to these "stipulations," Anderson said: "I believe the Senate of the United States should ratify this treaty."<sup>148</sup>

On the day before he appeared before the Foreign Relations Committee, General LeMay was a witness before the Preparedness Subcommittee. In the latter environment he went into considerably greater detail concerning the specific disadvantages of the treaty as he saw them, although he believed that "if we carry out the safeguards in an efficient manner" then "the risk of losing any more ground is small." On the other hand, he said, "we may get some very great rewards out of the political field if indeed the predictions come true."<sup>149</sup> The main rewards he identified as the division of the Chinese and the Russians,<sup>150</sup> slowing of nuclear proliferation,<sup>151</sup> responding affirmatively to the hopes of other nations, and, conversely, the propaganda benefits to the Soviet Union of rejection of the treaty by the United States.<sup>152</sup> In this context General LeMay was asked what

<sup>143</sup> *Ibid.*, p. 792.

<sup>144</sup> *Ibid.*, p. 810.

<sup>145</sup> *Ibid.*, pp. 892-893.

<sup>146</sup> *Ibid.*, pp. 892-893.

<sup>147</sup> *Ibid.*, pp. 893-894.

<sup>148</sup> *Ibid.*, p. 894. The terminology used by the admiral was not precise, in that the ratification process is performed by the President; the function of the Senate is to contribute its "consent" under the Constitution to enable the President to take this action. However, the error was a common one.

<sup>149</sup> *Ibid.*, p. 722.

<sup>150</sup> *Ibid.*, p. 738.

<sup>151</sup> *Ibid.*, p. 754.

<sup>152</sup> *Ibid.*, p. 751.

his position would be if the treaty were not yet signed but merely in the proposal stage. The following exchange took place:

General LEMAY. I hadn't thought of it in that light before. I think that if we were in a proposal stage that I would recommend against it. I think one of the factors that weighs heavily with me was the situation we find ourselves in in having signed it. I think that is important.

Senator THURMOND. You would recommend against it if it were in the proposal stage?

General LEMAY. I believe I would; yes, sir.

I haven't given it much thought in this atmosphere but just a quick answer I would say that is what I probably would do.<sup>153</sup>

General Schriever, Commander of the Air Force Systems Command, told Senator Stennis that he would not feel seriously handicapped in carrying out his mission of weapons development under the treaty.<sup>154</sup> There would be restraints on the development of high-yield weapons, a matter which he considered of marginal importance,<sup>155</sup> proof tests would not be permitted which meant that some extent of overdesign would be necessary,<sup>156</sup> and in the effects area, "we are extremely limited" with particular respect to blackout phenomena and reentry.<sup>157</sup> He attached great importance to the vigorous implementation of the four JCS "Safeguards," and identified the Secretary of Defense and the AEC chairman as the Government officials principally responsible for carrying them out.<sup>158</sup> The deployment of an ABM system was less crucial, although he thought one should be developed.<sup>159</sup> There was risk associated with the treaty, but the United States, he believed, had a "considerable strategic superiority" over the Soviet Union and could improve the survivability of its deterrent force without atmospheric testing.<sup>160</sup>

The last two witnesses to come before the Preparedness Subcommittee were two retired military officers, Admiral Burke and General Twining. Burke said he was opposed to the treaty because it provided for no inspection within the Soviet Union. "Without a system of inspections which makes it possible to enforce realistically the sincerity of stated intentions, a test ban treaty cannot lead to the results which are claimed for it."<sup>161</sup>

He was sure that no pressure had been brought to bear on the JCS to support the treaty. If the treaty was to be approved by the Senate, he recommended that the Senate assure itself that the JCS safeguards were "carefully, clearly, and distinctly spelled out [and also] that the safeguards are carefully implemented and continued to be implemented throughout the life of this treaty."<sup>162</sup>

General Twining, the concluding witness, believed that "political considerations aside, the treaty will eventually weaken our military capacity." He noted that the Soviets had surpassed the United States in high-yield weapons, had tested weapons that were "exceedingly

<sup>153</sup> *Ibid.*, p. 757. However, before the Foreign Relations Committee hearing, the following day, in answer to the same question, he replied: "I had not given any thought to that particular one. This is an important question. I would think that I would have been against it.

"But I am not sure until I spend some time on the problem." *Op. cit.*, p. 372.

<sup>154</sup> Preparedness Subcommittee hearing, *op. cit.*, p. 821.

<sup>155</sup> *Ibid.*, pp. 837, 841.

<sup>156</sup> *Ibid.*, p. 821.

<sup>157</sup> *Idem.*

<sup>158</sup> *Ibid.*, pp. 823-825.

<sup>159</sup> *Ibid.*, p. 829.

<sup>160</sup> *Ibid.*, pp. 830-831.

<sup>161</sup> *Ibid.*, p. 938.

<sup>162</sup> *Ibid.*, p. 939.

clean," and could overcome by testing underground the U.S. lead in low-yield weapons. There were military disadvantages for the United States in the treaty if it were faithfully observed. Moreover, the attitude of the Soviet Union toward treaties was one of expedience. He was apprehensive about the reasons behind Soviet willingness to accept the treaty. He feared apathy in the United States. He regretted that the treaty contained no provision for inspection and verification. Peace depended on U.S. superiority in weapons. Therefore—

It is my fervent hope that if this treaty is ratified, the legislative branch of the Government of the United States will take appropriate and concurrent action to guarantee that the safeguards recommended by the Joint Chiefs of Staff are aggressively pursued.<sup>163</sup>

In clarification of his position, General Twining noted that it was based on military considerations alone. He reserved judgment on the total question as there were "political considerations that the military men never hear about because they are not told to the military."<sup>164</sup>

#### IV. REPORTS OF THE COMMITTEES

To some degree the findings in the reports of the two Committees, and the subsequent votes of their members on approval of the treaty, reflected the scope of the issues as differently defined in the two sets of hearings. As the Foreign Relations Committee wrote in the conclusion to its report:

A good part of the committee's time and attention during the hearings was devoted to military considerations. This treaty does bear, though perhaps not heavily, on the military balance. But its thrust is political. And among other things, it illustrates that military considerations cannot be divorced from political considerations; they are inseparable, especially in the nuclear age. The maintenance of a strong military position is clearly essential to the national security of the United States. But exclusive, or excessive, reliance on military considerations could undermine national security by encouraging comparable military efforts by others, thereby strengthening the destabilizing forces adrift in the world, possibly creating new ones.

This treaty offers the prospect of a gradual lessening of tensions, of a start toward the progressive elimination of the danger of nuclear war. Thus, the committee (by a vote of 16 to 1) recommends that the Senate give its advice and consent to the ratification of the pending treaty.<sup>165</sup>

Although the Preparedness Investigating Subcommittee recognized in its Interim Report that there were "other factors which, while not within the scope of this report, are pertinent to a final judgment on the treaty," it stressed "very strongly" that "Soviet secrecy and duplicity requires that this Nation possess a substantial margin of superiority in both the quality and the quantity of its implements of defense."<sup>166</sup>

In considering the impact and effect of the proposed test ban [declared the report] it is important to remember that for nearly two decades this Nation has been confronted by an adversary who has openly and repeatedly proclaimed that his dominant goal is to destroy the nations of the non-Communist world. Only because we have maintained clear military superiority and the ability to inflict

<sup>163</sup> *Ibid.*, pp. 972-973.

<sup>164</sup> *Ibid.*, p. 975.

<sup>165</sup> U.S. Congress, Senate, Report of the Committee on Foreign Relations, The Nuclear Test Ban Treaty, on Exec. M, Exec. Rept. No. 3, Sept. 3, 1963, 88th Cong., 1st sess. (Washington, 1963), p. 26. Ordered to be printed.

<sup>166</sup> U.S. Congress, Senate, Committee on Armed Services, Investigation of the preparedness program, Interim Report by Preparedness Investigating Subcommittee, under the Authority of S. Res. 75 "on the Military Implications of the Proposed Limited Nuclear Test Ban Treaty," printed for the use of the Committee on Armed Services (committee print) 88th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1963), p. 12.

unacceptable damage upon him has the would-be aggressor been deterred. The basis of our deterrence is military superiority which, in turn, is based on our nuclear weapons programs and nuclear retaliatory forces.

It is vital to our survival that no step be taken which in any manner would impair the integrity and credibility of our deterrence or degrade the ability of our military forces to protect our security if we should be challenged militarily by a hostile nuclear power.<sup>167</sup>

Both committees accepted the need for the preservation by the United States of a nuclear deterrent—and for an unmistakably superior nuclear force. The issue lay in the relative degree of importance—and the consequences foreseen—in combining this force with efforts in the political sphere to break the ideological deadlock between East and West. The first quotation suggests that the Foreign Relations Committee was feeling its way toward this concept. Yet the committee devoted most of its effort to searching carefully for pitfalls. These turned out to be mainly in the area of military technology: “In assessing the balance of technical and military risks of the treaty, the committee sought to compare the technological as well as the military capabilities of the United States and the Soviet Union.”<sup>168</sup>

Possibly because the Preparedness Subcommittee limited itself to consideration of only the military aspects of the test ban treaty, a majority of its members by their eventual vote on the treaty, September 24, showed that they regarded the military aspects as of commanding importance and decisively adverse. The possibility that there were genuine military advantages in the treaty does not appear to have been seriously entertained. This interpretation may be reinforced by the words of Senator Saltonstall, a member of the subcommittee whose dissenting view was presented at the conclusion of the interim report. Senator Saltonstall said that he favored ratification of the treaty, and that, while the factual data contained in the report were accurately stated, “its general findings and conclusions are unduly pessimistic as to the effect of this treaty, if ratified, upon our national security.”<sup>169</sup>

The two reports each demonstrated a substantial consensus within the respective committees. The Foreign Relations Committee report was approved by a vote of 16 to 1 (the lone dissident later identified himself as Senator Long of Louisiana),<sup>170</sup> although Senator Lausche, who voted to approve the report, later voted against the treaty in the final action on September 24. The Preparedness Subcommittee's interim report was signed by six of its seven members, although Senator Symington, while praising the hearing as “the most complete record ever made on this vital subject,” agreed with Senator Saltonstall that the conclusions drawn in the report were “overly pessimistic.” He said: “Based on the record, I am worried about the treaty; but more worried about the possibility of an all-out nuclear exchange some day in the future—particularly if there is a proliferation of nuclear weapons among more countries.” He saw the treaty as a first step in imposing control on nuclear weapons and declared his intention of voting for it.<sup>171</sup> The dissident member of the Preparedness Subcommittee,

<sup>167</sup> *Ibid.*, p. 1.

<sup>168</sup> Report of the Committee on Foreign Relations, *op. cit.*, p. 10. In point of fact, the committee's report, 26 pages in length, devoted 3½ pages to historical background, 3½ pages to the substance of the treaty, 1½ pages to a tabulation of witnesses, 13 pages to military technology, 2½ pages to Plowshare, fallout, and procedural matters, and 2 pages to political considerations.

<sup>169</sup> “Interim Report by Preparedness Subcommittee,” *op. cit.*, p. 14.

<sup>170</sup> Congressional Record (Sept. 20, 1963), p. 16730.

<sup>171</sup> “Interim Report by Preparedness Investigating Subcommittee,” *op. cit.*, p. 13.

Senator Saltonstall, expressed the belief that insufficient attention had been given to testimony of responsible Government officials before the Foreign Relations Committee that had tended to counteract, for him, the "overly adverse" conclusions of the interim report.<sup>172</sup>

*Findings of the Foreign Relations Committee*

The report of the Foreign Relations Committee dealt systematically with the various issues that had been raised in the course of the hearings, either by witnesses or by Members of the Senate themselves. It stressed the bipartisan nature of the treaty and that it was "an American proposal." Also, that the United Kingdom, closest ally of the United States, supported it.<sup>173</sup>

Why had the Soviet Union, after a long history of opposition to this form of test ban, changed its position? While admitting the speculative nature of its answer, the committee adduced five reasons for the Soviet reversal. First, progress in Soviet nuclear technology had provided assurance that the Soviets could accept the technological consequences of the test ban. Second, the Cuban missile crisis of 1962 had been "a sobering experience." Third, the test ban might have been regarded by Soviet leaders as a means to strengthen Soviet leadership of the Communist States in view of the "Sino-Soviet schism." Fourth, the "social and political ferment in the Soviet Union" was seen as a motivation to impel the Soviet leadership to enlarge production of peaceful products for consumers at the expense of the military sector of the economy. Fifth, "Soviet leadership seems to share Washington's concern with the problem of proliferation of nuclear weapons."<sup>174</sup>

In describing the treaty itself, the committee accepted the views and interpretations of the Secretaries of State and Defense. The treaty "in no way" prohibited the use of nuclear weapons in time of war.<sup>175</sup> Any amendment to the treaty "must be submitted to the Senate and approved before it can take effect."<sup>176</sup> The treaty would not effect the recognition of "regimes" which the United States had chosen not to recognize.<sup>177</sup> The 90-day waiting period before withdrawal from the treaty (as provided in article IV) was clarified as to meaning, but also as to its effect on resumption of testing: "As a practical matter \* \* \* the committee was told that with a high state of readiness, even the simplest nuclear test series requires 2 months' preparation, development tests 3 months, and effects tests 6 months."<sup>178</sup> The committee had also been told that the withdrawal arrangement had been inserted in the treaty to satisfy the JCS.

In anticipation of the question as to the function of the Senate in advising on the treaty before the fact, the report assured that body that "The committee was periodically consulted by the executive branch during the course of the negotiation of the treaty."<sup>179</sup>

*Committee citations of principal points in testimony*

The report reviewed the positions of witnesses, noting that the treaty was favored by all but one (Dr. Foster) of the Government wit-

<sup>172</sup> *Ibid.*, p. 14.

<sup>173</sup> *Ibid.*, p. 2.

<sup>174</sup> *Ibid.*, pp. 2-3.

<sup>175</sup> *Ibid.*, p. 5.

<sup>176</sup> *Ibid.*, p. 6. This statement in the report, which the President categorically confirmed, was questioned by Senator Russell, who prevailed upon the Senate to insert a proviso in the resolution of ratification, reasserting the rights of the Senate in this regard.

<sup>177</sup> *Ibid.* Also, pp. 7-8.

<sup>178</sup> *Ibid.*, p. 7.

<sup>179</sup> *Ibid.*, p. 8.

nesses, by Presidents Eisenhower and Truman (in communications), by 5 of 8 other persons with special knowledge or qualifications who appeared as witnesses; a majority of the 25 public witnesses also favored the treaty.<sup>150</sup> The committee then took note of its own difficulty in resolving differences of opinion on the part of highly qualified technical witnesses who dealt with abstruse and highly classified matters. Alluding to questions as to Soviet superiority in high-yield weapons, and to the three questions of penetration capability of missiles, antiballistic missile development, and survival capability of missile sites and systems as influenced by communications blackout caused by nuclear blast and radiation, the report said:

\* \* \* The committee was presented with a great deal of highly technical testimony, some of it sharply conflicting. For example, two distinguished scientists challenged the testimony of a number of other distinguished scientists. It was necessary for the committee to bear in mind that some witnesses had the advantage of possessing all of the relevant information—technical and military information, together with intelligence. These witnesses who were able to discuss the questions against so broad a background included the Secretaries of State and Defense; the Director of the Central Intelligence Agency; the Chairman of the Atomic Energy Commission; the Joint Chiefs of Staff; and the Director of Defense Research and Engineering of the Department of Defense. Each of these witnesses supported the treaty.<sup>151</sup>

The report noted that questions by committee members had been concentrated on the effects of the treaty "on the present and future military balance of power." While some questions remained imprecisely or indeterminately answered—

Nevertheless the committees did produce a record containing a large body of information, much of it new and only recently top secret, that should give reassurance to the American people that the treaty represents a net advantage to the United States; that the risks it contains are acceptable; that the nuclear strike forces of the United States are superior in number and variety to those of the Soviet Union.<sup>152</sup>

The report quoted witnesses and expressed the conclusions of the committee as to the effect on penetration capability of U.S. missiles (it posed no serious risk), on ABM development (unlikely in any event, but not seriously inhibited), on survival capability of U.S. missile sites (the U.S. deterrent was adequately secure against a first strike by an adversary).<sup>153</sup> The risk of gain by the Soviet Union through clandestine testing of nuclear devices or from planned surprise abrogation was discounted as minor.<sup>154</sup>

#### *Importance ascribed to military safeguards*

The report then turned to the Joint Chiefs of Staff "safeguards" which it described, with an indication of the support by the administration for their implementation. It concluded:

It is the committee's clear understanding and opinion that the safeguards will be maintained for just as long as the security of the United States and its allies requires continued nuclear development and testing programs, together with elaborate means of detecting and identifying the nuclear activities of other nations."<sup>155</sup>

<sup>150</sup> *Ibid.*, pp. 8-9.

<sup>151</sup> *Ibid.*, p. 11.

<sup>152</sup> *Ibid.*, p. 9.

<sup>153</sup> *Ibid.*, pp. 11-18.

<sup>154</sup> *Ibid.*, p. 18.

<sup>155</sup> *Ibid.*, p. 20.

*Findings as to proliferation, Plowshare, radiation, military acceptance*

The treaty would not affect the "cooperative relationship between the United States and the United Kingdom on nuclear weapons matters." It would prohibit transfer of nuclear weapons, materials, or information to any country that was testing or preparing to test in any of the prohibited environments. It would not seriously inhibit the Plowshare program.<sup>186</sup>

With respect to the issue of radioactive fallout, the report observed that most informed opinion considered it below the level of hazard although "Geneticists have shown greater and more specific concern."

It is feared [the report continued] that continued, or stepped up, atmospheric nuclear testing would increase the damage, genetic and otherwise, induced by increased exposure by population groups to radiation. The treaty, in halting the release into the atmosphere of radioactive fallout, offers a distinct benefit. Moreover, great numbers of people around the world have been deeply disturbed by the implications of this fallout. It may be that their concern has been highly exaggerated. Nevertheless, it exists. The ability of this treaty to ease their concern must also be regarded as a beneficial consequence.<sup>187</sup>

The final issue with which the report dealt was that of sufficient and effective exposure of the treaty-making process to the views of the JCS. It was concluded that the testimony of the Secretary of Defense and the JCS "showed that the Chiefs of the uniformed services had been intimately involved with the question."<sup>188</sup>

*Findings of Preparedness Investigating Subcommittee*

The more narrowly focused interim report of the Preparedness Investigation Subcommittee concluded that the treaty offered "serious—perhaps even formidable—military and technical disadvantages to the United States" by obstructing attainment of "the highest quality of weapons of which our science and technology is capable." Any military and technical advantages the treaty conferred would not "counterbalance or outweigh the military and technical disadvantages." Meanwhile the Soviet Union would not be "similarly inhibited in those areas of nuclear weaponry where we now deem them to be inferior."<sup>189</sup>

The subcommittee identified 19 "test objectives" which it considered "desirable or necessary in any future U.S. nuclear test programs."<sup>190</sup> The subcommittee did not attempt to distinguish between "desirable" and "necessary" items. However since some of the items enumerated were virtually impossible of achievement and others were declared by the JCS to be undesired, the force of this table is conjectural. Of the items on the table, six were declared feasible under the treaty, one partially so, and 12 not. With respect to most of the items prohibited by the treaty, the United States possessed superior knowledge and experience to the Soviet Union and it is not clear that the treaty was disadvantageous on this account. The subcommittee seems to have been generous in its assessment of Soviet capabilities to bring its weaponry, in lagging areas, up to U.S. standards.

The report then tabulated eight "military disadvantages" of the treaty, which—with accompanying explanations deleted—were as follows:

<sup>186</sup> *Ibid.*<sup>187</sup> *Ibid.*, pp. 21–22.<sup>188</sup> *Ibid.*, p. 22.<sup>189</sup> *Ibid.*, p. 2.<sup>190</sup> *Ibid.*, p. 5.

1. The United States probably will be unable to duplicate Soviet achievements in very high yield weapon technology.
2. The United States will be unable to acquire necessary data on the effects of very high yield atmospheric explosions.
3. The United States will be unable to acquire data on high altitude nuclear weapons effects.
4. The United States will be unable to determine with confidence the performance and reliability of any ABM system developed without benefit of atmospheric operational system tests.
5. The United States will be unable to verify the ability of its hardened underground second-strike missile systems to survive close-in high-yield nuclear explosions.
6. The United States will be unable to verify the ability of its missile reentry bodies under defensive nuclear attack to survive and to penetrate to the target without the opportunity to test nose cone and warhead designs in a nuclear environment under dynamic reentry conditions.
7. This treaty will provide the Soviet Union with an opportunity to equal U.S. accomplishments in submegaton weapon technology.
8. The treaty will deny to the United States a valuable source of information on Soviet nuclear weapons capabilities.<sup>191</sup>

The interim report then turned to the subject of the "safeguards" upon which the approval of the treaty by the JCS had been contingent. It noted that Senator Jackson had moved in the subcommittee that the JCS be called upon to report the actions taken to implement these safeguards, and that Senator Russell, chairman of the Armed Services Committee, had transmitted a letter to the JCS to request a statement in response to the motion.<sup>192</sup> While indicating its firm intention of monitoring the implementation of the safeguards in the event the treaty was ratified, the subcommittee emphasized that "even the most rigorous and conscientious implementation of the JCS safeguards will not alter, modify, or reduce the military and technical disadvantages listed herein which will result from this treaty."<sup>193</sup> Moreover, the problem of cheating still had not been laid to rest. Under the limited treaty, "problems of detection, identification, and verification still remain although they are of a lesser order of magnitude than would be true of a treaty banning underground testing."<sup>194</sup>

It might have been noted by the Preparedness Subcommittee that there were some military advantages to the treaty. It is true that the interim report presents a section of about a page in length titled "Counterarguments." But these were mostly qualifications of statements against the treaty. The closest to a positive statement was the following:

In summary, it was the contention of witnesses who supported the treaty that it will tend to stabilize the advantages which the United States now maintains in military nuclear superiority over the Soviet Union. While recognizing that doubts concerning the quality of some of our weapons systems do exist, they maintained that these doubts can be compensated by "brute force" techniques by which quantity is substituted for quality at considerably greater cost to achieve approximately the same results in military system effectiveness.

The effect of this statement is weakened by the "interesting and sobering" observation, immediately following, that the Soviet Union in several of its publications had also proclaimed its own superiority over the United States in nuclear weaponry.<sup>195</sup>

<sup>191</sup> "Interim Report by Preparedness Investigation Subcommittee," op. cit., pp. 7-8. Original in *italics*.

<sup>192</sup> This material appears in the interim report, *ibid.*, p. 10.

<sup>193</sup> *Ibid.*, p. 10.

<sup>194</sup> *Ibid.*, p. 11.

<sup>195</sup> *Ibid.*, p. 9.

*Military advantages neglected by the subcommittee*

But in point of fact there were a number of important military advantages accruing from the treaty. It was evident to the subcommittee that the United States had performed many more tests than had the Soviet Union of very small-yield, lightweight warheads, and that the United States had had far more experience with both underground and underwater testing than had the Soviet Union. For both strategic and tactical applications, these small weapons—available in large numbers—gave the United States a military superiority over the Soviet Union which the test ban treaty would make more durable. The “inverse cube” blast ratio referred to above<sup>196</sup> denigrated the significance of the so-called big bombs, insofar as blast effect is concerned. No reference was made to the probable military desirability of inhibiting the proliferation of nuclear weapons, nor to the contribution of the treaty to this end. The inability of U.S. scientists, under the treaty, to adduce information about Soviet weaponry on the basis of air sampling and other external techniques was accounted a disadvantage; conversely, cessation of tests would deny Soviet access to information about U.S. tests.

However, an important and the most obvious military advantage was not developed in either report. The function of military power is to provide security and not merely to maintain a capability to wipe out a potential adversary. By reducing military emphasis on atomic weaponry, effort and resources might be released from the conduct of hypothetical nuclear general war, and made available to support the real conflict actually in progress in combating insurgency and instability in the developing nations. The utility of nuclear weapons to deter this kind of military challenge had demonstrably been negligible, even during the period of U.S. monopoly of atomic weapons, 1945–48. Yet the subject of a partial inhibition on nuclear testing was approached on the hypothesis that achievement of overwhelming nuclear superiority was the sole and complete requirement for national security, bearing no relation to other forms of military preparedness.

## V. FINAL SENATE DECISION PROCESS ON THE TREATY

Senate debate on the test ban treaty began September 9, 1963. It had been preceded by the report of the Foreign Relations Committee, September 3, by extensive statements and documentation from the press, pro and con, discussions of reported dangerous concentrations of radioactivity and their adverse psychological consequences, and by evidences of popular support based on public opinion polls. Beyond the obvious issue of whether or not to accede to ratification—which in most quarters was regarded as a foregone conclusion—there were three other important issues involved:

1. How to approve the treaty without weakening it in the process;
2. How to assert the coequal status of the Senate with the President in treaty-making without weakening the treaty;
3. How to decide the underlying issue of how to secure the national security in a nuclear age.

<sup>196</sup> See p. 213.

As statement followed statement in support of the treaty, it became evident that the necessary two-thirds vote was assured unless opponents could discover a persuasive new objection. Most of the debate repeated or enlarged upon points that had been presented earlier in the hearings; periodically there were reflexes in the form of supplementary statements and fact sheets supplied by the Administration to satisfy or silence specific protests. Most of the opposition views derived from the testimony before the Preparedness Investigation Subcommittee, and from the conclusions it had drawn.

Early in the debate, on Friday, September 13, Senator Stennis introduced into the Record the first 14 pages of the interim report of his subcommittee, dated September 9. This report stressed the "serious, and perhaps formidable, military and technical disadvantages" of the treaty and had expressed doubt that the treaty offered military advantages.<sup>197</sup>

#### *Preservation of the treaty from "eroding" amendments*

Various amendments and understandings to qualify the treaty were offered, mainly by treaty opponents. These seem generally to be characterized by an effort to extract further concessions from the Soviet Union, evidently under the impression that the Soviet Union wanted the treaty more than did the United States and might be coerced into paying more for it. Chief among these was a proposal by Senator Goldwater to "make the effectiveness of the treaty contingent upon the removal of the Soviet military presence in Cuba."<sup>198</sup> When the Senate took up the Goldwater amendment on Monday, September 23, it was tabbed by Senator Fulbright "inappropriate, unwise and irrelevant" and the majority leader charged that its purpose was to destroy the treaty. When the Goldwater amendment came to a vote it was defeated (17 yeas, 75 nays, and 9 not voting).<sup>199</sup>

Another amendment, by Senator Miller, proposed that the treaty not become effective until the Soviet Union had paid up the arrears of its financial obligations to the United Nations. This amendment was withdrawn immediately after being introduced.<sup>200</sup> However, the issue was taken up by Senator Tower who demanded a record vote; it was rejected, 11 yeas, 82 nays, with 7 not voting.<sup>201</sup> Senator Tower also proposed a "reservation" to remand the treaty for renegotiation to insert a provision for onsite inspection to verify compliance. The Senate turned back this proposal by a vote of 16 yeas, 76 nays, with 8 not voting.<sup>202</sup>

An "understanding" was proposed in absentia by Senator Long of Louisiana, to clarify the expression "or any other nuclear explosion" in the treaty as not meaning the restriction of nuclear weapons in armed conflict. This action was tabled (in effect—without prejudice) by a vote of 61 yeas, 33 nays, and 6 not voting.<sup>203</sup>

Accordingly, the treaty went to the final vote almost entirely without emendation or qualification by the Senate. Only the Russell amendment to the resolution of ratification was added. And the purpose of this

<sup>197</sup> Congressional Record (1964), pp. 16071-16075.

<sup>198</sup> Congressional Record (Sept. 12, 1964), p. 16020.

<sup>199</sup> Congressional Record (Sept. 23, 1964), pp. 16804-16810.

<sup>200</sup> *Ibid.*, pp. 16817-16818.

<sup>201</sup> *Ibid.*, p. 16821.

<sup>202</sup> *Ibid.*, p. 16821. This vote had considerable significance in that it indicated a hard core support of the principle that inspection should be the sine qua non of any arms control treaty.

<sup>203</sup> *Ibid.*, p. 16832.

action was merely to reassert the constitutional role of the Senate in treaty-making.

*Protection of Senate prerogatives in treaty-making*

Two actions were entertained to establish the coequal status of the Senate with the President in treaty-making. One was an amendment to the resolution of ratification, proposed and then withdrawn by Senator Mundt. He had expressed objection to the procedure that had been adopted by the original parties to the treaty in opening it up to the signatures of other States before the Senate had an opportunity to vote on it. This move he considered had imposed undue pressure on the Senate to accede to the treaty without change.<sup>204</sup>

Of greater consequence was an amendment by Senator Russell, chairman of the Armed Services Committee, September 12, that, he said, "would make perfectly clear that any future amendments to this treaty must be submitted to the Senate for its advice and consent, as in the case of the original treaty."<sup>205</sup> Subsequent discussion of the Russell amendment made evident that agreement had been reached among the Senate leadership to accept it.<sup>206</sup> A move to table was defeated, 8 yeas, 79 nays, and the amendment was adopted, 79 yeas, 9 nays.<sup>207</sup>

In addition to the acceptance of the Russell amendment, several other efforts were made to satisfy the Senate that its participation in the treaty process had been properly respected. An extensive account was presented by Senator Humphrey of the numerous occasions on which the Administration had consulted with the Senate on the test ban treaty, both before and during the negotiations.<sup>208</sup> A similar list had earlier been supplied by the majority leader, September 20, in his speech introducing the subject of the test ban to the Senate.<sup>209</sup> Other assurances were supplied by the Department of State that "no amendment to the treaty can enter into force unless and until the United States has deposited an instrument of ratification"<sup>210</sup> and later, "The U.S. Government has never deposited an instrument of approval of an amendment to a treaty without first going back to the Senate."<sup>211</sup>

However, the strongest assurance of the Senate's role was provided in a letter from the President, read to the Senate by the minority leader, September 11, in connection with his own endorsement of the treaty. Although the terms of the letter dealt mainly with aspects of the national security, the effect was that of a declaration of the President's own "understanding" as to the terms under which the treaty would be acceptable to the Senate.<sup>212</sup>

The abundant assurances the Senate received from the administration as to its past and future roles in treaty-making, plus its own assertion in the Russell amendment, evidently sufficed to answer the question.

*Preservation of the national security under the treaty*

The most fundamental question to be resolved was whether, on balance, the political, military, and technological (environmental)

<sup>204</sup> *Ibid.* (Sept. 23, 1963), pp. 16810-16816.

<sup>205</sup> *Ibid.*, pp. 15968-15969.

<sup>206</sup> Senator Dirksen said (*ibid.*, p. 16836): "There was a discussion of this matter with the distinguished Senator from Georgia. \* \* \*" And Senator Javits said (p. 16337) he realized "that an arrangement has been made \* \* \*."

<sup>207</sup> *Ibid.*, pp. 16841-16842.

<sup>208</sup> *Ibid.* (Sept. 13, 1964), pp. 16124-16126.

<sup>209</sup> *Ibid.*, pp. 16744-16745.

<sup>210</sup> *Ibid.*, p. 15969.

<sup>211</sup> *Ibid.*, p. 16003.

<sup>212</sup> *Ibid.*, p. 15915.

benefits under the treaty would be bought at too great a cost in increased risk to the national security. There seemed to be no question but that the treaty involved risk to the national security. But there were also risks in failing to act. As Majority Leader Mansfield said:

The truth is that there are risks in this as in any venture in foreign relations. But I remind the Senate that there are also risks in failing to venture, in standing still in a world which does not stand still for this or any other nation. And at this moment in the world's time, the risks of a paralyzed uncertainty may be far greater than those which might stem from the pursuit of this venture.<sup>213</sup>

He suggested that there were eight criteria to be considered. These were, in paraphrase:

1. Might some "nth country" reach nuclear parity with the United States by testing while the United States did not?

2. Were U.S. atmospheric tests needed to neutralize some demonstrated Soviet advantage?

3. Would the treaty hamper the United States more than it would the Soviet Union?

4. Were there legal advantages under the treaty that the Soviet Union could exploit but not the United States?

5. Conversely, did the treaty forbid the United States to do something permitted to the Soviet Union?

6. Could the Soviet Union cheat on the treaty without being detected?

7. If the Soviet Union did cheat, and was detected, would the United States still be bound by the treaty?

8. Might surprise abrogation by the Soviet Union "so alter the balance of military forces between the two nations as to increase the risk of military attack upon us?"<sup>214</sup>

Other risks were cited by Senator Jackson (paraphrase):

There is the risk that we will relax and fall back into a state which the Senate has learned to call euphoria.

There may be a serious misjudgment of the basis for the change in Soviet policy.

It is generally conceded that the Communist Chinese are now engaged in a substantial nuclear weapons program and that in the very near future they will be testing in the atmosphere. The advent of this new unchecked nuclear power may well require us to withdraw from the agreement.

It is altogether possible and indeed \* \* \* probable that a group of nations, with Soviet encouragement, will seek to amend the treaty \* \* \* so as to ban underground tests without inspection or with wholly inadequate arrangements for inspection.

However, notwithstanding these risks, said Senator Jackson, he still found the treaty acceptable:

Provided, that it is firm national policy to keep alert and to protect the present and future credibility of our military deterrent; and provided, furthermore, that it is firm national policy to use the protections provided in the treaty when, as, and if needed to guard vital national interests, including the right of withdrawal and the right to exercise the veto by withholding our consent under article 2 to any attempt to change the treaty by amendment in a form imperiling our vital interests.<sup>215</sup>

<sup>213</sup> *Ibid.*, p. 15466.

<sup>214</sup> *Ibid.*, pp. 15462-15463.

<sup>215</sup> Congressional Record (Sept. 13, 1964), pp. 16078-16084, especially pp. 16078-16079.

Much of the testimony in committee hearings had concerned this question of risk; and, particularly in the foreign relations hearings, on how to reduce it. In the debate on the floor of the Senate, there was some dissatisfaction with the stress placed by military witnesses on the risks alone, rather than on the total question of risks and benefits. Moreover, in the Military Preparedness Investigation Subcommittee hearings, the risks were described by opponents of the treaty primarily in terms of military or technological handicaps. Concerning this abundant array of objections, Senator Humphrey protested:

We rely chiefly on the testimony of generals, colonels, majors, and scientists. Yet we are supposed to understand the political, the economic, and the social forces. Paradoxically, Senators are trying to decide on the size of weapons and ballistic missiles, whereas they should be considering economics, history, and the social and political forces which are at work in America and throughout the world.<sup>216</sup>

And Senator Morse was even more emphatic:

If the time ever comes when American foreign policy is determined by American military authorities, we are on our way to inevitable war. I speak weighing fully the meaning and implication of every word that I utter. If we permit the American military to determine American foreign policy, or have the determining voice in American foreign policy, we are on our way to an inevitable war and the destruction of our country, for all of history points out that unless we keep military forces in control, they will lead us to a manifestation of their art, which is the art of war.<sup>217</sup>

The four JCS reservations provided the focus for ways in which the risks were to be obviated. There were several pledges by and to the Senate, during the debate, that these provisos would be fully adhered to. The fullest expression of this matter was in letters from President Kennedy to the majority leader and the minority leader; Senator Dirksen read his to the Members September 11. The President's pledges in the letter may be paraphrased as follows:

1. Underground testing will be vigorously pursued under the test ban treaty, if it is approved.
2. The United States will keep ready to resume atmospheric testing, and will promptly resume such testing if the Soviet Union should violate the treaty.
3. Capability to detect clandestine nuclear tests will be improved.
4. The President of the United States is in no way limited by the treaty in the use of nuclear weapons for the defense of itself or its allies.
5. If Cuba is "used either directly or indirectly to circumvent or nullify this treaty, the United States will take all necessary steps in response."
6. Approval of the treaty will not "change the status" (i.e., result in U.S. recognition) of the "authorities in East Germany."
7. The United States will maintain strong weapons laboratories.
8. Development of peaceful uses of atomic explosions will be diligently pursued: when such uses become practicable, "the United States will seek international agreement under the treaty to permit such explosions."<sup>218</sup>

<sup>216</sup> *Ibid.* (Sept. 10, 1963), p. 15766.

<sup>217</sup> *Ibid.* (Sept. 18, 1967), p. 16488.

<sup>218</sup> *Ibid.*, p. 15915.

On the question as to the role of atomic weaponry in national security, the debate in favor of the treaty appeared to rest on three unrelated and even incompatible points:

(1) The nuclear arms race was itself a source of danger to the national security.<sup>219</sup>

(2) Progress in maintaining technological and numerical superiority of the United States in nuclear weaponry would not (and should not) be halted by the treaty.

(3) The preservation of U.S. military security depended on other factors than nuclear weaponry.<sup>220</sup>

Much less attention was given to the expected benefits from the treaty than to the question of military technological risks. However, there were a number of evident benefits, mainly in the political aspects, and also a number of political disadvantages. Among the political advantages claimed for the treaty were:

The further estrangement of Russian and Chinese Communist States from each other;

The commitment of the Soviet Union to a policy of "peaceful coexistence";

The identification of nation states that accepted the U.S. policy of searching for ways to "lessen the atomic peril and to promote disarmament";

The promotion of a climate of international agreement and cooperation.

However, there were also a number of political disadvantages, such as—

The further alienation of France, whose leadership had resolved on a course of nuclear armament and could not or would not subscribe to the treaty;

The threat of impairment of the NATO Alliance;

The risk of a lessened vigor and initiative in the United States, a condition that military leaders had termed "euphoria."<sup>221</sup>

Eventually the debate ended; the amendments, resolutions, understandings, and amendments were cleared away; and the vote was taken. The Senate on September 24 approved the resolution favoring ratification by a vote of 80 yeas, 19 nays, comfortably in excess of the required two-thirds margin.<sup>222</sup>

<sup>219</sup> As the majority leader put it: "This furious and frantic race for superiority in the capacity to inflict nuclear devastation in mass or in calliperic refinement in the interests of national security in the end has provided security to no nation. It has provided only the assurance that the prospect of immediate and massive destruction to others will be at least as great as that prospect is to ourselves" (ibid., p. 15467).

<sup>220</sup> On this point, said Senator Fulbright: "Security \* \* \* is not merely a military and technological commodity, but a combination of many elements, all of which must be taken into account in the shaping of national policy." It was a "dangerous oversimplification to regard national security solely in terms of weapons systems and military technology" (Congressional Record (Sept. 9, 1964), pp. 15662-15663).

<sup>221</sup> Virtually all administration witnesses supporting the treaty warned against "euphoria." The word seemed to take on a special meaning in the hearings. Instead of retaining its dictionary significance as a sense of good feeling and ebullience, it began to sound like a one-word precis of Tennyson's "Lotus-Eaters." Unfortunately, the State Department presented no counterpart theory as to the need for keeping up its own intellectual guard. Secretary Rusk, or a spokesman for his Department, might have suggested that the objective of the United States in its foreign policy was to induce in the Communist States at least the same degree or greater of euphoria than prevailed in the United States.

<sup>222</sup> Ibid. (Cong. Rec. (Sept. 24, 1964), pp. 16909-16910).

## VI. THE AFTERMATH AND THE SIGNIFICANCE OF THE TEST BAN TREATY

From a vantage point of 5 years later, it appears that the test ban treaty has proved neither the great boon its strongest proponents believed it to be, nor the path to early disaster foreseen by its strongest adversaries. A mild condition of "detente" had indeed prevailed between the Soviet Union and the United States, as foreseen among the benefits of the treaty. Relations between the two major Communist states have indeed worsened, as was also foreseen. However, the cohesion of the NATO alliance, and relations with France, as foreseen by treaty opponents, may also have suffered.

Testing of nuclear weapons has continued in the permitted environments by both the United States and the Soviet Union. France, and the Communist Chinese have both conducted tests in the air, which the treaty forbids. Most of the other nations of the world joined in the treaty and have observed its terms.

With the nomination of Senator Goldwater as a presidential candidate in 1964, since he had been an outspoken opponent of the treaty, it became an issue in the 1964 campaign, but not a very salient one.

Various nuclear explosions underground have occurred in the Plowshare program, which has probably been impeded but not halted by the treaty.

The net level of atomic radiation in the environment has undoubtedly been reduced.

The ABM development which the treaty was claimed to retard, if not render impossible, has continued at a modest level of priority. It is not evident that the treaty has affected its progress seriously; other more significant factors have been the higher priority of other weapons, and other military requirements.

It is probable that the assassination of President Kennedy only 2 months after the ratification of the test ban treaty affected the impetus of exploitation of the detente it had generated. The escalation of the conflict in Vietnam has further obscured the situation, insofar as continuation of the detente is concerned. It has also dramatically illustrated the point made by some advocates of the treaty that nuclear weaponry might shape the nature of military confrontations but would be unlikely to be used to resolve them.

#### *Expectations of President Kennedy for the treaty*

For President Kennedy's own assessment of the implications of the treaty it is necessary to rely mainly on his statements and messages before the Senate action was completed, plus the few references he made during the short interval thereafter before his assassination. There is no question but that he attached great importance to the treaty as a symbol. The President certainly hoped that it would provide a turning point, a way to break out of the circle of fear, distrust, conflict, insistence on strength, demands for guarantees, insistence on the unchanging and implacable hostility and activist role of the Soviet Union, and the futile search by the United States to bring back the total security of the preatomic period.

The President probably also hoped the debate on the test ban treaty would inform the Congress and the electorate on some apparent propositions applicable to the futile and dangerous nuclear arms race. These propositions are, in sum :

That the offense, technologically speaking, could always beat the defense.

That there could be no technological assurance of security.

That no new scientific weapon was likely to provide an easy route to the restoration of the military preeminence enjoyed by the United States in the short period between Hiroshima and the exploding of the first Soviet nuclear device.

That national security for both the United States and the Soviet Union had continued to deteriorate even as the capability of each state to inflict destruction on the other had continued to increase.

That there could be no guarantee that the Soviet Union would not violate or abrogate the test ban treaty as it had violated so many others in the past when abrogation proved more in its short-run interest than continued observation.

But, that unless the Soviets were afforded opportunities to demonstrate their good faith—preferably in ways involving little risk to the United States—the circle of fear and mistrust could never be broken.

#### *Future guidance afforded by the treaty debates*

One useful product of the Senate's consideration of the test ban treaty is that it provides a format for future arms control and disarmament treaties, and their approval. By its very comprehensiveness, its minute and exhaustive nature, the Senate's examination of the 1963 pact gives future Administrations a splendid array of criteria by which to measure its treaty-making in the field of arms control and disarmament. Future Administrations might expect that their treaties will be tested as follows:

(1) Is it in the best interest of the United States?

(2) What assurance is there that a major adversary who has cosigned will not trick the United States by a surprise abrogation? And what arrangements can be made by the United States to abrogate promptly and effectively if an adversary does?

(3) Is the treaty enforceable? What assurance is there that it is not being violated by stealth, and what reliable arrangements are being undertaken to be sure about this?

(4) Have military leaders participated in the preparatory stages, and in the actual negotiation of the treaty? Do they approve of it from the military point of view—or, at least, do they consider the military disadvantages tolerable in relation to explicit "broader" political advantages?

(5) What tangible gains does the treaty afford the United States?

(6) Can a reasonable case be made that the treaty benefits the United States at least as much as it does the Soviet Union—and preferably more?

(7) Have all technical and scientific questions been fully explored? Is there a good sound answer to every substantial reservation that the scientific community might raise? And do a preponderant number of the Nation's most respected senior scientists favor the treaty on scientific grounds?

(8) Has any opening been provided that will afford opportunity for exploitation by an ingenious and persistent adversary to the peril of the United States?

(9) Does the treaty deprive the United States of any essential freedom or useful course of action—particularly if such deprivation is unnecessary to the purposes of the treaty?

A future arms control treaty will almost certainly receive a more searching inquiry as to its financial implications. The cost of carrying out the precautionary provisions recommended by the Joint Chiefs of Staff—on which the Senate Military Preparedness Subcommittee set such store—has reached an impressive total, and seems destined to amount to a significant cost for as long as the treaty remains in force.

The Senate underwent an exhausting exercise in the absorption of highly classified and highly technical information. The proposition was demonstrated that extreme competence in some scientific areas does not necessarily qualify a witness to express authoritative judgments over the entire scientific spectrum. The proposition was also demonstrated that the self-discipline that scientists impose on themselves in their own fields does not necessarily extend to their expressions of view on other matters. The result is an increase of skepticism as to the ability of science to achieve all things.

It is difficult to assess the effect on the Senate decision that was contributed by public attitudes, and attitudes of witnesses, toward radioactivity. There was no question but that weapons tests raised the level of radioactivity in the environment, that some radioactive isotopes were so harmful to human physiology that concentrations of these isotopes in the environment needed to be kept below some "safe" level. The determination of such "safe" levels was never satisfactorily resolved, however, because it involved proving a negative; accordingly, it had become a political rather than a technical question. Undoubtedly the test ban treaty would result in a reduction in the quantity of radioactivity dispersed into the environment. Undoubtedly also, this beneficial effect was well established with the Members of the Senate. However, it appears to have been accepted as a general "plus" rather than specifically advanced as an urgent and decisive reason for approving the treaty.

## CHAPTER NINE—ESTABLISHMENT OF THE PEACE CORPS

### I. INTRODUCTION

President Kennedy established a temporary Peace Corps by Executive order, March 1, 1961.<sup>1</sup> A subsequent administration proposal to authorize a permanent Peace Corps was adopted with substantial bipartisan support, September 2. The technological transfer goal inherent in almost all foreign development programs was, in this statutory agency, to be approached by indirection. Means rather than ends were stressed in its statement of objectives:

\* \* \* To promote world peace and friendship [by making] available to interested countries and areas men and women \* \* \* qualified for service abroad and willing to serve, under conditions of hardship if necessary, to help [such peoples] in meeting their needs for trained manpower, and to help promote a better understanding \* \* \*.<sup>2</sup>

The statutory program was funded for the fiscal year 1962 at \$30 million. Both the administration and the Congress viewed it as frankly experimental; manifestly a few thousand young people, demonstrating and using rudimentary technologies of the developed world, could not produce instant development of many lagging economies. However, the pioneering aspect of a low budget, semistructured program of service abroad might attract a previously untapped and highly motivated group, which might catalyze small, local developments—in effect, create seedbeds of technological, economic, and democratic progress.

Goals of U.S. foreign aid programs are both political and economic, intended to support both the growth of democracy and, as its prerequisite, the economic advance of lagging economies. Economic aid, in turn, depends on and supports the transfer of technological information and hardware. The Marshall plan and the Point IV program relied on the assumption that the preferred route to technological and economic advance was by the infusion of technically trained manpower and massive capital investment. Increasingly, there was a suspicion that social, cultural, and psychological differences as between the United States and the aided countries were major intervening variables in the effective transfer of technology. The lack of attention given to these obstacles received criticism by the economists, Theodore Geiger and Roger D. Hansen, in their recent view of the information bases of U.S. foreign policy; they observe:

Only very occasionally in designing the technical-assistance projects were investigations conducted to evaluate the consistency between the new techniques and methods to be introduced and the existing attitudes, values, and expectations

<sup>1</sup> Executive Order 10924, "Establishment and Administration of the Peace Corps in the Department of State." The White House, Mar. 1, 1961; In U.S. Congress, House, Committee on Foreign Affairs, Peace Corps Act; report of the \* \* \* on H.R. 7500, To provide for a Peace Corps to help the peoples of interested countries and areas in meeting their needs for skilled manpower, 87th Cong., 1st sess., House Report 115 (Washington, U.S. Government Printing Office, Sept. 5, 1961), p. 63.

<sup>2</sup> Peace Corps Act, title 1, sec. 2.

of the people who were supposed to adopt them; to identify the particular agents in each village, local, or national society who were willing and able to be innovators and whose examples would be followed by others \* \* \*<sup>3</sup>

The Peace Corps was designed to supplement ongoing technical assistance programs, particularly the Point IV program, not only by direct technological transfer at the community level, but also by giving specific attention to the cultural dimension in technical assistance. Congressional support appears to have responded to both aspects. Development of this understanding was attributable to the special efforts made by the Peace Corps at the outset in presenting the Congress with an objective overview of the problems to be encountered in implementing a program to transfer technology at the grassroots level.

The primary mission of the Peace Corps was to provide developing countries with an infusion of youthful and flexible Americans who could familiarize urban and rural peoples with a technological orientation—with the skills of technical training and with the activities of a technically developed society. It was designed to provide manpower to work with and teach these peoples how to solve the basic problems of underdevelopment—to purify water, devise educational programs, build bridges, organize administrations, contrive procedures, wash clothes, vaccinate, and—in short—imbibe some of the “do it yourself” spirit congenial in the American culture.

An effective program needed a highly structured underpinning. Americans who would serve overseas would have to be properly selected and trained. They would have to be taught to understand the complex cultural, economic, political, and technological obstacles to development. They would have to be familiar with the basic technical tools of the specific tasks they would face: to understand the mores and traditions of the societies to which they would be sent and to communicate with its peoples.

The program that resulted had several shortcomings: neither the Congress nor the administration had explored intensively the subject of specific technical training and supporting research, and the program did not call for adequate followup of results. Notwithstanding these fairly secondary exceptions, it appears to have been that intended by its authors, and that sought by the Administration.

## II. IDENTIFICATION OF THE ISSUE

The notion of a technological army of youth to serve at the grassroots to demonstrate skills and techniques to people in developing nations was long in germinating. The idea was linked to William James, early 20th century philosopher,<sup>4</sup> and refined by Heinz Rollman, an American industrialist, who proposed a “Peace Army of 5 million American men and women who would be sent to the world’s underprivileged, underdeveloped countries.”<sup>5</sup>

<sup>3</sup> Theodore Geiger and Roger D. Hansen, “The Role of Information in Decisionmaking on Foreign Aid,” in “The Study of Policy Formation,” edited by Raymond A. Bauer and Kenneth J. Gergen, (New York, the Free Press, 1968), p. 355.

<sup>4</sup> U.S. Peace Corps, “Peace Corps Presentation of FY 1962 Program to U.S. Congress,” May 29, 1961 (Washington, mimeo, 1961), p. 1.

<sup>5</sup> Statement of Heinz Rollman. In U.S. Congress, Senate, Committee on Foreign Relations. The Peace Corps, hearings before the \* \* \* on S. 2000 (A bill to provide for a Peace Corps to help the peoples of interested countries and areas in meeting their needs for skilled manpower), June 22 and 23, 1961, 87th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1961), pp. 124-134.

The first Federal program to use youth in a service capacity, but only domestically, was the 1933 Civilian Conservation Corps. The CCC was a depression-time organization to provide jobs and improve natural resources. It employed teenagers and young adults to build parks, clean and restore barren lands, plant trees, and work on farms and irrigation projects.<sup>6</sup> David Lilienthal, former Chairman of the Tennessee Valley Authority, advocated a universal public-service plan in which every educated American would devote a number of years to Federal service at home or abroad.<sup>7</sup> Various voluntary, nongovernmental, people-to-people programs of educational and technical assistance in developing countries appeared after World War II: the Experiment in International Living (for teenagers), Cross-Roads Africa (summer work for college students in Africa), and the International Voluntary Services (established in 1953 to coordinate U.S. religious mission activities in underdeveloped area). When Point IV legislation was being considered in Congress, Dr. Dewey Anderson, director of the Public Affairs Institute, recommended that 250 work centers, staffed by skilled American workers and natives, be established in underdeveloped countries.<sup>8</sup> Similarly, Victor G. Reuther of the United Auto Workers Institute suggested that the United States participate in a "Point 4 Youth Corps" to be administered through the United Nations.<sup>9</sup>

#### *Congressional proposals by Reuss and Neuberger*

Representative Henry S. Reuss, after reviewing American technical assistance efforts in Cambodia in 1958, told an audience at Cornell University that he favored the formation of a "Youth Corps" under the Point IV program.<sup>10</sup> Later Mr. Reuss described this proposal as a corrective supplement to enlarge the scope of the aid program, put more workers in the field, and redress the balance away from military overemphasis. He criticized the existing program as inadequate and "suffering from bureaucratic hardening of the arteries." A more fundamental criticism was its orientation to the status quo—

Too often we seem to emphasize military alliances with corrupt or reactionary leaders; furnishing military hardware which all too frequently is turned on the people of the country we are presumably helping \* \* \*. Would we not be farther along if we relied more heavily on a group of some thousands of young Americans willing to help with an irrigation project, digging a village well, or setting up a rural school?<sup>11</sup>

In 1959, Representative Reuss and Senator Richard Neuberger introduced bills which called for a study of a bilateral "Point 4 Youth Corps." Their objectives, which resembled those of the program later enacted, were defined by Representative Reuss as follows:

To make additional technical manpower available \* \* \* in underdeveloped, friendly, foreign countries:

To assist in broadening the understanding by the peoples of other nations of the ideals and aspirations of Americans;

To broaden [the] understanding [by American youth] of the problems facing other peoples \* \* \*.

<sup>6</sup> Roy Hoopes, "The Complete Peace Corps Guide" (New York, The Dial Press, 1961), p. 11.

<sup>7</sup> *Ibid.*, p. 21.

<sup>8</sup> *Ibid.*, p. 22.

<sup>9</sup> Paper prepared at Mr. Reuther's suggestion and distributed at a meeting called by Representative Henry S. Reuss at the Capitol, Dec. 20, 1960.

<sup>10</sup> Hoopes, *op. cit.*, p. 24.

<sup>11</sup> Henry S. Reuss, "A Point 4 Youth Corps," *The Commonwealth* (May 6, 1960), pp. 146-147.

Arthur H. Darken, a specialist in U.S. foreign affairs of the Legislative Reference Service of the Library of Congress, prepared an analysis of the tasks of the proposed study for Representative Reuss, who then asked Congress to appropriate funds for a nongovernmental organization to assess—

Types of projects;  
 Use of private and nongovernmental groups;  
 Questions of draft exemption for volunteers;  
 Size and salary;  
 Type of training needed;  
 Use of noncollege graduates;  
 Administrative organization and proposed semiautonomous status of the State Department; and  
 The link of the program to ongoing technical assistance programs.<sup>12</sup>

The proposals of Reuss and Neuberger, passed as a rider to the Mutual Security Act of 1960,<sup>13</sup> provided that the President contract for a study of—

\* \* \* the advisability and practicability of a program, to be known as "The Point Four Youth Corps," under which U.S. citizens would be trained and serve abroad in programs of technical cooperation.

There was already sentiment in the Congress favoring enactment of such a program. For example the House Foreign Affairs Committee reported:

The committee believes that the United States is failing to utilize one of its important assets by not developing a program for using such services. If young Americans with farm backgrounds and adequate technical training, who are willing to live in the villages and share in the daily work of the people and who would serve with only a minimum salary and subsistence allowance, could be carefully selected and sent to the less developed countries, they could be unusually effective representatives of the United States.

Should this study support the committee's present belief that there is substantial merit in the proposal, the committee will prepare specific recommendations for getting the program underway, and will expect the Executive to make a serious and constructive effort to put the program into effective operation.<sup>14</sup>

Ten thousand dollars was provided for the study, which was assigned to the Colorado State University Research Foundation.

*The Peace Corps bill introduced by Senator Humphrey*

Meanwhile, Senator Hubert H. Humphrey proposed an immediate Peace Corps. He told the Senate, June 15, 1960, that in his judgment, "There is sufficient evidence now in hand to justify moving directly to the formation of such a corps now, rather than waiting for a study to be made.<sup>15</sup> He introduced, that same day, a bill to establish a "Peace Corps" to—

\* \* \* Develop a genuine people-to-people program in which talented and dedicated young American men will teach basic agricultural and industrial techniques, literacy, the English language and other school subjects, and sanitation and health procedures in Asia, Africa, and Latin America.<sup>16</sup>

<sup>12</sup> Arthur H. Darken, "Analysis of a Proposal for the Establishment of a Point 4 Youth Corps," Dec. 17, 1959, cited by Hon. Henry S. Reuss, "A Point 4 Youth Corps—To Enable More Young Americans To Participate in Technical Assistance Programs," Statement upon introduction of H.R. 9638; Congressional Record (Jan. 14, 1960), pp. 491-494. The late Senator Neuberger's bill was S. 2903, introduced Jan. 26, 1960.

<sup>13</sup> Sec. 203(c), H.R. 11510, approved May 14, 1960, as Public Law 82-472.

<sup>14</sup> U.S. Congress, House, Committee on Foreign Affairs, Report on the Mutual Security Act of 1960. House Report 1464, (Washington, U.S. Government Printing Office), Apr. 8, 1960.

<sup>15</sup> Senator Hubert H. Humphrey, "Establishment of Peace Corps," Congressional Record (June 15, 1960), p. 11732.

<sup>16</sup> S. 3675, *Ibid.*, pp. 11732-11734.

The Humphrey bill provided for a 3-year term of enlistment. An "essential part of the whole program" would be that the first year of service should be devoted to training. Six months would be allocated to intensive area and language study, and study of American public policy and contemporary thought. During the second 6 months, the trainee would go to the country to be served for further training in language and technical skills. Under the Humphrey plan—

The Peace Corps would be a separate agency, but would work in cooperation with the Department of State, USIA, and ICA. It could be placed in another department for administrative purposes.

The first year's program would be limited to 500 men; and should increase to 4,000 men in the fourth year of operations.

Academic credit might be earned for orientation work.

Members of the Corps would be carefully selected, must be at least 21½ years of age and qualified in a skill, must be dedicated, physically fit, mature, and prepared to serve in primitive areas.

A 3-year term of service would be equivalent to peacetime military draft; but no veterans benefits would be allowed.

Salaries would be equivalent to those paid to military enlisted men.

Volunteers would serve in a country only if they were requested; a binational commission would coordinate operations in each country.

No action was taken on the bill in the Senate. Nevertheless Senator Humphrey's request that the " \* \* \* bill \* \* \* be presented and appropriately referred so that it would be the subject of intensive study during the coming months \* \* \* " <sup>17</sup> was heeded. The Senate Foreign Relations Committee sent the bill to the Department of State, U.S. Information Agency, International Cooperation Administration, and the Bureau of the Budget. <sup>18</sup> These agencies reported to the committee in early August of 1960, a few weeks before the Congress was adjourned.

### *The Kennedy proposal*

During his campaign for the Presidency, Senator John F. Kennedy told a San Francisco audience, November 2, 1960, that he favored the formation of a Peace Corps. He said in part:

Think of the wonders skilled American personnel could work, building good will, building the peace. There is not enough money in all America to relieve the misery of the underdeveloped world in a giant and endless soup kitchen. But there is enough know-how and enough knowledgeable people to help those nations help themselves.

I therefore propose that our inadequate efforts in this area be supplemented by a "Peace Corps" of talented young men willing and able to service their country in this fashion for 3 years as an alternative to peace-time Selective Service—well qualified through rigorous standards—well trained in the language, skills and customs they will need to know \* \* \* <sup>19</sup>

### *Public reaction pro and con to the Peace Corps plan*

Representative Reuss, and Senators Humphrey and Kennedy, reported having immediately received a great deal of mail, unanimously favorable, regarding the proposal. <sup>20</sup> It was especially popular among

<sup>17</sup> Idem.

<sup>18</sup> U.S. Congress, Senate, Committee on Foreign Relations, Legislative Calendar, 86th Cong., No. 20 (Aug. 17, 1960), p. 36.

<sup>19</sup> New York Times (Nov. 3, 1960), p. 32.

<sup>20</sup> Dr. Samuel P. Hayes, "An International Peace Corps," "The Promise and Problems" (Washington, D.C., the Public Affairs Institute, 1961), p. 23.

college students, some of whom began to organize their own pilot programs. Students at Harvard, the University of Michigan, and elsewhere, established organizations to recruit students.<sup>21</sup> The National Student Association, representing more than a million college students registered its support and began to study the concept.<sup>22</sup> On November 11, 1960, a "Conference to Discuss the Challenge to American Youth from the World's Emerging Nations," was held at Princeton University. Conferees consisted of students and educational, labor, and technical assistance experts from the eastern seaboard, plus representatives from the staff of Senators Kennedy and Humphrey. The conferees concluded that a massive Federal youth program consisting of draft-exempt and trained men would help solve many of the problems of the underdeveloped world.<sup>23</sup>

Additional support came from all levels of American public opinion. In mid-January 1961, the American Institute of Public Opinion, the Gallup poll, reported that 71 percent of all Americans favored the proposal, while only 18 percent opposed it. It was favored by both Democrats (74 percent) and Republicans (67 percent) as well as by Independents (73 percent).

Criticisms of the Peace Corps plan centered on its personnel selection, training aspects, and the Kennedy suggestion for exemption from selective service. For example, Josephine Ripley, in the *Christian Science Monitor*, concluded that dedicated young Americans might not be as attracted by it as the "undergraduate drifter." This, she said, was the "most common criticism of the Youth Corps plan \* \* \*." Standards of selection were accordingly "the most important problem."<sup>24</sup>

The *Wall Street Journal* objected, editorially, to the draft exemption and suggested that the economic contest inherent in the cold war could never be won without a greater infusion in the foreign aid program of highly technically trained manpower:

The idea of giving one lad a uniform and another a passport to Indonesia presupposes a screening for which no objective criteria exist \* \* \*.

What the backward countries \* \* \* need is trained, experienced technical help. One skillful man in field boots, slogging through a paddy to teach natives how to grow more rice, is worth a dozen aid dispensers in air-conditioned retreats. Certainly such skill and experience are not acquired during a "cram" course in Washington. It would better serve U.S. interests abroad—and American "prestige," if you will—to send no technicians rather than young and inexperienced ones.

But perhaps the worst feature of Mr. Kennedy's "Peace Corps" is its gimmicky approach to the deep and intractable problems of cold war. It purports to offer a dramatic solution to problems which simply are not susceptible to easy solution.<sup>25</sup>

### III. ASSESSMENT OF THE ISSUE

Formal congressional consideration of the Peace Corps proposal began with the introduction, on June 1, 1961, of an administration bill by Senator Humphrey and Representative Thomas E. Morgan, chair-

<sup>21</sup> Josephine Ripley, "Exploration of a Youth Peace Corps," *Christian Science Monitor* (Dec. 9, 1960), editorial.

<sup>22</sup> Helen B. Shaffer, "Government Youth Corps," *Editorial Research Reports* (Jan. 4, 1961), p. 4.

<sup>23</sup> Alan C. Elms, "New Frontier: The Peace Corps," *The Nation* (Dec. 3, 1960), pp. 430-432.

<sup>24</sup> *Christian Science Monitor* (Dec. 9, 1960), p. 1; see also editorial: "Youth Corps Bipartisan Project" (Nov. 5, 1960), p. 1.

<sup>25</sup> *Wall Street Journal* (Nov. 15, 1960), p. 1.

man of the House Committee on Foreign Affairs. However, assessment of the concept was initiated long before June by interested Members of Congress, experts on contract to Senator Kennedy, nongovernmental groups, and the Peace Corps task force Director R. Sargent Shriver. By the time the Congress came to consider the legislation, most of the spadework had been completed, controversy eliminated, operational plans designed, and a pilot program begun. Throughout this evolutionary period the Congress was kept well informed.

### *International versus National Peace Corps*

An early Peace Corps study was prepared at Candidate Kennedy's request by Dr. Samuel P. Hayes, professor of economics at the University of Michigan and former director of its foundation for research on human behavior. It first appeared as a memorandum in September 1960, and was subsequently amplified into a pamphlet report for general circulation.<sup>26</sup> The Hayes plan was based on the concept that national volunteers would operate under the administrative organization of a United Nations International Youth Service. Extensive training and orientation would be prerequisites for service; volunteers would not be exempted from military obligations. The U.S. contingent in this International Peace Corps would consist of some 30,000 to 50,000 volunteers.<sup>27</sup>

A more comprehensive study was presented to the President-elect on December 18, 1960, by the Committee on Educational Interchange Policy of the Institute of International Education, chaired by Harlan Cleveland, dean of the Graduate School of Citizenship and Public Affairs of Syracuse University.<sup>28</sup> This study recommended that the youth service program should make volunteers available to private agencies engaged in development work, as well as to other governments, and that the proposed agency serve as a funding and clearing house for all public and private volunteer assistance programs. Other recommendations were: one 3-year term of service, 1,000 volunteers in the field the first year, and no exemption from military service.<sup>29</sup>

### *Evolving scope of the plan through professional reviews*

A third study for the President-elect, prepared in December 1960, was conducted by Dr. Max Millikan, director of the Center for International Studies, Massachusetts Institute of Technology. It recommended—

No exemptions from the selective service ;

Incorporation of the program into a broader foreign aid effort ;

High standards of selectivity and training ("extensive language training in native dialects, even with native instructors, \* \* \* instruction in the economic, cultural, social, and political characteristics of the region to which the participant will be assigned, [and appropriate] technical training");

Operational rather than advisory program ("\* \* \* Explicitly designed to fill a temporary shortage of indigenous persons with the necessary qualifications in

<sup>26</sup> "An International Youth Service," September 1960. Cited by Hayes, *op. cit.*, p. 7.

<sup>27</sup> "An International Peace Corps \* \* \* the Promise and Problems," *op. cit.*, pp. 92-94.

<sup>28</sup> Other members were: Leo Dowling, associate dean of students, Indiana University; Luther H. Evans, Brookings Institution; William Fels, president of Bennington College; Fred W. Hechinger, education editor of the New York Times; Margaret Hickey, public affairs editor of the Ladies Home Journal; Kenneth Holland, president, Institute of International Education; John Ivey, president of the Midwest Council on Airborne Television Instruction; Benjamin R. Shute, former Director of Intelligence of the United States High Commissioner in Germany; and Donald J. Shank, executive vice president of the Institute of International Education ("Details Proposed for Peace Corps," New York Times (Dec. 19, 1960), p. 19).

<sup>29</sup> *Idem.*

the host country.") (Also—salaries commensurate with the local standards for these skills);

Supervisory volunteer team leaders stationed in each country where volunteer workers were serving.<sup>30</sup>

Millikan preferred a gradually evolving program starting "on a limited basis with no more than a few hundred members." The new agency should not itself directly administer overseas programs. There should be a "large amount of experimentation" especially in the early years. Organization and operation of the program should be the subject of continuing research and evaluation. The program should be closely linked to the foreign assistance activities of the United States, and provision should be made for host country citizens to be trained to take over functions initially performed by Peace Corps volunteers.<sup>31</sup>

### *The Reuss conferences on Peace Corps proposals*

Representative Reuss, an early sponsor of the Peace Corps concept, regarded the election of President Kennedy as a mandate for its enactment.<sup>32</sup> To further the program by eliciting public reaction to various alternative approaches, he sponsored a series of conferences in December 1960, in New York, at the Brookings Institution in Washington, D.C., and in the House Banking and Currency Committee hearing room. At these meetings he addressed some 50 Members of Congress and representatives of Federal agencies, student leaders, and spokesmen for various public organizations. Apparently a consensus emerged out of these meetings as to the general principle of the Peace Corps, and on the proposition that it should not be an alternative to selective service. The conferences were beneficial, also, in contributing ideas and data to the study being conducted of the Peace Corps program by the Colorado State University Research Foundation.

### *Peace Corps evaluation contract for the Congress*

Of especial interest, as an effort by the Congress to obtain by contract a direct social science evaluation in advance of a legislative proposal, is the study commissioned to the Colorado State University Research Foundation. To the congressional allocation of \$10,000 for the study, the university added \$50,000. The foundation designed and circulated questionnaires to thousands of American citizens, soliciting opinions and suggestions about the idea; it surveyed nationals, administrators, technical assistance experts, and labor leaders in 10 countries of Asia, Africa, and Latin America, where Peace Corps programs would be established; and it participated in and interviewed attendees of the Reuss conferences. The preliminary report of the foundation in February 1961 endorsed the concept and recommended that the Congress enact permanent authorizing legislation. Its recommendations as to training and implementation were (in summary):

Volunteers should be provided only with a subsistence allowance;  
Service should not be an alternative to the draft;

<sup>30</sup> [Dr. Max Millikan.] International Youth Service, press release, press office of John F. Kennedy, Stanhope Hotel, New York, N.Y., Jan. 9, 1961. (Mimeo, 1961), pp. 3-7. Also reprinted as a task force report in "New Frontiers of the Kennedy Administration: The Texts of the Task Force Reports Prepared for the President" (Washington, D.C., Public Affairs press, 1961), pp. 146-159.

<sup>31</sup> *Ibid.*, pp. 4, 7-8.

<sup>32</sup> "Youth Peace Corps Held Essential," *New York Times* (Dec. 20, 1960), p. 30.

Men and women should be allowed to serve ;  
 Volunteers should have at least a high school education ;  
 Optimum age would be 20 to 30 ;

The length of service should be about 2 years ;

A high level advisory board should be formed ;

A small staff should be provided, but major support should come from ICA or its successor agency ;

A binational board, composed of United States and Peace Corps host country nationals would be formed to set policy, approve projects, provide staff, and plan pilot programs ;

The cost should run to about \$50 million for 5,000 volunteers.<sup>33</sup>

The final report of the research group was not presented to the Congress until June 5, 1961,<sup>34</sup> well after the Peace Corps pilot project was underway, after Mr. Shriver had completed his task force studies, and after legislation had been introduced in the Congress. Two recommendations not in the preliminary report were included in the published version of the final study: (1) the program should start slowly and on a small scale only :

Interviews found a substantial unanimity, among both U.S. nationals and host country nationals, concerning the policy that Peace Corps programs should be initiated in the countries as pilot projects, with limited numbers of participants. There was caution to "start slowly and plan carefully."<sup>35</sup>

(2) There should be an extensive program of in-house and external research :

All parts of the Peace Corps program must be studied carefully to ascertain which parts would have research and evaluation built into them.<sup>36</sup>

It is difficult to assess the precise impact of the Colorado study, or even to identify this impact apart from that of the many other studies conducted of the same subject at about the same time. Members of Congress made reference to the existence of this research; principal officers of the interim Peace Corps, including the Director, had access to its literature. Some of the findings and conclusions of the study were apparently incorporated in official Peace Corps testimony, as well as serving as an independent yardstick by which this testimony was evaluated by the Congress. The Colorado project appears to have been a conscientious and painstaking effort at opinion and data collection. Its findings confirmed those of other study groups. Had this not been the case, it is possible that a congressional consensus favoring Peace Corps legislation might not have been achieved so readily. It is also to be noted that the obtaining by the Congress of an explicit assessment, by a group independent of the executive branch of the Government, of a new concept of cross-cultural technological transfer marks a different legislative approach from that taken in the course of development of Point IV legislation.

<sup>33</sup> Colorado State University Research Foundation. Preliminary report, "A Youth Corps for Service Abroad," by Maurice L. Albertson, Pauline E. Birky, and Andrew E. Rice, (Fort Collins, Colo., February 1961, revised March 1961), pp. 9-11, 13, 23.

<sup>34</sup> Congressional Quarterly Almanac, 1961 (1961), p. 325.

<sup>35</sup> The final report presented to the Congress was transmitted to that body by the International Cooperation Administration: United States, International Cooperation Administration, Peace Corps. Final report. A study by Colorado State University Foundation, Fort Collins, Colo., M. L. Albertson and A. E. Rice (The Administration, Washington 1961). It has not been made available to the researcher. However, the authors of the study later published their report, slightly revised, for the general public. This quote is taken from that publication: Maurice L. Albertson, Andrew E. Rice, and Pauline E. Birky "New Frontiers for American Youth, Perspective on the Peace Corps" (Washington, Public Affairs Press, 1961), p. 35.

<sup>36</sup> *Ibid.*, pp. 128-129, 142-143.

*Peace Corps task force report to the President*

Shortly after taking office in 1961, President Kennedy established still another Peace Corps task force, this one headed by R. Sargent Shriver, former president of the Chicago Board of Education, to study the feasibility of immediately organizing a Peace Corps. Robert B. Textor, a social scientist, has suggested that the new President judged that congressional acceptance of the program would be immeasurably improved by having already underway a provisional program with many volunteers already in training.<sup>37</sup> He adds that the proposal was “\* \* \* faced with the overwhelming concern of simple political survival \* \* \*.” The new agency, engaged in an uncertain, transcultural program, required funding support for a long enough period in its provisional status to prove itself; it also had to contend with a “\* \* \* general skepticism \* \* \* shared widely among members of what might be called the ‘overseas establishment,’ the State Department Foreign Service Officers, Agency for International Development \* \* \* personnel, foundation officials, missionaries \* \* \*” and others, who perceived the Peace Corps as “\* \* \* an insult, a threat, or both.”<sup>38</sup> Sargent Shriver has confirmed this view.<sup>39</sup>

Consistent with the previous efforts to bring a wide range of expertise to the planning of the Peace Corps, Shriver gathered together men with broad academic and foreign policy experience to assist him.<sup>40</sup>

Shriver's report to the President, February 22, 1961, was broad in scope. It set objectives for the Peace Corps to aim at; proposed selection and training methods for future volunteers; suggested technical assistance projects in which volunteers would be most likely to be effective (education, community development, public health, construction projects, government administration, and agriculture); discussed relationships of overseas contingents of volunteers with U.S. diplomatic missions; and advised the formation of a National Advisory Council “to permit criticism and review by some of the best men and women in the field of world development \* \* \*.” Shriver did not favor exemption of Peace Corps volunteers from selective service, nor did he endorse suggestions for a substantially international program.<sup>41</sup> The report acknowledged the work of Millikan and Hayes,

<sup>37</sup> Robert B. Textor, Introduction. In Robert B. Textor, ed., “Cultural Frontiers of the Peace Corps” (Cambridge, the MIT Press, 1966), p. 3.

<sup>38</sup> *Ibid.*, pp. 1-2.

<sup>39</sup> Sargent Shriver, “Five Years With the Peace Corps,” *Saturday Review* (vol. 49, No. 17, Apr. 23, 1966), pp. 14, 18, 54, 57.

<sup>40</sup> Warren Wiggins, Deputy Director of the International Cooperation Administration, who had written a paper entitled “The Towering Task” based on ICA experiences, later to become Director of Program Development and Operations of the Peace Corps; Dr. Max Millikan, who had studied the proposal for the President-elect; Dr. Samuel Hayes, who had studied the plan; Dr. F. Gordon Boyce, director of the Experiment in International Living; Edwin R. Bayley, former newspaper reporter; Morris B. Abraham, a lawyer; Albert G. Simes, of the Institute of International Education, who was in charge of studying affiliations with universities; Dr. Howard A. Rusk, consultant on health affairs for the Peace Corps; Louis E. Martin, newspaper editor, to work with international organizations; Thomas H. E. Quimby, business executive to work on recruitment; Arthur S. Adams, president of the American Council of Education, to work on training programs; Lawrence E. Dennis, vice president in charge of academic affairs at Pennsylvania State College, to survey fulfilling training objectives; Forrest Evashovski, athletic director, to act as a training consultant; Lester Gordon, deputy assistant director for planning and economics of the Development Loan Fund; John D. Young, management consultant; Bradley Patterson, to establish an executive secretariat; Carl Bode, of the Agency for International Development; Harris Wofford, in charge of programs for Africa; Richard Goodwin, Deputy Assistant Secretary of State; William Josephson, lawyer and first Peace Corps General Counsel; and James Grant, Assistant Secretary of State for the Near East. (George E. Sullivan, “The Story of the Peace Corps” (New York, Fleet Publishing Corp., 1964), pp. 30-32; and New Peace Corps, *Bulletin of the Atomic Scientists* (April 1961), p. 161.)

<sup>41</sup> U.S. Peace Corps, “Report to the President on the Peace Corps From Sargent Shriver,” Feb. 22, 1961 (mimeo, 1961), pp. 1-4, 8-10; and U.S. Peace Corps, “Summary of Next Steps From Sargent Shriver” (to the President), Feb. 22, 1961 (mimeo, 1961), pp. 1-4.

the Institute of International Education, the National Student Association, and the Colorado State University Research Foundation. It acknowledged also a debt to consultations with Representative Reuss and Senator Humphrey.<sup>42</sup>

Two of Shriver's conclusions differed from the recommendations set forth in previous supporting studies. While the "Peace Corps should take its place as a basic component of our whole overseas [foreign aid] program," it should be established as a semiautonomous entity within the State Department as a " \* \* \* new experiment in international cooperation" so that its staff must have "great flexibility to experiment with different methods of operations." If it were made a subdivision in the ICA the new program "would share the public, political, and bureaucratic disabilities" of the older organization. Continued the report—

This is not to detract from the very real worth of ICA's present assistance programs. But the idea of a Peace Corps has captured the imagination of a great many people. Support for it cuts across party, regional, ethnic, and other lines. The Peace Corps, therefore, offers an opportunity to add a new dimension to our approach to the world—an opportunity for the American people to think anew and start afresh in their participation in world development. That opportunity should not be jeopardized. Beginning the Peace Corps as another ICA operation runs the risk of losing that new appeal.<sup>43</sup>

As to timing, he urged that the President establish the Peace Corps as soon as possible and on a substantial scale:

How and when should the Peace Corps be launched? The Peace Corps can either begin in very low gear, with only "preparatory work" undertaken between now and when Congress finally appropriates special funds for it, or it can be launched now and in earnest by executive action, with sufficient funds made available from existing mutual security appropriations to permit a number of substantial projects to start this summer.<sup>44</sup>

#### IV. INFORMATION ASSESSED BY THE CONGRESS

Immediately after the administration bill had been sent up and introduced, the Peace Corps transmitted to the Congress a very detailed 67 page proposal for the fiscal year 1962.<sup>45</sup> Much information about the temporary agency had gone earlier to the Congress, on March 21, 1961, when the Senate Foreign Relations Committee held a hearing on the nomination of Sargent Shriver to be director of the Peace Corps.<sup>46</sup> Additional hearings on the President's proposal were held by the House Committee on Foreign Affairs in August, and the Senate Committee on Foreign Relations in June.<sup>47</sup> In addition, the Peace Corps staff through its congressional liaison officer, William Moyers, and others,

<sup>42</sup> "Report to the President on the Peace Corps From Sargent Shriver," op. cit., p. 1.

<sup>43</sup> Ibid., pp. 4, 10, 11, 12; and "Summary of the Next Steps From Sargent Shriver," op. cit., p. 1.

<sup>44</sup> "Report to the President on the Peace Corps From Sargent Shriver," Ibid., p. 13.

<sup>45</sup> U.S. Peace Corps. Presentation of fiscal year 1962 program to U.S. Congress. May 29, 1961 (mimeo, 1961), 67 pages.

<sup>46</sup> U.S. Congress, Senate, Committee on Foreign Relations, Nomination of Robert Sargent Shriver, Jr., to be Director of the Peace Corps. Hearings before the \* \* \* on the nomination of Robert Sargent Shriver, to be Director of the Peace Corps. Mar. 21, 1961, 87th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1961), 58 pages.

<sup>47</sup> U.S. Congress, House, Committee on Foreign Affairs, The Peace Corps. Hearings before the \* \* \* on H.R. 7500, A bill to provide for a Peace Corps to help the peoples of interested countries and areas in meeting their needs for skilled manpower. Aug. 11 and 15, 1961, 87th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1961), 132 pages; and U.S. Congress, Senate, Committee on Foreign Relations, The Peace Corps. Hearings before the \* \* \* on S. 2000, A bill to provide for a Peace Corps to help the peoples of interested countries and areas in meeting their needs for skilled manpower. June 22 and 23, 1961, 87th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1961), 254 pages.

endeavored to provide the Congress with complete information about planning and current training operations of the first Peace Corps contingent at Rutgers University.

Members of Congress, both in committee, and in general debate, expressed satisfaction at the quantity and quality of information they received from the temporary agency. For instance in the House hearings, Representative Marguerite Church commended the communications efforts of Mr. Shriver and his staff:

\* \* \* I know of no other program about which so much advance information has been sent to the Congress. I know of no Director who has made such an effort to bring this story personally to Members of Congress. It is phenomenal, this way in which you have really attempted to contact us personally, and I credit it as due to your sagacity as well as to your own enthusiasm for your program.<sup>48</sup>

*Grassroots technology aspects in Peace Corps presentations*

The information presented by the Peace Corps to the Congress explained how the program differed from ongoing foreign aid programs and why middle-level manpower would help the introduction of technology to the developing countries. The Colorado study had included a survey of middle manpower needs in the developing countries and had elaborated upon the potential use of volunteers in teaching, agricultural and rural development, health, and large-scale construction and industrial projects.<sup>49</sup> Drawing on this material, the presentation urged that the program receive substantial flexibility and independence. It was evident that it would not be a comfortable 2-year vacation for persons seeking to avoid Selective Service obligations. Its contribution would be mainly technical:

The missing link in many of these [underdeveloped] countries is manpower at the middle level: teachers, electricians, home economists, Government clerks, nurses and nurses' aides, farmers, water and sanitation experts, medical technicians, and so on. Rather than to advise and counsel the local people on *how* to accomplish these jobs, Peace Corps volunteers will go to help *do* the work and in the process will teach local people how to do it themselves.<sup>50</sup>

Detailed appendices elaborated on this theme in discussing selection, training, and summaries of the training of the country projects already underway for Tanganyika, Colombia, and the Philippines.<sup>51</sup> As to recruitment, the statement emphasized that while college graduates would comprise the bulk of volunteers, special efforts would be made to recruit noncollege graduates with agricultural and labor skills.<sup>52</sup> Information detailing criteria and methods of selection was presented:

Information on quality will come from the comprehensive battery of Peace Corps entrance tests which measure \* \* \* knowledge of American history, institutions and values, language aptitude or achievement, and job competence. Optional tests will measure skills in such areas as teaching ability, farming and animal husbandry, basic mechanical engineering, and basic health and child care. [Candidates will also be given psychological and medical examinations.]<sup>53</sup>

A detailed training program had been developed to prepare the volunteer for grassroots contact with foreigners. Training would take place first on U.S. college campuses and might be continued in selected overseas training stations in order to simulate circumstances that the volunteer would encounter. It would last 3 to 6 months and would include training in—

<sup>48</sup> House, The Peace Corps. Hearings. \* \* \* op. cit., p. 23.

<sup>49</sup> Presentation of fiscal year 1962 program to U.S. Congress, op. cit., pp. 4-5.

<sup>50</sup> *Ibid.*, pp. 1-2.

<sup>51</sup> Respectively, appendixes D, E, B-1, B-2, and B-3, in *Ibid.*

<sup>52</sup> *Ibid.*, p. 5.

<sup>53</sup> *Ibid.*, pp. 5-6.

Skills and knowledge required in the project ;  
 Methods of organizing and communicating skills and knowledge to accomplish project goals ;  
 U.S. history, democratic institutions and international relations ;  
 The geography, culture, and government of the host country ;  
 Language training to enable the volunteer to manage his everyday living requirements and to communicate with people with whom he would work ;  
 Physical conditioning and training in health and personal adjustment to different environments.<sup>54</sup>

Further appendixes to the report described medical training and planned health care for volunteers (app. G) ; details of interagency and field relationships (app. H) ; departmental personnel policies (app. F) ; administrative support and cooperation with the International Cooperation Administration (app. I) ; and a detailed estimate of annual cost per volunteer for training and field operations (app. A).

#### V—CONGRESSIONAL HEARINGS AND ENACTMENT OF LEGISLATION

Each committee held 2 days of hearings on the administration bill. Testimony was taken from Sargent Shriver and other Peace Corps officials, representatives of religious missions, labor unions, and other groups with programs in international development. The only academic witness was Dr. Andrew E. Rice, of the Colorado State University Research Foundation, who briefly testified before the Senate Foreign Relations Committee. In addition, numerous supporting statements, supplementary memorandums from the Peace Corps, and newspaper articles were inserted in the record of the hearings. The majority of witnesses enthusiastically supported the proposal and discussed how they might support the operation.

Both committees favorably reported the legislation and recommended a \$40 million appropriation.<sup>55</sup> The committees commended the spadework done by the Peace Corps, by the Colorado State University Research Foundation, and by other students of the issue. Apparently a consensus was reached regarding the experimental nature of the program and the need for a flexible, experimental operation. For instance, the Senate Foreign Relations Committee concluded :

The committee strongly recommends the full \$40 million authorization. It is of the opinion that the request is justified and that the Peace Corps should be permitted enough flexibility to try the methods of approach it envisages. Only in that way can it be known whether the program offers opportunity to assist in the development of nations seeking assistance.<sup>56</sup>

Peace Corps authorization and appropriation was the subject of several days of discussion on the floor of the House and Senate.<sup>57</sup> Congressional reaction, both in the hearings and on the floor was generally favorable. The record of both hearings and floor debate contained voluminous testimonials from those wishing to serve, favorable reviews of intensive training programs in progress at Putney, Va., and Rutgers University, eyewitness accounts by legislators who had

<sup>54</sup> *Ibid.*, pp. 6-7. These points are summarized.

<sup>55</sup> U.S. Congress, Senate, Committee on Foreign Relations, "The Peace Corps: Report of the \* \* \* on S. 2000," Senate Rept. 706, 87th Cong., 1st sess., Aug. 10, 1961 (Washington, U.S. Government Printing Office, 1961), 24 pages; and U.S. Congress, House Committee on Foreign Affairs, "Peace Corps Act: Report of the \* \* \* on H.R. 7500, to provide for a Peace Corps to help the peoples of interested countries and areas in meeting their needs for skilled manpower," House Rept. 1115, 87th Cong., 1st sess., Sept. 5, 1961, (Washington, U.S. Government Printing Office, 1961), 78 pages.

<sup>56</sup> The Peace Corps, Report of the \* \* \* on S. 2000, op. cit., p. 18.

<sup>57</sup> June 1; Aug. 23-25; Sept. 13-20, 1961. Congressional Record (1961).

visited the training camps,<sup>58</sup> and results of public opinion polls taken by legislators of their constituents and by independent polling organizations of the general public showing support of the program.<sup>59</sup>

### *Objections*

Minor objections to the program on the floor dealt primarily with selection of volunteers, and administrative and legal problems. There was the possibility of religious proselytizing by missionary groups, if allowed to assist the program; the potential size of the group and age limits of volunteers were questioned as was the propriety of an oath of allegiance (as enacted, the volunteers were required to take an oath); and there was the possibility of discrimination by foreign nationals of American volunteers of particular ethnic or religious background.<sup>60</sup>

Several trimming actions were taken to the legislation on the floor, such as reducing the employment of foreign nationals and international organizations in training of volunteers, and eliminating a proposed Career Planning Board to help returned volunteers find jobs in Government or other service; also dropped from the bill was authorization for volunteers to work for international programs, and an exemption of returned volunteers from taking Civil Service exams to qualify for Federal employment.

### *Compatibility of the Peace Corps with U.S. foreign policy and goals*

On two related issues the Congress took a firm stand contrary to the views of the administration proponents of the Peace Corps:

As to the role of volunteers in the "ideological struggle" of the cold war;

As to the compatibility of the program with the broader elements of U.S. foreign policy.

The views of the Peace Corps and its proponents on these two issues are indicated in the following two quotations:

(a) There is no better way to counteract anti-American propaganda than by providing contact between Americans and citizens of other countries. Such propaganda is inevitably most effective among people who have never had an opportunity to get to know, or even to meet, Americans.<sup>61</sup>

(b) Because the Peace Corps is so unquestionably different [from ongoing foreign policy and technical assistance programs] there is simply no organizational reason why it should be part of the new foreign aid agency. The mere fact that it operates abroad is almost all that it has in common with ICA or with its successor organization.<sup>61</sup>

In the hearings, Representative Chester Merrow insisted that volunteers engage not only in technical assistance but also in ideological competition. Director Shriver offered assurances that both purposes would be served by the work of volunteers trained in the culture and language of the local people, and that they would also be trained in principles of American Government, democracy, and tactics of Communist agitation. However, to provide further assurance on these two issues, the Congress added two provisions to the final legislation to link the Peace Corps more closely to U.S. foreign policy objectives and operations. (a) It required that volunteers be trained in Communist

<sup>58</sup> Congressional Record (Aug. 24, 1961), p. 15724.

<sup>59</sup> For instance, see: House, "The Peace Corps. Hearings. \* \* \*" op. cit., p. 23.

<sup>60</sup> Respectively: Senate, "The Peace Corps." Hearings \* \* \* op. cit., pp. 19, 41, 51, 29, and 97, and Congressional Record (Aug. 25, 1961), p. 15491.

<sup>61</sup> "Peace Corps: The Need for the Peace Corps," Congressional Record, op. cit., pp. 16882-16883.

philosophy, strategy and tactics; (b) while making the Corps a semi-autonomous agency, insisted that it be subject to general policy direction and supervision of the Secretary of State.

### *Language training*

The only substantive facet of the proposal which was challenged at any length in the Congress related to language training. Senator Carl Curtis of Nebraska, citing examples of ineffective foreign service due to a lack of adequate language training, proposed the Peace Corps be required to give each volunteer a speaking knowledge of the particular language of his place of assignment, and where such language was written, an ability to read and write it.<sup>62</sup> The Peace Corps felt the amendment to be unduly "restrictive" and objected to it. Spokesmen said that although they agreed with the objectives of the amendment, "\* \* \* it would impose an impossible burden and unbearable cost on the Peace Corps."<sup>63</sup> Moreover, it would unduly lengthen the training program, and would be astronomical in cost. Their alternative was to focus on a program of training "\* \* \* so that each Peace Corps volunteer [would] be able to engage in simple conversation in the primary language of the country of assignment."<sup>64</sup> They would not require fluency in speaking and writing. The Peace Corps reservations were noted and agreed to, and the Curtis amendment was replaced with a requirement of "reasonable proficiency" in language.

### *Enactment of the Peace Corps legislation*

Opposition to the final passage of the legislation came from those Members unwilling to create another foreign aid agency, or who objected to the size of the proposed organization, or who preferred to wait until the interim Peace Corps, operating under Executive Order, had completed a full year of operation under funding from the President's foreign aid contingency fund. Although the bulk of objections were offered by Republican Members, the final vote for passage was substantially bipartisan.<sup>65</sup>

## VI. ASSESSMENT OF CONSEQUENCES

As of 1968, the Peace Corps had been in existence for 7 years. Congressional support remained substantial with appropriations rising from \$30 million in fiscal year 1962 to \$107,500,000 in fiscal year 1968. From its inception until 1967, 28,000 volunteers had served overseas.

The Peace Corps itself has endeavored to improve its organization and overseas operations. For example, in October 1965, the Congress amended the Peace Corps Act at the request of Sargent Shriver so that no staff members above the grade of GS-9 would be permitted to remain employed in the organization longer than 5 years. The intention of this amendment was to avoid "bureaucratic arteriosclerosis," and to encourage the employment in Washington headquarters of

<sup>62</sup> Congressional Record (Aug. 25, 1961), p. 15941.

<sup>63</sup> U.S. Peace Corps, Differences between S. 2000 (S) and H.R. 7500 (H) as passed by Senate and House, Sept. 18, 1961. Attachment: "Peace Corps Language Training," non-published, p. 2.

<sup>64</sup> *Ibid.*, p. 1.

<sup>65</sup> The Peace Corps bill was passed in the House on Sept. 14, 1961, 288 yeas to 97 nays. (Democrats, 206 yeas to 29 nays; Republicans, 82 yeas to 68 nays.) The key rollcall vote on the bill in the Senate was on the Hickenlooper amendment, proposing to reduce the fiscal year 1962 appropriation authorization from \$40 million to \$25 million. It was rejected by a vote of 32 yeas to 54 nays. (Democrats, 8 yeas to 51 nays; Republicans, 24 yeas to 8 nays.)

qualified returned volunteers in "associate, deputy or representative jobs" so that their experiences and recommendations might improve operations.<sup>66</sup> The Peace Corps has also sought recommendations of volunteers regarding improvement of operations. All volunteer country teams are interviewed together a few months before their own tour of duty ends. Periodic conferences of returned Peace Corps volunteers in Washington have focussed on evaluation of the impact of Peace Corps programs overseas and on the potential contribution that could be made by returned volunteers to domestic social improvement programs such as VISTA and the Teacher Corps.<sup>67</sup>

Nevertheless the Peace Corps has encountered increasing criticism from the Congress. For instance the supplemental views of several House Foreign Affairs Committee members in 1968 included the following points:

[Because the Peace Corps consistently returns funds appropriated to it, and doesn't train as many volunteers as it anticipates, there must be a lack of qualified volunteers]:

\* \* \* Poor administration is slowly choking the high ideals that marked the inception of the Peace Corps. Retrenchment in expenditures is our most pressing national need. Trimming the bureaucratic fat and the slick public relations posture of the Peace Corps will make a modest contribution to a better fiscal situation \* \* \*.<sup>68</sup>

Textor has completed extensive research based on data obtained in numerous interviews with returned volunteers and has suggested that the Peace Corps has not met all of its objectives.<sup>69</sup> Although the Peace Corps has taken steps to remedy some difficulties, its record in influencing development, he says, is uneven because of deficiencies in—

General training (some teachers are inadequately prepared, there is not enough technical training);

Making training more culturally relevant (the Peace Corps has begun to experiment with training volunteers in the host country rather than in the United States);

Lack of in-service training in the field for volunteers in service;

Evaluative feedback from the field;

Lack of stabilized relationships with training institutions (early training contracts were determined on the basis of requirements for political distribution of contracts);

Lack of integration of Peace Corps experience and later educational training.<sup>70</sup>

Other deficiencies mentioned by Textor relate to the developmental process in the host country itself: a socially closed society; political instability; and cultural factors (the volunteer must try to relate to and modify the attitudes of both the elite and the lower classes, who often have contradictory objectives and forms of behavior).<sup>71</sup> Other defects cited were administrative inefficiency, brevity of the volunteer tour, underqualification of some volunteers, inappropriate assignments, and inadequate continuity of Peace Corps programs in the host country.<sup>72</sup>

<sup>66</sup> Memo from Robert B. Textor, PDO/EE, to Franklin H. Williams, chairman, Talent Search Panel, "A Plan To Keep the Peace Corps Permanently Young, Creative, and Dynamic," Dec. 11, 1961, in Textor, ed., op. cit., p. 350.

<sup>67</sup> For example, a conference was held on Mar. 5-7, 1965. Congressional Quarterly Almanac (1965), p. 491.

<sup>68</sup> Supplemental views. In U.S. Congress, House, Committee on Foreign Affairs, Peace Corps, Report (to accompany H.R. 15087), 90th Cong., 2d sess., Rept. No. 1519, June 5, 1968 (Washington, U.S. Government Printing Office, 1968), pp. 6-7.

<sup>69</sup> "Robert B. Textor, Conclusions, Problems, and Prospects." In Textor, ed., op. cit., p. 229.

<sup>70</sup> Respectively. *Ibid.*, pp. 305, 328, 329, 332, and 332-333.

<sup>71</sup> *Ibid.*, pp. 206-220.

<sup>72</sup> *Ibid.*, pp. 320-22.

*Neglect of research as a major program defect*

According to Textor, the major deficiency in Peace Corps programs, is neglect of research. In this diagnostic finding his opinion is shared by a number of Peace Corps administrators and other informed observers. Says Textor:

\* \* \* There are simply not sufficient data available on which to base [conclusions evaluating performance and impact]. It is doubtful if even Peace Corps Washington has sufficient data. The measurement and prediction of cultural impact is an immensely complex problem involving careful observation of many variables. An enormous—and expensive—amount of research is usually required \* \* \*.<sup>73</sup>

Neglect of this essential function, he continues, is attributable to hard choices made by both the agency leadership and the Congress:

During its first 5 years, the Peace Corps has been a highly pragmatic organization, little given to research of a deliberate or deeply probing nature. Its Division of Evaluation has focused primarily on troubleshooting inspection trips which have been valuable as a means of detecting and obviating immediate operational problems, but of little value in developing deeper or more systematic understanding of persisting intercultural problems. Senior officials at the Division of Evaluation have tended to be lawyers and journalists rather than social scientists. Often, these officials have lacked previous experience in the host country in which they are evaluating Peace Corps operations, and sometimes they have lacked previous transcultural experience of any kind. During the Corps' second 5 years, it is to be hoped that this nonprofessional, pragmatic emphasis will gradually be supplanted by a more professional, searching approach aimed at discovering the deeper origins of operational problems. More ex-volunteers with relevant social science credentials are needed in the Division of Evaluation.

\* \* \* Much more research on the Peace Corps is needed. In particular, we need to know more about processes of transcultural adjustment, about ways and means of more effectively preparing and assisting the volunteer to achieve cultural proficiency, and about the Corps' developmental impact in various host countries. If even 1 percent of the total Peace Corps budget were devoted to research—a much smaller percentage than a forward-looking industrial firm would spend—the quality of administrative and policy decisions could be greatly improved.<sup>74</sup>

Many of the reports presented to and consulted by Sargent Shriver in 1961, contained well-formulated and detailed recommendations for extensive research and evaluation. In addition to Dr. Millikan's recommendations (see pp. 247–248 above), the Colorado State University Research Foundation recommended research in the following areas:

Short-range and long-range program planning, establishment of objectives, development of personnel programs [study of the] impact [of volunteer operations] on individuals and groups [overseas], project evaluation, organizational structure and operational procedures, and establishment of fundamental principles.<sup>75</sup>

With respect to research on volunteer training and performance the Colorado group suggested that indigenous social scientists should be used; this would insure more valid results and provide foreigners with training in American social science research methods.<sup>76</sup>

The Colorado group also recommended "fundamental or basic research \* \* \* on the \* \* \* basic principles underlying the reasons for

<sup>73</sup> *Ibid.*, pp. 312–3.

<sup>74</sup> Textor, *Ibid.*, pp. 337–338. For a concurring view on the need for better coordination of research and evaluation in the Peace Corps see Meridian Bennett, "Evaluation and Change," *Annals of the American Academy of Political and Social Science* (May 1966), p. 127.

<sup>75</sup> "New Frontiers for American Youth: Perspectives on the Peace Corps," *op. cit.*, p. 128.

<sup>76</sup> *Ibid.*, pp. 228–229.

certain results or consequences \* \* \*." For instance they recommended research on (summarized) :

Group interaction: How Peace Corps volunteers as individuals and in a group interact or work with individuals of another culture.

Group dynamics: The development of successful leadership while operating under conditions of severe stress from internal or external factors.

Communications: Meaningful transference of an idea between persons with diverse cultural backgrounds.

Decisionmaking: What are the best procedures for successful decisionmaking, and who should participate? What problems tend to arise when individuals with unlike cultural backgrounds are involved in decisionmaking, and how can the problems be anticipated and avoided or solved?

Cultural change: How can the volunteer introduce cultural change? <sup>77</sup>

These recommendations seem not to have been heeded by the Peace Corps itself; there was virtually no reference made in the Peace Corps presentation materials to the need for extensive research. The only reference, made in passing, related to the potential tasks of private agencies which might be invited to undertake such programs. In discussing the proposed functions of educational institutions which might contribute to the development of training programs, research was not mentioned.<sup>78</sup> The only Peace Corps reference to the need for research in hearings before the Congress came when Mr. Shriver was testifying before the Senate Foreign Relations Committee on his nomination. In response to a question by Senator Wayne Morse, Shriver stated that while the Peace Corps felt a research program was needed, and was receiving suggestions about it from the Colorado group, the National Research Foundation, the American Psychological Association, and the Brookings Institution and the Princeton Educational Testing Service, " \* \* \* we have not resolved now exactly how that evaluation of that research should be carried out." <sup>79</sup>

In sum, there was no request from the Peace Corps in 1961, and no provision in the 1961 legislation, for a program of research.

There were only two other instances in Congress when the need for research was made explicit. The first came from Dr. Albertson, in his printed testimony before the Senate Foreign Relations Committee.<sup>80</sup> And the second came from some Republican Members of Congress, who, while not calling for authorization of a research program, wanted to wait to evaluate the first year's experimental program before enacting permanent legislation.

The Peace Corps expenditures for research studies in fiscal years 1962 and 1963 were relatively small: \$111,689 and \$175,385, respectively. In the fiscal year 1964, the agency spent \$554,857 on research and evaluation studies. In an apparent effort to win congressional approval for a substantially expanded program of research, the Peace Corps in 1965 asked the Congress for \$1,400,000 which Sargent Shriver justified before the Senate Foreign Relations Committee in terms of such elements of program improvement as better recruiting and improved preventive health care for volunteers and country representatives.<sup>81</sup> The Congress denied this request, holding that in relevant

<sup>77</sup> *Ibid.*, pp. 142-143.

<sup>78</sup> Peace Corps. Presentation of fiscal year 1962 program to U.S. Congress, op. cit., pp. 14, 16.

<sup>79</sup> Senate, "Nomination of Robert Sargent Shriver, Jr., to be Director of the Peace Corps," Hearings, \* \* \* op. cit., p. 33.

<sup>80</sup> The Peace Corps, "Hearings Before the \* \* \* on S. 2000," op. cit., p. 142.

<sup>81</sup> U.S. Congress, Senate Committee on Foreign Relations, To Amend the Peace Corps Act, Hearings Before the \* \* \* on S. 1368, A Bill To Amend Further the Peace Corps Act, as Amended, Apr. 26, 1965, 89th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1965), p. 51.

areas other Federal agencies were already carrying out research whose results the Peace Corp could use.<sup>82</sup>

Despite denials of duplication of research by the Peace Corps and by the Agency for International Development,<sup>83</sup> subsequent requests for increased funds for research have not been met by the Congress.<sup>84</sup>

### *Technology transfer in the Peace Corps*

Evaluation of the technology transfer function of the Peace Corps must relate to the assumptions and objectives of the program, i.e., highly technically trained volunteers versus moderately trained volunteers who are culturally and linguistically prepared to demonstrate the rudiments of technological skills needed for a particular task. It must also relate to research on technical training and impact—as yet decidedly inadequate components of the program.

Legislative inquiry relating to the technical assistance facets of the program per se in 1961 was limited to brief exploration of the relationship of the Peace Corps to the Point IV program. Those legislators who inquired into the relationship appeared to agree with the reply that the Peace Corps would provide practical technicians:

Now in between that actual physical help, physical capital resources, and technical advice [of the ongoing overseas aid programs of the United States] we believe there is room for actual workers, for doers, for practitioners of what we preach. So that if a man preaches and teaches about how to cultivate a farm, he will have a Peace Corps volunteer who actually goes out and practices and does what the technical adviser preaches.<sup>85</sup>

Apparently it was assumed that in this admittedly experimental program, appropriate technical training would be provided by the Peace Corps after projects were selected. It is also likely that not enough was known at the outset—or indeed subsequently—about the complex processes of intercultural transfer of technology. However, there is no evidence that the Peace Corps foresaw much difficulty with the technical training and technical assistance components of the program. The idea was to send over volunteers as quickly as possible, and to rely on their initiative; whatever degree of proficiency in particular technological skills that was required could be quickly introduced into the

<sup>82</sup> U.S. Congress, Senate Committee on Foreign Relations, Report on the Peace Corps S. Rept. 267, in United States Code, Congressional and Administrative News (1965), p. 2766.

<sup>83</sup> Included in the Senate Foreign Relations hearings on the Peace Corps authorization for fiscal year 1966, was a memo from the Agency for International Development stating that while the research programs of the two agencies are complementary, they are different and duplication is avoided. "To Amend the Peace Corps Act," op. cit., 1965, p. 82.

<sup>84</sup> In fiscal year 1969 appropriations hearings, Jack Vaughn, Director of the Peace Corps stated:

Peace Corps research supports applied research that will help the Peace Corps better to carry out its operations. The strategy adopted capitalizes on Peace Corps staff talent through a program of in-house studies and selected contracted research. A major focus of Peace Corps research concentrates on overseas performance of the volunteers through studies of programing and impact. These studies are designed to measure the effectiveness, or impact, of volunteers in helping host countries, and to study systematically how Peace Corps programs can be improved to increase this impact. Other studies deal with improving Peace Corps recruiting, selection, training of volunteers in skills such as community development and teaching, language training of volunteers, programing in new areas such as tuberculosis control, agricultural improvement, etc. Much more research is needed than can be carried out under the budgetary amount requested; only the most crucial projects have been carried out in fiscal year 1968 and planned for fiscal year 1969. The Peace Corps research budget is less than one-half of 1 percent of its total budget. (U.S. Congress, House Committee on Appropriations, Foreign assistance and related agencies appropriations for 1969. Hearings before a subcommittee of the \* \* \* Part 1. 90th Cong., 2d sess. (Washington, U.S. Government Printing Office, 1968, p. 795.)

<sup>85</sup> Statement of Robert Sargent Shriver. In "Nomination of Robert Sargent Shriver, Jr., to be Director of the Peace Corps," Hearings, op. cit., p. 49.

program as needed.<sup>86</sup> It is also evident that the extensive administration and congressional inquiries into the social underpinnings of the program, and into the legal, policy, and management aspects left little time for consideration of the very difficult and not very salient problems of technology transfer.

Nevertheless, the technical assistance facets of the Peace Corps program have encountered increasing criticism. Textor suggests that "technical training, especially, has often lacked a realistic relationship to host country conditions and problems."<sup>87</sup> Donald Shea, a political scientist who has worked with the Peace Corps, concludes that there was no way for administrators to know what specific technical training and tasks would be required and that only completion of intensive evaluation of many volunteer contingents could provide appropriate answers.<sup>88</sup>

More attention to the technical components of the Peace Corps program in 1961 and in subsequent years might have improved the program. Over one-half of the projects contemplated for 1969 relate directly to highly technical skills, as for instance, in electronics, surveying, city planning, occupational therapy, geology, X-ray technology, civil engineering, agronomy, forestry, marine biology, and wildlife management. The other half, while based in larger measure in experience in the social sciences and humanities, as for instance, in marketing, hotel management, journalism, elementary education, law, library science, public relations, and secretarial skills, are all based on a substantial familiarity with industrial technology and practical professional experience.<sup>89</sup> In addition, it is generally held that project requests for volunteers tend to place increasing emphasis on technically trained individuals. Jack Vaughn, Director of the Peace Corps, has recognized the inadequacies of the technical assistance components of the problem. He has detailed the dearth of hoped-for technically trained volunteers:

Liberal arts graduates have always made up a large percentage of our volunteers, but in the early days we always had hopes of finding more applicants with technical skills. However, we have now resigned ourselves to the fact that technically trained volunteers, who usually have children and a mortgage, are just not available in large enough numbers to meet all demands.

He adds that liberal arts graduates are given training in specific technical skills required:

Consequently, we have retooled our recruitment, selection, and training programs toward these liberal arts graduates (we call them A.B. generalists). Now we train them in the needed technical skill, such as secondary school teaching, poultry, simple construction techniques, or some aspect of public health. "If you can teach public health to a Nigerian mother," one of our staff doctors said of a health program developed for Niger, "you can certainly teach it to an A.B. generalist." Or as we put it: "If you can't teach it—whatever it is—to a liberal arts graduate in 3 months, you probably can't teach it where we are going."<sup>90</sup>

<sup>86</sup> This is a conclusion of Dr. Donald R. Shea, a political scientist and administrator of the University of Wisconsin-Milwaukee Peace Corps Training Center. He has also participated in official seminars evaluating the Peace Corps training program. "The Preparation of Peace Corps Volunteers for Overseas Service: Challenge and Response." *Annals of the American Academy of Political and Social Science* (May 1966), p. 38.

<sup>87</sup> Textor, *op. cit.*, p. 305.

<sup>88</sup> Shea, *op. cit.*, p. 38.

<sup>89</sup> Extrapolated from "Training Directory Index in U.S. Peace Corps." *Factbook and Directory, 1968* (Washington, Peace Corps [1968]), pp. 49-51.

<sup>90</sup> Jack Vaughn. "The Peace Corps: Now We Are Seven," *Saturday Review* (Jan. 6, 1968), p. 22.

## VII. CONCLUSION

Although the Peace Corps proposal of 1961 encountered mild skepticism in both Democratic and Republican quarters, there were at work strong forces in its favor. The enthusiastic tenor of public opinion, the vitality of the new Administration, and the relatively low initial cost of the plan helped insure legislative success. However, congressional receptivity to this proposal, and the eventual marshaling of legislative support for it were largely attributable to the Administration's inclinations to secure preliminary information and to consult fully with individual Members of Congress and with the relevant committees. This was a well-planned procedure, for several Members of Congress themselves had initially authored similar proposals. It is also evident that the intensive analysis done by President Kennedy's staff before inauguration and Shriver's staff after January, coupled with the strategy of presenting Congress with a well-run and established program, helped insure passage.

Nevertheless, there were two major informational requisites for legislative success. First, the Administration had to convince the Congress that this new people-to-people approach to foreign relations could be advantageous. The Peace Corps had to convince Congress that this new foreign aid program, virtually unrelated to ongoing programs of technical assistance or the transfer of technology (particularly military technology), could make a positive contribution to the national security. The Administration's efforts to devise a small and unassuming program, without guaranteeing immediate positive results in economic development and improvement in foreign relations, were apparently successful.

Second, the Peace Corps had to familiarize the Congress with some of the details of the developmental tasks envisioned. The Congress was not told that thousands of trained and willing Americans were ready to serve for 2 years in some jungle slum or barren desert. The Congress was provided with information detailing the complex cultural variables which would make it difficult for Americans to modify opinions and attitudes and to teach a technological orientation to peoples of developing nations. The Congress was presented with details of the immensity of differences between traditional and modern cultures; with detailed information about the health hazards and cultural variants volunteers would encounter. Similarly the Congress was presented with detailed information about the steps that would be taken to insure the program's success: highly selective recruitment, intensive language training; and education in the culture, traditions, history and technical needs of the country to which the volunteer would be sent. Three and one-half months after introduction of the legislation, Congress, with only minor technical modifications granted the requested program and gave the Peace Corps a mandate to begin. In order to explain and implement a technical assistance program accounting for cultural variables, the executive branch made considerable use of social scientists in fashioning its program. Undoubtedly their efforts and conclusions were filtered to the Congress through testimony and helped in the fashioning of the necessary legislative consensus.

The Congress, and individual Members, had undertaken their own efforts to obtain social science advice independent of the executive

branch and prior to the introduction of the administration's bills. It had enacted legislation enabling the granting of a \$10,000 contract to the Colorado State University Research Foundation to study the proposals introduced by Senators Humphrey and Neuberger and Congressman Reuss. The final Colorado study was presented to the Congress on June 5, 1961—regrettably late and after the Peace Corps had already been established by Executive order. Nevertheless the preliminary findings of the Colorado study were timely and useful and reinforced the executive branch's efforts. However, the Congress did not investigate the merits of two recommendations contained in the Colorado report, for formation of binational planning boards and for intensive research and evaluation of training and field operations. Congress continued to withhold its approval of these conclusions.

Dr. Rice, of the Colorado group, who briefly testified before the Senate Foreign Relations Committee, was the only social scientist or technical assistance expert to testify in 1961. There has been no concerted effort subsequently to secure further advice in this field respecting the Peace Corps. Such experts would probably advocate an increase in the program of supporting research on substantive, operational, and interface problems of the Peace Corps, and refinement of technical training (as is illustrated by positions presented in this case study). The Congress might also search out and evaluate the justifications for such changes. And, in a broader sense, the congressional oversight function might conceivably benefit from such an evaluative contribution of both social scientists and technical experts to a genuinely experimental and still remarkably flexible program of technical assistance.

## CHAPTER TEN—HIGH-ENERGY PHYSICS: AN ISSUE WITHOUT A FOCUS

### I. INTRODUCTION

The substantial expansion of the field of high-energy physics, largely with Government funding, may be attributable in part to the fact that few issues in this field have been permitted to come to a head. A possible explanation of this absence of controversy is that the science community, or that substantial portion of the scientific leadership that is committed to preserving U.S. eminence in high-energy physics, attaches so much importance to this field of basic research that it makes a positive effort to preserve a solid front, with virtually all issues mediated within the community. Another possibility is that the close relationship between the Atomic Energy Commission and the high-energy physicists, and the close relationship between the AEC and the Joint Committee on Atomic Energy, insure that issues are resolved at the technical level, before they burgeon into political controversies.

Since 1945, Government support for basic research in high-energy physics has risen from \$3.9 million to more than \$150 million annually. The subject of this field of science is the ultimate structure and composition of the atomic nucleus. Penetration of the nucleus can be accomplished only by particles accelerated to extreme velocities by high-energy accelerators. Decisions have been taken leading to Government-funded construction of a 33 billion electron volt (Bev.) accelerator at Brookhaven National Laboratory, costing some \$30 million; a 20-Bev. linear accelerator at Stanford University, Palo Alto, Calif., costing some \$114 million; and a 200-Bev. accelerator at Weston, Ill., to cost an eventual \$280 million or thereabouts. In prospect is an 800-Bev. accelerator, estimated to cost some \$800 million. As a rough rule-of-thumb factor, the annual operating cost of these large, experimental machines is between one-third and one-half of the acquisition cost.

During the evolutionary period in the discipline, after World War II and particularly in the past decade, a number of issues regarding one or another of the programs of new research hardware in the field might have expanded into major controversies, but did not. One was as to the marring of the landscape near the Stanford accelerator by the powerline to the project. Another involved the acceptance or rejection of an accelerator of novel design to be sited in the Middle West, which was turned down by President Johnson as an economy

measure in early 1964.<sup>1</sup> The Weston accelerator generated a brief flurry of controversy as to its site—both in general, as a matter of competition for the privilege of receiving it, and later with particular reference to open housing ordinances in nearby communities. However, none of these controversies seriously interrupted the continuation and even expansion of the national effort in high-energy physics. Today an important fraction of the total Government investment in basic research (more than one-third of all Federal outlays for physics; more than one-tenth of all outlays for the physical sciences) is being channeled into this field. At no time has the research effort encountered a serious setback; if the decisions to retard the program somewhat, taken in 1967 and again in 1968, should be continued in future years, the effect—although encountering criticism from the scientists in this field—will nevertheless leave high-energy physics still in a commanding position relative to other scientific claimants for Government sponsorship.

The underlying issue of high-energy physics is as to the allocation of funds to basic research in this costly field. This issue leads in turn to a considerable range of related issues:

(1) As to the division of funds for new starts of construction on accelerators to extend research capability versus full use of accelerators already in being (and the subsidiary question as to the rate of effort and support to hasten new construction already authorized);

(2) As to the effect of the generous support for basic research in high-energy physics, as a discipline that is already strongly established, manned, supported, and productive, upon less favored, new or lagging disciplines that may be judged to have more important potential implications for social or technological contributions;

(3) As to the broader question of allocation of funds for basic research versus support for applied research and technological development having more direct and immediate social utility;

(4) As to the feasibility of measuring basic scientific productivity, so as to apply cost/effectiveness criteria in the evaluation of programs in competition for public support;

<sup>1</sup>The unsuccessful campaign to obtain Federal funding of the FFAG (fixed field alternating gradient synchrotron) accelerator, developed under the auspices of MURA (Midwest Universities Research Association) consortium is described in considerable detail by Daniel S. Greenberg, "The Politics of Pure Science" (New York, The New American Library, 1967), chapter X, High Energy Politics, pp. 209-269. The FFAG was a high-intensity beam device, of 12.5-Bev. energy level, employing a colliding particle principle, to be located at the University of Wisconsin. An estimate of its cost was \$170 million, although uncertainties as to design made this figure less than firm. Issues concerning the FFAG, in addition to that of budget, were: the relative merits of a beam of high particle density versus a beam of high energy, the relative merits of a new technological concept versus a more conventional approach, the question of a national laboratory versus one managed by a university consortium, and the regional issue of Midwest versus east/west coast as locus for a research center. Location of the 200-Bev. accelerator in Illinois may have served as a part-compromise of some of these issues.

(5) As to the applicability of criteria for the relative scientific significance of competing research programs.<sup>2</sup>

*Priority of high-energy physics among basic research disciplines*

High-energy physics has been fortunate in its acceptance by the scientific community, in the number and eminence of advocates for its support, and in the explicitness of plans for its development. The leaders of the discipline have provided the Congress with a succession of reports, studies, assessments, and policy documents over the past decade, all conveying essentially the same themes:

An understanding of the fundamental forces and nature of matter is essential to provide an underpinning for all science;

The quest for knowledge in high energy physics is exciting, vigorous, rewarding, and intellectually extending;

Most of the major recent scientific contributions to high-energy physics have been made in the United States;

Costs of research in high-energy physics are rising and larger support by the Government is essential to further progress;

The field is ripe for further exciting discoveries;

The manpower for research is available (and, indeed, there is a surplus generated by the field):

Close international collaboration in high-energy physics has helped establish good relations, thereby "improving the image of the United States abroad and \* \* \* lessening of world tensions."<sup>3</sup>

<sup>2</sup> Dr. Phillip H. Abelson, director of the Geophysical Laboratory, Carnegie Institution of Washington, in a round table discussion in hearings before the Subcommittee on Research, Development, and Radiation, of the Joint Committee on Atomic Energy, Mar. 3, 1965, proposed 3 major criteria by which to guide national policy in the allocation of funds for basic research. These were: "\* \* \* importance to science, philosophical values, and contributions to the material needs of society." U.S. Congress, Joint Committee on Atomic Energy, "High-Energy Physics, Research, Development, and Radiation of the \* \* \* on High-Energy Physics Research," Mar. 2, 3, 4, and 5, 1965 (Washington, U.S. Government Printing Office, 1965), pp. 209-211.

Relative merit of several scientific activities follows:

	High-energy nuclear physics 10 <sup>6</sup> electron volts		Materials sciences		Unmanned space exploration		Molecular biology	
	Past	Future	Past	Future	Past	Future	Past	Future
Importance to science:								
Practitioners.....	5	5	5	5	5	5	5	5
Scientists in other fields.....	3	5	4	4	4	4	5	5
Philosophical values:								
Intellectual values.....	5	5	3	3	4	4	5	5
Interest to nonscientists.....	3	3	4	4	5	5	5	5
International prestige.....	4	5	4	4	5	5	5	5
Contributions to needs of society:								
Energy, food, clothing, shelter, transportation, etc.....	0	0	5	5	2	4	2	3
Health.....	1	1	3	4	1	2	5	5
Defense.....	2	2	5	5	5	5	3	3
International trade balance of payments.....	0	0	5	5	0	3	3	3

In the table the following scale has been employed:

- 0 none
- 1 slight
- 2 moderate
- 3 significant
- 4 important
- 5 very important

The column headed "Past" refers to the last 10 years; the column headed "Future" is my guess as to developments during the next 10 years.

<sup>3</sup> "Policy for National Action in the Field of High-Energy Physics" (U.S. Atomic Energy Commission, Jan. 24, 1965), especially p. 29.

In general, it may be said that the field has been firmly established as a discipline of high scientific priority. Many witnesses in congressional hearings have expressed the view that the field has characteristically attracted the cream of the crop of young scientists. Although the impact of research in high-energy physics on science and technology generally is not considered or claimed to be preeminent, its intellectual appeal and challenge are undeniable.

*Direct rewards of national investment in high-energy physics*

The goal of the researchers in high-energy physics is the exploration of a complex and mysterious world, difficult of access, whose relation to the world of human experience is extremely remote and perhaps totally irrelevant. For them, the exploration of this world is both an intellectual challenge and an esthetic experience. Presumably, the reward to those who pay the rising costs of this research is in the vicarious sharing of the excitement and the gratification of the general curiosity about the remote places of the universe. However, the growing complexity of this world has tended to separate it further and further from the comprehension of those who pay these costs, as well as of those who must decide on the allocation of resources for national research and other national purposes. And the growing costs of the research makes increasingly relevant the question as to the social returns of an activity so reliant on social resources.

Man's enormous curiosity about his physical universe, the microcosmos and the macro-cosmos, may or may not ever be essentially gratified. However, the quest goes on in both directions; discoveries are made and pondered upon; another layer of the cosmos, above or below, is laid bare and examined. As the search becomes remote and costly, the role of Government in supporting the quest remains undefined, but unmistakably more essential and more onerous if the search is to continue.

There appears to be no end to the quest to identify and catalog new particles, or new excited states of previously identified particles. The question as to whether this particulate population explosion is the correct view of the ultimate composition of matter or whether all these particles will ultimately be reduced to a coherent and simplifying set of two or three ultimate-ultimate forms of matter is today one of the most engaging problems facing high energy physics. The further awkward possibility has not yet been hinted at that when and if this simplifying set is revealed, it will in turn be found—by some enormous engine of still vaster power and cost—to consist of a further complexity of constituent particles of undreamed-of properties and minuteness.

*National security aspects of high-energy physics*

The implications of the field for the national security appear to warrant separate discussion. It was from early experiments with the atomic nucleus that the way was found to release energy from the atom. High energy physics is an extension of this same kind of research. It enlists the interest of the same kinds of scientists who were instrumental in producing the atomic bomb, who manned the Manhattan District and the subsequent Atomic Energy Commission. The modest dollar investment in studies of the atomic nucleus before 1940 resulted in a tremendous impact on science, technology, and strategic warfare. The analogy is clear: an area of pure science unexpectedly

produced a technological capability of great military and industrial consequence; the same area, with similar people, might yield another unexpected bonus. In view of the large and well-documented research effort in this field in Western Europe, and the even larger potential effort underway in the Soviet Union,<sup>4</sup> the implication is also clear that a kind of indirect race involving the national security is underway, to "prove a negative." That is, to secure an exhaustive knowledge of the ultimate constitution of matter, in order to show conclusively that it affords no further contributions analogous to the atomic bomb and atomic energy. Unfortunately, there is no assurance that an "exhaustive" knowledge is obtainable; meanwhile the quest for it rises exponentially in cost.

#### *Indirect social benefits of high-energy physics*

The undeniable benefits of this national science effort are largely indirect. Great ingenuity is displayed by the high-energy physicists to design experimental apparatus to serve in a field in which the basic hardware and the associated instrumentation are growing in size, complexity, sophistication, precision, and cost. Linear accelerators are longer; cyclotrons of greater radius; bubble chambers of larger volume. As the dimensions grow, so does the cost of acquisition and maintenance; it is not evident, however, that such derivative benefits as technological gains, spin-off inventions, and industrial expertise continue to accrue commensurately. With increasing size, much of the cost goes into repetitive hardware (magnets and klystron tubes and the like), housed in expensive but not extraordinary structures, and supported by a growing army of highly trained but narrowly specialized technologists.

Those who direct and use these installations receive training in the solving of extremely complex and difficult problems at a high level of abstraction. These learned qualities are broadly transferable, and undoubtedly strengthen the national resources in problem solving.

In a more specific and material way, the outlays for large accelerators provide ancillary benefits. The keen competition for the site of the 200-Bev accelerator suggests that there are considered to be practical economic advantages in hosting a facility that costs a quarter billion dollars to acquire, and tens of millions annually to operate and man. Such an activity undoubtedly has an economic stimulus in the region where it is located.

However, the question might also be raised as to whether the technological impact on industry of the hardware requirements for large accelerators might not be actually adverse. The production costs are inherently secondary to quality as a procurement factor; rate of pro-

<sup>4</sup> One measure of level of effort is in terms of energy level and number of large accelerators in operation. See table:

TABLE 2.—STATUS OF ACCELERATORS IN UNITED STATES, WESTERN EUROPE, AND U.S.S.R.

	Number of 1+ Bev. accelera- tors in operation	Largest accel- erator in opera- tion (Bev.)	Accelerator largest planned (Bev)
United States.....	11	33	200
Western Europe (CERN).....	9	28	300
U.S.S.R.....	5	76	

duction of hardware and components is not crucial, while rejection rate is likely to be high—especially in items close to the state of the art; useful applications to commerce or even to other fields of science of the skills required do not appear to be consequential. In the jargon of economics, the industrial skills associated with a large accelerator might be dysfunctional for capacity to produce goods economically to satisfy other human requirements in competitive markets.

Moreover, if the justification of support for high-energy physics is based on benefits that are irrelevant to the purposes that motivate the scientists, while the costs are directly related to these purposes, then a social anomaly is at hand. Costs and benefits to society are on different scales of values; they are independent variables, and the latter cannot logically be used to justify the former.

To the extent that there is merit in acquiring national prestige through excellence in an undoubtedly prestigious scientific field, this factor might also warrant consideration. However, it appears that this sort of prestige is costly to acquire and highly perishable. In 1968, after nearly three decades of steadily rising national contributions to the high-energy physics effort in the United States, during which period the Members of Congress were repeatedly assured that the United States was in the forefront of the science, an advisory panel on high-energy physics of the Atomic Energy Commission warned that "Leadership in high energy physics is expected to pass from the United States to Western Europe and the U.S.S.R. in the next few years unless the U.S. funding trend for this frontier field is radically modified."<sup>5</sup>

#### *Considerations of continued Government support*

In summary, the quest for knowledge about the ultimate composition of matter involves scientific curiosity, indirect benefits (educational, economic, cultural, technological) accruing from a vigorous program of basic research, the advantages of enhanced national prestige, and the possible implications for national defense.

The costs of the quest are rising steeply, both to acquire larger and more powerful accelerators, and to operate them. Programs of research in Western Europe and the Soviet Union parallel those in the United States. No evident cutoff point in the further pursuit of knowledge in the field has been found. There is no assurance that the projected 200-Bev accelerator will resolve the fundamental questions of matter, nor indeed that they will be answered by a projected 800- to 1,000-Bev accelerator now under study funded by the AEC.

In short, each increment of increase in power or intensity of accelerators, sensitivity of detection apparatus, and skill in data management and analysis, opens the way to further disclosures but at the same time raises new questions that can be answered only by further incremental increases of greatly increased magnitude in research capability. And each further incremental increase in research capability is provided at an exponential increase in costs.

<sup>5</sup> "The Status and Problems of High Energy Physics Today," a report of the High Energy Physics Advisory Panel of the Atomic Energy Commission, Jan. 30, 1968; In U.S. Congress Joint Committee on Atomic Energy, "AEC Authorizing Legislation, Fiscal Year 1969. Hearings Before the \* \* \* on Nuclear Rocket (Rover): Space Electric Power; Physical Research; Raw Materials; Isotopes Development; Biology and Medicine; Plowshare; Special Nuclear Materials; Community; Program Director and Administration; Training, Education and Information and Weapons," Feb. 7 and 21, 1968, pts. 1-3, 90th Cong., 2d sess. (Washington, U.S. Government Printing Office, 1968), pp. 1207-1222.

The question to be explored in the remainder of this chapter is: What arrangements for the flow of technical information and advice have been in effect that have produced so positive a congressional response in a field so abstruse and unrelated to political values? How has the Congress met the problem posed by the circumstance that the rate of increase in costs is independent of the benefits to society that the research effort provides?

### *Recapitulation*

High-energy physics deals with the essence of all physical being—the ultimate nature of matter itself. No basic research field illustrates more elegantly the modern dilemma of Government sponsorship of science. Thus:

(1) The field of inquiry has long been one of the most central to the concerns of man.

(2) The field is said to attract the most highly gifted, educated, and motivated of research scientists.

(3) Research into the atomic structure three decades ago yielded results applicable to the creation of a new technology of warfare in which offense was decisive, defense dubious, and destructiveness intolerable.

(4) Further penetration of the intricate complex of energies, masses, motions, fields, and interchanges within the atomic nucleus, is certain to yield further basic information—but is equally sure to yield questions and challenges calling for still further research.

(5) The quest for knowledge of these mysteries is endorsed by groups of outstanding scientists in many foreign countries, and most notably in the Soviet Union; efforts abroad threaten to match or to outpace those in the United States.

(6) The possibility, or the fear, that further research discoveries will yield applied results comparable to those produced by earlier atomic research, while not apparently the motivation for the researchers, is an important reason for public support of high-energy physics. Although expectations of further shattering discoveries are not widely shared by the scientists themselves, the possibility, while remote, cannot be totally dismissed.

(7) Costs of the research have been mounting with each new increment of capability for further penetration of the nucleus, with a single installation—the most advanced now entertained in concept—approaching a billion dollars.

(8) Wide participation in the use of the largest facilities—and their employment as training tools as well as for research—begins to be precluded by their size, cost, need for tight scheduling, and specialized skills associated with their use. Some of the educational reasons for Government sponsorship of science are thus weakened by this trend. The purpose of the very largest high-energy facilities is restricted to front line research in the hands of the most qualified and advanced scholars. The process of separation and specialization seems likely to continue, as the size and power of the newest facilities continue to increase.

(9) There is no end in sight, no final goal can yet be defined, in the quest for knowledge about the ultimate composition of matter. It is altogether possible that complete characterization of all the “ultimate”

particles to be found in matter (now approaching 150) will eventually be explained in terms of a composition of two or three particles of still finer mesh—in the same way that the atomic elements were reduced to combinations of the electron, proton, and neutron. Or it may be that there are merely more and more different kinds of particles or different-sized pieces of energy/matter dislodged from the nucleus by different energies of impact.

(10) As the research proceeds, fewer and fewer researchers, more and more remote from the rest of the scientific community, equipped with more and more costly accelerators, supported by more and more elaborate and costly recording and computing equipments, are making discoveries more and more remote from public understanding, and more and more unrelated to human reality.

The dilemma presented by these 10 circumstances is that—

To halt the research is to expose the Nation to the fear that discoveries by other nations will jeopardize U.S. security;

To pursue the research at the rate desired by the scientists who are engaging in it, for an indefinite future period, would be to preempt resources from other sciences, throw the national scientific effort out of balance, reduce research and educational opportunities, and delay progress toward U.S. objectives other than in science;

To pursue the research at a lower level, on a "stretched out" schedule, would result in frustration of those engaged in the inquiry, lessened efficiency in the use of facilities, increased possibility that scientists elsewhere would achieve more rapid results damaging to the security and prestige of the United States; and

To enlist the scientifically minded nations of the world in a more tightly organized and fully international research program might reduce the costs to each, and reduce the possibility of some technological surprise in nuclear weaponry, but might also reduce the quantitative opportunities for participation by U.S. scientists, and the national prestige of the United States through eminence in the field.

## II. ADVICE TO THE CONGRESS ON HIGH-ENERGY PHYSICS

In the presenting of a case to the Congress for Federal funding, no field of basic research has approached high-energy physics in the volume, scope, variety of forms of presentation of data, detail of coverage, and number and eminence of advocates. Immediately after World War II, several Government agencies shared the task of supporting this area of basic research. The Office of Naval Research, and later the Air Force Office of Scientific Research and the National Science Foundation, all contributed to the funding of the discipline. However, the AEC early assumed a predominant role.

Not long after the Soviet sputnik achievement stimulated an enlarged national scientific effort in the United States, a forum to assist in the coordination of the Federal support of high-energy physics was provided by the Technical Committee on High-Energy Physics (TCHEP), a committee of the Federal Council of Science and Technology (FCST). General science policy recommendations were generated by the President's Scientific Advisory Committee (PSAC),

organized in 1951 and substantially enlarged in 1957. Policy guidance was provided from 1962 on by the Office of Science and Technology, and in particular by the President's Adviser on Science and Technology. Fiscal guidance was exercised by the Bureau of the Budget. Technical recommendations came from many sources: the General Advisory Committee (GAC) of the AEC, various advisory panels of NSF, and advisory groups formed by the National Academy of Science-National Research Council.

The special relationship that has grown up between the AEC and the Joint Committee on Atomic Energy (JCAE) also contributed to a stable and systematic formulation and support of high-energy physics programs. The JCAE periodically called for long-range program statements of goals, plans for new construction, assurances of balanced utilization of facilities, indications of expected research results, and authoritative prescriptions of national policy in the field of high-energy physics.<sup>6</sup>

As a result of all these arrangements for control, management, policy guidance, and program review, the high-energy physics program achieved high visibility, accountability, and stable growth.

*The technical advisory panel as a mechanism to advise Congress*

Notable use has been made by the proponents of high-energy physics of the device of the advisory panel, to generate information and technical recommendations for consideration by the Congress and by policymaking officials of the Government. Among such panels have been the following:

NSF advisory panel on ultrahigh-energy nuclear accelerators, 1954 (Bacher).

NSF advisory panel on high-energy accelerators, 1956 (Haworth).

NSF advisory panel on high-energy accelerators, 1958 (Haworth).

PSAC-GAC special panel on U.S. policy and action in high-energy accelerator physics, 1958 (Piore).

PSAC-GAC special panel on high-energy accelerator physics, 1960 (Piore).

PSAC-GAC panel on high-energy accelerator physics, 1963 (Ramsey).

NAS-NRC panel on elementary particle physics, 1964 (Walker).

FCST Technical Committee for High Energy Physics, 1963.

PSAC panel of accelerator users, 1963 (Good).

AEC report: Policy for National Action in the Field of High-Energy Physics, 1965.

AEC high-energy physics advisory panel, 1967-68 (Weisskopf).

High-energy physics panel reports generally are characterized by (1) an appeal for stronger Government support for the discipline, (2) assurances that the scientific endeavor proposed is of fundamental significance, (3) indications of the ripeness of the field for deeper penetration, and important discoveries, (4) various indications of the ancillary benefits of such research, (5) a proposed schedule of addi-

<sup>6</sup> The "special relationship" of the JCAE is discussed by Harold Orlans, "Contracting for Atoms." See especially ch. VIII, "The Joint Committee on Atomic Energy" (Washington, D.C., the Brookings Institution, March 1967), pp. 154-171.

tional hardware to be built, and (6) an assessment of the status of U.S. research vis-a-vis that of Western Europe and the U.S.S.R.

The Ramsey panel, 1962-63, may be considered a typical example. Its report, completed April 26, 1963, and released to the public May 20, presented the views of the President's Scientific Advisory Committee and also the views of the General Advisory Committee of the AEC. However, "In its deliberations, the panel has been assisted by the representatives of the Technical Committee on High-Energy Physics of the Federal Council for Science and Technology, by the staffs of Government agencies supporting this research, by representatives of the laboratories interested in new accelerators, and by a number of other individuals."<sup>7</sup> (See participants, p. 273.) The report of the Ramsey panel also called attention to the fact that "the membership of the panel included specialists in several fields of physics other than high energy."<sup>8</sup> It acknowledged that "By its very nature, the field of high-energy physics is costly and any significant growth requires large expenditures," but offered assurances that the program it recommended was " \* \* \* limited and selective in the number of new facilities to be provided." Then the report established the basic scientific bona fides of the field of research—

The principal unanswered questions about elementary particles lie today in high-energy physics, the study of particles in the subnuclear domain. (p. 1695)  
Study of the elementary particles is central to the quest for a more profound understanding of the structure of matter. (p. 1696)

The leadership and prestige of the United States in the field was applauded—

Over the last decade, most of the major inventions and discoveries in high-energy physics have been made in U.S. laboratories. Several of these have been recognized by the award of the Nobel Prize.

This U.S. leadership was identified as the direct result of generous Government sponsorship—

\* \* \* Based primarily on the willingness of the U.S. Government to support \* \* \* construction and operation of accelerators of many different characteristics, and also the support of extensive high-energy physics programs using such accelerators. (p. 1696)

The "technological byproducts" of this sponsored research were enumerated:

*Table of high-energy physics byproducts*

<i>H.E.P. item</i>	<i>Commercial input</i>
Cyclotron-----	High power transmitting tubes.
Linear accelerator-----	Klystron.
Van de Graff generator-----	Use of same in radiology and radiography.
Alternating gradient principle-----	Electron tube applications.
General technology required-----	Advances in— high vacuum techniques, cryogenics, superconductivity, solid state applications, ultra-high-speed electronics, computer data processing.

<sup>7</sup> Report of the Panel on High Energy Accelerator Physics of the General Advisory Committee to the Atomic Energy Commission and the President's Science Advisory Committee Apr. 26, 1963. [Ramsey panel]. In U.S. Congress Joint Committee on Atomic Energy, AEC Authorizing Legislation, Fiscal Year 1965. Hearings \* \* \* 88th Cong., 2d sess., 3 parts (Washington, U.S. Government Printing Office, 1964), p. 1695.

<sup>8</sup> Id.

## Participants in the Ramsey panel—

Panel members: Norman F. Ramsey, Chairman, Harvard University; Philip H. Abelson, Carnegie Institution of Washington; Owen Chamberlain, University of California; Murray Gell-Mann, California Institute of Technology; E. L. Goldwaber, University of Illinois; T. D. Lee, Columbia University; W. K. H. Panofsky, Stanford University; E. M. Purcell, Harvard University; Frederick Seitz, National Academy of Sciences; John H. Williams, University of Minnesota.

Ex-officio members: Randal M. Robertson, National Science Foundation (representing the Technical Committee on High-Energy Physics of the Federal Council for Science & Technology); David Z. Robinson, Office of Science and Technology.

Executive Secretary: Johannes C. Severiens, Atomic Energy Commission.

Participants: Air Force Office of Scientific Research—J. E. Duval, A. W. Harrison, Jr., L. A. Wood; Argonne National Laboratory—A. V. Crewe, R. H. Hildebrand.

Atomic Energy Commission: L. J. Haworth, Commissioner, S. G. English, G. M. Kavaragh, G. A. Kolstad, L. J. Laslett, P. W. McDaniel, R. P. McGee, D. R. Miller, W. A. Wallenmeyer.

Brookhaven National Laboratory: M. Goldhaber, Director, J. P. Blewett, C. E. Falk, G. K. Green, G. F. Tape, L. C. L. Yuan.

Bureau of the Budget: F. C. Schuldt, Stanley Small.

University of California, Los Angeles: J. R. Richardson, B. T. Wright.

Columbia University: Melvin Schwartz, Robert Serber.

Cornell University: D. A. Edwards, R. R. Wilson.

CERN: V. F. Weisskopf.

Department of Defense: F. J. Weyl.

Lawrence Radiation Laboratory: E. M. McMillan, Director, G. F. Chew, Dennis Keefe, E. J. Lofgren, Lloyd Smith, G. H. Trilling.

Los Alamos Scientific Laboratory: C. L. Critchfield, Louis Rosen.

University of Michigan: L. W. Jones.

Midwestern Universities Research Association: Bernard Waldman, Director, F. T. Cole, Aaron Galonsky, K. R. Symon.

National Aeronautics and Space Administration: Harry Harrison.

National Science Foundation: R. H. Bolt, Wayne Gruner, W. L. Kolthun, J. H. McMillen.

Office of Naval Research: J. H. Fregeau, S. H. Krasner, W. E. Wright.

Oak Ridge National Laboratory: R. S. Livingston, A. H. Snell, Alexander Zucker.

University of Pennsylvania: Henry Primakoff.

Princeton University: G. K. O'Neill.

Stanford University: W. M. Fairbank, Robert Hofstadter, P. B. Wilson.

Department of State: Ragnar Rollefson.

University of Washington: R. W. Williams.

University of Wisconsin: M. L. Good, R. G. Sachs.

Yale University: V. W. Hughes, G. W. Wheeler.

The deeper significance of high-energy physics, as to its contribution to social utility, said the report, lay in its challenge—

Its challenging technical problems have engaged a group of most inventive and resourceful scientists, on a frontier where technology must be pushed to its limits. They are a reservoir of inventive energy and broadly based scientific and engineering skill from which leadership can be drawn for other scientific enterprises. It must be recognized that high-energy physics is a unique training ground for some of our most creative people. (p. 1697)

The dynamic nature of the field of high-energy physics was demonstrated by discussion of recent new discoveries. Goals were adduced in terms of linking up the new discoveries into coherent theory—with the aid of further empirical data, to be secured by the use of larger and more powerful (higher energy) accelerators, accelerators having a higher density of particles (higher intensity) or, preferably, both.

The problem of manpower allocation was considered: large accelerators needed first-class resident staffs, but not so as to deplete the

teaching ranks, nor preempt the accelerators so that outsiders could not use them. The report also conveyed concern lest Government support of high-energy physics not be backed by the sustained enthusiasm of the taxpayer:

High-energy physics is an effort whose basic scientific validity and possible far-reaching implications are accepted by the scientific community but which has not caught the imagination of the public. It appears reasonable for the Government and scientists to encourage a more organized effort in attempting to explain the meaning and extent of this highly successful U.S. activity both at home and abroad.<sup>9</sup>

The report reviewed the potential advantages of various kinds and levels of particle accelerators, the manpower factors, and the possibility of various kinds of international cooperation. On this last item, it noted that cost and hardware sharing with the Soviet Union would be "a major 'breakthrough'" and would establish a contact between U.S. and U.S.S.R. engineering groups which would be desirable, but would require that the Russians take the initiative. Noted the report:

If it did become possible to proceed with a joint U.S.-U.S.S.R. undertaking, the merits of such a project in the cause of international amity would be so large that its cost could be legitimately related to expenses in the foreign-policy field rather than being considered in competition with the national accelerator program. (p. 1722)

A similar cost-sharing program involving only Western Europe, however, had less to recommend it:

A joint accelerator construction and management undertaking involving only the United States and Western Europe does not appear to offer much advantage to either side at the present time. Accelerators of the sizes now contemplated are within the capacity of both the United States and of the Western European group and such accelerators are needed on both sides of the Atlantic. Furthermore, technical exchange of information is virtually complete, and access of scientists from Western Europe to U.S. machines and vice versa is proceeding on an informal basis in a entirely satisfactory manner. There is, therefore, no need to complicate the administrative arrangement by a formal joint management arrangement in the immediate future.<sup>10</sup>

After presenting an indication that its recommendations had been formulated after full consideration of possible alternatives, the panel offered 13 specific recommendations for Federal action:

1. Authorize, at the earliest possible date, the construction, by the Lawrence Radiation Laboratory, of a high-energy proton accelerator at approximately 200 billion electron volt energy.

2. Authorize the construction of storage rings at Brookhaven National Laboratory after a suitable study.

3. Support intensive design studies at Brookhaven National Laboratory of a national accelerator in the range of 600-1000 billion electron volts. Request for authorization may be anticipated in about 5 or 6 years.

4. Authorize in fiscal year 1965 the construction, by MURA, of a super-current accelerator, including plans leading to its evolution into a nationally available facility.

5. Support the construction of the proposed 10 billion electron volt Cornell electron accelerator, including plans leading to its evolution into a nationally available facility.

6. Support the development and construction of electron-positron storage rings.

7. Provide strong support for the development and the utilization of new techniques of particle detection, data reduction, and data analysis.

8. Continue to support accelerators in operation or under construction, as well as their associated research programs, without neglecting the need for new

<sup>9</sup> Ibid., p. 1708.

<sup>10</sup> Ibid., p. 1722.

facilities. Recognize the special need for expansion in operating and research budgets of the newest accelerators before they come into full operation.

9. Increase the support of university high-energy users groups for buildings, major equipment, and computational facilities.

10. Close down or reduce the level of operation of accelerators which become relatively unproductive. The prime considerations in continuing an accelerator program are its scientific significance, the suitability of the machine relative to other available machines, the capacity of the group to carry out the proposed program, and the provision of adequate support of research programs elsewhere. Additional factors are the educational function served by the accelerator and its use in preparing experiments for more costly facilities.

11. Support the study of new accelerator principles and techniques.

12. Recognize the need for adequate visitor housing (both short and long term) at the above recommended new national facilities.

13. Provide for a review of the high-energy physics program at suitable intervals.<sup>21</sup>

In the Ramsey panel report a total pattern of funding support was proposed in the form of a time-phased schedule of new construction and subsequent operation of six recommended new elements in addition to the "base program." The proposed total national effort called for would increase from \$108 million in 1962 to \$268 million in 1967, to \$457 million in 1972, \$605 million in 1977, and \$600 million in 1981. The total outlay proposed for the years 1962-81 was \$8,262 million. (See table 3.)

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<sup>21</sup> *Ibid.*, pp. 1728-1729.

TABLE 3.—PROGRAM COSTS IN MILLIONS OF DOLLARS/YEAR<sup>1</sup>

	Fiscal year																			
	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Total Programs.....	108	143	175	218	237	268	317	351	370	408	457	523	549	596	607	605	574	572	584	600
Base Program.....	96	128	153	176	187	190	187	190	199	206	212	219	233	230	200	170	140	120	105	103
Users Program.....	12	15	18	28	30	32	34	36	41	56	50	54	60	66	70	80	90	100	110	115
Total New Program.....	4	14	20	46	96	125	130	156	195	250	296	300	337	355	344	352	344	352	369	382
FFAG—12.5 Bev (\$148 M).....	1	6	10	21	47	52	37	37	40	46	51	53	55	55	57	59	61	63	65	65
R&D Pre-Oper., & Oper.....	1	3	3	3	3	3	3	4	16	30	40	45	50	52	54	56	58	60	62	64
Construction.....									44	48	21	7		1	1	1	1	1	1	1
200 Bev Accelerator (\$240 M).....	1	3	3	14	34	54	69	75	50	50	55	61	66	71	77	82	87	92		
R&D Pre-Oper., & Oper.....	1	3	3	4	4	4	4	4	10	30	50	55	60	65	70	75	80	85	90	90
Construction.....									30	50	65	20		1	1	1	2	2	2	2
Storage Rings—33 Bev (\$60 M).....	1	1	1	1	5	12	17	22	19	12	12	12	15	16	16	16	17	17	17	17
R&D Pre-Oper., & Oper.....	1	1	1	2	2	2	2	2	7	12	12	12	14	15	15	15	16	16	16	16
Construction.....									3	10	15	20	12		1	1	1	1	1	1
10 Bev Electron Synchrotron (\$15 M).....	3	5	5	2																
Construction.....	3	5	5	2																
SLAC—Phase II (\$90 M).....	17	49	42	15	20	20	21	21	22	22	22	23	23	23	23	23	23	23	23	23
R&D Pre-Oper., & Oper.....	2	4	12	15	20	20	21	21	21	21	21	22	22	22	22	22	22	22	22	23
Construction.....	15	45	30																	
£00 Bev Accelerator (\$800 M).....	1	1	1	1	1	2	2	2	8	44	100	120	150	180	190	170	170	180	185	185
R&D Pre-Oper., & Oper.....	1	1	1	1	1	2	2	2	3	4	10	10	15	20	25	25	25	25	25	25
Construction.....									5	40	90	110	135	160	165	95				
Percentage Growth Rate of Total Programs.....	29	32	22	24	9	13	18	11	5	10	12	14	5	8	2	-----	(5)	-----	2	2

<sup>1</sup> Ibid., p. 1736.

Note: Parentheses indicate minus quantity.

*Presidential support for high-energy physics programs*

The large magnitude and cost of modern research facilities required to support high-energy physics has inevitably involved the office of the President in the programs. Thus, the White House, May 17, 1959, released a report of the President's Science Advisory Committee recommending Government sponsorship of the 2-mile-long linear accelerator (SLAC) at Stanford University. President Eisenhower announced his own decision to support the project before a symposium on basic science, May 14, 1959.<sup>12</sup>

President Kennedy's attitude toward basic research was reportedly one of lively enthusiasm, tempered by " \* \* \* a realization that, in the early 1960's, after 15 years of fantastically rapid growth of Federal support for basic research, the Congress was feeling sour and restless about the seemingly endless financial appetite of the Nation's scientific community."<sup>13</sup> The President, this source continues, "After several discussions with Wiesner (the President's scientific adviser) on the most basic and most expensive of the sciences—high-energy physics— \* \* \* informally gave an assurance that his administration would back the construction of one major new accelerator about every 5 years \* \* \*"<sup>14</sup>

A major review of high-energy physics was undertaken by the President's Science Advisory Committee together with the Panel on High-Energy Accelerator Physics of the General Advisory Committee to the Atomic Energy Commission (Ramsey panel), early in 1963. However, by November 1963, the President had taken no action in response to its recommendations.

President Johnson, upon his accession to the Presidency, found it necessary for budgetary reasons to deny the aspirations of the Midwest Universities Research Association for a high intensity FFAG accelerator. However, the National Science Foundation was permitted to proceed with the support of a 10 Bev accelerator at Cornell University, and planning and design continued for both the 200 Bev accelerator by the Berkeley scientists and the 600–1,000 Bev accelerator at Argonne National Laboratory.

At the request of the members of the Joint Committee on Atomic Energy (principally Representative Chet Holifield), Dr. Donald F. Hornig, the President's science adviser, transmitted to the JCAE a policy statement, March 30, 1964, that contained seven principal items, as follows: (paraphrase)

1. It was in the national interest "to support vigorous advancement of high-energy physics as a fundamental field of science."

2. This was a national program, not identified with any one agency, although AEC would be its "primary custodian." NSF and DOD support would also be beneficial.

<sup>12</sup> According to Daniel S. Greenberg, "The Politics of Pure Science," op. cit., p. 238, the President's support of the Stanford accelerator aroused partisan support and opposition in the Congress. The Joint Committee on Atomic Energy withheld approval of the project, and an effort to restore the budget for SLAC on the floor of the House was defeated "in a vote that closely paralleled party lines" (Democrats against: 188 to 10; Republicans in favor: 118 to 7). The project was subsequently given the go-ahead in 1961.

<sup>13</sup> As an indication of congressional concern for the increasing costs of science Representative Holifield observed to Dr. Hornig in the hearings on AEC authorizing legislation for the fiscal year 1965 (p. 1487): "There is no doubt \* \* \* that high-energy physics is the most exciting scientific field we are now working in \* \* \*. We concede that there is no limit to the scientists' ideas or their ambitions to explore these ideas \* \* \*. But \* \* \* it seems to some of us that we are getting to the point where we are squeezing to death many other fields of science. Very frankly, the Congress is becoming alarmed at it."

<sup>14</sup> Greenberg. Op. cit., pp. 239–230.

3. Periodic review was needed of the level and character of support for high-energy physics, in the context of advances in the field, the relation to other fields of science, and the existing fiscal situation.

4. There should be two significant steps, the second—on the order of 1,000 Bev—to be available in 15 to 20 years.

5. A sound national program required support for, and utilization of, existing accelerators; unproductive ones should be closed down or reduced in level of operation; new accelerators should be “constructed only to provide significant extension of parameters or a new order of scientific capability.”

6. Organizations to manage major new facilities would be critical; they should be planned to serve the entire national community of high-energy physicists.

7. Opportunities for international cooperation should be actively explored, “in view of the high cost of new very high-energy accelerators.”<sup>15</sup>

Also at the request of the Joint Committee on Atomic Energy, the staff of the AEC prepared, and transmitted January 24, 1965, a “Policy for National Action in the Field of High-Energy Physics.”<sup>16</sup>

This report, in which the AEC commissioners concurred, was described by the President as a “useful guideline for decisionmaking in the development of high-energy physics.” This language was obviously short of a full endorsement of the report as a definitive statement of administration policy. This impression was confirmed by other of the President’s comments in the transmittal. Said the President: “It seems to me that this is a particular fruitful field for international collaboration.” Moreover: “We will continue to compare the needs in this field with those of other scientific fields. In turn, the needs of science as a whole will be assessed in the light of other demands on Federal resources.”<sup>17</sup>

#### *Hearings before the Joint Committee on Atomic Energy*

The Joint Committee on Atomic Energy has maintained a continuity of membership, and has devoted so much attention to the field of high-energy physics, as to acquire a considerable degree of expertise in the subject. Protracted sessions have been held with leading scholars in the field, and a substantial literature from these sources has been accumulated by the committee. Hearings have been of two general kinds: (1) the annual sessions to consider authorizing legislation for the forthcoming fiscal year, in which the AEC presents its total program; and (2) such special hearings before JCAE subcommittees as the 1959 hearings on the Stanford Linear Electron Accelerator,<sup>18</sup> and the 1965 subcommittee hearing on high-energy physics research, which principally concerned the 200-Bev. accelerator.<sup>19</sup> The latter hearing, in particular, was an outstanding example of the collection of pertinent technical information bearing on a difficult subject.

Representative Price, subcommittee chairman, in opening the 1965 hearing, described its purposes as to investigate:

<sup>15</sup> AEC authorizing legislation, 1965, op. cit., pp. 1510–1511.

<sup>16</sup> Representative Holifield had asked, in the hearings on AEC authorizing legislation, fiscal year 1965 (p. 1509): “Do you believe we can have a national policy in this high-energy field that is more definite regarding plans and schedules than we do have?”

<sup>17</sup> U.S. Congress, Joint Committee on Atomic Energy, High-Energy Physics Program: Report on National Policy and Background Information, February 1965, 89th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1965), Joint Committee Print, pp. 1–2.

<sup>18</sup> U.S. Congress, Joint Committee on Atomic Energy, “Stanford Linear Electron Accelerator, Hearings before the Subcommittee on Research and Development and the Subcommittee on Legislation of the \* \* \* on Stanford Linear Electron Accelerator,” July 14 and 15, 1959, 86th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1959), 649 pages; U.S. Congress, Joint Committee on Atomic Energy, “Amending the Atomic Energy Act and Authorization of Stanford Accelerator Project, Hearings before the \* \* \* on Bills To Amend Sections 91, 161, and 163, of the Atomic Energy Act (S. 2569—H.R. 8754) and To Authorize Stanford Linear Accelerator Project (S. 2073—H.R. 7464) Aug. 26, 1959,” 86th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1959), 29 pages.

<sup>19</sup> High-energy physics research, Hearings, 1965, op. cit.

(1) The purpose, objectives, and tools required for high-energy physics research.

(2) Achievements of the United States and in other countries, and the place of high-energy physics in the context of the total U.S. research effort. (This will involve, he said, "an exploration of the relationships of high-energy physics to other fields of research and education and an evaluation of the effects, if any, that allocation of funds and scientific manpower to high energy physics may have on other fields of Government-supported research.")

(3) Examination of the AEC National Policy Report of January 24, 1965, "Policy for National Action in the Field of High-Energy Physics."

The Chairman noted that research in the field entailed large and costly equipment, for which the Federal Government was "practically the sole source of funds." (In the fiscal year 1965, he said, the outlay for Government support of high-energy physics would reach an estimated \$173 million.) He then presented the following points:

(1) The burden \* \* \* rests with the scientists in this field to communicate to the Congress and the public, the objectives, the needs and the social benefits of high-energy physics research.

(2) Scientists should not forget that if society pays for the research, there must be adequate repayment to society.

(3) To assist the public understanding, \* \* \* proponents of any field of federally supported research should make an effort to evaluate their research in terms of public benefits.<sup>20</sup>

In response to this challenge, the representatives of the scientific discipline under examination produced for the subcommittee an impressive array of witnesses and testimony. The AEC policy statement before the JCAE itself consisted of 48 pages of detailed discussion and fact about the long-range plans for research and research hardware development, to which were added an analysis by Luke C. L. Yuan of Brookhaven National Laboratory on the relevance of a 1,000-Bev. accelerator for the many unresolved questions about elementary particles. Six appendixes to the report contained texts of previous panel reports on national policy in high-energy physics.

The hearings themselves occupied 4 days, and produced some 800 pages of testimony and supplementary exhibits. They included: (a) a panel discussion of two AEC commissioners, the AEC research director, and the President's science adviser: Dr. Glen T. Seaborg, Chairman, AEC; Dr. Paul W. McDaniel, Director, Division of Research, AEC; Dr. Donald F. Hornig, Director, Office of Science and Technology; and Dr. Gerald F. Tape, Commissioner, AEC; (b) a roundtable discussion of eight leading scientists<sup>21</sup> under the chairmanship of Dr. Frederick Seitz, president of the National Academy of Sciences; (c) statements by 32 witnesses, including 11 from universities having high-energy physics research programs, 17 from AEC (mainly from the Lawrence Radiation Laboratory, Brookhaven National Laboratory, and Argonne National Laboratory); plus Dr. Haworth, Director of NSF; Dr. Hornig; and Dr. Weisskopf, Director General of the European Organization for Nuclear Research (CERN).

<sup>20</sup> Ibid., p. 2.

<sup>21</sup> Dr. Frederick Seitz, President, National Academy of Sciences, chairman; Dr. Philip H. Abelson, director, Geophysical Laboratory, Carnegie Institution of Washington; Dr. George Kistiakowsky, professor of chemistry, Harvard University; Dr. William McElroy, professor of biology, Johns Hopkins University; Dr. Wolfgang K. H. Panofsky, director, Stanford Linear Accelerator Center; Dr. Emanuel R. Piore, vice president for research and engineering, International Business Machines Corp.; Dr. Charles Townes, provost, Massachusetts Institute of Technology; Dr. Eugene P. Wigner, professor of physics, Princeton University; Dr. C. N. Yang, professor of theoretical physics, Institute for Advanced Studies, Princeton, N.J.

Added to the hearing were 18 items and 26 appendixes of supplementary statements, technical discussions, and collections of data and correspondence.

*Testimony of the Director of the National Science Foundation*

Dr. Haworth testified before the JCAE Subcommittee as Director of the NSF. Previously he had served as Director of Brookhaven National Laboratory of the AEC, and as president of Associated Universities, Inc., the academic consortium that manages the Brookhaven Laboratory. This is the site of the most powerful accelerator currently in operation in the United States, the 33-Bev. alternating gradient synchrotron (AGS) proton accelerator. Dr. Haworth's testimony is illustrative of the scope and technical detail explored by witnesses at the hearing. In 11 pages of prepared statement and eight additional pages of questioning, he covered:

A short history of the evolution to the present of high-energy physics;

Descriptions, by time periods, of the prevailing technological situation with respect to accelerators, particle detectors, and numbers of groups engaging in research;

Detailed descriptions, by time periods, of significant discoveries of new particles, and the evolving theory of their relationships;

An evaluation, and quantitative description, of the support by the Federal Government of research in high-energy physics;

A description of the management arrangements by which large national laboratories possessing accelerators made these available to user groups from universities.

Dr. Haworth paid particular tribute to the Joint Committee on Atomic Energy and to the Office of Naval Research for supporting the research in the discipline. His assessment of the present situation was:

We are now in a period of exploiting the energy range of tens of billions electron volts \* \* \*. Until rather recently a new generation of accelerators was begun as soon as \* \* \* the preceding generation was completed.

As you know, there is a considerable timelag between the authorization of an accelerator and the time when experiments can begin. This interval inevitably lengthens as the size of machines grows larger \* \* \*.

My concluding impression would be that particle physicists, \* \* \* with the generous and far-reaching support provided by the U.S. Government, might be said to have created an entire new branch of physics—one with broader horizons and a quite different direction from what we started with in 1946 \* \* \*.

This support has been provided in a farsighted and timely fashion, largely on the recommendations of your committee, and has created a climate in which U.S. scientists have been encouraged to think creatively through the assurance that their ideas had some possibility of being brought to fruition.

\* \* \* The net effect has been that in this important field of science which is concerned with the most fundamental constituents of the universe, our country unquestionably leads the world.<sup>22</sup>

While advanced accelerators were very costly, Dr. Haworth observed that their costs were spread out over a number of years, so that “\* \* \* annual costs do not in any sense overwhelm \* \* \*.” Annual operating costs, on the other hand, might become onerous. The cost of the Brookhaven AGS, for example, had been spread out over more than 6 years.

That was \$5 million a year on the average which even in those days was a fraction of the total cost of the program \* \* \*. Although the accelerator costs seem

<sup>22</sup> High-Energy Physics Research, Hearing, 1965, op. cit., pp. 20-21.

to stand out like sore thumbs at the time they are authorized, the annual rate at which the money is spent, even for the next generation, will be only a modest fraction of the annual spending rate of the total program.

Indeed, to use these accelerators it now costs from a third to a half the construction cost, to use them properly. That is, each year it costs a third or half of the total construction cost to use them properly.<sup>23</sup>

*Panel discussion by senior Government officials*

An interesting experiment conducted by the JCAE subcommittee at the close of the 1965 hearings was a "panel to discuss organization for management of proposed large accelerators." Those participating in the panel consisted of the President's science adviser, Dr. Hornig; NSF Director Haworth; Chairman Seaborg of AEC; AEC Commissioner Tape; and the AEC research director, Dr. McDaniel. The problem was set forth by Dr. Seaborg:

\* \* \* Because of the large expense of these accelerators [and] also because of the available scientists, there are going to be only one or two \* \* \* built in the next 15 or 20 years.

Therefore \* \* \* these accelerators should be under some sort of national management that makes them equally available to all competent high-energy physicists.<sup>24</sup>

He endorsed the proposal of the 1965 AEC report, Policy for National Action in the Field of High Energy Physics, in the section on management. This called for a corporation of universities with active high energy physics programs to operate under contract the proposed 200-Bev. facility. He brought out the further point that the Lawrence Radiation Laboratory at the University of California at Berkeley was "almost completely integrated" into the university, and "probably" had less use by outside groups, in consequence of this integration, than did other of the AEC national laboratory accelerators.

In response to an inquiry by Representative Price, subcommittee chairman, Dr. Hornig agreed as to the desirability of broadening the base of high-energy physics research to 40 or 50 universities, if it could be done " \* \* \* without in any way cutting back on the levels of achievement and excellence that we have obtained already in the best centers."<sup>25</sup> However, he cautioned: "We can't advance as a country in any field purely by spreading things out."

On the other hand, Dr. Haworth pointed out that in setting up a university consortium, the university representatives should not consider themselves merely as representatives of their institutions, but as spokesmen for all scientists. Thus, they should not intercede on behalf of personnel from their own institutions.

The only time that I know of that a physicist requested a trustee from his university to intervene on his behalf, to get him a little better chance to do an experiment (at the Brookhaven National Laboratory), he was so roundly spanked that it never happened again so far as I know.<sup>26</sup>

Another management approach, suggested by Commissioner Tape, was that of a national corporation working with a contractor, as a kind of joint venture during design and construction. Once the facility was built, the corporation would assume responsibility for operation and research.

Representative Hosmer suggested that in the consideration of how to provide for the management of a very large new accelerator labora-

<sup>23</sup> *Ibid.*, p. 24.

<sup>24</sup> *Ibid.*, p. 276.

<sup>25</sup> *Ibid.*, p. 378.

<sup>26</sup> *Ibid.*, p. 382.

tory, it might be a wise move "to get ourselves an outfit that does do management work and does it successfully, tell them what our problem is, and try to get them to come up with some reasonable suggestions based on actually known principles of management and how to go about it." He noted that: "We have two physicists and three chemists on that side of the table. We have a lawyer and a journalist on this side of the table." The subject was management, and "we don't have any experts on that subject." The scientists disagreed; they had had a great deal of management experience running laboratories, any management consultant would have to go through a lengthy educational process in laboratory management, and, as Dr. Hornig observed: "This is a management problem for which there is very little experience outside the AEC."<sup>27</sup>

*Roundtable discussion in JCAE hearing*

Another novelty of the 1965 hearing was a discussion by nine scientists of the allocation of national resources to the support of basic scientific research.<sup>28</sup>

Extracts of the views of the nine speakers are presented in paraphrase as follows:

SEITZ. The scientific community is looking forward to the next generation of accelerators; machines are envisaged "which cost hundreds of millions of dollars and require operating budgets in the range of a hundred or more million dollars per year for individual machines." To what extent should the Federal Government support such machines? He admitted that " \* \* \* Tensions between groups of physicists and universities in different regions of the country have developed out of the fear that individual groups of scientists might be excluded \* \* \*." However, a meeting under Academy auspices of 25 university presidents had unanimously favored construction of a 200-Bev. accelerator, that it should be managed by an association of universities under conditions that would assure access.

ABELSON. "Eventually, our Nation must allocate its research resources, both men and money, more effectively. This will require making value judgments among various fields and establishing criteria for making such judgments. Through application of intelligence we can arrive at an improved method of allocation." He proposed as criteria: "importance to science, philosophical values, and contributions to the material needs of society." Since every scientist believed his own research to be important, a more objective evaluation was the opinion of other scientists "when self-interest is not involved." He asserted that high-energy physics "recently has had little interaction with other sciences." It had made "great contributions" to philosophical values. The subject had produced Nobel prize winners, but lack of lay interest might limit the prestige value; the field had "contributed comparatively little toward meeting needs of society." While it should be supported because of its importance to science and its philosophical values, "the highest priorities should be assigned elsewhere."

KISTIAKOWSKY. The Government supported high-energy physics because of its importance for higher education, military and economic technological development, world prestige and leadership, cultural values, and the claims for support of "outstanding people." It was necessary to recognize that "the interplay of the market, the competitive spirit, has not been able to provide adequate support \* \* \*." Although he "could not assert that (high-energy physics) rates highest in all these ways of rating scientific fields," nevertheless "it is certainly at the top in the cultural and intellectual assessment of sciences."

McELROY. " \* \* \* If we are to understand the fundamental building blocks of matter and the basic forces which determine their behavior, continued research in high-energy physics is absolutely essential. Biology, chemistry, medicine, and other related areas must turn to the techniques of high-energy physics in order to investigate in greater detail the submolecular structure of matter. These new frontiers are the ones that are attracting our outstanding thinkers in the biological sciences."

<sup>27</sup> Ibid., pp. 288-289.

<sup>28</sup> Ibid., pp. 204-237.

"We can understand the origin and evolution of life itself only when we understand the origin and the evolution of our universe. And before we can do this, we must understand the fundamental structure of matter."

"I submit that many of our most productive young scientists today are in high-energy physics \* \* \*."

PANOFSKY. " \* \* \* Control of our natural environment will depend more on our understanding of the basic laws of nature than on conventional exploration."

"It would indeed violate all our past experience in the progress of science if nature had created a family of phenomena which governs the behavior of elementary particles without at the same time establishing any links between these phenomena and the large-scale world which is built from these very particles."

"There was a time when nuclear physics was just as remote as high-energy physics is today."

High-energy physics " \* \* \* involves many interactions with technology" because it "demands tools which exceed the limits of existing art and because the scientists \* \* \* are willing to work both on improving their tools as well as using these tools for research."

" \* \* \* High-energy physicists are providing a pool of capable and experienced individuals who when called upon can cope with demanding problems outside their specialty."

PIORE. The issue was " \* \* \* whether the field of science will stagnate or not; whether the United States will lose the leadership it now has in the field of science."

To degrade high-energy physics, because at present we cannot pinpoint the applications, in contrast to the materials sciences \* \* \* and to state that the materials sciences should be supported at the same rate as high-energy nuclear physics is not a responsible analysis."

"Shall we permit a very vigorous field, which illuminates a great deal of nature and which draws to it some of the brightest young people in our country, to stagnate?"

TOWNES. There were two primary points: "The first is the effect of high-energy physics and study on the general intellectual tone of our society and of our universities \* \* \*" He declared that: " \* \* \* A university which is not active and on the forefront of particle physics is an incomplete university." He challenged the "statement that high-energy and particle physics will have little practical application. Practical applications are frequently not easy to see and understand in advance."

WIGNER. The question to be analyzed was: " \* \* \* how much, in terms of progress in other areas of science, is it worth to arrive in, let us say, 30 months, at the level of knowledge in high-energy physics which would be attained, with lower expenditures, only after 36 months?"

" \* \* \* High-energy phenomena are worth exploring \* \* \* should and will be explored." The question, however, "concerns the rate of exploration; that is, whether or not the proposed rate is so fast that it entails a less effective use of the expenditures and scientific manpower than could be attained in other areas."

"What part of our future expenditures and scientific manpower—and this is a very limited manpower—can we afford to devote to this subject which, in spite of its importance, is not the only subject and not the only endeavor which is vital for this Nation?"

"I think there are two principles involved here. One principle on which we disagree is whether there is one basic principle from which everything else should be derived or will science always have a loose structure \* \* \*?"

"The second question \* \* \* Is physics the basic science and to what extent is physics the basic science?"

" \* \* \* The structure of science is perhaps not so monolithic as to justify that we support—exclusively support—one part, the most basic part as I say, of physics. It is not right to support this entirely without regard to the expense which it makes to other parts of science."

YANG. He referred to an essay by A. M. Weinberg, which proposed three external criteria for scientific choice: scientific merit, technological merit, and social merit. Dr. Weinberg had graded high-energy physics poorly on all three criteria. With this assessment, Dr. Yang disagreed.

" \* \* \* The aim of high-energy physics is very much broader than an understanding of nuclear structure. It embraces such fundamental questions as the basic space time structure and the origin and meaning of electricity."

"High-energy physics, in studying the most minute distances and the shortest time intervals, should be expected to serve as a source of new ideas and new stimulation that will be essential in [solid state] technological developments."

As to social value, "It is not every society \* \* \* that has the opportunity to support an undertaking with as much potential importance, both intellectually and technologically, as the proposed high-energy program you are examining."

In the discussion that followed these brief statements, Dr. Seitz observed that there was no opinion that the field should be abandoned or even stabilized; the question was merely as to its rate of further expansion. Dr. Piore protested that the position seemed to have been established that high-energy physics was an expensive area of research, in competition with the rest of science which was inexpensive. Many other branches of science (oceanography, low-energy physics, space, even biology) were also costly. However, he said: "I think we all can afford \* \* \* these costly equipments for the good of our souls and for the good of our society."

Dr. Panofsky proposed that "the ratio of our investment in basic research should go up relative to the investment in trying to exploit the basic research." At this point in the hearing a staff memorandum on allocation of Federal funds to basic and applied research was introduced. (See table 4.) Then a concluding comment was offered by Dr. Seitz, who acknowledged that Dr. Abelson's comments "get close to the heart of issues that all of us concerned with the process of relating science and society must worry about continuously." It was, he said, "quite likely" that high-energy physics "will do little to alleviate the problems of transportation \* \* \* or add very little to the evolution of household equipment."

TABLE 4.—ESTIMATES, FISCAL YEAR 1964—FEDERAL FUNDS

[In millions of dollars]

	A—Total research	B—Basic research	A—B—Ap- plied research
Life sciences (biology, medicine, agriculture).....	1,084	434	650
Behavioral sciences (psychology, sociology, economics, etc.).....	200	79	121
Astronomy.....	214	201	13
Chemistry.....	215	89	126
Earth sciences (atmosphere, ocean, solid earth).....	574	349	225
Elementary particle physics (high-energy physics).....	146	142	4
Nuclear structure (medium-energy physics plus some low-energy).....	57	33	24
Atomic, molecular, and solid state (low-energy plus solid state).....	156	63	93
Other physics.....	153	48	105
Other physical sciences.....	31	18	23
Mathematical sciences.....	101	49	52
Engineering sciences.....	1,551	129	1,322
Other sciences.....	89	2	87
<b>Total.....</b>	<b>4,571</b>	<b>1,635</b>	<b>2,936</b>

<sup>1</sup> Ibid., p. 232.

The thing that we have to keep in mind [concluded Dr. Seitz] is that its ultimate applications may be in spheres which we simply cannot imagine today because they are either on the periphery or over the horizon. The important thing about classical high-energy physics, the nuclear physics of the 1930's, is that it opened up a completely new energy source, visualized dimly only by a few.

Similarly, it might turn out that present-day high-energy physics would play a great role in the devices we develop, for planetary science and engineering including matters such as control of the atmosphere, and so forth. We simply must recognize that there are many open doorways which we are not bright enough to peer into at the present time.

### III. STATUS OF HIGH-ENERGY PHYSICS SUPPORT AFTER 1965

The extensive JCAE review of high-energy physics plans and accomplishments in 1965 appear to have resulted in a tacit decision by the Congress that continued support should be given to the discipline, but at a slower pace. The 1965 policy study by the AEC had called for a steep increase in funding, whereas in fact the support continued at about the 1965 level thereafter. The economic impact of U.S. military action in Vietnam brought pressure generally on civil programs of the Government, and imposed significant constraints on funding for basic research, including high-energy physics. Inflation resulting from the overseas military action, at the same time, operated as a further discount on the funding level.

A report by the AEC High Energy Physics Advisory Panel (Weisskopf panel), January 30, 1968, expressed concern over this state of affairs. The level of funding, said the panel chairman in his transmittal letter to Dr. McDaniel, director of the research division of AEC, was insufficient to sustain a "reasonable exploitation of the existing facilities." Moreover—

The development of high-energy physics in the United States is seriously threatened and cannot be maintained within the expected level of support without most dangerous consequences. The funds are insufficient to maintain the necessary activities in this field, commensurate with the needs of our universities. The panel is concerned about the adverse consequences of this situation in respect to the future development of science in this country and expects that the leadership in this fundamental field will be lost to Western Europe if the financial situation is not significantly improved.<sup>29</sup>

The "only positive element" in the situation, Dr. Weisskopf continued in his letter, was that progress was being maintained on the 200-Bev accelerator.

The decision to proceed with construction of the 200-Bev accelerator meant that the high-energy physicists in the United States would possess in due course the most energetic accelerator in the world; they would regain this primacy from the Soviet Union, where the Serpukhov accelerator had recently become operational.<sup>30</sup> Moreover, attention was being given, in the planning of the new U.S. machine, to incorporating in it some capability for expansion in its energy level.

It was foreseeable, on the basis of recent experience with the Stanford accelerator, that completion and activation of the 200-Bev accelerator would confront the Congress with further awkward alternatives in decisionmaking. During the fiscal years 1968 and 1969, in part because of the emphasis on economy imposed by commitments in Vietnam, funds had not been available to support full utilization of accelerators already available. The consequences of this situation were described by the Weisskopf panel as follows (condensation):

\* \* \* During the last 2 years, all increases in operating and equipment budgets for high-energy physics have been absorbed by cost escalation and by the advent of SLAC as a new accelerator facility. Hence, the entire programs at other national laboratories and at universities \* \* \* have had to operate at constant or decreasing levels, while the number of university-user groups was growing, and while many new and existing problems have opened up experimental and theoretical opportunities.

<sup>29</sup> Reproduced as app. 2, p. 1207, in AEC authorizing legislation, fiscal year 1969, op. cit.

<sup>30</sup> Dr. McDaniel told the JCAE, Feb. 21, 1968: "\* \* \* that the Soviet 70-Bev machine that was constructed at Serpukhov, near Moscow, was completed on, roughly their schedule. It produced 76-Bev protons when first turned on and is expected to eventually go as high as 85- to 90-Bev." He added that it was "\* \* \* apparently a very fine machine" (Ibid., p. 1041).

In fiscal year 1968 it is anticipated that new user group support will be essentially nil and, indeed, some productive existing groups will be losing their support \* \* \*.

It has been particularly difficult to mount new university-operated experiments using modern electronic detectors.

There was an unmet demand for bubble chamber pictures for analysis, amounting to 3 years or 15 million pictures at Brookhaven alone.

\* \* \* Every high-energy physics laboratory in the country faces a serious overdemand for accelerator beam time \* \* \*.

The fiscal squeeze has produced conservatism in relation to technological innovation.<sup>31</sup>

The effects described were attributable in considerable measure to the introduction of the Stanford linear accelerator into the national system of high-energy physics research apparatus. This was the accelerator that President Eisenhower had called for in 1959. It is foreseeable that a similar effect, of greater magnitude, will result from the eventual activation of the 200-Bev accelerator (presumably, some time after 1973).

The apparent alternatives facing the Congress, in dealing with high-energy physics, in the face of the rising costs of individual new facilities, are—

(1) To encourage the closing down of least productive accelerators, disregarding their contributions as teaching tools, and their considerable remaining potential for further scientific discovery;

(2) To insure the distribution of funds among major accelerator installations so as to keep all available machines in operation at some reasonable partial level of operation—and accepting the inherent inefficiencies implied by this approach;

(3) To expand the technological research effort in the development of novel accelerator concepts (such as clashing beam and the “coherent accelerator” concept<sup>32</sup>), to enable a greater energy and intensity of beam to be achieved at less cost (the effect of such research, however, was not judged likely to materialize in time to contribute to the proposed 200-Bev accelerator);

(4) To increase the level of funding for research in high-energy physics very substantially.

TABLE 5.—FIVE-YEAR FUNDING PLAN OF AEC FOR HIGH ENERGY PHYSICS RESEARCH<sup>1</sup>

[In millions of dollars]

	Fiscal year						
	1967	1968	1969	1970	1971	1972	1973
Operating costs.....	107.7	113.4	120.4	162.0	188.9	212.0	239.
Capital equipment obligations.....	21.4	15.7	22.7	39.4	61.0	52.4	47.
Construction obligations (NOA).....	51.8	13.3	28.0	182.9	165.4	80.6	64.

<sup>1</sup> Source: AEC authorizing, fiscal year 1969, pt. 1, p. 358.

Apparently, the alternative recommended by the AEC was the fourth. (See table 5.) However, Representative Holifield, vice chairman of the JCAE, remarked that “\* \* \* the thing that bothers me in this is the rapid acceleration.”

<sup>31</sup> *Ibid.*, p. 1211.

<sup>32</sup> Reference was made to this concept by Dr. McDaniel, pp. 1038-1040, *op. cit.*, along with an indication that there were “very exciting possibilities” in superconducting elements for magnets. Concerning the coherent accelerator concept, John T. Conway, staff director of JCAE, remarked: “If it does prove to be feasible \* \* \* it is possible to get into these multi-Bev energies at a very much less cost than the current projects on the 200-Bev or 400-Bev and so-called 1,000-Bev machine.”

Operating costs under your projected estimates are up from \$107.7 million in fiscal year 1967 to \$239.4 million by fiscal year 1973. Your capital equipment goes up from \$21.4 to \$47.4 million. Construction obligations, new obligational authority, goes up from \$51.8 to \$64.2 million. These are annual expenditures, of course.

What it amounts to is that it more than doubles. It goes up from \$180.9 million to \$351 million in the next 6 years, which is nearly double.<sup>33</sup>

In the background was the 1,000-Bev accelerator, concept research for which was already underway. Dr. McDaniel told the JCAE that the 1969 budget contained an item of \$900,000 "earmarked for general advanced accelerator studies \* \* \*." He noted that work on the 200-Bev accelerator had inspired a reexamination of plans for the longer range future: "\* \* \* as to precisely what the second step should be. Should it be 600 to 1,000 Bev, should it be higher, should it be something a little different?"<sup>34</sup>

By the latter part of the calendar year 1968, work was proceeding on the construction of the 200-Bev accelerator at Weston, Ill. Funding for studies in design of the machine had been available since late in 1963; \$7.333 million had been authorized for architecture and engineer work in the fiscal year 1968; and some \$12 million for further architecture-engineering and some construction work in the fiscal year 1969. At the end of 1968, in the face of many claims on the National Treasury for military and nonmilitary programs, for social and technical undertakings, for applied and basic science, high-energy physics remained as it had been for more than two decades a major national effort of high quality in basic research, with questioned relevance for other national programs of research or technology.

<sup>33</sup> AEC authorizing legislation, fiscal year 1969, pt. 2, op. cit., p. 1026.

<sup>34</sup> *Ibid.*, p. 1038.

## CHAPTER ELEVEN—THE OFFICE OF COAL RESEARCH: THE USE OF APPLIED RESEARCH TO RESTORE A “SICK” INDUSTRY

### I. STATEMENT OF THE PROBLEM

The subject of this chapter is the congressional decision to create the Office of Coal Research, an agency of the Department of the Interior. The issue can be approached as a national measure to assist a declining industry of great magnitude, as an effort to enhance the utility of one of the most abundant natural resources in the United States, or as a move to restore balance in the U.S. system of essential energy. All of these objectives were cited in support of the proposal. In each case, the assumption was that the application of Federal funds for applied research to improve one or another of the aspects of coal—production, distribution, or utilization—would further the objective sought.

#### *The changing product mix of energy sources*

Historically, energy has had two primary functions in an industrial society: to warm the human environment, and to supplement human energy in the manufacture of useful products. Up to the founding of the Republic, the first function was predominant. Wood was almost the only fuel consumed and water power was crudely exploited. However, between 1800 and 1900, along with the growth of industry in the United States, the second function grew in importance and coal (mainly bituminous) replaced wood as the principal fuel for both heat and power.

The development of electrical energy—as a form capable of conversion into power, thermal energy, or light—further complicated the energy picture. Its generation from the combustion of coal became a major consumer of that fuel; its generation by combustion of other fossil fuels, or from atomic energy or hydroelectric sources, became a competitor of coal.

Coal production and consumption, after rising steadily throughout the 19th century, reached a peak during and after World War I. Production of bituminous, the principal form of coal, was 579 million tons in 1918; by 1932, it had declined to 310 million. It rose again during and immediately after World War II, reaching a wartime peak of 620 million tons in 1944, and an all-time peak of 631 million tons in 1947. Thereafter it sagged below 400 million in 1954.<sup>1</sup>

Mechanization of coal mining and handling equipment proceeded steadily after World War II, accompanied by increased output per worker and reduced employment in the industry. Peak employment in bituminous mines was 704,793 in 1923; by 1955, the number had declined to 225,093. Production in tons per man/day rose from 4.47 in 1923 to 9.84 in 1955. Mechanization also called for capital investment.

<sup>1</sup> Except as indicated, data in this section of the study are derived from various publications of the Bureau of Mines, and from secondary sources relying on Bureau of Mines data. They are to be taken as approximate and only to indicate trends in the coal industry.

Whereas it had been possible in the 1920's and 1930's to open a mine with a minimum of capital equipment, by the 1950's the required investment had about doubled.<sup>2</sup>

One measure of the pressure on the industry (reflecting the sagging markets and competition for them) is the number of producing mines. This figure reached a peak of 9,331 in 1923; declined to a low of 5,427 in 1932; reached another peak of 9,427 in 1950; and declined to 6,130 in 1954.

Another measure is afforded by the pressure of competing forms of thermal energy. Just as coal replaced wood as a source of thermal energy, so it has encountered increasing challenge from petroleum fuels, natural gas, and—more recently—atomic power. In 1900, nearly 90 percent of all energy requirements was supplied by coal, divided roughly one-fourth anthracite, three-fourths bituminous. On the eve of World War II, natural gas and petroleum had made significant inroads, and coal supplied only 50 percent of total energy requirements. There was a further postwar decline, until, by 1955 coal provided less than one-third of total energy requirements. (See table).

In all major categories of direct consumption of fuel energy, changes since 1900 have occurred at the expense of coal. There are three of these categories: industrial power, household and commercial space-heating, and transportation. In 1900, coal provided almost all thermal energy for space-heating, for railroad transportation, and for industrial (steam and steam-electric) power. By 1947, petroleum (fuel oil) had replaced coal in more than half of all space-heating; thereafter, natural gas became a significant additional competitor.<sup>3</sup> Between 1940 and 1955, the quantity of diesel oil consumed by railroads rose from 1.8 million barrels to 80 million barrels.<sup>4</sup>

U.S. PRODUCTION OF ENERGY RESOURCES, PERCENTAGES BY MAJOR SOURCES, 1947, 1955, 1965<sup>1</sup>

Consuming sectors	Primary energy sources					Total primary energy inputs
	Anthracite	Bituminous coal	Natural gas	Petroleum	Hydro and nuclear power	
Total primary energy inputs:						
1947.....	3.7	44.0	13.6	34.3	4.4	100
1955.....	1.5	27.8	23.1	43.9	3.7	100
1965.....	.6	22.4	30.0	43.1	3.9	100

<sup>1</sup> Adapted from: Resources for the Future, Inc. U.S. Energy Policies: an agenda for research. A Resources for the Future staff report. (Baltimore, Resources for the Future, Inc., distributed by the Johns Hopkins Press, 1968, pp. 10-11.)

<sup>2</sup> According to the prepared statement of Harry LeViers, chairman of the Committee on research, National Coal Association, before the Special Subcommittee on Coal Research, Mar. 26, 1957. "A large share of the existing coal mine properties were built and are capitalized on the basis of a cost ranging from \$3 to \$7 or \$8 per ton of annual capacity. In today's markets the cost of constructing new or replacing depreciated plants, with their highly mechanized natures, is more nearly \$10 to \$15 per ton of annual capacity." (U.S. Congress, House, Committee on Interior and Insular Affairs, "Coal Hearings before the Special Subcommittee on Coal Research of the \* \* \* on the Establishment of a Research and development program for the Coal Industry." Pt. 1, Feb. 13, 1957, at Ebensburg, Pa., Feb. 15, 1967, at Abingdon, Va., Feb. 22, 1957, at Wilkes-Barre, Pa.; Pt. 2, Mar. 9, 1957, at Henryetta, Okla., Mar. 11, 1957, at Pueblo, Colo., March 26, 1957, at Washington, D.C., 85th Cong., first sess., serial No. 3 (Washington, U.S. Government Printing Office, 1957), p. 545.)

<sup>3</sup> According to the Resources for the Future study, "Energy in the American Economy, 1850-1975." "In 1955, the amount of energy inherent in the 2,753 billion cubic feet of natural gas used in the residential and commercial sector was the equivalent of 109 million tons of bituminous coal. Household use amounted to 2,124 billion cubic feet, of which it has been estimated that some 1,375 billion cubic feet were consumed for space heating \* \* \*." (Sam H. Schurr and Bruce C. Netschert et al., "Energy in the American Economy, 1850-1975, economic study of its history and prospects" (Baltimore, published for Resources for the Future, Inc., by the Johns Hopkins Press, 1960, p. 134.)

<sup>4</sup> Ibid., p. 121.

Coal consumption for industrial power declined as a factor relative to total industrial power requirements between 1925 and 1954, both because of declining use of coal in direct (steam) power,<sup>5</sup> and because of increased efficiency in the generation of electricity from coal.

Chemical, atomic, or mechanical potential energy can be converted into electrical energy for ease of distribution and use. In 1900 the predominant source of energy thus converted came from the combustion of coal, and most of the remainder came from hydro sources. Between 1920 and 1955 the consumption of coal for electric power utilities rose from 32 million tons to 144 million, an increase by 350 percent. However, the electrical energy production for these same 2 years was 39,405 million kilowatt-hours in 1920 and 547,038 in 1955, an increase by 1,288 percent.<sup>6</sup> Coal required per kilowatt-hour of electrical power declined between 1920 and 1955 from 3.05 pounds to 0.95 pounds. In 1920, coal provided 88 percent of all fuel for utility power (exclusive of hydro) while in 1955, it provided only 69 percent. (Hydropower generation in 1920 was 56,599 million kilowatt-hours, and in 1955 it was 116,236 million kilowatt-hours.) The increasing role of electrical utilities as consumers of coal, however, is reflected in the fact that coal consumption by the utilities in 1920 was 31.6 million tons (about 5.6 percent of bituminous coal produced) while in 1955 it was 143.7 million tons (about 30.9 percent). In summary, while electric power became the largest single market for bituminous coal, the role of coal in generating electric power was reduced as a percentage of total fuel and hydroenergy thus converted. This latter effect was the consequence of invasion by competing fuels, and an increase in the efficiency of the use of coal.

Whether coal will maintain its 1955 position in the future depends on many factors. For example, in the past 3 years, 1966-68, more than half of all new capacity construction in the electric power industry was for atomic power. There is room for considerable increase in efficiency of the conversion of energy from nuclear fission to electricity, and the development of breeder reactors is expected eventually to free atomic power from the constraint of uranium availability. The availability of petroleum and natural gas is another question mark; however periodic waves of new discovery have more than kept pace with increases in the rate of consumption. A third consideration, air pollution, has constrained the burning of coal for electric power generation in some localities, and threatens to impose further constraints in the future; here the question is whether the processing of combustion effluent will succeed in reducing the constraint or whether other fuels or energy sources will receive preference on this account.

#### *Problems and opportunities in coal research*

Coal as a mineral fuel presents certain inherent disadvantages in comparison with liquid or gaseous fuels. The latter can be more conveniently processed and purified, standardized, blended, transported, and

<sup>5</sup>The category "electric motors" as percent of total industrial horsepower in 1925 was 73, and in 1954 it was 84.7; however, in 1939 it had been 89.8, suggesting that petroleum rather than coal provided most of the remainder (*Ibid.*).

<sup>6</sup>Series S 36-43, "Consumption of Fuels by Electric Utilities: 1920 to 1957," and Series S 15-26, "Net Production of Electric Energy, by Central Stations, by Type of Prime Mover: 1902 to 1957," in U.S. Department of Commerce, Bureau of the Census, "Historical Statistics of the United States, Colonial Times to 1957; A Statistical Abstract Supplement," prepared by the Bureau of the Census with the cooperation of the Social Science Research Council (Washington, U.S. Government Printing Office, 1960).

handled in large volume. Coal varies widely in quality, with varying contents of sulfur, fly-ash, moisture, useful chemicals and volatiles. It may vary in density, in coking qualities (for blast furnace use), in flash point, and in thermal content. Since a considerable amount of coal is produced from small mines, this variability of quality presents awkward problems in marketing. Accordingly, a good deal of research has been directed toward converting coal to liquid fuels or into a standardized "char" of consistent combustion qualities.

Among the problems of coal research are the fact that its distribution among many small volume producers makes difficult the accumulation of capital reserves to invest in research. The problem is made worse by the narrow price margin in coal, attributable to the considerable competition for markets with producers of other fuels and among coal producers. Specialized technology of coal processing inclines toward the application of large volume production. Because of the structure of the industry, there is insufficient general interest in broadly applicable research and there are insufficient resources to conduct very much research applicable to a particular resource situation.

In summary, by 1955, technology of coal mining had increased the efficiency of production, but had imposed substantial capital costs (cost per annual ton of output of \$10 to \$15), which smaller mines were not able to afford. The tendency, therefore, was for production to be increasingly concentrated in larger deposits. Strong political pressures were accordingly generated at the local level out of the inability of small mines to compete, to maintain their employment, and to provide the basis for community income. Much of the Appalachian region, a major coal-producing area, was experiencing increasing hardship in consequence of the economic concentration of the coal industry and the diminishing market for coal.

#### *National moves to strengthen the coal industry*

Heavy reliance was placed on the coal industry for industrial energy, electric power, space heating, and export to allies during World War II. After the war ended, exports were expanded to aid the war-devastated countries of Western Europe. U.S. coal production reached a peak in 1947. However, thereafter, energy demands declined, and competing fuels began to make heavy inroads. The railroads converted rapidly to diesel power. By early 1950, the coal industry was in the throes of a labor dispute which motivated President Truman to ask the Congress for "legislation authorizing the Government to take over the coal mines and operate them temporarily as a public service." However, said the President:

These recurrent breakdowns between labor and management in the coal industry are only symptoms of profound and longstanding economic and social difficulties in which the industry has become involved. We can hope to work toward real solutions of the unstable relations between labor and management in the coal mines, only if we come to grips with the problems which foster instability.

I further recommend, therefore, that the Congress establish a commission of inquiry, including members from the Congress, the executive branch, and the public, to make a thorough study of the coal industry, in terms of economic, social, and national security objectives.<sup>7</sup>

<sup>7</sup> Special message to the Congress on the coal strike, Mar. 3, 1950, In U.S. Public Papers of the Presidents, Harry S. Truman, 1950 (Washington: U.S. Government Printing Office, 1950), p. 190.

Four days later, on March 7, the President sent identical letters to the President of the Senate and the Speaker of the House, requesting establishment of a commission on the coal industry.<sup>8</sup> He proposed a nine-member commission with two representatives each from the Houses of Congress, and five appointed by the President. Hearings were held on the measure in the Senate Committee on Interior and Insular Affairs, but no action was completed on the proposal.<sup>9</sup>

A broader approach to national materials policy, by the President, was the creation of the President's Materials Policy Commission, early in 1951. The charge to this Commission, presented in a letter from the President to its chairman, Mr. William Paley, January 22, 1951, asked that the Commission study the "broader and longer range aspects of the Nation's materials problem \* \* \*." Chapter 19 of the Commission's report<sup>10</sup> dealt with coal. The problem was: " \* \* \* how to put the vast reserves to greater use at lower costs." The Commission took note of the fact that coal had "earlier the reputation of a sick industry," because of its competitive disadvantage vis-a-vis liquid and gaseous fuels and because of the diffusion of its producing units. (" \* \* \* Made up of small companies that are financially unable to invest heavily in research and development.") Research could be highly beneficial, in improving mining methods, coal transportation, and conversion of coal to liquid fuel forms. Finally, the Commission concluded that restrictions should not be imposed on competing sources of energy but that the Government should—

\* \* \* acting through the Bureau of Mines, undertake, with the cooperation of private industry, labor, and private research organizations, a thorough appraisal of present research and development work relating to coal; and the formulation of a strong program to advance coal technology to be carried out by a combination of private and public effort. In light of the needs revealed by this proposed study, ample funds should be provided by Congress to carry out the Government's share of a comprehensive coal research and development program, with provisions for using such funds in part for contracting to non-Government research organizations.

A similar recommendation was offered February 26, 1955, in a report by a Presidential Advisory Committee on Energy Supplies and Resources. Said the report:

We recognize that coal is a great national asset and endorse a cooperative study to determine what research and development could be undertaken. The coal industry and both Federal and State governments should participate in this study and its cost.<sup>11</sup>

In response to this latter recommendation, the Bureau of Mines, in cooperation with Bituminous Coal Research, Inc., undertook a "survey of current research on bituminous coal," issued in May 1956, by the Bureau as Information Circular 7754, "Outlook and Research Possi-

<sup>8</sup> *Ibid.*, p. 191.

<sup>9</sup> U.S. Congress, Senate, Committee on Interior and Insular Affairs, "Fuel Study Proposals," Hearings Before the \* \* \* on S. Res. 239, Resolution to investigate available fuel reserves and formulate a national fuel policy of the United States; S.J. Res. 157, a joint resolution to establish a special bipartisan coal commission; S. 3215, A bill to establish the commission on the coal industry; S. 3383, a bill to promote interstate commerce in coal; to provide for the conservation of the coal resources of the Nation, to assure an adequate supply of coal, and for other purposes; and S. 6, A bill to aid in preventing shortages of petroleum and petroleum products in the United States by promoting the production of synthetic liquid fuels, July 13, 1950 (Washington, U.S. Government Printing Office, 1950), 101 pages.

<sup>10</sup> U.S. President's Materials Policy Commission, "Resources for Freedom," vol. I, "Foundations for Growth and Security" (Washington, U.S. Government Printing Office, 1952), ch. 19.

<sup>11</sup> U.S. Presidential Advisory Committee on Energy Supplies and Resources, "Report on Energy Supplies and Resources Policy: Recommendations" (Washington, 1955) [issued as a White House press release, Feb. 26, 1955], p. 4.

bilities for Bituminous Coal." The study identified 209 "research possibilities" that would need to be exploited "if coal is to be assured its proper share of total energy demand." Among its problems were cited the prospect of commercial energy from atomic fission, the pollution of air and water from the combustion and mining of coal, and the need for improved management of research data about coal. Considerable emphasis was placed on the diminishing role of coal in meeting national energy demands,<sup>12</sup> and the vast reserves of coal remaining in the United States. (See table.)

REMAINING COAL RESERVES OF THE UNITED STATES, JAN. 1, 1953<sup>1</sup>

	Estimated total reserves remaining in the ground, Jan. 1, 1953 (million net tons)	Estimated recoverable reserves Jan. 1, 1953, assuming 50 percent recovery	
		Million net tons	Quadrillion B.t.u.
Bituminous coal.....	1,049,457	524,729	13,643
Subbituminous coal.....	372,934	186,467	3,543
Lignite.....	463,356	231,678	3,105
Anthracite and semianthracite.....	13,992	6,996	178
Total.....	1,899,739	949,870	20,469

<sup>1</sup> Paul Averitt, Louise R. Berryhill, and Dorothy A. Taylor, Coal Resources of the United States, Geological Survey Circular 293 (1953), p. 1.

Congressional leadership in a growing movement to review the situation of the coal industry was assumed by Representative John P. Saylor of Pennsylvania. Representative Saylor had introduced a House Resolution (H. Res. 400, 84th Cong., second sess.), to authorize the Committee on Interior and Insular Affairs "\* \* \*" to conduct a full and complete study on the possibilities of a research and development program for the coal industry of the United States." The study was to ascertain how a cooperative research program for coal might be sponsored by the Federal Government " \* \* \* in the same magnitude, and on the same general organizational basis, as those which have been and are now currently conducted by the Atomic Energy Commission, the National Advisory Committee for Aeronautics, the National Science Foundation, and similar groups." The research to be sponsored by such an organization should have as its objective "an economic revival of the coal industry." Its scope should include technological improvement of coal production, transportation, distribution, utilization, and development of new uses. The measure received unanimous approval of the House of Representatives in April 1956. Accordingly, a Special Subcommittee on Coal Research was created by the Committee on Interior and Insular Affairs, and was placed under the chairmanship of Representative Edmondson of Oklahoma. Representative Saylor was the ranking minority member of the subcommittee. In a preliminary statement, May 18, the subcommittee announced its purposes, objectives, and plan for hearings.

<sup>12</sup> U.S. Department of the Interior, Bureau of Mines, "Outlook and Research Possibilities for Bituminous Coal," by Bureau of Mines in cooperation with Bituminous Coal Research, Inc., Information Circular 7754, May 1956 (Pittsburgh, Pa., Bureau of Mines, 1956), fig. 1, p. 10.

*Plan of investigation of the Special Subcommittee on Coal Research*

In an introductory statement the subcommittee took note of the 1,900 billions of tons of U.S. coal reserves, the decline in coal production and markets, recent technological advances in the industry, and the importance of coal for the steel and electrical power industries. In its discussion of the "purpose of the coal study," the statement noted the plight of coal mining communities, the importance of coal in the national economy, and the essentiality of coal for the national defense. The scope of the study would encompass all ranks of coal, and would seek to determine the possibilities for developing new and expanded uses through research programs. The goal was a "stable and thriving coal industry." To this end, the subcommittee proposed to obtain comprehensive information on coal with respect to—

- (a) Industry problems ;
- (b) Recent developments and their possibilities ;
- (c) The status and possibilities of research and development programs now in progress ;
- (d) The possibilities of solving industry problems and creating new and increased uses for coal through additional and expanded research and development programs ; and
- (e) The requirements, feasibility, and degree of urgency of each program that may be recommended to the subcommittee, the facilities and personnel now available, and the means by which each program may be initiated and carried through to success, including the type and degree of private and public participation and methods of financing.

Each of these factors would be considered in regard to a number of subjects relating to coal, including, but not limited to—

- |                      |   |
|----------------------|---|
| 1. Mining            | 9. Hydrogenation processes                    |
| 2. Preparation       | 10. Carbonization processes                   |
| 3. Handling          | 11. Gasification processes                    |
| 4. Marketing         | 12. Oils and tars from coal                   |
| 5. Distribution      | 13. Coal chemicals                            |
| 6. Transportation    | 14. Miscellaneous coal processes and products |
| 7. Conventional uses |   |
| 8. Combustion        |   |

The subcommittee indicated that in its investigation it would give special attention to problems and opportunities of smaller mines, as these had been "hardest hit by the drastic drop in the demand for coal and by other factors contributing to the unstable condition of the coal-mining industry."

The subcommittee planned to hold hearings in Washington until congressional adjournment. Thereafter, it would hold a number of field hearings. Witnesses would be called from industry, labor, trade associations, Federal and State agencies, other public and private research groups, and qualified individuals.

The opening statement in the initial hearing, June 4, was by Representative Saylor who repeated the emphasis on the goals of the investigation—

If we can open the door to steady employment, against the ups and downs that have prevailed in the past, we shall be affording new hope for a deserving segment of our population. At the same time, any progress in this direction will be a distinct contribution to the Nation's overall economy and to our defense structure. With God's help, those are the objectives which we want to accomplish.<sup>13</sup>

<sup>13</sup> U.S. Congress, House, Committee on Interior and Insular Affairs. "Coal." Hearings before the Special Subcommittee on Coal Research of the \* \* \* pursuant to H. Res. 400, to authorize a study leading to the establishment of a research and development program for the coal industry, June 4, and 6 and July 19, 1956. 84th Cong., 2d sess., serial No. 35 (Washington, U.S. Government Printing Office, 1956), pp. 2-5.

## II. THE INVESTIGATION BY THE SPECIAL SUBCOMMITTEE ON COAL RESEARCH

In accordance with its plans pursuant to Representative Saylor's resolution, the special subcommittee undertook a major investigation into the problems and opportunities of short-range research in coal. The subcommittee held 9 days of hearings, 4 in Washington, D.C., and 5 in three coal-producing States. There were 58 witnesses, and 579 pages of testimony and exhibits were taken.<sup>14</sup>

The initial hearings, in Washington, were to establish the basic facts as to the condition of the coal industry, the national reserves of coal, the status and prospects of research in coal, and the interest of the Congress in ameliorating the condition of the industry. Five Members of Congress testified as to their anxiety that the industry's prospects be advanced. From the Department of the Interior, four members of the staff of the Bureau of Mines, a spokesman for the U.S. Geological Survey, and the Assistant Secretary for Mineral Resources, provided historical and technical data. Three representatives of coal industry trade associations and a spokesman for the United Mine Workers also testified.

The 5 days of hearings in the field included testimony from 35 witnesses, with supporting exhibits. The 35 included 13 coal producers, 5 spokesmen for local chambers of commerce, 4 officials of State governments, 4 representatives of academic institutions, 3 leaders of labor unions, 3 representatives of coal associations, a spokesman for the electric utility industry, and 2 others. The concluding session in Washington, heard testimony from 3 railroad company officials, 2 spokesmen for the National Coal Association, and the director and two staff members of the Bureau of Mines.

The findings of the special subcommittee, drawn from the testimony of these witnesses, was presented in its report, August 27, 1957, as follows:

1. The coal reserves of the United States are this Nation's greatest mineral resource available for immediate development and use.

2. The coal-mining industry, on a national scale, is a sick industry. Although a number of so-called captive mines and independent coal producers are doing well productionwise, due to various advantages which they enjoy and to the immediate past export situation, the overall picture is one of economic ills, widespread mine shutdowns, staggering unemployment among coal miners, and an uphill struggle for survival.

3. Research and development programs of the coal industry and of State-supported organizations, although genuine and continuing efforts, have been woefully inadequate. The Federal effort in this field has been relatively small and has not met the needs of the industry.

4. There is a compelling need, both from the standpoint of a great industry's health and this Nation's future, for a greatly expanded research and development program for the coal industry.

5. While some differences of opinion are present in the definition of Federal responsibility, there is almost unanimous agreement that enlarged Federal activity in coal research and development is necessary at this time.<sup>15</sup>

<sup>14</sup> In 1956, *Ibid.*; and in 1957, "Coal, Hearings Before the Special Subcommittee on Coal Research of the \* \* \* on the Establishment of a Research and Development Program for the Coal Industry," pts. 1 and 2, 1957 (serial No. 3), *op cit.*

<sup>15</sup> U.S. Congress, House, Committee on Interior and Insular Affairs, Findings and Recommendations of the Special Subcommittee on Coal Research, Report of the \* \* \* Pursuant to H. Res. 94 (85th Cong.), Authorizing the Committee on Interior and Insular Affairs to make investigations into any matter within its jurisdiction, and for other purposes," 85th Cong., 1st sess., H. Rept. 1263 (Union Calendar No 490), (Washington, U.S. Government Printing Office, Aug. 27, 1957), p. 1.

*Scope of testimony in coal research hearings*

Many of the witnesses stressed the economic plight of the local communities in the coal fields, which were adversely affected by the fluctuations in coal markets and production. Several of the witnesses related this characteristic, and the low-profit margins in the coal industry, to this industry's inability to sponsor an adequate program of applied research of its own. For example, in a supplementary statement by G. Don Sullivan, representing the committee on research of the National Coal Association, in the concluding day of hearings, level of coal production was shown to have considerable bearing on the number of coal producers making a profit. (See table.)

COAL PRODUCTION—PROFIT RELATIONSHIP <sup>1</sup>

Year	Production (million tons)	Percent of coal producers re- porting a profit
1947.....	630.6	74.6
1948.....	599.5	66.3
1949.....	437.8	49.9
1950.....	516.3	55.5
1951.....	533.6	50.2
1952.....	466.8	47.3
1953.....	457.2	40.2

<sup>1</sup> Adapted from: Coal. Hearings before the Special Subcommittee on Coal Research of the \* \* \* on The establishment of a research and development program for the coal industry, pt. 2, 1957 (serial No. 3), op. cit., p. 569.

*Position of Bureau of Mines on expanded research in coal*

The opening witness before the special subcommittee was Felix Wormser, Assistant Secretary of the Interior for Minerals Resources. He called attention to the cooperative study by his Department with Bituminous Coal Research, Inc., reviewing the condition and prospects of the coal industry and identifying 209 specific areas of opportunity for expanded research. He expressed confidence that the coal industry had the prospect of a 50-percent increase in markets by 1975, and " \* \* \* if coal's proportion is only 40 percent of the total energy demand in 1975, approximately 1 billion tons of bituminous coal will have to be mined."<sup>16</sup> The current and previous year's status of the coal industry's production and markets, he said, " \* \* \* exceeded the fondest expectations of the most optimistic observers."<sup>17</sup>

With respect to an expanded program of research by the Bureau, he said he had asked it to review its coal research program to identify current programs that could be " \* \* \* redirected toward more productive lines of research." More emphasis on coal was probably needed. Accordingly—

Subject to the stringent budgetary limitations, the Department will review the coal program to determine how more emphasis may be placed on this important national problem. Let me assure you that the Department of the Interior recognizes the need for a more intensive research coal program and \* \* \* welcomes the opportunity to cooperate in any possible way with this committee to establish a sound program of coal research.<sup>18</sup>

There were, however, limitations on the extent to which coal research could be expanded. To give full treatment to the 209 areas of needed

<sup>16</sup> "Coal," Hearings before the Special Subcommittee on Coal Research of the \* \* \* pursuant to H. Res. 400 \* \* \* 1956 (serial No. 35), op. cit., p. 8.

<sup>17</sup> *Ibid.*, p. 10.

<sup>18</sup> *Ibid.*, p. 10.

research, he said, “\* \* \* would run into the hundreds and hundreds of millions of dollars \* \* \*.”<sup>19</sup> Moreover, there was a shortage of trained research personnel. “Unless you contract with somebody who already has the necessary personnel to pursue a particular avenue of research, you are apt to find them depending upon Bureau [of Mines] personnel to carry on the program.”<sup>20</sup> Earlier, he had said—

As with all other natural sciences there is a shortage of competent trained personnel in all phases of coal research. Every effort should be made to increase the supply of geologists, fuels technologists, mining engineers, chemists, chemical engineers, and others necessary to carry out a large expanded coal research program. A knowledge that increased emphasis will be placed on coal research in the future may encourage the formation of a reservoir of capably trained personnel.<sup>21</sup>

Secretary Wormser was also reluctant to have the Bureau of Mines enlarge its scope of coal research effort into short-term projects. For example—

I think that the Government should confine its research to those fundamental projects that you cannot expect private industry to undertake because of the very fact that there is no immediate profit motive involved and yet is a necessary item of research to add to human knowledge.<sup>22</sup>

In response to a question from the subcommittee chairman, the Acting Director of the Bureau of Mines, Thomas H. Miller, provided a table of expenditures by the Bureau for coal research over a 5-year period.

EXPENDITURES BY BUREAU OF MINES FOR COAL RESEARCH<sup>1</sup>

Year	Coal except synthetic liquid fuels	Synthetic liquid fuels (coal portion of program)
1952.....	\$2,060,000	\$5,539,200
1953.....	1,997,063	5,483,300
1954.....	2,472,558	2,655,600
1955.....	1,860,000	2,285,200
1956.....	1,957,030	2,830,040

<sup>1</sup> *Ibid.*, p. 23.

Some criticism was expressed to Secretary Wormser concerning the program of applied research in the conversion of coal to liquid fuels. This program, which had been initiated in 1944, as a response to the wartime shortage of petroleum fuels, had recently been terminated by the Bureau. Of this program, Representative Aspinall remarked: “We got no place. We spent some \$45 million or something like that and had nothing to show for it as far as answers, apparently.”<sup>23</sup>

When the special subcommittee hearings were in their closing session, almost a year later, one of the final witnesses was T. Reed Scollon, chief of the division of bituminous coal of the Bureau of Mines. On this occasion, a stronger representation was made for participation by the Bureau in an expanded program of coal research. The following are extracts from Mr. Scollon’s testimony:

The hearings have reflected almost complete unanimity on the need for expanded coal research in this country.

The coal industry is probably the only industry of any size in the United States that has been forced to operate on such small profit margins over the years.

<sup>19</sup> *Ibid.*, p. 14.

<sup>20</sup> *Ibid.*, p. 15.

<sup>21</sup> *Ibid.*, p. 9.

<sup>22</sup> *Ibid.*, p. 18.

<sup>23</sup> *Ibid.*, p. 17.

Research on coal will \* \* \* help to stabilize the industry by providing new outlets and new markets for coal [and] raise the hopes of the communities and the people who are engaged in coal mining.

At this point, Mr. Scollon introduced a document titled "Expansion of Coal Research in the United States," prepared by the Bureau of Mines.<sup>24</sup> The general policy of the Bureau was to "improve the Nation's ability to meet the energy needs of an expanding economy and to insure the Nation's security." Within this policy, Bureau projects in coal research were to—

1. Increase (a) efficiency, (b) economic development of the industry including new uses.
2. Conserve resources through prevention of waste.
3. Investigate mineral fuels belonging to or for the use of the United States.
4. Improve health and safety conditions in the mineral industries.

As to whether expanded research should be conducted in-house by the Bureau, or externally with Government sponsorship, the statement concluded:

\* \* \* The most desirable method of expanding coal research in the United States is through chosen projects carried out by a Federal agency with Federal funds (or with added private funds as is now done at times under cooperative agreements) and through chosen projects carried out by private interests with non-Federal funds.<sup>25</sup>

*Scope of potentially useful research in coal*

A number of witnesses addressed themselves to the question as to what applied research in coal might be beneficial. The 209-item table of "research possibilities for bituminous coal" presented in Bureau of Mines Information Circular 7754 was before the subcommittee. This listed the following categories of research projects:

- Coal reserves (three items).
- Mining methods and equipment (13 items).
- Underground haulage (three items).
- Roof control (six items).
- Ventilation (three items).
- Power (one item).
- Lighting (one item).
- Causes and control of acid mine water (five items).
- Underground gasification (10 items).
- Dense-medium washing (four items).
- Jig washing (three items).
- Pneumatic cleaners of fine coal (two items).
- Wet-concentrating tables (two items).
- Froth flotation (two items).
- Drying and dewatering (three items).
- Crushing and blending coal (one item).
- Performance testing of equipment (six items).
- Sulfur removal from coal by chemical means (one item.)
- Salvage of valuable products from washery refuse (two items).
- Surface treatment of coal (two items).
- Transportation and storage (seven items).
- Improved performance of coal-burning and handling equipment (four items).
- Elimination of stack emission (two items).
- Utilization of waste products (two items).
- Economic aspects of coal-heat energy and power transmission (two items).

<sup>24</sup> Cited in "Coal," Hearings Before the Special Subcommittee on Coal, Research of the \* \* \* on the Establishment of a Research and Development Program for the Coal Industry, pt. 1, 1957 (serial No. 3), op. cit., pp. 528-532.

<sup>25</sup> Ibid., p. 532.

Railroad motive power (two items).  
 Ship motive power (three items).  
 Industrial motive power (five items).  
 Industrial stack emission (seven items).  
 Other fundamental aspects of coal combustion (three items).  
 Other process uses (nine items).  
 Reverberatory furnaces (one item).  
 Solvent extraction (eight items).  
 Electrode carbon manufacture (one item).  
 Manufacture of specific chemicals (six items).  
 Residential and commercial heating—combustion equipment (six items).  
 Handling and storage (three items).  
 New market areas, farm research (three items).  
 Availability and quality of coals for coking (four items).  
 Pretreatment of coals for coking (six items).  
 High-temperature carbonizing equipment and conditions (five items).  
 Upgrading primary coke-oven products (four items).  
 Low-temperature carbonization (eight items).  
 Special or upgraded products from low-temperature carbonization (four items).  
 Production of synthesis gas (six items).  
 Utilization of synthesis gas (seven items).  
 Coal hydrogenation (seven items).  
 Physical and chemical properties of coal (nine items).

A counterpart list of research tasks in anthracite coal was presented to the subcommittee by Joseph T. Kennedy, Secretary of Mines and Mineral Industries of the Commonwealth of Pennsylvania. The list had been prepared by the coal research section, Mineral Industries Experiment Station, at Pennsylvania State University. It consisted of 106 items which were proposed for consideration.<sup>26</sup>

An engineering analysis of main lines of research was offered to the subcommittee, July 19, 1956, by Dr. Wilburn C. Schroeder, on behalf of the American Mining Congress. He recommended particularly Government research in the determination of coal reserves, mine-mouth processing technology, extraction of liquid and gaseous fuels from coal, development of a coal-based chemical industry, and the maintenance of statistical data.<sup>27</sup> Another spokesman for the American Mining Congress, J. D. A. Morrow, spoke in opposition to the use of Government funds to sponsor research and development in mining machinery. He said private industry was investing on the order of \$3 million annually in this area.<sup>28</sup>

#### *Proposed magnitude of expanded coal research effort*

None of the witnesses before the special subcommittee made any attempt to relate the level of effort in coal research—either generally or toward specific objectives—to increments of resultant increase in consumption of coal. At one point, Representative Chenoweth asked what this relationship might be. The witness (Mr. Scollon) replied: "I cannot answer your question directly \* \* \*."<sup>29</sup>

The Bureau of Mines Information Circular 7754 had given the figure of \$17 million as the lower limit of annual R. & D. investment in bituminous coal. The Federal Government's contribution to this was \$4.8 million.<sup>30</sup> One witness (Dr. Schroeder) contrasted this figure

<sup>26</sup> *Ibid.*, pt. 1, pp. 233-235.

<sup>27</sup> "Coal," Hearings Before the Special Subcommittee on Coal Research of the \* \* \* Pursuant to H. Res. 400 \* \* \* 1956" (serial No. 35), op. cit., pp. 134-136.

<sup>28</sup> "Coal," Hearings Before the Special Subcommittee on Coal Research of the \* \* \* on the Establishment of a Research and Development Program for the Coal Industry, pt. 1, 1957 (serial No. 3), op. cit., p. 43.

<sup>29</sup> *Ibid.*, pt. 2, 1957, p. 538.

<sup>30</sup> "Outlook and Research Possibilities for Bituminous Coal," op. cit., p. 6.

with " \* \* \* the petroleum industry's expenditures of about \$146 million and the chemical industry at \$361 million."<sup>31</sup> Other witnesses alluded to the substantial support for research in atomic energy.<sup>32</sup>

Constraints on the feasible level of effort in coal research were of several different kinds. One was the ability of the private coal industry to sponsor its own research. This had been shown to be inadequate. (See page 296.) Another was the availability of research personnel and facilities. On this point, a principal spokesman of the Department of the Interior had expressed his reservations. (See page 297.)

The relationship between the availability of trained research personnel and the existence of a stable and dependably expanding program of coal research was suggested by the testimony of Prof. H. R. Charmbury, head of the department of mineral preparation at Pennsylvania State University. Although his institution specialized in coal research and training, he said, only 11 of 22 graduates at all levels in the preceding year had entered the coal industry. He went on—

Upon questioning these graduates who normally would enter the coal industry, they frankly state, for the most part, that they consider coal on the way out. This impression is definitely not developed within their instruction courses; in fact, their instruction is quite to the contrary.

However, due to the bad publicity about the coal industry, such as the difficulties of a dependable supply due to strikes, railroad car shortages, and permanent loss of trained labor in distressed periods, plus the glamorous writeups about other energy-producing materials, the general impression is created that the coal industry is dying, if not already dead.

He noted that the newspapers were replete with advertisements "practically begging the young engineers, regardless of their specific training, to enter the field of commercial atomic power, jet fuels, guided missiles, and the like." The contrast with the prospects for advancement in coal, he suggested was "rather obvious."<sup>33</sup>

#### *Organizational issues in expanded coal research program*

There were two overriding questions, in the event that coal research was to be expanded, as to the organizational arrangement to manage the expansion. Should a new agency be created, or should the expanded effort be entrusted to the Bureau of Mines? Should a new agency, if one was created, be closely associated organizationally with the Bureau of Mines or the Department of the Interior, or should it be an independent agency like the Atomic Energy Commission and the National Science Foundation?

The Bureau of Mines had received some criticism from members of the subcommittee for its handling of applied research in extraction of liquid fuels from coal. (See page 297.) Its general responsibility for research in all mineral resources, at least by implication, might be considered to diffuse its research effort away from coal. Various spokesmen for the Bureau had expressed reservations as to whether a broad

<sup>31</sup> "Coal." Hearings Before the Special Subcommittee on Coal Research of the \* \* \* pursuant to H. Res. 400 \* \* \* 1956 (serial No. 35), op. cit., p. 134.

<sup>32</sup> For example, Harold J. Rose, vice president and director of research, Bituminous Coal Research, Inc., said that " \* \* \* It should be pointed out that hundreds of millions of U.S. dollars are being spent for research in this country to develop atomic power, with no assurance that atomic power can in the foreseeable future compete in economy and safety with power from coal" ("Coal." Hearings Before the Special Subcommittee on Coal Research of the \* \* \* on the Establishment of a Research and Development Program for the Coal Industry, pt. 1, 1957 (serial No. 3), op. cit., p. 28).

<sup>33</sup> *Ibid.*, pt. 1, 1957 (serial No. 3), p. 54.

gaged program of applied research was a proper function for the Bureau. (See page 297.)

An alternative proposal was offered, for an entirely new and independent agency, in the hearings. In a prepared statement, the National Coal Association suggested that there be established a "Coal Research Foundation" to make contracts, grants, and loans to encourage the development and exercise of a strong research capability in science and technology related to coal.

*Findings of the special subcommittee on coal research*

The subcommittee findings and recommendations were published as a Report of the Committee on Interior and Insular Affairs of the House of Representatives, August 27, 1957. The report adopted, with some modifications, the recommendations of the National Coal Association for an independent Coal Research and Development Commission. It would have three members appointed by the President. The level of effort in the first year should not exceed \$2 million, and funding thereafter should be based on the recommendations of the Commission. It should have advisory committees relating to major elements of the coal industry and markets (11 were suggested). It should be authorized to place contracts with public agencies, or private organizations, profitmaking or not for profit. It should develop a technical information system for coal research reports. It might conduct research itself in its own laboratories in the event no other agency was prepared to undertake it. Its program should be broad-gaged research, designed but not limited to—

- (1) develop new and more effective uses for coal,
- (2) improve and expand existing uses,
- (3) reduce the cost of coal production and distribution,
- (4) emphasize those uses and developments of particular value to smaller coal producers.<sup>34</sup>

In its concluding paragraphs, the subcommittee's report summed up the findings on which these recommendations were based. Coal research in the United States was at an inadequate level, and the industry was unable to better this situation. The Bureau of Mines "as a matter of policy, does not concentrate its coal research activities on efforts to solve the short-range problems of the industry." Short-range research could be expected to produce "highly beneficial" results. The U.S. economy and national security would be enhanced. Such a program would be in the national interest. However, such a program "should be administered by an independent Federal agency which must not be shackled and inhibited by such traditional approaches and restrictive policies as control the research activities of the Department of the Interior."<sup>35</sup>

### III. SUBSEQUENT HISTORY OF THE COAL RESEARCH PROGRAM

The recommendations of the Special Subcommittee on Coal Research were not acted upon in either House of Congress in 1957. In 1958 a bill (S. 4248) providing for an independent commission for research and development in coal passed the Senate, August 14, and a

<sup>34</sup> "Findings and Recommendations of the Special Subcommittee on Coal Research, report \* \* \* 1957," op. cit., pp. 2-5.

<sup>35</sup> *Ibid.*, p. 91.

similar bill (H.R. 9460) was reported by the Interior and Insular Affairs Committee of the House, but the House took no action on it before adjournment. Apparently, there was still some possibility (or expectation) that the Department of the Interior without further legislative authority, might be induced to intensify its coal research efforts—with particular reference to short-range applied research to improve the demand for coal.<sup>36</sup>

*Presidential veto of Independent Coal Research Agency*

In 1959, hearings were held by the Mines and Mining Subcommittee of the Committee on Interior and Insular Affairs on H.R. 6596, introduced by Chairman Aspinall of the full committee, and on 16 other similar or identical bills, and on six other bills of similar purpose. Main reliance, however, was still placed on the voluminous hearings in 1956-57 and the report of these findings from these hearings. In particular, the report of the committee on H.R. 6596 reaffirmed the findings of the earlier report. It went on to dismiss the proposal by the Department of the Interior for an Office of Coal Research in the Department as not likely to be “\* \* \* as effective [as if administered] by an independent coal research and development commission established for the sole purpose of developing and conducting such a program.”<sup>37</sup> The previous year the committee had dismissed the Department’s proposal as “little more than a ‘self-defense’ proposal offered as a counter to the proposals for an independent Commission.”<sup>38</sup>

A brief 1-day hearing was held in the Senate Committee on Interior and Insular Affairs, June 10, 1959, to consider coal research legislation. Before it were two bills, one (S. 49) a companion measure to H.R. 6569, and the other (S. 1362) to authorize the Secretary of the Interior to place contracts for research in coal. Before the Senate committee hearing, Marling J. Ankeny, Director of the Bureau of Mines, recalled that his agency “\* \* \* in its previous testimony has stated that, should Congress decide on additional research, it would create a new office within the Bureau which would report directly to the Director.”<sup>39</sup> Nevertheless, the full committee, July 22, reported H.R. 6569, with a compromise amendment, placing the new agency within the Department of the Interior “to give the commission a home and to provide it with housekeeping facilities.” In conference, language making the commission independent of the Department was restored, and the conference report was accepted by both Houses of Congress by voice vote. However, when it went to the President, he rejected it by pocket veto. In a memorandum, September 16, 1959, he explained that the creation of an additional agency would dilute the Department of the Interior’s “established interest” and “\* \* \* the result could only be a blurring of the lines of governmental responsibility in this important area of concern.” However, the President agreed that legislation authorizing

<sup>36</sup> In 1959, the House committee reported: “\* \* \* the Department of the Interior has made no effort to establish an Office of Coal Research as proposed in its report of Apr. 14, 1958. This is evidence of its indifference to the coal mining industry’s acute need for increased and reorganized research and development assistance” (U.S. Congress, House Committee on Interior and Insular Affairs, “Coal Research and Development Act: report [to accompany H.R. 6596], May 20, 1959,” 86th Cong., 1st sess., H. Rept. 370 (Washington, U.S. Government Printing Office, 1959), p. 12.

<sup>37</sup> *Ibid.*

<sup>38</sup> *Ibid.*, p. 11.

<sup>39</sup> U.S. Congress, Senate Committee on Interior and Insular Affairs, “Coal Research. Hearings Before the Subcommittee on Minerals Materials, and Fuels of the \* \* \* on S. 49 and S. 1362, bills to encourage and stimulate the production and conservation of coal in the United States,” June 10, 1959, 86th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1959), p. 40.

the Secretary of the Interior to contract for local research would be "highly desirable." Legislation to accomplish this purpose had been endorsed by his Administration.<sup>40</sup>

Finally, in 1960, the purposes sought in the 1957 subcommittee report reached legislative enactment. A bill introduced by Representative Saylor (H.R. 3375) would expand coal research by the Department of the Interior, by contract; advisory committees would assist in shaping the program. As reported by the House committee, February 4, 1960, the bill did not require creation of a new agency, but the committee report quoted the testimony of the Department as offering assurances that "If the authority contained in H.R. 3375 is conferred upon the Secretary of the Interior, it is our intention to establish administratively within the Department of the Interior an Office of Coal Research \* \* \* directly responsible to the Secretary \* \* \*."<sup>41</sup> The House passed the bill by voice vote, February 15. In the Senate committee, the bill was amended to make mandatory the creation of an Office of Coal Research, and in this form the bill was reported, May 31, and passed by the Senate by voice vote, June 27. The House agreed to the modified version, June 29, by voice vote, and the bill was accepted by the President, July 7.<sup>42</sup>

#### *Provisions of the Coal Research Act*

In its final form, H.R. 3375 directed the Secretary of the Interior to establish an Office of Coal Research to—

(1) Develop, through research, new and more efficient methods of mining, preparing, and utilizing coal;

(2) Contract for, sponsor, cosponsor, and promote the coordination of, research with recognized interested groups, including, but not limited to, coal trade associations, coal research associations, educational institutions, and agencies of States and political subdivisions of States;

(3) Establish technical advisory committees composed of recognized experts in various aspects of coal research to assist in the examination and evaluation of research progress and of all research proposals and contracts and to insure the avoidance of duplication of research; and

(4) Cooperate to the fullest extent possible with other departments, agencies, and independent establishments of the Federal Government and with State governments, and with all other interested agencies, governmental and nongovernmental.

Although earlier versions of the bill had proposed that research contracts should be preferentially placed in distressed areas, the final version (sec. 5) provided that "research authorized by this act may be conducted wherever suitable personnel and facilities are available."

#### *Implementation of the Coal Research Act*

Some dissatisfaction was expressed in Congress at the deliberate pace with which the Department of the Interior proceeded to carry out the authority conferred by H.R. 3375. However, the act had been passed shortly before the opening of the presidential election campaign of 1960, and a new Administration was in prospect after November. Shortly after the new Administration took office, a series of hear-

<sup>40</sup> Memorandum of disapproval of bill creating a Coal Research and Development Commission, Sept. 16, 1959, in "U.S. Public Papers of the Presidents, Dwight David Eisenhower, 1959" (Washington, U.S. Government Printing Office, 1959), p. 660.

<sup>41</sup> U.S. Congress, House Committee on Interior and Insular Affairs, "Encouraging and Stimulating the Production and Conservation of Coal in the United States Through Research and Development by Authorizing the Secretary of the Interior To Contract for Coal Research." Feb. 4, 1960, H. Rept. 1241, 86th Cong., 2d sess. (Washington, U.S. Government Printing Office, 1960), pp. 2-3.

<sup>42</sup> Public Law 86-599, 74 Stat. 336.

ings were conducted, during February 1961, by the House Committee on Interior and Insular Affairs, on various aspects of the program of the Department of the Interior. The program and status of the newly authorized Office of Coal Research came under committee scrutiny February 27. In his introductory remarks at that session, John A. Carver, Jr., Assistant Secretary of the Interior, said: "It is my understanding that the chairman has requested a report and the presence specifically of the Coal Research people. The Office of Coal Research is under the Office of the Secretary, and I have at my side Mr. Samuel Lasky, the Acting Director of that office and I would like to present him first." Representative Edmondson, chairman of the Subcommittee on Mines and Mining, before which this session was being held, responded: "Fine. There are several on this committee who are most keenly interested in the progress of this coal research program."<sup>43</sup>

Mr. Lasky had no prepared statement. After describing the authority conferred by the coal research statute, and noting that an initial appropriation of \$1 million had been given to the program, he went on—

Very little of that has been spent, because we are not yet staffed. So that leaves most of that \$1 million to be carried over, and we are asking then for another \$1 million for the next fiscal year. That would be a working fund, so to speak, of \$2 million if that \$1 million is granted.

The Acting Director said that divisions of mining, utilization, and economics and marketing had been established; a general advisory committee of (originally) 14 members had been announced; staffing had been deferred (except for one or two men) until appointment of a permanent Director; and other preliminaries were underway.<sup>44</sup> (By close of the fiscal year 1961, the expenditures of the Office of Coal Research amounted to \$60,000.)

Representative Aspinall, chairman of the full committee, said he was "not very well satisfied" with this report. "The President approved the bill as of July 7 [he said], and here we are, 8 months later, with an Acting Director, with no real value to the coal mining industry as yet, and apparently with some jurisdictional questions still unresolved, and no program in mind." Representative Edmondson added:

I think one thing that is in the minds of all of us at this time: most of the people on this committee on both sides of the aisle felt that this should have been an independent commission. And we yielded after the veto and put legislation through for an office within the Department of Interior. But we are curious, all of us, right now, to know whether you folks in the Department believe this function can be performed efficiently and with real results within the framework of the Department of the Interior. Because it certainly has not given any signs up to now of moving forward under any kind of head of steam.<sup>45</sup>

At this hearing, also, the Director of the Bureau of Mines, Mr. Ankeny, described the policies of his agency in terms that suggested a marked change from those earlier presented by Felix Wormser. For example—

A lot has been said about the functions of the Bureau of Mines being long range. The Bureau has never said that our function has been long range, and the Congress has never said that. If you examine our projects, you will find that

<sup>43</sup> U.S. Congress, House Committee on Interior and Insular Affairs, "Policies, Programs, and Activities of the Interior." Hearings Before the \* \* \* serial No. 1 (Washington, U.S. Government Printing Office, 1961), p. 168.

<sup>44</sup> *Ibid.*, pp. 169-171.

<sup>45</sup> *Ibid.*, pp. 171, 173.

we have projects that must be considered of the shortest possible range. They are things that we are doing that are of immediate benefit and immediate help to the coal industry.

In fact, except for the authority to contract research with outside people, and to work on patented processes, " \* \* \* there is nothing that this Office of Coal Research can do that the Bureau of Mines cannot do." <sup>46</sup>

#### *Uncertainties over the goals of the program*

At the outset of congressional development of the coal research program, in 1956, Representative Saylor had sought "an economic revival of the coal industry." (See p. 294.) The emphasis of the report of the special subcommittee had been on finding ways to increase the consumption of coal. The objective of Public Law 86-599 was "to encourage and stimulate the production and conservation of coal \* \* \*." Mr. Lasky, at the 1961 hearing on Policies of the Department of the Interior, described the objectives of the coal research program as being " \* \* \* to get miners back to work and to alleviate the distress in coal mining communities." <sup>47</sup> Subsequently, when he was challenged by Representative Rogers as to this interpretation, he explained further—

I was going to say that it can make that contribution. Actually, its function, whether you call it an aid-to-depressed-areas bill or not, is to do something for the coal mining industry. <sup>48</sup>

Subsequently, Representative Rogers observed:

\* \* \* What you are actually doing, if you carry this out on the theory of a depressed area situation, as Mr. Lasky put it: You are using tax money paid by the producers of other fuels, fuels other than coal, to do research and development to provide a more competitive situation for coal, and you are using the money provided by the other fuels in order to help put them out of business, are you not? <sup>49</sup>

By way of conclusion to this topic, Representative Edmondson, who had chaired the special subcommittee investigation in 1956-57, suggested that the objective of the Office of Coal Research was "to be an effective and a successful adjunct to our Government's effort to strengthen the country and to make a beneficial use out of one of the undoubtedly great resources of our country, this particular area of coal."

We found in our survey of the energy picture of the country [he went on] that coal presented our greatest long-term physical asset in terms of energy that we could see on hand and readily available to us at this time, and it was our desire to see that that resource was beneficially developed and used, and that the human resources that are today being wasted also in so many coal mining areas of the country are beneficially used.

I think that inspired this legislation in the first place. <sup>50</sup>

#### *Status of coal research program in 1968*

The annual report of the Office of Coal Research for 1968 indicated that OCR, since its inception and up to the beginning of 1968, had received and screened more than 450 research proposals, had placed 58 contracts for research (of which 29 were then active), had issued 39 technical reports, and had received 3 patents (with 8 other applications and 33 candidate applications pending).

<sup>46</sup> *Ibid.*, p. 181.

<sup>47</sup> *Ibid.*, p. 168.

<sup>48</sup> *Ibid.*, p. 180.

<sup>49</sup> *Ibid.*, p. 184.

<sup>50</sup> *Ibid.*, p. 192.

The character of the program had undergone considerable change since its initiation. Initially, the program was concerned with funding of exploratory technological development in promising new areas which, if successful, would entail the utilization of coal in additional ways. Some attention was given also to economic analyses of markets for coal and special problems of marketing. As the program matured, a concentration of effort along what were judged to be the most significant lines was evident. Thus, by the fiscal year 1968, no request for funding was made by OCR for new (as opposed to continuation) research contracts, and only \$300,000 was requested for this purpose for the fiscal year 1969. The bulk of the funded OCR program consisted in the continuation of ongoing research programs which Director George Fumich, Jr., testified, in 1968, "are going to require \$11,400,000 this coming year, which is more than our present entire program of \$10,980,000." His prepared statement presented more detail on these:

The major portion of the [1969 fiscal year] funding, including the increase of \$2,919,000 for contract research, will be used to continue funding five pilot plant projects: Consolidation Coal Co. Project Gasoline, \$2,400,000; Consolidation Coal Co. lignite gasification (CO<sub>2</sub> acceptor process), \$2,600,000; FMC Corp. Project Coed (char-oil-energy-development) \$2,700,000; and Westinghouse Electric Corp. Project Fuel Cell, \$1 million.<sup>51</sup>

Apart from the shift in emphasis, it is evident that throughout its life the total investment of OCR in coal research had continued to mount. (See table.)

*Appropriations for Office of Coal Research, by fiscal years<sup>1</sup>*

[In thousands of dollars]

<i>Year</i>	<i>Appropriation</i>	<i>Year</i>	<i>Appropriation</i>
1961 -----	1, 000	1966 -----	7, 220
1962 -----	1, 000	1967 -----	8, 220
1963 -----	3, 450	1968 -----	10, 980
1964 -----	5, 075	1969 <sup>2</sup> -----	<sup>2</sup> 13, 900
1965 -----	6, 836		

<sup>1</sup> Source: Annual hearings before House Appropriations Subcommittee on OCR appropriation requests.

<sup>2</sup> Appropriation request.

With respect to the relationship of OCR with the Bureau of Mines, Director Fumich testified in 1965 that all promising research proposals received by his office were reviewed by the Bureau of Mines, both for duplication and as to merit. No projects had been accepted that the Bureau of Mines had not recommended. This procedure, he said, had been instituted in 1964.<sup>52</sup> Again in 1967, Director Fumich testified as to the close relationship with the Bureau: "We have utilized the Bureau of Mines on several occasions to come up with evaluations for our program." And again, "We have been using their services and we hopefully believe we can coordinate this even more in the future." There was no duplication in research by the two agencies—"I think our procedures guarantee against that." And Fumich concluded: "I

<sup>51</sup> U.S. Congress, House, Committee on Appropriations, "Department of the Interior and Related Agencies Appropriations for 1968," Hearings before a subcommittee of the \* \* \* pt. 2: Department of the Interior: Geological Survey, Office of Coal Research, Office of Oil and Gas, Office of the Secretary, Office of the Solicitor; Related Agencies (Washington, U.S. Government Printing Office, 1967), pp. 155, 157.

<sup>52</sup> U.S. Congress, House Committee on Appropriations, "Department of the Interior and Related Agencies Appropriations for 1966," Hearings before a subcommittee of the \* \* \* pt. 1, Department of the Interior (Washington, U.S. Government Printing Office, 1965), p. 277.

think we are getting as much reciprocity as possible now and I believe there will be even more mutuality in the future.”<sup>53</sup>

#### IV. ASSESSMENT OF ORC IN THE LIGHT OF CONGRESSIONAL OBJECTIVES

It is probably too early to draw any firm conclusions as to the contributions of the Office of Coal Research toward the objectives for the coal industry or the Congress, or of the witnesses who testified in 1956-57 before the Special Subcommittee on Coal Research. The “plight” of the coal industry, as described in those hearings, was mainly that of the 90 percent or so of the Nation’s 8,000-odd coal mines that might be characterized as “small businesses.” It seems almost inherent that the effect of the increasing capitalization that accompanies mechanization of the coal mines, except under the most favorable circumstances, will be to freeze smaller producers progressively out of the picture. Although the research sponsored by OCR is aimed—hopefully with success—at expanding the markets for coal in the United States and abroad, it is again inherent in technology itself that the main benefits of new uses of coal will be felt by the operators of larger mines in the most extensive and consistent of coal deposits.

Nevertheless, research that elevates coal as a basic material by deriving new useful products from it can be expected to stimulate new industries and create new opportunities for employment in the coal-producing regions, whether in small or large enterprises. And there is always the hope that small as well as large coal producers can share in any expanded market for coal.

In a small way, OCR appears to have patterned its operation upon that of the U.S. Atomic Energy Commission, and is attempting to demonstrate the utility of large R. & D. contracts for public purposes outside of the fields of defense and aerospace. If enough of the pilot plant programs of the agency mature into economically practicable and successful industries, then OCR might indeed become the prototype for other public investment in the large-scale application of science and technology to the resources of nature.

#### *Consideration of the information-gathering procedures leading to the Coal Research Act*

The information-gathering procedure of the Special Subcommittee on Coal Research warrants further analysis. It provided the basic data on which all subsequent legislative proposals, and legislative committee action on coal research depended. The subcommittee began by presenting its hypothesis as to the need for some kind of action, and then challenged the best available specialists in the executive branch to present their proposals as to what the detailed circumstances were and what action should be taken in response. Then, by going out into the regions most concerned, the subcommittee was able to obtain at first hand the relevant sociological data. It secured the opinions of the producers and workers most intimately concerned, in order to evaluate the political urgency of ameliorative action. Also, by consulting with a broad spectrum of coal producers, consumers, and technological authorities in the coal industry, the subcommittee accumulated a partial consensus as to the kind of action that might be

<sup>53</sup> House, “Department of the Interior and Related Agencies Appropriations for 1968,” hearings, op. cit., pp. 144-145.

taken. By consulting with the technologists in the industry, and with academic authorities engaged in coal research, the subcommittee secured supplementary information as to the scope and possible economic consequences of a vigorous program of applied research in coal. Finally, by presenting a final opportunity for both the specialists of the Bureau of Mines and the policy spokesmen of the trade associations of the coal industry to react to the evidence, and to refine their own earlier testimony, the subcommittee was able to assess the responsiveness of both sources to the evidence.

The emphasis on short-range research in coal—on one kind of applied research rather than another—was apparently shown by later events to be of less consequence than was attached to this distinction by members of the subcommittee. The conclusion seems to be suggested that all new technology matures on its own built-in time schedule, and that attempts to force it more quickly to exploitation tend to be costly and wasteful.

The attempt to separate the Office of Coal Research from the Bureau of Mines, and even from the Department of the Interior, appeared to relate to a philosophic concept that a long-standing or old-line agency was unlikely to possess the initiative and vigor to undertake a creative program yielding a quick and significant economic impact. Although this is apparently a widely-held view, it is hard to find confirming evidence. On the other hand, the effort at this separation was beneficial in that it generated congressional pressure on the Bureau of Mines to evidence a greater creativity and also dramatized the significance of contract research as against in-house research in Government laboratories. It seems reasonable to expect that intensified competition between these two research sectors would be healthy. The question remains, however, as to whether such competition is likely to occur under the institutional arrangements favored by the House Appropriations Committee and by the Interior and Insular Affairs Committee, that encourage coordination of OCR research with the program of the Bureau of Mines.

## CHAPTER TWELVE—CONGRESSIONAL RESPONSE TO THE SALK VACCINE FOR IMMUNIZATION AGAINST POLIOMYELITIS

### I. INTRODUCTION

This chapter considers the problem that confronted the Congress in mid-1955 concerning Government action to make widely available the first effective immunization treatment for polio.

From the outset the task was generally recognized as calling for some degree of participation by the Federal Government. Poliomyelitis, or polio, was a dangerous disease, widespread in occurrence, causing frequent death or severe and permanent crippling impairment. The level of effort inherent in the full, speedy, and effective distribution of a promising vaccine implied support of such a magnitude as to require Federal assistance. The vaccine itself had been developed under a program supported by broad public contributions of funds; this was the March of Dimes campaign, whose inspiration had been associated with President Franklin D. Roosevelt, himself a victim of the disease.

The announcement of the successful development of the vaccine, by Dr. Jonas Salk of the University of Pittsburgh, had been made jointly by the University of Michigan and the National Foundation for Infantile Paralysis (NFIP) on April 12, 1955. Since the incidence of polio attacks reached a peak during the summer months, the public response was to call for a prompt and vigorous national program of immunization in hope of averting this annual plague. This urgency provided further justification for participation in the program by the Federal Government.

On the other hand, the risk inherent in any new vaccination program was made more extensive by the prospect of national distribution of the biologic and more intensive by the public insistence on its speedy exploitation. The established governmental procedures for licensing of the vaccine were accordingly put under stress, in addition to which, the participation of the Federal Government in the distribution program implied an increased extent of obligation to assure the safety and reliability of the new preventative. It quickly became evident that the employment of polio vaccines was not without some degree of medical risk.

#### *Increasing incidence of polio in early 1950's*

The menace of polio as a rising problem of national health was brought out in hearings in 1955. In a report on the Poliomyelitis Vaccination Assistance Act of 1955, the House Committee on Interstate and Foreign Commerce found the incidence of the disease, its severity, and the range of ages affected, all on the increase.

\* \* \* Particularly during the last decade, a marked increase has occurred. The death rate has shown a slight but definite increase. In 1952, for the Nation, both the case rate and the estimated death rate were the highest since the 1916 epidemic.

In recent years, roughly 35,000 to 50,000 cases have been reported. [Rates were as high in some parts of the country as 200 or 300 per 100,000.]

Moreover, with increasing frequency, the disease was occurring among the age group of young adults. Among those who contracted it later in life, the after-effects of the disease were likely to be more severe. The number of persons crippled by the disease, moreover, was cumulative: "In January 1952, the Nation had 45,000 patients requiring continuing care [and] this number in January 1955 reached the figure of 71,000 \* \* \*."<sup>1</sup>

#### *Present immunization treatments for polio*

By 1962 there were available in the United States two types of vaccine to prevent paralytic polio. The first, developed largely by Dr. Salk, is given most usually to persons over 18 years of age. The second, developed by Dr. Albert Sabin of the Children's Hospital, Cincinnati, Ohio, and licensed in 1961, is recommended by the Public Health Service to be given only to children. Both vaccines were developed with the encouragement and financial support of the National Foundation for Infantile Paralysis (NFIP), using funds from the annual March of Dimes collection campaigns.

The development of the Salk vaccine was made possible by important prior discoveries in the isolation of the three strains of the polio virus, and in advances in tissue culture and virology.<sup>2</sup> It is an aqueous solution of the three types of polio viruses, cultured in monkey tissue, and inactivated by successive exposure to formalin or combined treatment with formalin and ultraviolet rays. It retains enough potency to produce antibodies or immunity in the human body. The Sabin vaccine produces the same antibody response. It differs from the Salk vaccine in that the viruses remain alive in the vaccine; they are attenuated, or made relatively harmless, and may produce a mild intestinal infection in the vaccinated subjects.

#### *Controversy over introduction of the Salk vaccine*

The polio immunization treatment developed under the direction of Dr. Salk was the first to come to public attention. After widespread testing in 1954 and early 1955, carried out under the auspices of the NFIP in cooperation with State and local public health officers and private physicians, the vaccine was publicly declared ready for general use. The announcement precipitated a chain of responses that included considerable confusion over the role of the new Department of Health, Education, and Welfare in supporting distribution of the vaccine, difficulties with the process of assuring its safety under conditions of large-scale manufacture, and eventually congressional hearings to air the issues raised by the new development.

One set of controversies concerned the role of the Department of Health, Education, and Welfare (DHEW) in helping to distribute

<sup>1</sup> U.S. Congress, House, Committee on Interstate and Foreign Commerce Poliomyltitis Vaccination Assistance Act of 1955, Report [to accompany H.R. 7126] July 14, 1955, House Report No. 1186, 84th Cong., first sess. (Washington, U.S. Government Printing Office, 1955), pp. 2-3.

<sup>2</sup> For a description of scientific developments leading to the achievement of polio vaccines, see James A. Shannon, M.D., NIH—Present and Potential Contribution To Application of Biomedical Knowledge, In U.S. Congress, Senate, Committee on Government Operations, Research in the Service of Man: Biomedical Knowledge, Development, and Use. A conference sponsored by the Subcommittee on Government Research (pursuant to S. Res. 218, 89th Cong.) and the Frontiers of Science Foundation of Oklahoma for the \* \* \*, 90th Cong., first sess., Committee print. (Washington, U.S. Government Printing Office, 1967), pp. 72-86.

the Salk vaccine. It involved such questions as whether the Federal Government should assume direct responsibility for vaccinating all children or only those of indigent families; whether distribution should be managed by the Federal Government or by State or local medical organizations, or by the medical profession privately; whether DHEW had been sufficiently vigorous in taking appropriate action when the vaccine became known, or unduly hasty in putting it to work; and whether the control over manufacture of the vaccine should extend to the testing of all lots produced, or merely rely on detailed descriptions (called "protocols") by the manufacturers of their production steps.

Another set of controversies centered on the basic soundness of the Salk vaccine in concept. Dr. Salk's decision to develop a vaccine based on the controversial use of killed rather than an attenuated live virus was questioned by Albert Sabin, working on an oral attenuated vaccine, and by other virologists inside and outside of the Public Health Service. These critics challenged Salk's claims about the safety and efficacy of his vaccine. They " \* \* \* thought the trials were premature;" there would be " \* \* \* difficulties in killing the polio virus by the Salk methods;" and there were instances reported of firms producing the vaccine who had to reject unsafe lots containing live virus, without knowing " \* \* \* why some viruses were not being inactivated."<sup>3</sup>

Some dissatisfaction over the Salk testing program may be attributed to the manner in which the results of the test were announced. The testing program itself had involved almost 2 million children in 44 States, of whom 500,000 received one or more doses of the vaccine while the rest received placebos or served as observed controls. Dr. Thomas Francis, Jr., head of the Poliomyelitis Vaccine Evaluation Center, University of Michigan, and a renowned epidemiologist, had directed the field study and the analysis of the data. However, contrary to the usual medical practice of announcing scientific results in a medical journal, for professional evaluation, the results of the Francis study were disclosed at a widely publicized press conference, attended by Dr. Salk, Dr. Francis, and officials of the NFIP and the Public Health Service, and televised to doctors throughout the country. The vaccine was described as successful because it had proven in this mass test to be 60 to 90 percent effective in preventing polio.

An immediate technical problem was encountered by the Public Health Service in licensing the new vaccine.<sup>4</sup> The PHS had worked closely with Dr. Salk and NFIP in setting requirements for the vaccine and its commercial production. However, Dr. James Shannon, Assistant Director of the National Institutes of Health, in DHEW, had repeatedly recommended revision of minimum requirements to assure a greater margin of safety of the vaccine. He questioned Salk's belief that the virus could be adequately inactivated with formalin. Nevertheless, despite the initial uncertainties over quality control, the Secretary of DHEW, Mrs. Oveta Culp Hobby, announced that PHS had given its approval of the vaccine and that its manufacture had

<sup>3</sup> P. J. Fisher. *The Polio Story*. (London, Heinemann, 1967), pp. 71-72.

<sup>4</sup> Section 351 of the Biologics Control Act of the PHS Organic Act instructs the PHS to set requirements for the safety and efficacy of vaccines proposed for general medical use.

been licensed to six pharmaceutical firms. The announcement was made April 12, the same day as the publication of the Francis report.<sup>5</sup>

### *Congressional concern over Salk vaccine distribution*

Congressional hearings concerning the Salk vaccine, in late spring of 1955, had as their focus the proposed Poliomyelitis Vaccination Assistance Act of 1955, that would extend grants to the States to purchase and distribute the vaccine to all children to age 20, and to pregnant women. The variety of issues described above were raised in these hearings. Testimony was taken mainly from representatives of DHEW and persons supporting the administration's proposal for a limited program of Federal support for a voluntary State-based program. These included State health officers and spokesmen for the American Medical Association. Many Members of Congress opposed the limited provisions of the administration's bill. In its final form, the Congress took this approach, rejecting proposals to restrict the assistance program to indigents, and for matching Federal with State funds.

There were a number of beneficial effects of the hearings, in addition to the specific legislative product. They impelled DHEW to tighten its arrangements for large-scale control of vaccines. The role of the Federal Government in mass medical programs was more precisely defined. The way was paved for a more orderly introduction of future vaccines (such as that later developed by Dr. Sabin). Although there were evident limitations in the hearing process, the Congress was able to make a finding on the basis of professional testimony that helped pave the way toward the substantial conquest of polio in the United States.

## II. CONGRESSIONAL CONSIDERATION OF ARRANGEMENTS FOR DISTRIBUTING THE NEW VACCINE

On April 22, 1955, in presenting a citation to the NFIP on the success of the vaccine, President Eisenhower stated that the NFIP and Secretary Hobby were looking into the problems of rapid production and fair distribution.<sup>6</sup> While a National Advisory Committee set up in DHEW was looking at the alternatives for polio vaccine distribution, the NFIP, using vaccine left over from field trials and additional sources secured from the other licensed firms, began free inoculation of all first and second graders through the machinery set up for the field trials.

On April 27, President Eisenhower told his press conference that he envisioned a limited Federal role in distribution. While "I would not hesitate to use any power of Government, if necessary, I just believe that others can do it better." He opposed "\* \* \* any compulsory role for the Federal Government \* \* \* it would slow it up." The National Advisory Committee would establish sound medical and equitable priorities for distribution.<sup>7</sup> On May 4, the President announced that "\* \* \* there will never be a child in the United States denied this

<sup>5</sup> Richard Carter, "Breakthrough: The Saga of Jonas Salk" (New York, Trident Press, 1966), p. 311. See also Fisher, *op. cit.*, p. 76.

<sup>6</sup> U.S. President Dwight David Eisenhower. Citation presented to the National Foundation for Infantile Paralysis and accompanying remarks, April 22, 1955. *In Public Papers of the Presidents. Dwight David Eisenhower, 1955.* (Washington, U.S. Government Printing Office, 1956), pp. 415-6.

<sup>7</sup> President Dwight David Eisenhower. The President's news conference of April 27, 1955. *In ibid.*, pp. 437-8.

emergency protection for want of ability to pay for it.”<sup>8</sup> It was then reported that the President would submit legislation recommending a voluntary State program partially financed by Federal funds for indigent children.

*Early difficulties with quantity production*

Apparently unknown to the reporters questioning the President on April 27, it was announced that same day that the Surgeon General had requested the Cutter Laboratories to withdraw its vaccine lots from the NFIP inoculation program. The Surgeon General reported that some children inoculated with vaccine from the Cutter lots were getting polio—in the limb where the injection was made. Other reports stated that some inoculated children were transmitting the disease to those not inoculated and to susceptible parents.

On April 30, 18 days after the announcement of the success of the vaccine, the Surgeon General advised manufacturers that approval of new lots of vaccine had to await pending revision of PHS minimum safety and production standards. And on May 8, the vaccination program was wholly suspended while the manufacturing processes of all the licensed pharmaceutical firms were reappraised by PHS. On May 27, the PHS promulgated revised manufacturing standards and safety test regulations. Small amounts of vaccine again began to be released to the NFIP; however, the Cutter contractual arrangements were canceled. Finally on June 10, the PHS attributed the problem to faulty manufacturing processes: Clumps of live virus in the vaccine were not being inactivated by the formalin.

*The distribution issue in congressional hearings*

The administration's distribution plan was introduced on May 16, 1955, by Senator H. Alexander Smith, Republican of New Jersey, (S. 1984). It proposed a voluntary system at the State level aided by \$28 million in grants to the States to vaccinate only children in low-income groups. Democratic Members of Congress presented several alternatives for tighter Federal control of distribution, including: (a) free vaccination of all children of critical age groups regardless of need; (b) a Federal program to buy and directly distribute the vaccine to all regardless of means (S. 1781, S. 2147, H.R. 5599, H.R. 5611, H.R. 5696, H.R. 5983, and H.R. 5987); (c) standby or permanent mandatory Federal controls and regulations for the distribution and use of vaccines (S.J. Res. 68, S. 1925, S. 1691, H.J. Res. 297, H.J. Res. 298, H.J. Res. 299, H.J. Res. 300, and H.J. Res. 302).

The initial concern of the congressional committees looking at the issue of polio vaccine was to evaluate the legislative alternatives for distribution. The questions of safety and efficacy were also cautiously explored. Legislators questioned whether the committees concerned with distribution possessed the capability or jurisdictional prerogative to investigate polio research and PHS safety testing and licensing procedures. Yet they realized that the technical issue was intimately related to the legislative alternatives for distribution. Congress sought assurance that it would not be financing distribution of a hazardous biological. It received this assurance and proceeded to arrange for assistance in a national program of distribution. As to the technical problems in PHS, no legislative action was found necessary.

<sup>8</sup> President Dwight David Eisenhower. The President's news conference of May 4, 1955. *In ibid.*, p. 460.

Three committees held hearings on the alternative proposals for Federal intervention in distribution programs: the House Committee on Banking and Currency,<sup>9</sup> the Senate Committee on Labor and Public Welfare,<sup>10</sup> and the House Committee on Interstate and Foreign Commerce.<sup>11</sup>

Major testimony before both House and Senate committees in support of the administration's program for voluntary distribution came from medical staff members of the PHS and DHEW, other officials of the Department, the Bureau of the Budget, spokesmen for the American Medical Association, pharmaceutical producers, and State and local health officials. Individual Democratic Members of Congress and spokesmen for the American Federation of Labor testified in support of a greater Federal involvement.

*Distribution—The administration plan*

Support for the administration's program was voluminous and virtually the same in all hearings. And despite controversy and intervening testimony relating to the need to revise PHS standards, and investigation of scientific matters, the bulk of information presented consistently supported the administration program for voluntary distribution at the State level. Democratic sponsored proposals for stand-by and long-term mandatory Federal control received little support.

The House Banking and Currency Committee was the first of the congressional committees to hold hearings on the distribution alternatives. Dr. Leonard Scheele, Surgeon General of the Public Health Service, led off for DHEW. His initial testimony before the committee (May 6 and 13) was speculative—the National Advisory Committee in DHEW had not yet prepared detailed recommendations for distribution. Nevertheless, when questioned as to the pros and cons of Federal control, Dr. Scheele said that a voluntary program would work, and that medical doctors as well as the pharmaceutical profession had pledged their cooperation.

Asked by Representative Wolcott as to whether the existence of controls by the Government would speed up the program at all, Dr. Scheele replied:

No \* \* \* I don't think it would speed it up. As a matter of fact, I have tried to visualize what we would have to do in establishing the controls. It seems to me it might slow it down, rather substantially \* \* \*. To place that kind of a program would mean the acquisition of a substantial staff of the type we don't have.<sup>12</sup>

To various questions about the extent and effectiveness of the statutory responsibilities held by PHS in the instance of vaccine distribution, Dr. Scheele continued to support existing regulations:

<sup>9</sup> U.S. Congress, House, Committee on Banking and Currency, Salk vaccine hearings before the \* \* \* on H.R. 5599, 5611, 5696, 5987, H.J. Res. 297, 298, 299, 300, and 302, May 6 and 13, 1955, 84th Cong., first sess. (Washington, U.S. Government Printing Office, 1955), 92 p.

<sup>10</sup> U.S. Congress, Senate, Committee on Labor and Public Welfare, Poliomyelitis vaccine hearings before the \* \* \* 84th Cong., first sess. (Washington, U.S. Government Printing Office, 1955), 178 p., 2 parts: Part 1, on S. 1984, and S. 2147, June 14 and 15, 1955, Part 2, on S. 1925, 1976 and S.J. Res. 68, May 16, 1955.

<sup>11</sup> U.S. Congress, House, Committee on Interstate and Foreign Commerce, Poliomyelitis vaccine hearings before the \* \* \* 84th Cong., first sess. (Washington, U.S. Government Printing Office, 1955), 228 p., 2 parts: Part 1, on Poliomyelitis vaccination assistance legislation, May 25 and 27, 1955, and part 2, on scientific panel presentation on poliomyelitis vaccine, June 22 and 23, 1955.

<sup>12</sup> House, Committee on Banking and Currency, Salk vaccine hearings, op. cit., p. 55.

Representative VANIK. As a matter of law, shouldn't the Federal Government have a greater control of a mass inoculation program than was afforded in this instance?

Dr. SCHEELE. I personally don't believe so.

Representative VANIK. You think then it is safe and wise, as a matter of governmental policy, to permit a private organization, or someone outside of the Government, to decide whether or not millions of our youngsters should be inoculated, regardless of what the vaccine is?

Dr. SCHEELE. \* \* \* The final responsibility rests on the individual doctor who gives the \* \* \* injection.

Representative VANIK. \* \* \* In your opinion shouldn't legislation be enacted to provide some real effective control of vaccines designed for a mass inoculation, something special over [and] beyond all other biologicals? This is something different. \* \* \* Where something is being given to a tremendous segment of our population, an entire generation, it seems to me that we owe a higher degree of care, a higher degree of control, than we do in the ordinary private case \* \* \*.

Dr. SCHEELE. \* \* \* I think that our present biologicals control act is pretty adequate.<sup>13</sup>

Responding to a question by Representative Patman about equity in manufacturers' prices, Dr. Scheele replied that the Department considered the quoted prices to be consistent with prices for comparable pharmaceutical products. He assured the committee that there was no danger of a black market in pricing, that private physicians could more efficiently inoculate children than could physicians in the PHS system, that he had assurances from the American Medical Association that physicians would cooperate in charging only a small fee for inoculation or nothing at all, and that manufacturers had agreed that the NFIP would receive the bulk of vaccine to be produced so that they could complete their program of vaccinating all first and second graders.<sup>14</sup>

Replying to additional questions about insuring equitable and geographic distribution in the face of the threat of a 1-6 imbalance in supply and demand, Dr. Scheele assured the committee that the report being completed by the Secretary of Health, Education, and Welfare would address these questions:

\* \* \* Our Secretary is currently assembling material for a report to the President, to be made within a relatively few days, which will contain the whole background of this problem and her recommendations to the President on these very things. This is not an easy matter to arrive at a quick conclusion on, as you can, I think, see after the hearing this morning, because of the varied factors that are currently operating, because of the complicated vaccine itself and the difficulties in its production.<sup>15</sup>

He suggested that the States be given an opportunity to advise the committee on distribution plans:

The States will indicate \* \* \* to the committee \* \* \* made up of outside people, how they would like to see distribution as between tax-supported use and commercial distribution \* \* \* and this then, will give equity of supply flow to the State, and it will give equity as the State and the people in the State see fit to choose between the two uses.<sup>16</sup>

The Secretary's report, outlining a distribution program, was presented to the President on May 16. That same day Mrs. Hobby and other officials of the Department appeared before the Senate Committee on Labor and Public Welfare and reported on the recommendations made to the President on distribution. In offering 11 specific

<sup>13</sup> *Ibid.*, pp. 87, 89.

<sup>14</sup> *Ibid.*, pp. 12, 15, 20, 37.

<sup>15</sup> *Ibid.*, p. 35.

<sup>16</sup> *Ibid.*, pp. 78-9.

recommendations, Mrs. Hobby emphasized the Department's concern for safety of the vaccine :

\* \* \* The safety of the vaccine must always be the first consideration. Distribution must be secondary to safety. The safety of the vaccine released for use will continue to be the responsibility of the Public Health Service Act, and the biologics-control provisions of the Public Health Service Act, and is receiving the constant and diligent attention of the Public Health Service.<sup>17</sup>

Her recommendations detailed the testing responsibilities of PHS and other departmental responsibilities of DHEW; provided guidelines in the determination of priorities for vaccination and distribution of vaccine by NFIP to fulfill its contract to immunize the Nation's first and second graders; and proposed establishment of a committee to oversee international distribution of the vaccine. Mrs. Hobby emphasized that the distribution program could be effectively carried out under existing law, that it should be voluntary, and that Federal funds should be used to buy vaccine only for indigent children :

That the Secretary of Health, Education, and Welfare direct on a national level the division among the States of the entire output of the \* \* \* vaccine \* \* \*.

\* \* \* \* \*  
 That the supplies of vaccine be allocated to each State on the basis of its population of children within the 5-through-9 age group until all children of that group have been vaccinated. [That HEW receive reports from manufacturers and physicians regarding shipping, vaccination, and lot number, for epidemiological study purposes.]

That each State, through an appropriate single agency to be designated by the Governor of the State, direct the distribution of the vaccine within the State. [That the State advise HEW on its ratio between dissemination to public and private agencies.]

[That, commensurate with the bill sent to the Senate] \* \* \* Federal funds [be made] available to the States for the purchase of vaccine \* \* \* sufficient to pay the cost of vaccine for children through age 19 in low-income families.<sup>18</sup>

In justifying the distribution plan preferred by the administration Mrs. Hobby stated :

In our opinion it is both practicable and desirable to permit States and localities to apply these established policies and procedures to their programs for poliomyelitis vaccination.

\* \* \* \* \*  
 These services are well established and accepted in nearly all communities, and they are provided in a manner which is not discriminatory or offensive. Seldom, if ever, is any formal "means test" applied. Rather, free injections are available at clinics or other centers to all who request them, but the great majority of those who are able to pay prefer to go to their family physicians for preventive services as well as for treatment. The arrangement is analogous to the availability of pediatric services from a "well baby clinic" operated by the local health department. Many mothers—particularly in communities where the income is at least average—prefer to take their children to a private pediatrician or family doctor, but there is certainly no stigma attached to the use of the public clinic.

\* \* \* \* \*  
 If [States] wish to adopt special programs for this purpose they should have that privilege, but we see no reason for the Federal Government to require or promote a separate and different local policy for immunization against one particular disease. That many States and communities are willing and able to provide funds for polio vaccination programs is clearly evident. Steps have already been taken by State legislatures, local governments, voluntary organiza-

<sup>17</sup> Senate, Committee on Labor and Public Welfare, Poliomyelitis vaccine hearings, pt. 2 (May 16, 1955), op. cit., p. 131, citing U.S. Department of Health, Education, and Welfare, Report to the President by the Secretary of \* \* \* on distribution of Salk vaccine, May 16, 1955, (Washington, D.C., mimeo, 1955), 34 p. plus appendixes.

<sup>18</sup> Ibid., pp. 129-132.

tions, professional societies, and other civic groups to assure the opportunity of vaccination to children in priority groups. Additional plans for financing the costs of vaccination programs are currently in preparation in other States and communities.

We believe, however, that Federal participation in such financing is desirable in order to provide additional assurance that the opportunity for vaccination will be afforded to all children in all parts of the country. We also believe that Federal sharing in the costs of vaccination will serve to accelerate State and community efforts toward this end, and will help offset variations in State and local financial resources.<sup>19</sup>

Intensive questioning of DHEW witnesses continued in the Senate committee and in additional hearings in the House Committee on Interstate and Foreign Commerce. Many democratic Members of Congress objected to the voluntarism and "means test" provision implied in the administration bill and urged that the Federal Government provide vaccine to all children regardless of income. Mrs. Hobby rejected this as "\* \* \* socialized medicine by the backdoor \* \* \*."<sup>20</sup>

Typical of opposition to this view was the comment by Representative Bennett:

\* \* \* Do you not think it would be better to have the Federal Government take control of this program, not only as to the allocations of the vaccine, but in the manner of providing rules and regulations as to the priority of its use and providing all of the funds that are necessary to carry that out?

\* \* \* My reason for suggesting that is this: This is not a program of socialized medicine. It is not a program that is of special concern to any locality or State. It is a problem of great national concern. To meet it, why would it not be better to have a program of complete Federal control, of complete Federal financing, of this program, until every child from birth through high school age has been inoculated?<sup>21</sup>

Some Members of Congress criticized DHEW's distribution and licensing procedures. Representative Buchanan called the distribution program "a very sorry mess" and said that the lack of a plan had caused confusion, fear, and distress among the parents of our country.<sup>22</sup>

Other Members asked how DHEW might increase the supply of vaccine and improve distribution. They foresaw obstacles in such circumstances as the different and inequitable distribution in the States and the fact that State legislatures, for the most part, were no longer in session. An asserted shortage of vaccine was also foreseen. Some Members, feeling that PHS had a precedent in controlling the allocation of important preventive biologics, inquired into the history of PHS control of diphtheria, smallpox and tetanus vaccine. Dr. Scheele said the PHS had no precedents in this area.<sup>23</sup> Congressional attention was also directed to a comparison of United States and Canadian manufacturing and distribution programs. (Canada manufactured the vaccine in a central-government subsidized laboratory and distributed it through a Province-based operation with national direction.) On this aspect, Representative Multer's comment to Dr. Scheele was that:

The Canadians were able the day they released the vaccine, as we did on April 12, at the same time to put into effect governmental regulations as to the distribution of the product. They made sure that they wouldn't have to wait for the head of the Government to say that "if and when \* \* \* they hear that

<sup>19</sup> *Ibid.*, p. 14.

<sup>20</sup> Senate, Committee on Labor and Public Welfare. Poliomyelitis vaccine hearings. Pt. 1, June 14 and 15, 1955, op. cit., p. 46.

<sup>21</sup> House, Committee on Interstate and Foreign Commerce. Poliomyelitis vaccine hearings. Pt. 1 (May 25 and 27, 1955), op. cit., p. 42.

<sup>22</sup> House, Committee on Banking and Currency. Salk vaccine hearings, op. cit., pp. 57-8.

<sup>23</sup> *Ibid.*, pt. 1, p. 21.

some child can't get this vaccine because they haven't got the money with which to pay for the inoculation he will make people listen." The time for this Congress to make people listen is in advance of that. Mrs. Hobby, I charge, was derelict in her duty in one of two respects: Either she has the power under the law to act, in which event she was derelict in not acting, or she doesn't have the power under the law to act, in which event she was derelict in her duty in not coming before the Congress and saying "Members of the Congress, we need a law so that we can regulate this thing."<sup>24</sup>

The bulk of the June Senate hearings was devoted to the testimony of witnesses favoring the administration proposal of a voluntary program of distribution with minimal Federal controls. Drs. Julian Price and Walter B. Martin, representing the American Medical Association, inserted part of a resolution adopted by the AMA House of Delegates:

\* \* \* disapproving the purchase and distribution of the Salk polio vaccine by any agency of the Federal Government except for those unable to procure it for themselves and that such necessary Federal funds therefore be allocated to the various proper State agencies for such purposes; and be it further *Resolved*, that the American Medical Association urge the Congress of the United States to allow the Salk polio vaccine to be produced, distributed, and administered in accordance with procedures on any new drug or vaccine.<sup>25</sup>

Dr. Price added that the AMA had requested its members to administer vaccine only to those groups for whom priorities had been fixed by the DHEW advisory committee, and that "In accordance with the great traditions of medicine no child will be denied a vaccination because of inability to pay a physician's fee."<sup>26</sup> Dr. Martin inserted a favorable report on the status of State poliomyelitis vaccine programs compiled by the Chief, Bureau of State Service, PHS. It stated that most States and State legislatures were providing for vaccination of children who could not afford to pay. It commended the excellent cooperation achieved by medical societies, pharmaceutical associations and public health officials in developing broad programs. The only unresolved problem "\* \* \* was equitable geographic distribution within the State."<sup>27</sup>

Dr. R. H. Hutcheson, chairman of Committee on Federal Relations of the Association of State & Territorial Health Officers, said his organization favored:

\* \* \* A voluntary system of Federal distribution of poliomyelitis vaccine among the several States to go into effect as soon as the National Foundation for Infantile Paralysis orders have been filled; that the system of distribution of poliomyelitis vaccine within the individual States be left to each State to decide whether the State system is voluntary or mandatory, this system to be determined by each State agency in charge of the distribution program after consideration of the needs, resources, and attitudes of the people in that State.<sup>28</sup>

In justification he added:

I can't see that administrative justification for making a special program out of something that has nothing special about it except that it has attracted the attention nationwide, emotional attention, if you will, of the peoples of this country, and they are clamoring for something to be done immediately.<sup>29</sup>

Mr. Basil O'Connor, president of the national foundation, reviewed the role of the NFIP in development and field testing of the vaccine.

<sup>24</sup> *Ibid.*, p. 64.

<sup>25</sup> Senate, Committee on Labor and Public Welfare. *Poliomyelitis vaccine hearings*, Pt. 2, op. cit., pp. 82-3.

<sup>26</sup> *Ibid.*, p. 83.

<sup>27</sup> *Ibid.*, pp. 90-93.

<sup>28</sup> *Ibid.*, p. 51.

<sup>29</sup> *Ibid.*, p. 56.

He described consultations with various medical associations and their assistance in determining priority age groups in carrying out the field test. He also detailed the NFIP program for distributing vaccine to all the Nation's first and second graders. He judged the States to have ample experience and administrative machinery to meet NFIP goals. He did not comment on the capability of PHS distribution mechanisms; also, he said NFIP would not accept Federal funds to purchase vaccine to carry out its program, but would accept vaccine bought by the Federal Government and given to the NFIP to distribute.<sup>30</sup>

Further support of a voluntary program was expressed in communications from the American Drug Manufacturers' Association and the American Medical Association.

The bulk of testimony supporting the Democratic proposals for greater Federal control of the purchase and distribution of the vaccine came from legislators who had introduced bills supporting this position and from George Meany, president of the American Federation of Labor. He said:

\* \* \* We are concerned that the first announcements listing the representatives who are to be invited [to the HEW Advisory Committee] appear to include only professional and business groups and not the people who are most concerned—the parents of the children of America. \* \* \* The matter of distributing the vaccine presents basic economic, social, and humanitarian problems which are not within the special competence of the medical profession and the pharmaceutical industry. The American Federation of Labor calls upon the President \* \* \* to broaden the invitations to the conference \* \* \*.

\* \* \* No American child should go without [the vaccine] because his parents have low income, or live in a place with few doctors \* \* \*. To achieve these ends an official national policy is necessary, and if any such policy is to be effective, a substantial part of the supply of the Salk vaccine must be purchased and distributed through the public health agencies.<sup>31</sup>

### III. THE SAFETY AND EFFICACY ASPECTS OF THE VACCINE

Only one bill, and that indirectly, addressed the questions of safety and efficacy of the vaccine. These questions were recognized as both germane and formidable.<sup>32</sup> The legislators appeared divided as to whether to tackle such technical issues.

On May 6, Representative Joseph P. O'Hara asked:

Is it the responsibility of this committee and within our jurisdiction to determine whether this is a good product or not or are we concerned solely with the matter of controlling its distribution to assure its getting to the people who need it regardless of their financial status?

Representative Abraham Multer assured him that it should be the responsibility of the committee to consider all problems:

\* \* \* whatever committee gets the bill must consider all the problems involved. These are necessarily related problems.

Representative Patman, the committee chairman, disagreed:

<sup>30</sup> Ibid., pp. 102–121, especially pp. 113–116.

<sup>31</sup> Ibid., p. 122.

<sup>32</sup> At that time, in the Congress, the issue of distribution method of the vaccine was foremost, and questions of efficacy and safety were considered secondary. At a later date, and on another medical issue, this order of priority was reversed. See ch. 14 on the *Thalidomide* case, which dramatized the possible hazardous consequences of premature wholesale distribution of a new medication.

I don't think it is the function of this committee to determine the quality of this product. If we have to do that, I want to resign now because I am not capable of going into it. I think distribution is what we are interested in.<sup>33</sup>

In the Senate hearings, the chairman had stated its concerns in his opening statement thus:

First, we would like to know whether we now have a safe poliomyelitis vaccine \* \* \* Secondly, is it sound public policy, from a public health point of view to encourage and urge our local communities to vaccinate just as many children as possible, as quickly as the vaccine become available, or as soon as possible before the onset of the 1956 polio season?<sup>34</sup>

However, Senators Allott and Purtell protested that this double objective, especially that of looking into technical problems, had not been agreed to in executive session. They added, furthermore, that the witness roster, consisting mainly of the Secretary and other spokesmen for DHEW, would need to be augmented to insure objective coverage.<sup>35</sup>

Accordingly, these two committees did not probe deeply into questions of efficacy and safety of the vaccine, nor was any additional canvass made to find disinterested witnesses who could enlighten them on these technical matters. Scientific and technical information was forthcoming from PHS and DHEW most usually only in response to intensive interrogation by committee members. Because the situation was in flux—PHS had suspended the program, revised standards, encountered manufacturing difficulties, halted production without public explanation, and then renewed it—it was evident that clarification was needed. Testimony before the two committees did not altogether satisfy the need.

*Initial congressional probes of the safety and efficacy issue*

DHEW spokesmen appeared to be on the defensive. They explained that they had done everything possible to foresee and to correct faulty production and testing standards and asserted that the situation was under control. These answers did not quiet congressional anxieties, nor serve to allay criticism being expressed in editorial comment at the time.<sup>36</sup> Congressional inquiry into technical matters touched on—

- timing and extent of publicity attached to the Francis report;
- licensing and testing responsibilities of PHS;
- danger of contracting hepatitis from impurities in the vaccine;
- need for additional research;
- need for a substitution of strains;
- the merits of an oral (attenuated) versus an injected (killed) vaccine; and
- factors to be evaluated in determining calculated risk.

In his first appearance before the Congress, in testimony before the House Banking and Currency Committee, Dr. Scheele explained that there were three types of virus which caused polio, and that, according to the results of the Francis report, the Salk vaccine was 60 to 90 per-

<sup>33</sup> House. Committee on Banking and Currency. Salk vaccine hearings, op. cit., p. 22.

<sup>34</sup> Senate. Committee on Labor and Public Welfare. Poliomyelitis vaccine hearings, op. cit., p. 7.

<sup>35</sup> *Ibid.*, pp. 8-9.

<sup>36</sup> Several stories in the New York Times had such leads as: U.S. PHS orders temporary withdrawal from use of vaccines made by Cutter Laboratories of Berkeley, Calif., as six cases of paralytic polio occur in children recently inoculated (New York Times, Apr. 28, 1955, p. 1); Salk urges thorough probe to determine whether there is link between vaccine and polio cases (New York Times, Apr. 28, 1955, p. 1); Three doctors report studies indicate vaccine was contributing cause in 10 polio cases in Idaho (New York Times, May 5, p. 21); and, Scheele urges suspension of inoculations continue until after plant-by-plant check of manufacturing process (New York Times, May 9, 1955, p. 1).

cent effective in preventing paralytic polio in those inoculated. Then he cautiously gave some indication of the calculated risk theme which would later be questioned in depth by the House Committee on Interstate and Foreign Commerce. He explained that a vaccine cannot be 100 percent perfect:

It is a wonderfully effective vaccine, but like most vaccines and serums we have developed through time are never perfect. We are constantly improving them, and you have probably discovered that even now reports are made on work that has been in progress for a number of years on types of polio vaccine, other than the Salk vaccine.<sup>37</sup>

When asked if PHS had rushed into licensing the vaccine and if that was the cause of the current problems, Dr. Scheele answered that PHS had determined to take a calculated risk, but that appropriate safeguards had been taken:

\* \* \* Well, that, I think, would be a matter of opinion. It is one of these difficult problems. A member of my staff tried to describe this thing as taking all of the scientific data, and the scientists' opinions, of the known and the unknown—and in science we have many unknowns—and you can spread them out over a spectrum and they will run through shades of gray, but when it comes then to decisions as to whether or not smallpox vaccine is ready to go or typhoid vaccine was ready to go, yellow fever vaccine was ready to go, at a certain point, someone interested in overall public health, an epidemiologist, or someone else with similar qualifications, makes a decision as to whether the factors in the unknown outweigh the factors in the known sufficiently, in relation to the disease one is trying to conquer to lead us to wait.

Now, we could have waited. There were people who said that the field trials should not have been done, and there were people who said that this year's large-scale program should not be done. But those people were also saying indirectly that another 30 or 40 thousand children should have polio.

So what we have here, I think, both in the case of the field trial, and the program on a large scale this year, we had a weighed, medical decision that we should go ahead. We must remember that 5½ million children—of that number, 300,000 or so had Cutter, and we can cross that off as we don't know the answer to whether that was the problem or not at the moment, we can cross that off—had vaccine safely, with 12 cases of polio in that group. That is running below our expected occurrence, that we would expect to occur naturally.

So, I would say, the balance is way in favor of the decision taken at the present time, and we have safeguards, we have additional safeguards \* \* \*.<sup>38</sup>

He then told how the Public Health Service had prescribed requirements for production of the vaccine and for safety testing and had then proceeded to license six manufacturers to produce the serum. He explained the limitations of licensing:

A license means that the company, the plant, is good, that there is demonstrated experience in production of biological products, and that in general, there is confidence in the ability of the plant to produce a suitable product \* \* \*. A license does not however clear vaccine for use.<sup>39</sup>

Dr. Scheele then defined the responsibility of PHS, under the Biologics Control Act, to check the product for safety. PHS, he said, did not test all lots or even samples of all lots, but relied on the written history of the manufacturing process:

As the manufacturer gains experience, and as we see ourselves that his processing is good, we then approve lots of vaccine, after very critical review of a document we call a protocol. A protocol is a series of about 30 pages of information recorded by the people manufacturing the vaccine, giving every stage in that process, and we are able normally in that review to detect flaws in the

<sup>37</sup> House, Committee on Banking and Currency. Salk vaccine hearings, op. cit., p. 10.

<sup>38</sup> *Ibid.*, p. 58.

<sup>39</sup> *Ibid.*, p. 11.

production method, if there are any. We are able to review the potency testing they have done, and able to review the safety testing they have done.<sup>40</sup>

When questioned about the defects of the Cutter vaccine, Dr. Scheele explained that no causality had been determined and the matter was under study.

\* \* \* As of the moment, we are not in a position to say that the Cutter vaccine caused the polio in these children, and it will be quite some time before we can determine that, if we can determine it. This is a matter that requires careful study. All of those materials that were used are under study at the present time, and we will, of course, in due time see whether we can tell definitely yes or no.<sup>41</sup>

He added that: "There is a possibility that there may have been some live virus that caused it," and that "There is a possibility that these cases were sheer coincidences, that these children had polio virus and would have developed polio anyway."<sup>42</sup>

The questions of the safety and efficacy of the Salk vaccine formula were not raised by PHS in these hearings. In response to a question by Representative Vanik about whether more testing of the vaccine would be needed before it could be declared effective, Dr. Scheele replied:

That would be impossible, the experiment has been completed and the efficacy of the vaccine shown.

Later he added that evaluation of moral issues compelled PHS to license the vaccine immediately, prior to doing more research:

I think we had had enough testing, that it was worth trying to do something about polio in 1955, and not wait until 1956 \* \* \*. And the decision was taken at that time, that the enemy we were fighting in polio was worth moving toward without taking too much time to do more research before we finally put the product into use.<sup>43</sup>

He then went on to say that investigations of new cases of polio caused by the vaccine would be examined by the recently activated polio epidemic intelligence activity in the Atlanta Communicable Disease Center.<sup>44</sup>

Many legislators took exception to the statistical conclusions of the Francis report and the subsequent interpretation of data contained in it.<sup>45</sup> Others were distressed by the rush to publicize the report and the contribution of this activity to charges of poor PHS administration. They felt that this action, coupled with the later defects found in manufacturing, had contributed to public apprehension and emotionalism about the issue.<sup>46</sup>

Senator Hubert Humphrey said:

I think it is generally known that this was a major public information extravaganza, so to speak—there was television, there was radio, and there was press. As a result of that, with the tremendous interest of the American people

<sup>40</sup> *Ibid.*, pp. 12, 17.

<sup>41</sup> *Ibid.*, pp. 18-19.

<sup>42</sup> *Ibid.*, p. 19.

<sup>43</sup> *Ibid.*, pp. 87-88.

<sup>44</sup> *Ibid.*, p. 4.

<sup>45</sup> *Ibid.*, pp. 60-76.

<sup>46</sup> Regarding public apprehension, Carter reports on a New York Times story printed in mid-May 1955. "The result of all the confusion," commented the New York Times, 'has been twofold. First, the Nation is now badly scared. Never before have reports of the number of polio cases been so widely publicized and so carefully studied. Millions of parents fear that if their children don't get the vaccine they may get polio, but if they do get the vaccine, it might give them polio. This fear was evident in New York State last week. The National Foundation for Infantile Paralysis \* \* \* received enough of the cleared Parke, Davis vaccine for New Yorkers. But as many as 30 percent of the children who had applied for injections last month failed to turn up last week.'" (Carter, *ibid.*, p. 327.)

in the discovery of the vaccine and its final approval, there naturally was great interest in the use of the vaccine.<sup>47</sup>

He then related this to the distribution testing and policing policies of PHS and asked Dr. Scheele: "What part did the U.S. Public Health Service \* \* \* or the Department of Health, Education, and Welfare, make in this launching of Dr. Francis' report and the announcement by Dr. Salk of the efficacy of the vaccine?" Scheele denied any PHS share of responsibility in organizing the presentation, attributed the publicity to the NFIP, and added:

The role we played on that day was twofold: We were eager listeners. I wasn't personally, but members of my staff were. And in addition to that, Dr. Workman, who directed our Laboratory of Biologics Control, was one of the scientific speakers on the program. He described the standard for the production of vaccine at that scientific meeting.<sup>48</sup>

Dr. Julian Price, of the AMA, also criticized the method of presentation of the Francis report. He presented a resolution adopted by his organization which reaffirmed:

\* \* \* the need for the presentation of reports on medical research before established scientific groups allowing free discussion and criticism, and the publication of such reports, including methods employed and data acquired on which the results and conclusion are based, in recognized scientific publications.<sup>49</sup>

Dr. Martin of the AMA stated that the potential emergency of a polio epidemic was not as threatening as believed:

We do not feel that there is any emergency in this particular situation that justified this procedure in this case. I do not think you can generalize completely on that. Your decisions have to be made according to the needs of an emergency situation that might arise with some acute epidemic disease.<sup>50</sup>

Some committee members sought advice as to whether any legislative action was feasible to hasten the production of a safe vaccine. Mrs. Hobby replied that some manufacturers were building additional plants and beyond this no additional initiatives were needed. She referred the scientific aspects of the questions to Dr. Scheele. He added that "I do not believe there is anything that can be done to speed up the process \* \* \*." Upon further questioning he revealed where research was needed and indicated deficiencies in present scientific understanding:

There is something that will help to speed it up, I think. The manufacturers will be doing research on the methodology of production, and undoubtedly as time passes they will improve the grade of virus in their culture bottles \* \* \*.

\* \* \* And one of the things that we have started to do and will continue to do is some research on methodology of testing. And it may be that as the months pass we will devise different techniques for testing which of themselves may speed up the rather cumbersome tests that science knows today.

For example, we use monkeys, and we carry these monkeys for 30 or 35 days before they are sacrificed and the cords in their brains are studied.

With continued research we may devise new methods which may cut down time and energy that has to be put into production, and by that very device permits speedups to occur.

He did not recommend, however, that Congress should attempt to enact legislation to improve the research process:

<sup>47</sup> Senate. Committee on Labor and Public Welfare. Poliomyelitis vaccine hearing, op. cit., p. 165.

<sup>48</sup> Ibid., pp. 165-6.

<sup>49</sup> Ibid., p. 82.

<sup>50</sup> Ibid., pp. 100-101.

But these are not matters of legislation, those are matters for scientists in the manufacturing plants and scientists elsewhere in the country and universities and their own laboratories doing their normal job of research.<sup>51</sup>

*Technical questions probed by House Commerce Committee*

A deeper inquiry into the technical aspects of the Salk vaccine was undertaken by the House Committee on Interstate and Foreign Commerce, under the subcommittee chairmanship of Representative J. Percy Priest, which had jurisdiction over PHS. The committee had earlier held hearings on polio research and had received considerable information on the pros and cons of attenuated versus killed vaccine.<sup>52</sup> The inquiry was renewed in 1955 in connection with a bill introduced by Chairman Priest, H.R. 6207, to raise the question of investigating PHS procedures with respect to licensing a vaccine, specifically:

\* \* \* For the purpose of raising the question whether permanent legislation is needed granting powers to the Secretary of Health, Education, and Welfare, through an amendment of the biologics control law to control, through regulations, in the interest of public health, the distribution and use of biological products.<sup>53</sup>

At the outset of the hearings, the chairman issued a list of questions which he wanted witnesses to consider:

A. RESPONSIBILITIES OF FEDERAL GOVERNMENT UNDER PRESENT LAW

1. Under present law, what are the responsibilities of the Federal Government with respect to new drugs as to (a) production and safety; (b) distribution; and (c) application and use?

2. Under present law, what are the responsibilities of the Federal Government with respect to new biological products, as to (a) production and safety; (b) distribution; and (c) application and use?

3. Under present law, what are the responsibilities of the Federal Government with respect to certain new drugs, including insulin, and several specifically enumerated antibiotics, as to (a) production and safety; (b) distribution; and (c) application and use?

4. What accounts for the difference in responsibilities?

5. Is this difference in responsibilities justified?

B. RAPID MASS APPLICATION VERSUS GRADUAL INDIVIDUAL APPLICATION

6. Are there any public policy considerations which distinguish rapid mass application of new drugs from gradual individual application with regard to (a) production and safety; (b) distribution; and (c) application and use?

7. Do these considerations differ according to whether such drugs are primarily preventive or curative?

C. RESPECTIVE RESPONSIBILITIES

8. What are the respective responsibilities (legal and other) in connection with rapid mass applications of new drugs (a) preventive, or (b) curative of—

A. Governmental agencies (Federal, State, and local)?

B. Voluntary agencies?

C. Manufacturers, wholesalers, retailers, and pharmacists?

D. Medical profession (individually and collectively)?

E. Others?

9. Are these respective responsibilities the same in the case of rapid mass application and in the case of gradual individual application of new drugs?

10. Are present Federal laws adequate for the discharge of Federal respon-

<sup>51</sup> *Ibid.*, pp. 142-143.

<sup>52</sup> U.S. Congress, House, Committee on Interstate and Foreign Commerce, Health Inquiry (Polio myelitis). Hearings before the \* \* \* on the Causes, Control, and Remedies of the Principal Diseases of Mankind. Pt. 3, Oct. 6 and 12, 1953, 83d Cong., 1st sess. (Washington, U.S. Government Printing Office, 1953.)

<sup>53</sup> House, Committee on Interstate and Foreign Commerce, Polio myelitis vaccine. Hearings, pt. 2, op. cit., p. 3.

sibilities in connection with rapid mass application and gradual individual application of new drugs (preventive or curative) with regard to (a) production and safety; (b) distribution; and (c) application and use?<sup>54</sup>

The May 25 hearings were opened with the testimony of Roswell B. Perkins, Assistant Secretary of Health, Education, and Welfare, who spoke for Mrs. Hobby. Mr. Perkins described the activities of DHEW immediately after information had come to the Department that some lots of the vaccine were causing polio in inoculated children. He reviewed how the Division of Biologics Control had dispatched scientists to study the manufacturing process at the Cutter laboratories; these scientists, May 8, had recommended that the vaccination program be temporarily halted pending revision of standards.<sup>55</sup> Dr. Scheele then told the committee about the destruction of the lots of Cutter vaccine; however, he could only speculate on what had been wrong with them. The infected children might have had lower natural immunity than those who were not infected, or they might already have been infected by polio virus from a natural source, or there could have been live virus remaining in the vaccine.<sup>56</sup>

Dr. W. H. Sebrell, Jr., Director of the National Institutes of Health, recounted the development of the vaccine and indicated some of the difficulties that PHS had faced in the safety testing of earlier field trial lots. He reviewed the formation of a vaccine advisory committee to assist PHS in determining minimum safety requirements. He then detailed the complexity of the vaccine manufacturing process and illustrated the difficulties of arriving at the appropriate margin of safety.

I may say that the production of Salk vaccine is an intricate manufacturing process. Whenever you move from a laboratory process, you always run into changes for which you have no previous experience. In making the Salk vaccine, if you overtreat it, you have nothing. It has no potency, no ability to immunize. If you do not treat it quite enough, it may have enough live virus in it to cause paralytic polio. Therefore, you have to operate within a range that is safe within these two extremes, one, complete destruction of its ability to confer immunity, and the other, as much safety as you can put around it so that there is not enough live virus in it to cause disease.

\* \* \* In safety testing you can never be absolutely certain in a biological product that the product in one particular vial is absolutely safe, because the only way you could determine that would be to test every drop of stuff in that vial. Then you would not have anything to use. So you set up the best test you can devise to reduce the chances to as near zero as you possibly can, and then you let the product go on the basis of its probability of complete safety. There is no other way to arrive at that \* \* \*.<sup>57</sup>

Dr. Sebrell also listed the potential human and mechanical pitfalls in safety testing faced by large-scale vaccine manufacturers. And finally, for the first time, Dr. Sebrell admitted what had been wrong with the Cutter vaccine and administrative flaws of PHS in licensing the vaccine prematurely. In part he said:

The committee was able to learn from manufacturers that inactivation \* \* \* sometimes fails in the plant for no immediately apparent reason. There was evidence also that the safety tests were perhaps less sensitive than was desired. On some occasions, pools of virus, each containing a single type and each negative after inactivation, were combined into what are called polyvalent pools, which then gave positive tests \* \* \*.

The supposed margin of safety conferred by inactivation, far beyond the calculated period, appeared no longer to be fully dependable. The sensitivity of the

<sup>54</sup> *Ibid.*, p. 4.

<sup>55</sup> House, Committee on Interstate and Foreign Commerce, Poliomyelitis vaccine. Hearings, pt. 1, op. cit., p. 19.

<sup>56</sup> *Ibid.*, pp. 26-29.

<sup>57</sup> *Ibid.*, pp. 47-48.

safety test in the light of the manufacturers' experience was less than satisfactory. It appeared, though it was not yet established, that live virus might be surviving even the most rigorous processing and escaping detection in the safety test \* \* \*.

On the basis of this new information, the committee agreed that changes in the minimum requirements should be considered. They felt that inactivation could be more rigidly controlled and safety testing could be improved \* \* \*.

[Additional information] indicated that all [the] plants were having problems in processing that tended to lessen confidence in the safety of commercially processed vaccine in general \* \* \*.

[Additionally secured] data were studied, and indicated a lack of sensitivity of the safety test, and this convinced the scientific advisers that even more stringent criteria must be applied both to finished lots, waiting to be assessed for release, and to those still in production or to be produced \* \* \*.

The committee, on May 23, recommended changes in processing controls and in safety tests.

\* \* \* Some vaccine, but not as much as we hoped, is going to be available soon.<sup>58</sup>

On June 10, 1955, Dr. Scheele released the technical report completed by the HEW Vaccine Advisory Committee on the Salk vaccine. It was quite candid in citing problems encountered in the inactivation process itself, and in detailing mistakes made by both manufacturers and the PHS. First the report criticized the manufacturers for not reporting problems they had encountered in the inactivation process of lots not reviewed by PHS:

The intensive investigations of the past 5 weeks indicate that the records which manufacturers were required to submit did not include certain data which are essential for an adequate assessment of consistency in performance. The protocols submitted related only to lots of vaccine proposed for clearance, and gave no information concerning lots discarded in the course of manufacture. Further, the information requested did not bring out certain data on processing and testing now known to be important.

The total experience of the manufacturers now reveals that the process of inactivation did not always follow the predicted course, since positive tissue culture tests not infrequently occurred after the expected completion of the inactivation process. Greater dependence, therefore, must be placed on sensitive tests for very small quantities of residual live virus as part of process control than would otherwise be the case.<sup>59</sup>

By implication, Scheele's report also criticized the NFIP for its haste in rushing to develop and manufacture the vaccine before the accumulation of adequate scientific knowledge:

The vaccine has progressed from the experimental level to large-scale production with unprecedented rapidity \* \* \*.

Events have been telescoped in time that the vaccine has been developed, tested, and used in a matter of months instead of years. Procedures which appeared sound and adequate several months ago on the basis of experience up to that time, have had to be modified in the light of scientific and technical data now available.<sup>60</sup>

Included in the report were PHS's new official mandatory regulations for safety testing and processing. Among them were: "Required uniformity of sampling," "application of more tests at two critical points in the manufacturing process." necessity for the manufacturer to "test a random sample of vaccine from the final containers of each

<sup>58</sup> *Ibid.*, pp. 47-50.

<sup>59</sup> U.S. Department of Health, Education, and Welfare, Public Health Service, Technical Report on Salk Poliomyelitis Vaccine, June 1955 ([Washington], Department of Health, Education, and Welfare, June 1955, mimeo), p. 3.

<sup>60</sup> *Ibid.*, pp. 4, 88.

lot," "substitution of less virulent type I strains for the Mahoney strain," "modification of physical arrangements during processing," and revision in several processing and testing sequences.<sup>61</sup>

The report also recommended that the Public Health Service take action to correct the problem. Among the actions proposed were:

Amendment of minimum requirements for the production and testing of poliomyelitis vaccine; incorporation of minimum requirements in official regulations as mandatory standards; creation of a technical committee on poliomyelitis vaccine; creation of a division of biologics standards, with strengthened staff and facilities; increased on-site plan surveillance and consultation; reoriented testing and research program; establishment of poliomyelitis surveillance unit; and review of legislative authority.<sup>62</sup>

Perhaps the most important action taken by PHS had been reorganization of the structure and function of the agency to improve the licensing and safety testing of new biologicals. The Division of Biologics Standards was created, new staff added, and additional administrative and testing facilities provided. The division was given responsibility for testing, as well as devising new safety tests and keeping up with the "trends, advances, and problems" of biologics control. A new emphasis was placed on on-site industrial testing so that PHS officials could both assist manufacturers and test the safety of new products during the development stage.<sup>63</sup>

#### *Additional sources of technical information tapped by Commerce Committee*

The first 2 days' testimony received by the Commerce Committee was primarily from executive officials; although in greater depth, it was similar to that received by the two other congressional committees which were investigating the matter. Then, on June 22-23, to supplement this testimony, the subcommittee opened a 2-day seminar on the issue. Participants were a panel of scientists, organized for the committee by the National Academy of Sciences. Representative Priest explained the need for scientific advice as follows:

I have felt for quite some time that there were two questions involved in the consideration of the legislation which should be considered separately and apart. One is a scientific question—a medical question. The other is a social question. In my opinion it is important that we discuss these two questions separately.<sup>64</sup>

\* \* \* So many conflicting statements had been made by public officials, private groups, and individuals connected with the production, safety, testing, distribution, and application of the vaccine that it was necessary to obtain independent scientific advice, primarily with respect to the safety of the vaccine, before taking action on any legislation providing for Federal funds for the purchase of the vaccine.<sup>65</sup>

The panel discussion held by the Health and Science Subcommittee opened on June 22 soon after the release of the PHS report. Dr. John R. Paul, of the Yale University School of Medicine served as discus-

<sup>61</sup> *Ibid.*, pp. 69, 89.

<sup>62</sup> *Ibid.*, pp. 4-5.

<sup>63</sup> *Ibid.*, pp. 91-93.

<sup>64</sup> House, Committee on Interstate and Foreign Commerce. Poliomyelitis vaccine, hearings, pt. 2, op. cit., pp. 131-132.

<sup>65</sup> U.S. Congress, House, Committee on Interstate and Foreign Commerce. Poliomyelitis Vaccination Assistance Act of 1955. H. Rept. 1186. In Congressional and Administrative News, 1955, pt. 2, p. 3056.

sion leader.<sup>66</sup> He outlined the agenda of items to be discussed and cautioned the panel and the committee that "there may well be differences of opinion expressed. \* \* \* and that \* \* \* the popular belief \* \* \* that scientists should not disagree \* \* \* is subject to some modification."<sup>67</sup>

The first discussant, Dr. Albert Sabin, described the incidence of polio within the country and detailed epidemiological variations due to type of virus, age, and types of infection and presence of natural immunity.<sup>68</sup>

Dr. Joseph Smadel, virologist with the Army's Walter Reed Medical Center, gave a detailed comparison of the advantages and disadvantages of inactivated (Salk) vaccine and attenuated (Sabin) vaccine. (Although Congress did not directly treat this question, it was salient for the scientists debating the continuance of the Salk vaccine program.) Advantages of the live attenuated virus included the small amount of vaccine required for antibody production and ease of manufacture. A disadvantage was the difficulty in finding a good mild strain that would be both potent and safe. The advantage of the killed virus was that any strain could be used as long as properly killed. Its disadvantages were that several large injections of vaccine were required for effectiveness; immunity was probably only temporary; and achievement of the proper degree of inactivation was difficult without harming the potency of the virus. Moreover, the inactivated virus vaccine contained animal tissue, used in culturing the vaccine, so that there was a possibility that the inoculated person might contract hepatitis or other infection.<sup>69</sup>

The discussion then moved to an assessment of both types of vaccine. Dr. Francis asserted that the Salk process was sophisticated enough to remove all hazardous animal impurities which might cause infection.<sup>70</sup>

Dr. Stanley stated that it would be much too expensive for the commercial manufacturer to eliminate all of the potentially hazardous animal protein. Salk asserted that all studies done on humans inoculated with the vaccine, which contained kidney tissue, showed that the hazard of infection from animal impurities was nil.<sup>71</sup> However, Dr. Smadel concluded that:

When one considers all of these theoretical advantages and disadvantages, most virologists usually conclude that a good live attenuated virus is preferable to a dead one \* \* \*.<sup>72</sup>

<sup>66</sup> Other panelists were: Dr. Daniel Bergsma, commissioner of health, New Jersey, and vice president, Association of State & Territorial Health Officers; Dr. John F. Enders, Children's Hospital, Boston; Dr. Thomas Francis, Jr., School of Public Health, University of Michigan; Dr. Horace L. Hodes, pediatrician in chief, Mount Sinai Hospital, New York, and member, Committee on the Control of Infectious Diseases, American Academy of Pediatrics; Dr. Frank L. Horsfall, Jr., Rockefeller Institute for Medical Research, New York; Dr. Collin MacLeod, Bellevue Medical Center, New York; Dr. Manfred M. Mayer, School of Hygiene and Public Health, Johns Hopkins University, Baltimore; Dr. Julian P. Price, member, board of trustees, American Medical Association; Dr. Thomas M. Rivers, Rockefeller Institute for Medical Research, New York; Dr. Albert B. Sabin, Children's Hospital Research Foundation, Cincinnati; Dr. Jonas E. Salk, Virus Research Laboratory, University of Pittsburgh, Pittsburgh; Dr. James A. Shannon, Associate Director, National Institutes of Health; Dr. Joseph E. Smadel, Army Medical Services, Graduate School, Walter Reed Army Medical Center; and Dr. Wendell M. Stanley, Biochemistry and Virus Laboratory, University of California, Berkeley.

<sup>67</sup> House, Committee on Interstate and Foreign Commerce, Poliomyelitis vaccine, hearings, pt. 2, op. cit., p. 132.

<sup>68</sup> *Ibid.*, pp. 134-136.

<sup>69</sup> *Ibid.*, pp. 139-141.

<sup>70</sup> *Ibid.*, p. 141.

<sup>71</sup> *Ibid.*, pp. 145, 147.

<sup>72</sup> *Ibid.*, p. 141.

Dr. Salk gave a detailed presentation of the theory and history of the production of his vaccine. Upon questioning he assured the panel and the committee that the advantages of using the controversial Mahoney strain, the most virulent paralytic strain then isolated, outweighed the disadvantages because the inoculated individual would then have immunities against this extremely severe form of polio. He added, however, that work was continuing on development of a less virulent vaccine. He also assured the panel that the manufacturing process was designed to insure that the viruses do not become reactivated after inoculation; the inoculated child could not transmit the disease unless there was something wrong with the vaccine.<sup>73</sup>

Much of the panel presentation concentrated on the manufacturing process and safety precautions used to insure that all the virulent virus had been inactivated. Dr. Stanley described the inactivation process—the chemical reaction between formalin and the virus proteins. But assurances of safety could not be given by chemists, he concluded, until they learned about the inactivation process. At the same time, they were working on the use of ultraviolet rays as a complementary inactivating agent.<sup>74</sup>

Dr. James Shannon, assistant director, National Institutes of Health, gave an overview of the manufacturing methods and of safety precautions. He stated that not only the Cutter laboratories, but all of the producers had difficulty with clumps of live virus remaining in the vaccine. He presented an overview of revised PHS safety regulations: revision in the time schedule for killing and checking the virulence of the virus, improvement of culture tests to discriminate between positive and negative virus, and the addition of more safety tests, especially after the lot had been declared safe.<sup>75</sup> There followed a lively debate between scientists asked by Representative Wolverton as to whether to recommend complete suspension or continuation of use of the Salk vaccine, and whether to recommend substitution of a less virulent strain for the Mahoney virus in that vaccine. Dr. Sabin, who was then working on the development of an oral attenuated polio virus, was most outspoken about halting the Salk program. He stated that while the new safety tests were an improvement, the vaccine was still not safe because of the use of the virulent Mahoney strain. He added:

I am fully aware of the excellent humanitarian motives of those people who do not want to wait until the best possible vaccine has been developed to provide this protection to those who may get it now. Their motives are of the best and highest \* \* \* But in attempting to do it at a time when we cannot be absolutely certain of avoiding another incident such as has occurred, we may eventually do more harm than good by going too fast. For that reason, the decision I have reached for myself \* \* \* is that it would be much better as of now, for the manufacturing companies to stop further production of this current vaccine with the dangerous strains, and immediately get to work \* \* \* to see whether or not they can produce antigenically equally as good vaccine with the other strains which are now available.<sup>76</sup>

Representative Wolverton pressed for an immediate vote of the panel on the two issues: the use of the Mahoney strain and the continuation or suspension of the program. Sabin stated his position, and inserted a letter agreeing with him from Dr. W. McD. Hammon, a panelist from

<sup>73</sup> *Ibid.*, pp. 150–158.

<sup>74</sup> *Ibid.*, p. 171.

<sup>75</sup> *Ibid.*, pp. 162–166.

<sup>76</sup> *Ibid.*, p. 170.

Dr. Salk's University of Pittsburgh, who could not appear at the hearing. The other panelists did not want to commit themselves at this point and continued the debate.

Dr. Stanley of Walter Reed criticized the NFIP methods of publicizing the report, saying that it did not advance scientific inquiry.

This is the first time in history \* \* \* when a scientific program has gone ahead pretty much on the basis of not completely unpublished work; but work which is not readily available to scientists generally.

He added that the National Foundation for Infantile Paralysis had tried to speed up the process by appointing a committee to oversee research and analysis, but that the procedure was faulty and should not be repeated.

I would hope that in the future that scientific accomplishments and discoveries would be published and made available to all throughout the world for checking and double checking \* \* \*.<sup>77</sup>

The panelists then explored the merits of PHS testing procedures. Dr. Shannon stated that improvement of such techniques was under study. Dr. Salk said that currently used techniques were sufficiently precise and did show the presence of dangerous live virus in the Cutter vaccine lots. Other members of the panel withheld judgment on the question either because they had not been provided with all necessary information, or because they said, they were not qualified to answer.<sup>78</sup>

As the pressure for taking the vote mounted, Dr. Paul repeated that both panelists and committee members would have to interpret the decision made as one of calculated risk:

\* \* \* What we will be discussing and voting upon is a problem of calculated risk. This problem comes to every clinician who treats sick patients a dozen times a day. There are dangers in doing this, there is good in doing this; there is no arbitrary answer. It is a question of calculated risk.<sup>79</sup>

Chairman Price told the committee and the panelists that the committee did not have the responsibility for making scientific decisions, but that he wanted it made known that he expected the information presented in the panel to help the PHS in solving many of the problems brought out in the discussion:

This committee \* \* \* has the responsibility to decide whether this legislation should or should not be reported to the floor of the House. Of course, this decision involves scientific questions relating to the safety and effectiveness of the vaccine which is to be used \* \* \*.

I want to point out \* \* \* this committee does not have the responsibility nor could it ever hope to discharge the responsibility of determining what the minimum requirements should be which the Public Health Service should insist upon with regard to the manufacture of any particular vaccine.

\* \* \* The committee could not hope to decide whether the protein matter remaining in the vaccine should be strained out by the manufacturers or can safely remain in the vaccine. Nor could the committee decide \* \* \* whether individual physicians should or should not give the vaccine to children \* \* \*.

Finally this committee does not have the responsibility of determining whether any private organization should or should not go ahead with any program \* \* \*.

I am aware, of course, that the testimony which was presented here \* \* \* will no doubt have indirectly some effect on these other determinations which the Public Health Service, individual physicians, private organizations, and \* \* \* the parents of this country will have to make.<sup>80</sup>

<sup>77</sup> *Ibid.*, p. 178.

<sup>78</sup> *Ibid.*, pp. 192-195.

<sup>79</sup> *Ibid.*, pp. 191-192.

<sup>80</sup> *Ibid.*, pp. 183-184.

When the final vote was counted, eight of the 13 panelists voted to continue the inoculation program: two declined to vote saying they were not competent in the area; one, Dr. Salk, abstained; and three, Drs. Sabin, Hammon and Enders voted to discontinue the program. Of those voting, all supported substitution of a less virulent strain for the Mahoney virus.

#### *Acceptance of enabling legislation for distribution of vaccine*

The Poliomyelitis Vaccination Assistance Act of 1955 (Public Law 377, signed by the President on August 12, 1955), was a compromise measure. It represented agreement of both House and Senate that existing State mechanisms should be used to distribute the polio vaccine. The Senate report had concluded:

\* \* \* that the objective of protecting the Nation's children against paralytic poliomyelitis \* \* \* could be realized without the creation of any new governmental mechanisms and without any major departure from established Federal, State, and local public health patterns.<sup>81</sup>

The House Subcommittee on Health and Science reported the bill to the full committee on July 8. The full committee favorably reported an amended bill, H.R. 7126 on July 14.<sup>82</sup> After debate on the floor, the House version was passed on August 1. It would have provided 50-50 matching grants to the States to provide vaccine only to needy children.

The Senate committee reported its version of the bill, S. 2501, on July 13, 1955. It did not require matching State funds for Federal grants. Even before the Senate hearings had ended, the administration had amended its bill by removing provisions which would have provided Federal funds to vaccinate only needy children. Thus, the Senate bill also authorized a broad program of Federal grants to the States to vaccinate children regardless of need. It was passed by voice vote, July 18.

The conference committee dropped the House provisions for matching funds only for needy children and substituted the Senate's broader grant authorization formula. The Senate and House agreed to the conference report on August 2, 1955, the last day of the session.

The sum of \$34.5 million was appropriated for the program for fiscal year 1956. At the request of the President, the program was extended in 1956 to July 30, 1957, and an additional \$72.8 million was appropriated.

#### IV. ASSESSMENT OF THE CONGRESSIONAL INFORMATION PROCESS

It was apparent throughout the 1955 hearings that the Congress was not inclined to favor the proposals for tight Federal control and support of the national distribution of the Salk vaccine. The report prepared by the Department of Health, Education, and Welfare supported the administration's view that existing distribution machinery was adequate. The Department and its Public Health Service, as well as the American Medical Association and State health officers, all testi-

<sup>81</sup> U.S. Congress, Senate, Committee on Labor and Public Welfare, Amending the Public Health Service Act to authorize grants to States for the purpose of assisting States to provide children and expectant mothers an opportunity for vaccination against poliomyelitis. Report [to accompany S. 2501.] 84th Cong., first sess., S. Rept. 839 (Calendar No. 847). (Washington, U.S. Government Printing Office, July 13, 1955), p. 1.

<sup>82</sup> U.S. Congress, House, Committee on Interstate and Foreign Commerce, Poliomyelitis Vaccination Assistance Act of 1955 [to accompany H.R. 7126] H. Rept. 1186. (Washington, U.S. Government Printing Office, July 14, 1955.)

fied in opposition to a tightly controlled Federal program. With the support of these groups, the administration was able to win acceptance for a program with a minimum of Federal involvement.

The technical issues of efficacy and safety of the vaccine were more difficult to resolve. Some members of congressional committees investigating the distribution issue questioned their own qualifications or jurisdiction to weigh these matters. The PHS had taken measures to strengthen its procedures concurrently with the hearings. While these actions were initiated by PHS after its own assessment of the vaccine management procedures, congressional pressure may have helped to motivate PHS assessment and subsequent corrective action. Undoubtedly, many Members of Congress were gratified by the changes in PHS procedures. Yet there still remained unanswered questions about both the PHS procedures and the vaccine itself.

The public had been led to expect wide distribution that season of an effective vaccine; this was in question by late June. Confusion about vaccine quality and safety had been evidenced in PHS management throughout the spring: PHS had licensed the biological, suspended its approval, reviewed the manufacturing process without revealing its findings, promulgated new standards, and then renewed the program. Members of Congress sought to learn more about the steps taken by PHS to correct deficiencies in its licensing procedure. Moreover, not wanting to underwrite distribution of a potentially hazardous biological, they wanted to learn how great a calculated risk was involved.

One flaw in the Salk vaccine procedure was attributable to the unprecedented nature of its sponsorship. The National Foundation for Infantile Paralysis was funded by donations from millions of Americans in annual voluntary campaigns. It was eager to fulfill its pledges to the public, and had extensively publicized Dr. Salk's vaccine as the first major fruit of its work. The unorthodox manner in which the medical development was publicized hampered its acceptance by the medical profession. Many physicians and public health authorities hesitated to take a stand on its use because the results of the testing program had not been circulated through the normal channels of scientific and medical literature. Medical periodicals could not publish the report in time for the vaccination program to begin before the start of summer. The National Academy of Sciences had declined to sponsor a conference to announce the results of the report. And Carter asserted that the NFIP had refused an offer from the American Medical Association to undertake a prepublication review of the field trial results.<sup>53</sup>

Congressional review of PHS procedures in bringing the vaccine to quantity production turned up other flaws, although PHS and DHEW witnesses released the details of the operation piecemeal and with apparent reluctance. The nature of the calculated risk, which the Francis report had said was based on an estimated 60 to 90 percent effectiveness of the vaccine, was rendered suspect by the manufacturing variables associated with large-scale production. It began to appear that PHS had not fully evaluated safety requirements, and had miscalculated the procedures needed to assure an adequate safety margin for quantity production. According to Fisher, the vaccine advisory committee established by NFIP had "\* \* \* lacked sufficient safeguards to prevent

<sup>53</sup> Carter, *op. cit.*, pp. 247-248.

possible \* \* \* dangerous action."<sup>84</sup> He also alleges that the foundation had committed itself to large orders of vaccine from commercial producers, who stood to lose if the program fell behind schedule; this circumstance contributed a further source of urgency.<sup>85</sup>

The interaction of safety and quantity production had many aspects of concern. Dr. Shannon and others in PHS had, indeed, questioned the validity of Dr. Salk's process for inactivating the virus with formalin. Another question had been with respect to the use of merthiolate as a preservative.<sup>86</sup> More generally, Dr. John Enders, who later received a Nobel Prize for his contribution to virology research that had opened the way to development of the Salk vaccine, had predicted that:

For a long time, researchers will be concerned with such matters as the duration of immunity, the determination of whether dissemination of the virus is reduced in the community, and whether resistance established as the result of vaccination will be reinforced and maintained, as Dr. Salk believes, through repeated inapparent infection of natural origin.<sup>87</sup>

One difficulty encountered by PHS in disclosing its own share of responsibility for error in the development of quantity production of the vaccine derived from the legal constraint that prevented public disclosure of problems encountered in manufacturing processes over which it maintained surveillance.<sup>88</sup> However, the June 10 report of PHS to the President publicly revealed both a deficient scientific base and a generally deficient industrial base in manufacturing operations. Although somewhat belatedly, PHS recognized these problems,<sup>89</sup> and, as indicated in the June 10 report, took steps to correct them.

To cut through the uncertainties that had accumulated about the vaccine and its safety, the House Committee on Interstate and Foreign Commerce resorted to a panel of scientific experts as a source of objective advice on the situation. The panel was able to draw on the information in the June 10 report, as well as on data from its own sources. The panelists reflected the controversy prevailing in the scientific community about the vaccine. However, it was contrary to customary scientific procedure in the resolving of the issue, to put pressure on the group of scientists to poll their membership on the matter; a more usual method is the systematic and deliberate winnowing of the evidence, and if necessary the gathering of new evidence, until a

<sup>84</sup> Fisher, *op. cit.*, p. 71.

<sup>85</sup> *Ibid.*, pp. 73-74.

<sup>86</sup> Carter, *op. cit.*, p. 261, observed that PHS officials had insisted on the use of merthiolate as an additive, while Dr. Salk had not. Field experience revealed that it reduced the antigenicity of the type I virus strain in the vaccine. Thereafter, PHS requirements omitted this item.

<sup>87</sup> As quoted in Carter, *op. cit.*, p. 260.

<sup>88</sup> According to the Code of Federal Regulations, "Information in the records or possession of the [Public Health] Service obtained by the Service under an assurance of confidentiality which the Surgeon General or his authorized representative determines to be necessary for the purpose of any research, survey, investigation, or collection of statistical data may be disclosed only with the consent of the person, association, or agency to which such assurance was given . . ." or if necessary to prevent epidemic or oppose legal action against a U.S. employee. Information relating to the licensing of a biological may be disclosed, at the discretion of the Surgeon General, ". . . only to Federal, State, or local authorities carrying on related governmental functions to the extent necessary to carry out such related functions." (Code of Federal Regulations, Title 42. (Washington, U.S. Government Printing Office, 1968), p. 5.) (Title 42, Subchapter A, pt. 1, paragraph 1.103, (a) and (c) (1).)

<sup>89</sup> See: Technical Report on Salk Poliomyelitis Vaccine, *op. cit.* Detailed statements on the lack of adequate science base were not given by the PHS in congressional testimony in 1955. Later statements detailing the problems were made in congressional testimony: Testimony of Dr. Leonard Scheele, in U.S. Congress, House Committee on Interstate and Foreign Commerce, Extension of Poliomyelitis Vaccination Assistance Act, Hearings before a subcommittee of the \* \* \* on H.R. 8704, a bill to extend through June 30, 1957, the duration of the Poliomyelitis Vaccination Assistance Act of 1955, January 24, 1956, 84th Congress, 2d session. (Washington, U.S. Government Printing Office, 1956), pp. 11-12, and James A. Shannon, M.D., Director of the NIH, PHS, U.S. Department of Health, Education, and Welfare, "NIH—Present and Potential Contribution to Application of Biomedical Knowledge." *Op. cit.*, pp. 72-86.

genuine consensus is arrived at. It was evident, on this occasion, that the panelists resisted the taking of such a vote on the continuance of a program that some of them said should be further studied and discussed. Nevertheless, when confronted with the need to arrive at a decision, the panel did not recommend halting the program. Apparently it was compelled, reluctantly, to conclude that PHS corrective actions were reasonably adequate. These conclusions helped to alleviate congressional concern, and encouraged the decision to sponsor mass public distribution of the vaccine.

In addition, the panel served usefully to provide the Congress with objective information about the issues at stake, and to inform the committee about the components of the calculated risk the program involved. It also served to make public a scientific debate that informed the public that there was some risk to be encountered in the wide public use of the vaccine.

The House Commerce Committee report made it clear that the committee regarded the panel presentation as valuable in allaying fears about proceeding with the program on the basis of a calculated risk:

The panel presentation made it clear that the use of the Salk vaccine involved certain risks. However, on the basis of the panel presentation, the committee believes that the experts, on the whole, feel the risks involved are small in comparison with the benefits which they expect can be derived from the application of the vaccine. Furthermore, there is a distinct possibility, according to the testimony, that the vaccine will be made still safer by substituting a less virulent strain of the virus for one of the strains now used in the production of the vaccine.<sup>60</sup>

While the committee did not consider legislation to strengthen PHS administration, it took notice of the procedural changes made in the agency and added its interpretation of the need for PHS obligations in future vaccine development and surveillance:

\* \* \* The committee is happy to note that the Public Health Service has announced the formulation of a research program which includes the consideration of other strains of poliomyelitis virus for inclusion in the vaccine. It is gratifying to the committee to know that this research program will be participated in by university, industrial, and governmental laboratories. This cooperative endeavor appears to give renewed assurance that the development of an even better vaccine will be pursued aggressively and on a cooperative basis.

Finally, the committee feels that compression of time has been responsible in several instances, in connection with development, testing, and licensing of the poliomyelitis vaccine, for a great deal of confusion and the taking of unnecessary risks. Under these circumstances, the committee feels all the more that sufficient time should be allowed to the States to develop the best possible vaccination programs and to use a vaccine which gives every assurance that the risks inherent in its use are as slight and the benefits as great as scientific knowledge may make possible.<sup>61</sup>

#### *Smooth acceptance and distribution of Sabin vaccine*

In evaluating the consequences of the congressional investigation of the Salk vaccine in 1955 and the result of congressional recommendations, it is useful to review the activities of the PHS in 1961 with respect to the licensing of the Sabin oral vaccine. On May 14, 1961, President Kennedy requested that Congress appropriate \$1 million for the "stockpiling" of the Sabin vaccine in case of polio outbreaks in the United States. At the same time he requested continued use of the Salk

<sup>60</sup> House Report No. 1186, cit., p. 3057.

<sup>61</sup> *Ibid.*, p. 3063.

vaccine. As of that date, no applications had been filed with the PHS by pharmaceutical manufacturers for licenses to produce the Sabin vaccine. The Health and Science Subcommittee of the House Committee on Interstate and Foreign Commerce, immediately held hearings on the matter (March 16 and 17, 1961).<sup>92</sup>

Several significant changes, detailed in these hearings, were made by the PHS in dealing with the development and licensing of the Sabin oral vaccine. The reorganization of the PHS in 1955 had provided for the establishment of the Division of Biologics Control, charged with keeping the PHS fully informed of the development of new biologicals, and taking part in onsite industrial inspection of plants while the new vaccine was being developed.

By 1961, the Sabin vaccine had been licensed and extensively manufactured and used in Great Britain, the Soviet Union, and other European countries. The delay in American licensing can be attributed to two factors: (1) the lack of a suitable U.S. population in which to test the efficacy of the oral vaccine because of the extensive Salk vaccination program; and (2) the cautious and deliberate response of PHS.

Even during the early 1950's the Congress had encountered the controversy over the relative merits of an oral (attenuated) versus a killed (inactivated) vaccine. Most virologists agreed that an oral vaccine would be cheaper to produce, would be easier to administer, and would provide longer immunity. Nevertheless much more research would be needed before an oral polio vaccine could be licensed. For example, the fact that an "attenuated virus" vaccine actually induced a mild infection provoked some question as to whether the virus might become dangerously virulent after passage through the human intestine and cause a polio epidemic in the community. Conversely, if the whole community were vaccinated at the same time would the chain of transmission of the disease be broken?

Profiting from experience with the Salk vaccine, the PHS anticipated research and potential requests for licenses for an oral vaccine. It took precautions to maintain surveillance over the research done on the Sabin vaccine by the manufacturers.

On June 30, 1958, the PHS established a Committee on Live Poliovirus Vaccine. From that date until licensing, the committee met some 15 times. Numerous articles were published in scientific periodicals by members of the committee as well as PHS officials to report to the scientific community on progress and problems in the development of the vaccine. PHS issued several interim reports and lists of proposed standards to manufacturers, issued warnings about hasty production, attended international conferences treating the matter, and frequently consulted with industry to discuss the safety and efficacy of the vaccine. Thus, despite charges of a "polio vaccine gap" between the United States and the Soviet Union, the PHS, cautious about potential hazards, refrained from yielding to the pressure of public opinion. Gradually, each of the three strains of the Sabin vaccine was licensed. PHS continued to maintain surveillance over the vaccine once distribution

<sup>92</sup> U.S. Congress, House, Committee on Interstate and Foreign Commerce. Polio vaccines. Hearings before a subcommittee of the \* \* \* on developments with respect to the manufacture of live virus polio vaccine and results of utilization of killed virus polio vaccine. Mar. 16 and 17, 1961, 87th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1961).

began, and later issued recommendations that the Salk vaccine be given primarily to adults, and the Sabin to children.

Undeniably, the introduction of the Sabin vaccine followed a more orderly and deliberate course than had the Salk vaccine. To some extent, this was attributable to the fact that the edge had been taken off the public fears of polio by the earlier treatment. The reduced pressure for an instant preventive allowed the systematic processes of scientific evaluation and validation to operate.

The question is unresolved as to whether the experience with the Salk vaccine has conferred any lasting lessons applicable to some new solution for a hitherto intractable disease such as cancer or leukemia. The complex jurisdictions prevailing in medicine, the deepseated policy positions concerning its organization and control, and the urgency of making generally available some promising remedy for a widely feared disease, might precipitate a future repetition of the confusions generated by the Salk vaccine. Possibly the enlarged research effort and capability of the NIH gives some assurance of improved coordination of large-scale medical programs in the future.

## CHAPTER THIRTEEN—THE WATER POLLUTION CONTROL ACT OF 1948, THE DILEMMA OF ECONOMIC COM-PULSION VERSUS SOCIAL RESTRAINT

### I. INTRODUCTION

The subject of this chapter confronted the Congress shortly after World War II: How to deal with the growing problem of polluted streams and other surface water.

The question arose out of public awareness that the quality of water in U.S. rivers and streams was deteriorating noticeably. Industry, after nearly a decade of depression doldrums, had experienced 5 years of war and postwar boom, and an expanding population required new housing and urban facilities; both of these developments increased the extent of use of the Nation's waterways, and virtually every such use increased the level of impurities they carried. In addition, during a decade of depression, the Government had undertaken many civil works, to dredge channels and impound streams behind dams; these had the combined effect of slowing streamflow and decreasing the rate at which impurities were carried away. Moreover, a lively technology had created new pesticides, new detergents, new fertilizers, and many other new chemicals for use in home, industry or farm, that poured into the Nation's drainage system.

The Congress, in 1948, was asked to decide what priority of water values society required, and who was to pay the costs resulting from the priorities selected.

#### *The issues of national water pollution and pollution control*

The problem was to achieve a balance between the economic values of unrestricted industrial and municipal uses of water on the one hand, and on the other the ethical values of cleanliness, esthetic quality, preservation of the ecology of nature, and human health. The health issue was less salient because household use of water required elaborate processing in any event; such processing not only eliminated bacterial pollutants but also filtered out or neutralized dangerous industrial contaminants.

From the economic standpoint, each industrial user of water required some initial level of quality for his purposes. He might understandably claim a constitutional right to this use, including the right to discharge pollutants into an adjacent stream, as essential to his competitive position. However, as streams became more polluted, more investment was required to process the water before it was usable by industry. Also, each industrial or municipal use of water added to the load of impurities as the water proceeded downstream. Thus, users upstream added to the costs of water use to users downstream. Downstream industry, accordingly, had more economic interest in pollution

control measures than industry upstream. Industry upstream impaired the property right in water of industry downstream.

Plant management might feel an obligation to the public to moderate the pollution it caused in a stream—to invest in byproduct research, in treatment facilities after use of the water, in settling ponds, and other appropriate measures—but there were practical limits to what the individual company could do without destroying its competitive position and itself.

In the issue of water pollution, there were many rival claimants—those upstream and those downstream, those having an economic interest in streams as sources of process water or as waste disposal systems and those having an ethical or social interest in preserving the relative purity of water for swimming, boating, fishing, recreation, and general environmental satisfactions. There were also those having an economic interest in real estate whose value depended on the preservation of the adjacent noneconomic values.

The Congress also was faced with many other complicating factors. Some of these were:

(a) *The issue of national governmental authority versus States' rights.*—Although river systems frequently involved several States, the individual polluter could be considered as operating within a single State. Regulation of pollution accordingly posed a thorny problem of State versus national legal jurisdiction.

(b) *The issue of administrative jurisdiction among Federal agencies.*—Pollution related to public health, civil engineering and construction, conservation, agriculture, urban problems, industry, and commerce, among other elements of public concern. Assignment of administrative responsibility for implementation of programs or formulation of policy had inescapable complications of agency jurisdiction.

(c) *Conflict of local interest and national policy.*—Many local communities had a parochial interest in the prosperity of their own local industry, as source of employment and income, and as a tax base to support community services. Some local communities had a parochial interest in the quality of adjacent waters. Proposed national policies or actions respecting pollution invariably had a wide range of possible different local impacts, making inescapable a conflict of national and local interests as to type, direction, level, timing, payment, and management of corrective action.

(d) *Assignment of costs for preventing or tolerating water pollution.*—Costs were involved, both economic and noneconomic, regardless of whether pollution was corrected or tolerated. Many kinds of economic and intangible costs were involved. Competitive position of industry, construction of facilities, loss of tax revenues, alternative methods of disposal of wastes, and additional processing arrangements were all factors that could be measured in quantitative dollar terms. Factors like odor, bacterial content, reduced game fish population, discoloration, oil slicks, sediment, and the like, were less amenable to measurement but yet constituted costs. However, at some point the load of pollutants would foreseeably become so heavy that a stream would lose not only its intangible recreational value, but also its economic value. Determination of the allocation of costs and benefits, and establishment of quality standards, were among the most difficult and controversial aspects of pollution control.

(e) *The timing of action to control, halt, or correct pollution.*—The timing of Government action, or of private action with Government sponsorship, depended on the resolution of a number of variables that determined the comparative economic, ethical, and political costs and benefits of action at various possible alternative times. Some of these variables included—

the advantage of early action to prevent a worsening of the problem, further increase in vested interest in opposition to action, or an enlargement in the costs of action;

the advantage of prompt action yielding early benefits versus the advantages of postponing action until an economic recession occurred; and

the taking of prompt action to prevent a worsening of national problems of pollution versus the deferral of action until public dissatisfactions became strong enough to provide an unmistakable mandate, including public willingness to defray the high costs of corrective action.

These were among the issues raised by witnesses and considered by the Congress when the first Water Pollution Control Act was adopted in 1948.<sup>1</sup> The legislation enacted was explicitly temporary and experimental. It was intended to be reviewed, after it had been implemented for a 5-year trial period. Then it was to have been revised on the basis of this experience. Greatest opposition had come from those parties who would be compelled to bear the economic burden of cleaning up their water—industries and local governments. Congress was aware of these factors and recognized the importance of these interests. Justification for enactment thus was based on concern for only one problem caused by pollution—concern for maintenance of public health. Consideration of water pollution within the scope of national effort to conserve and improve the Nation's water supply for multiple uses had to wait until later. Eight years went by before a first permanent measure became law. During this period, appropriations had been substantially less than had been requested, perhaps insufficient to provide a fair test of the provisional legislation, or of the advantages of Federal water pollution regulation generally.

However, once the legislation became permanent, in 1956, it was thereafter progressively further strengthened by amendments in 1961, 1965, and 1966.<sup>2</sup> Continued degradation of water quality helped sharpen the congressional and national perspective as to the water pollution problem. Passage of the Water Quality Act of 1965 ensured that antipollution measures would legally have to account for many other criteria of water quality. Creation of a Water Pollution Control Administration and transferral of that agency from the Department of Health, Education, and Welfare to the Department of the Interior indicated recognition of the need to coordinate water pollution activities with those of water conservation and water resources research. The outlook is for a continuation of this process, in response to the growing need for control and the growing technological and administrative capabilities for providing it.

<sup>1</sup> Public Law 80-845, signed June 30, 1948.

<sup>2</sup> Public Law 84-660, approved July 9, 1956, amended by the Federal Water Pollution Control Act Amendments of 1961, Public Law 87-88, approved July 20, 1961, Water Quality Act of 1965, Public Law 89-234, approved Oct. 2, 1965, and Clean Water Restoration Act of 1966, Public Law 89-753, approved Nov. 3, 1966.

The thrust of the present study, however, is to demonstrate the difficulty encountered by the Congress in designing legislation to satisfy two sets of unrelated constraints—economic and ethical—in a matter with both a national and local aspect, with dispersed administrative jurisdiction, incomplete technical foundation for decisionmaking, and a virtual absence of standards of value.

*Evolving problems with water pollution in prewar years*

Concern over water pollution in the United States had existed long before passage of the 1948 law. The discharge of increasing quantities of untreated industrial and human wastes had come to overtax the natural capacities of the Nation's waterways for self purification. Swimming areas had to be closed down for reasons of public health. Estuarine pollution killed off many shellfish beds, destroying the industries that depended on them. Even though public expenditures for sewage treatment plants continued to ascend, the capacities of such plants lagged further behind the need.

During the first half of the 20th century numerous abortive efforts were made in Congress to enact legislation asserting Federal control over water pollution, to increase research on aspects of pollution abatement, and to fund control measures carried out by States and municipalities. Between 1900 and 1948, 90 bills were introduced in the Congress to achieve one or more of these goals.<sup>3</sup>

In 1936, a water pollution control bill was introduced by Senator Barkley and Representative Vinson. This bill was first adopted and then turned back on a move to recommit in the closing hours of the session. The same bill was again passed in 1938, but was vetoed by President Roosevelt on the basis of technical defects in the provision for grants and also of the question as to the bill's constitutionality.

In 1939, the Special Advisory Committee on Water Pollution of the National Resources Committee reported to President Roosevelt:

Water pollution is a problem of national concern. It is especially serious in the relatively populous and highly industrialized northeastern section of the country. \* \* \*

Pollution comes from three major sources: municipal sewage \* \* \* mining waste \* \* \* industrial waste \* \* \*. These wastes are inimical to the public interest in a variety of ways. The receiving waters may carry substances which cause disease, obnoxious tastes, odors, and colors, which decrease the utility of water for industrial purposes, corrode structures, prevent or jeopardize recreation, and reduce aquatic and other forms of wildlife.<sup>4</sup>

The report urged that the scope of pollution control be enlarged beyond public health considerations and encompass the objectives of conservation of wildlife and development of recreation; pollution control should be included in the planning for the development of river basin projects; the hazards of pollution should receive publicity; and intensified research in causes and corrective measures should be undertaken by Government and industry. Emphasis should be on regulation by the States but Federal legislation was needed (in substance) to provide—

<sup>3</sup> The Library of Congress, Legislative Reference Service, *Water Pollution Control Bills*. Inserted in: U.S. Congress, House Committee on Public Works, *Water Pollution Control Hearings before the \* \* \* on H.R. 123, H.R. 315, H.R. 470, bills to provide for water-pollution-control activities in the U.S. Public Health Service, and for other purposes, June 11, 12, 13, and 16, 1947, No. 12, 80th Cong., 1st sess.* (Washington, U.S. Government Printing Office, 1947), pp. 117-117 (hereafter referred to as House hearings, 1947).

<sup>4</sup> U.S. National Resources Committee, *Advisory Committee on Water Pollution in the United States, "Third Report of the \* \* \* Message From the President of the United States Transmitting a Report on Water Pollution in the United States."* 76th Cong., 1st sess., H. Doc. 155. (Washington, U.S. Government Printing Office, Feb. 16, 1939), p. 1.

A Federal agency, working in cooperation with the States, to study and report on water pollution and pollution abatement projects, to determine criteria for water quality.

Loans or grants to public agencies, and loans to nonpublic enterprises for construction of waste treatment plants.

Federal assistance to the States in technical areas.<sup>5</sup>

A new bill somewhat along these lines was tried in Congress in 1940; this time the bill was defeated over a difference between the Senate and House versions. Thereafter, interest in the subject waned until after World War II.<sup>6</sup>

## II. POSTWAR CONSIDERATION OF ANTIPOLLUTION LEGISLATION

The issue of legislative control over water pollution was revived almost immediately after World War II. Four days of hearings were held by the House Committee on Rivers and Harbors on the subject in November 1945. Urgency of such legislation was stressed by representatives of the Izaak Walton League who asked for an early prohibition of further sources of pollution, and provisions for Federal funding of corrective measures. A different position was taken by Abel Wolman, former chairman of the National Resources Committee's special advisory committee on water pollution. He viewed water pollution as a serious and continuing problem, but one on which action could be deferred until the outlay would serve the double purpose of pollution abatement and providing unemployment relief during economic depression. For the most part, he implied, industries and municipalities could manage the financing of needed works.<sup>7</sup> Congress took no further action on the matter in that session.

The following year, under the sponsorship of the Conference of State Sanitary Engineers, a national meeting was convened, in November, of representatives of State and national health agencies, conservation organizations, and technical societies, to discuss water pollution. This meeting produced a legislative proposal which became the basis for the 1948 act.

### *Legislative proposals for water pollution abatement in 1947*

An initial bill, sponsored by Senators Barkley and Taft, S. 418, was introduced, January 29, 1947, that embodied the recommendations of the conference. The Barkley-Taft bill called for (in substance)—

Research and technical assistance to State and interstate agencies for investigation of water pollution from sewage and industrial wastes;

Federal grants to States and interstate agencies for investigation and promotion of water pollution control with annual appropriations at \$1.5 million for an indefinite period;

<sup>5</sup> *Ibid.*, pp. 82-87.

<sup>6</sup> For legislative history of this period, see: U.S. Congress, Senate, Committee on Commerce, Water-Pollution Control. Hearings before the \* \* \* on S. 1691, a bill to prevent the pollution of the navigable waters of the United States, and for other purposes, Mar. 22, 23, and 27, 1939. 76th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1939), 177 pages; U.S. Congress, Senate Committee on Commerce, Water-Pollution Control. Report to accompany S. 685, 76th Cong., 1st sess. Report 120, (Washington, U.S. Government Printing Office, 1939), 4 pages; U.S. Congress, Senate Committee on Commerce, creating a Bureau of Water Pollution Control. Report [to accompany H.R. 2711], 75th Cong., 1st sess. Rept. 1199. (Washington, U.S. Government Printing Office, 1937), 8 pages.

<sup>7</sup> U.S. Congress, House Committee on Rivers and Harbors. Pollution of Navigable Waters. Hearings before the \* \* \* H.R. 519, H.R. 587, and H.R. 4070. Bills for the Control of Water Pollution. Nov. 13, 14, 15, and 20, 1945. 79th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1946), p. 67.

Partial grants and loans to municipalities and industries for construction of pollution abatement works with annual appropriations at \$100 million for an indefinite period;

Grants for advance planning of pollution abatement works to States, interstate agencies and other public bodies:

Development by watersheds for pollution control;

Promotion of interstate compacts;

Enforcement of pollution abatement, of interstate waters only, through Federal court action without public hearings or State consent;

Establishment of a National Water Pollution Control Advisory Board; and

Administration by the Surgeon General.

Companion bills were introduced in the House.<sup>8</sup>

Extensive hearings were held on these bills in subcommittees of the Senate and House Committees on Public Works.<sup>9</sup> In the Senate subcommittee, testimony was received from 38 witnesses during 10 days of hearings (403 pages of testimony and exhibits); in the House subcommittee 40 witnesses appeared during 4 days of hearings (270 pages of testimony and exhibits). Views were obtained from representatives of the Federal Government, State health organizations, industry and trade associations, chambers of commerce, conservationists, sanitary engineering consulting firms, and municipal officials.

Communications from interested Federal agencies mostly supported the objectives of the proposed legislation, while differing on details. The Federal Security Agency, and the Public Health Service (later to be incorporated in the Department of HEW) recommended that the legislation be in the form of an amendment to the existing Public Health Service Act.<sup>10</sup> The Department of Agriculture recommended that the bill positively prohibit new sources of pollution.<sup>11</sup> It also proposed that if a State failed to act, cases could be brought to court, by authority given to the Surgeon General. The Department of the Interior expressed reservations as to the extent of enforcement desirable at that time:

\* \* \* Some exercise of the police power [said the Departmental statement] is probably necessary to implement an effective pollution program but it is very doubtful whether stringent methods should be resorted to at the present time, or within any narrowly limited time after enactment of appropriate legislation.<sup>12</sup>

The Bureau of the Budget said that authorization of Federal grants or loans for the construction of pollution abatement projects should be deferred until results were available from the studies and investigations envisioned under other provisions of the proposed legislation.<sup>13</sup>

<sup>8</sup> These were H.R. 315, introduced by Representative Spence, and H.R. 470, introduced by Representative Elston, Jan. 6, 1947; a separate bill by Representative Maudt, H.R. 123, introduced Jan. 3, 1947, differed from the others in (1) prohibiting new sources of pollution unless approved by the Surgeon General and State health officials, (2) providing an escape clause from Federal court action in the case of financial or technical inability to comply with an otherwise legally enforceable administrative order.

<sup>9</sup> House, Committee on Public Works, Water pollution control. Hearings op. cit.: U.S. Congress, Senate Committee on Public Works, Stream pollution control. Hearings before a subcommittee of the \* \* \* on S. 418, a bill to provide for water-pollution-control activities in the U.S. Public Health Service, and for other purposes, Apr. 22, 23, 24, and 28, 1947. 80th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1947), 403 pages. (Hereafter referred to as Senate hearings, 1947).

<sup>10</sup> Public Health Service Act (42 U.S.C., ch. 6A), July 1, 1944.

<sup>11</sup> Senate hearings, 1947, op. cit., p. 11.

<sup>12</sup> Ibid., p. 16.

<sup>13</sup> Ibid., p. 15.

A different approach to pollution control was suggested by the Federal Works Agency.<sup>14</sup> This was to consider pollution control as essentially a matter of civil engineering.

*Testimony in support of the water pollution control bill*

Testifying in support of S. 418, Dr. Thomas Parran, Surgeon General of the Public Health Service, dealt with the need for pollution control, the hazards to health of existing levels of pollution, the economic losses resulting from fouled streams, the issue of State versus National regulations, and the magnitude of the program his agency recommended. Pollution, he said, was an increasing hazard. Wastes were being dumped into the Nation's streams at an ever-increasing rate.<sup>15</sup> Industrial pollutants were being increased in both quantity and variety:

\* \* \* Untreated industrial wastes are damaging our waterways seriously. Tanneries, pulp, and paper mills, textile mills, canning plants, milk wastes, proteins, and grease, all go into our streams. In providing our tables with meat, the packing industry has contributed blood, dirt, hair, manure, flesh, and grease to the pollution our rivers must carry away. Gas and coke plants, oil fields, and refineries, mines, metal industries, dump cyanide salts, acids, culm (coal dust), waste oil, brine, phenols, into our water courses.

Moreover, [he went on], technological advances further complicate the picture. The synthetic rubber industry added butadiene and styrene wastes to our problems. With the development of industries engaged in work related to nuclear energy, there will be new difficulties in waste disposal \* \* \*. With each new industry and each new type of water there must be new investigation, study, and research [by the Public Health Service] in order to develop satisfactory methods of purifying such waste.<sup>16</sup>

Modern technology had greatly improved the ability of municipalities to assure the safety of their water supplies, said Parran, but as the levels of pollution in raw water increased the problems of treating it to achieve safety required "constant vigilance." In his judgment, conditions in many small cities were already unsafe:

Administrative control over the safety of water supplied in small cities is clearly inadequate \* \* \*. More attention is necessary in the \* \* \* control of disinfection of water \* \* \*. Defects in collection, treatment, storage, or distribution of water for public consumption are responsible for over three-fourths of the waterborne illnesses reported in the United States \* \* \*. Unprotected cross-connections between polluted fire or auxiliary water supplies and public water systems were the most important single cause responsible for waterborne outbreaks \* \* \*.<sup>17</sup>

On the other hand, these cities and their industries were intensifying the problem by releasing untreated sewage into the streams:

[P.H.S. studies indicated that] 40 percent, or the sewage from approximately 29,000,000 people, is discharged to receiving waters with no treatment of any kind \* \* \*. The combined sewage and industrial wastes pollution for the country as a whole approximates the raw sewage contributions of at least 100,000,000 people.<sup>18</sup>

Economic costs of pollution were important, as well as the social, recreational, and health costs. These included "added cost of treatment

<sup>14</sup> The Federal Works Agency (FWA) was created in 1939 by recommendation of Reorganization Plan I. It was intended to consolidate the construction and operating functions of the WPA, the PWA, the U.S. Housing Authority, the Public Roads Administration, and the Treasury and Department of the Interior in Washington. Administrator of FWA was Phillip B. Fleming, major general, USA (ret.), a former officer of the Corps of Engineers.

<sup>15</sup> Senate hearings, 1947, op. cit., pp. 25, 30-36.

<sup>16</sup> *Ibid.*, pp. 25-26.

<sup>17</sup> *Ibid.*, pp. 26-27, 43.

<sup>18</sup> *Ibid.*, p. 26.

of public and industrial water supplies, decrease in values of waterfront property, reduction in recreational returns, deterioration in commercial and sports fishing, loss of shellfish groups, [and] waterborne disease." For example, there were substantial decreases in income of small businesses dependent on shellfish—

Study of the waters in the vicinity of Hampton Roads in 1934 showed the total shellfish production for the State of Virginia dropped from 7,024,000 bushels in 1897 to 3,757,000 bushels in 1932. The effect on the small businessman is demonstrated by a typical case where one producer's net income dropped from 10,000 bushels (\$2,875) in 1910 to 251 bushels (\$30.22) in 1936.<sup>19</sup>

On the thorny question of Federal versus State regulation, the PHS position was that State control had proved inadequate but that Federal control would need to invade this field in a gradual way. On the basis of a compilation of current State laws relating to stream pollution abatement, it was found that "\* \* \* Few States have adequate laws for the prevention and abatement of water pollution and \* \* \* the majority of the States have only partially adequate laws based largely upon the prevention of gross nuisances and conservation of water resources rather than the protection of public health."<sup>20</sup> Federal action, according to the PHS presentation, should include stimulus, coordination, research, and funding. Thus:

National stimulation, leadership and help are essential if watershed planning is to take the place of the piecemeal approach we are now taking to the problem of pollution abatement. To attack the problem most effectively this stimulation and leadership should include research: assistance to States for carrying out investigations and preparing plans for pollution abatement; and financial aid for construction of facilities;

There are fine examples of interstate cooperation but there are many more places where immediate effective cooperation is needed \* \* \*. One of the promising features of the legislation under discussion [was the provision] for stimulation of interstate agreements and encouragement of uniform State laws for pollution abatement:

Federal sponsorship of cooperative research on common problems that confront many State and local governments avoids duplication of effort:

There is urgent need for Federal assistance in working out the interstate aspects of this problem. Practically all our river systems extend beyond the limits of a single city or State. The community which discharges sewage and industrial wastes into its streams is seldom affected by that pollution. It is the downstream city, often across the State border, that suffers.<sup>21</sup>

PHS testimony gave as the cost of a "practical, comprehensive program" based on 1942 construction costs, a total of about \$1.6 billion, including \$1.4 billion for municipal sewage systems, and \$160 million for other industrial treatment of wastes.<sup>22</sup>

The conservationist view was presented to both Senate and House committee hearings by Kenneth A. Reid, executive director of the Izaak Walton League. Like PHS, he favored the pending legislation, but regarded it as temporary and stopgap. Stronger legislation would soon be needed, which would, in summary:

Prohibit new outlets for the discharge of pollution without the approval of the Surgeon General;

Place research emphasis on the removal of pollutants from effluent systems before discharge into waterways, rather than on water purification at points of intake;

<sup>19</sup> *Ibid.*, pp. 91, 96, 184.

<sup>20</sup> *Ibid.*, pp. 350, 352-353.

<sup>21</sup> *Ibid.*, p. 29.

<sup>22</sup> *Ibid.*, p. 40.

Uniform control on a nationwide basis;  
 Require industry to pay for the treatment of its own wastes;  
 Require industry to pay for research in the treatment of industrial wastes, rather than to make this a Government charge;  
 Recognize all social costs of pollution, and not merely the public health hazard; and  
 Develop a strong program of Federal regulation.<sup>23</sup>

Several representatives of State and local governments supported S. 418. In particular, Arthur D. Weston, chief sanitary engineer for the Massachusetts Department of Public Health, and also representing the Conference of State Sanitary Engineers, presented the Senate subcommittee with the results of a detailed survey of existing regulatory measures of the States in water pollution abatement. Of these data he observed:

\* \* \* the most recent data indicate that, in 10 States, stream-pollution control is vested in the State health department only; in 11 States, control is vested in an agency which is separate from the State health department but closely allied to it, with technical service probably being furnished by the State health department and a member of the State health department serving on this separate agency; in 17 States, the State health department is charged with certain duties relating to stream-pollution control but there are also other State agencies involved to some extent; in four States, there is a water-pollution control board or similar agency, which is separate from the State health department and which handles all water-pollution control activities; in six States there appears to be as yet no State agency which has been charged with pollution-abatement control.<sup>24</sup>

Various spokesmen for municipalities gave graphic descriptions of the unclean waters from which they obtained their domestic supplies. Typical were the comments of W. R. Kellogg, city manager of Cincinnati, Ohio:

The Ohio river, which carries away the human wastes from 18 million people \* \* \* is the only source of water supply for the city of Cincinnati \* \* \*. The quality of the raw water supply has progressively deteriorated \* \* \* the situation was so intolerable that \* \* \* the city \* \* \* about in 1938 had to completely renovate its water-filtration plant \* \* \*. Since then \* \* \* the situation has become progressively worse \* \* \* due to new industrial wastes \* \* \*. The only common-sense thing to do is to eliminate the burden on our water-treatment plants.<sup>25</sup>

A number of Members of Congress, including the sponsors, took the stand to testify for the water pollution control bill. In particular, Senator Barkley, made a strong statement on the need for Federal action. It was, he insisted, “\* \* \* in harmony with the theory that Congress not only has the right under the Constitution to control and regulate commerce among the States, but it has a right to regulate the instrumentalities of commerce, including rivers and railroads.”

\* \* \* There is a Federal obligation [he went on], and no city, no industry, can do anything that would in any way affect the navigability of our rivers without the consent of the Federal Government. [Similarly], the pollution of a stream by any method, either by sewage or by wastage from manufacturing plants, is not necessarily a local matter. It does affect the local people, but it affects people [downstream] hundreds of miles from the point where the pollution has taken place. Therefore, it is in the interest of the national health that the Federal Government recognize its obligations and cooperate with every agency that is interested in the elimination of this danger to life and to health.<sup>25</sup>

<sup>23</sup> *Ibid.*, pp. 91, 96, 184.

<sup>24</sup> *Ibid.*, p. 274.

<sup>25</sup> House hearings, 1947, *op. cit.*, pp. 96-97.

<sup>26</sup> Senate hearings, 1947, *op. cit.*, p. 339. Similar statements were made by Senator Taft, *ibid.*, pp. 17-18, and by Representative Spence, House hearings, 1947, *op. cit.*, pp. 11-12.

Many meetings had been required for the drafting of the legislation, which represented a compromise among a number of views. It was a difficult area in which to legislate, and the members made it clear that they did not expect to dispose of it for once and for all in a single bill, nor to impose sudden and drastic changes by legislation.<sup>27</sup>

*Industrial opposition to Federal pollution control*

Spokesmen for the industries held mainly responsible for the generation of industrial pollutants lined up solidly against Federal regulation. They suggested that some degree of industrial pollution should be tolerated because of industry's contributions to the economic health, productivity, employment, and tax base of the Nation. State regulation was adequate. The problem was a local one. Arbitrary application of national standards would be inappropriate, would violate property rights, and might hamper full utilization of resources. Some industrial pollutants were harmless, moreover, and some were positively beneficial.

Speaking for the American Paper and Pulp Association, its executive secretary, E. W. Tinker, said that his industrial group had spent much effort and many millions of dollars "trying to find practical ways to treat or utilize their effluents." As to national regulation, experience in Europe and in the State governments had shown that "the purely negative method of restraints and controls is not fruitful."

All but a half dozen of the States have enacted legislation which provides ample funds and authority to study and, where appropriate, control municipal and industrial discharges. The administration of these laws has become increasingly effective. By what the State authorities have said \* \* \* I judge they have found their most effective tools to be, not the police power, but research and education, and the cooperation they have been able to elicit from municipalities and industrial establishments by personal acquaintance and daily contact.<sup>28</sup>

The Western mining industry presented similar views. On behalf of the American Mining Congress, its director and vice president, Donald A. Callahan presented a resolution which declared that—

Water pollution is a local problem, varying widely in nature and extent, and best dealt with by State and local agencies, supplemented where necessary by interstate compacts. We oppose legislation vesting control over water pollution in a Federal agency with power to set rigid standards and to force companies [to comply?] through action in the Federal courts.<sup>29</sup>

He added that Federal legislation would "\* \* \* create a threat which cannot but seriously affect the continued production of metals and minerals so essential to the security and prosperity of our people." In this same vein, A. W. Dickinson, also of the Mining Congress, asserted that maximum production in a complex economy required "\* \* \* balanced utilization of our streams by the individual, the municipalities, and by industry." This, he said, was best attained by "\* \* \* cooperation, and with a minimum of State and national regulatory legislation."<sup>30</sup> Another spokesman for the congress, Robert M. Searls, warned that representatives of a bureaucratic agency in Washington could not "appreciate the relative importance of local problems" as well as the local authorities in the Western mining States. Moreover, west

<sup>27</sup> Senate hearings, 1947, op. cit., pp. 337-338.

<sup>28</sup> *Ibid.*, pp. 180-181.

<sup>29</sup> *Ibid.*, p. 192.

<sup>30</sup> House hearings, 1947, op. cit., p. 235.

of the Mississippi it was a "very, very minor problem" that did not require Federal regulation.<sup>31</sup>

A blunt claim of the petroleum industry of the right to pollute was voiced by Harold L. Kennedy, speaking on behalf of the Independent Petroleum Association of America, Mid-Continent Oil and Gas Association, National Petroleum Association, and the Western Petroleum Association. He declared:

It is well known that the principal outlet for waste of every kind has from time immemorial been of necessity through the natural drainage and streams of the country. This is as true of industrial waste as of other types. The use of waterways by industry in general and by the petroleum industry in particular for the purpose of waste disposal has historically been necessary.<sup>32</sup>

An economic analysis presented by representatives of the bituminous coal industry, hard hit after World War I by competitive fuels and sagging markets,<sup>33</sup> demonstrated the difficulties that industry would have in complying with any thoroughgoing laws against stream pollution. Dr. Walter L. Slifer, research analyst and statistician of the Bituminous Coal Institute, judged the cost to his industry of adequate pollution abatement measures to be 50 cents per ton. He asserted that " \* \* \* The industry is not in a financial condition to bear it, especially in the face of competing sources of power—gas, oil, hydroelectric." Additional costs would have to be met by increased prices of manufactured products, which would result in inflation.<sup>34</sup> A technical analysis of the coal industry's problems with stream pollution was presented by Henry Otto, of the Hudson Coal Co., Scranton, Pa. There were, he said, no technical solutions available to reduce coal mine effluents. His analysis was as follows (in summary):

CONTRIBUTING POLLUTANT	ANALYSIS
Mine water and wash water containing sulphuric acid.	Technically impossible and economically prohibitive to neutralize with lime; also the need to dispose of the resultant polluting sludge.
Water containing fine coal and refuse in suspension, resulting from wet separation of coal for market.	Prohibitive capital cost to install purifying equipment; if installed, a resulting nuisance is caused by the dust retrieved.
Fine coal in suspension resulting from erosion of waste heaps from coal mined during the preceding 125 years.	Impossible to protect heaps from erosion, many are on abandoned properties not covered by law.

Other coal industry spokesmen agreed. Jesse V. Sullivan, of the West Virginia Coal Association claimed it would be impossible to neutralize acid mine drainage that seeped into surface streams. The only alternative would be to seal coal mines, which would put men out of work, in addition to being only 50-percent effective.<sup>35</sup> Dr. Harold J. Rose, vice president and director of research of Bituminous Coal Research, Inc. declared: "It is research, that is needed, not more legislation."<sup>36</sup> The special case of the bituminous coal industry was the basis of an appeal by Harry Gandy, Jr., representing the National Coal Association. If it were decided to adopt antipollution legislation,

<sup>31</sup> Senate hearings, 1947, op. cit., pp. 204-205.

<sup>32</sup> House hearings, 1947, op. cit., p. 151.

<sup>33</sup> See ch. 11.

<sup>34</sup> Senate hearings, 1947, op. cit., p. 254.

<sup>35</sup> House hearings, 1947, op. cit., pp. 201-202.

<sup>36</sup> *Ibid.*, pp. 257-260.

he urged, “\* \* \* then by the measure’s specific terms the bituminous coal industry should be exempted.”<sup>37</sup>

Some industry witnesses were not convinced that their effluent was in any way harmful, and some even attributed beneficial qualities to it. Andrew B. Crichton, president of the Johnstown Coal & Coke Co. of Pennsylvania, and director of the National Coal Association, remarked that:

As a matter of fact, acid mine drainage acts as a germicide and renders harmless great quantities of sewage pollution now flowing into the streams of the Nation. Any attempt to compel the treatment of mine drainage \* \* \* is an economic waste, as it robs the people of the benefit of the purifying action of the streams \* \* \*.<sup>38</sup>

The claim was substantiated by Otto who quoted from a U.S. Geological Survey paper (Water Supply Paper No. 8) to the effect that acid mine drainage helped to create a potable source of drinking water:

The purifying effect of acid mine water [said the USGS report] will prevent it from becoming a nuisance and damage to realty values \* \* \*. The Susquehanna River could not be used in its raw state for household purposes if no mine drainage was turned into it.<sup>39</sup>

Another witness told the committee that turbidity from mining fines had been found beneficial to fishing in Western rivers.<sup>40</sup>

#### *Ambivalence of State and municipal views on Federal legislation*

Although a few of the representatives of State and local governmental agencies had professed themselves in favor of Federal legislation, a majority were somewhat ambivalent. They agreed that water pollution was a serious and growing problem, but tended to resist an extension of the authority of the Federal Government in dealing with it. Reed W. Digges, manager of the Hampton Roads Sanitation District Commission, and president of the Virginia Industrial Wastes and Sewage Association, Norfolk, Va., in his opening testimony before the House committee, declared that:

\* \* \* Now is the time to start a large national program for antipollution, and I beg of you not to delay. It is inevitable because all of our flowing streams, the larger the more so, are open sewers.<sup>41</sup>

However, he opposed any control, because he did not think it would be acceptable to the Congress, and he did not think it would work if it did pass.

I think the way to approach pollution abatement is by lending a hand rather than holding a sword over the heads of the people \* \* \*.

Every area knows its problems and is ready and willing to do something about it, should they get financial help, engineering plans, working drawings and specifications. The Government can make these things possible through helping in the financing and you will not need a court action brought by the Surgeon General or others to force areas to abate pollution.<sup>42</sup>

Instead of Government grants-in-aid, he favored financing by revenue bonds or loans.

By having the Government accept second lien revenue bonds for one-third of the costs of a project, the financing of the remaining cost of the project would be facilitated, and will be accomplished on more advantageous terms than otherwise.

<sup>37</sup> Ibid., p. 272.

<sup>38</sup> Ibid., p. 244.

<sup>39</sup> House hearings, 1947, op. cit., pp. 70-71.

<sup>40</sup> Senate hearings, 1947, op. cit., p. 289.

<sup>41</sup> House hearings, 1947, op. cit., p. 42.

<sup>42</sup> Ibid., p. 43.

If, due to local laws or other reasons, revenue bonds could not be issued by a municipality, or district, to finance the costs of treatment facilities, and tax bonds or public assessment bonds must be issued, a Government loan in an amount not exceeding one-third of the estimated cost of the project might be made \* \* \*.<sup>43</sup>

Louis Auerbacker, counsel of the Passaic (New Jersey) Valley Sewage Commission, also opposed Federal enforcement. Existing arrangements for court action relating to the formation of interstate compacts were already prescribing and enforcing methods of treatment and proper standards for allowable effluent. He expressed the fear that, under the new legislation, the Surgeon General might issue regulations that would be prohibitive in cost to the taxpayers of an area :

Our concern is lest a new agency come in, with headquarters in Washington, that will say that these standards [already enforced locally] are not proper for handling the waters of that river, and that they do not think it should be treated in that way. That would mean all the local sewers would have to be rearranged and reconstructed for all these municipalities, and it would impose a staggering cost upon the inhabitants and taxpayers of that district.<sup>44</sup>

Others, echoing industry users, wanted Federal intervention limited to "coordinating and stimulating and planning function(s),<sup>45</sup> or to research.<sup>46</sup> Richard Martin, director of the Connecticut State Water Commission, said the Federal Government could materially assist in the pollution abatement program by enacting legislation to give Federal tax credits for industry's expenditures for pollution abatement.<sup>47</sup> Walter J. Shea, chief of the Division of Sanitary Engineers, Rhode Island Department of Health, objected to the provisions requiring promulgation of uniform regulations :

\* \* \* we can't require the same degree of treatment in any sensible way, because in some instances the same waste from the same industry would require very little treatment due to the large dilution, and in other cases it would require extensive treatment.<sup>48</sup>

The New Jersey State Department of Health presented to the House hearing a chart illustrating the number and types of sewers and sewage treatment plants in that State, as of May 1947. On the basis of the chart, the State's attorney general told the committee flatly that the States were better qualified than was the Federal Government to control pollution from local sewage effluent. He said :

Stream pollution is of local concern. It can be abated by State and interstate action. The bad effects of stream pollution are local and thus responsibility for controlling it rests upon the localities concerned. In this respect, it is like police and fire protection.

The enforcement of stream pollution laws oftentimes necessitates a balancing of advantages and disadvantages requiring discretion which can be exercised by local authorities. Sometimes a decision must be made whether to force the closing of an industrial plant or the suspension of its operations \* \* \* [or] to embarrass a municipality financially \* \* \*. Such measuring of relative advantages and disadvantages can best be done by a State or interstate authority \* \* \*.<sup>49</sup>

### *Interagency contest over pollution control jurisdiction*

Sponsors and supporters of the water pollution bills generally agreed that the Office of the Surgeon General and the Public Health Service

<sup>43</sup> *Ibid.*, p. 51.

<sup>44</sup> *Ibid.*, p. 77.

<sup>45</sup> Statement of Edwin R. Cotton, engineer, secretary of the Interstate Commission on the Potomac River Basin. In *Ibid.*, p. 223.

<sup>46</sup> Statement of Walter J. Shea, chief, division of sanitary engineering, Rhode Island Department of Health. Hearings, 1947, op. cit., p. 105.

<sup>47</sup> *Ibid.*, p. 131.

<sup>48</sup> *Ibid.*, p. 105.

<sup>49</sup> *Ibid.*, pp. 365-366.

would have principal responsibility for implementation. However, in the course of both Senate and House hearings, an alternative plan was advanced by Administrator Fleming of the Federal Works Agency. He offered the committee a draft of a substitute bill which proposed to deal with the problem of water pollution as an ingredient of a large public works program; FWA would share administrative responsibilities with the PHS for its implementation. Echoing the earlier proposal of Abel Wolman, Fleming suggested that the public works spending envisioned under the legislation might be deferred until it would be useful to help alleviate a depression. He saw pollution control as primarily an engineering problem—

\* \* \* requiring the services of professionally qualified and experienced sanitary engineers who have actually been engaged in building sewage-disposal systems, in preparing or reviewing plans and specifications therefore, in making engineering surveys, in evaluating the engineering feasibility of various types of treatment plants, and otherwise in supervising and inspecting the day-to-day construction activities both above and below the ground \* \* \*. Personnel qualified to perform these technical engineering functions are not available in a public health organization.<sup>50</sup>

It would be a waste of "money, time, and personnel" he said, if the FWA were not given shared responsibility for administration of the program.<sup>51</sup> PHS would have to retrain its staff to provide for the functions needed. In a subsequent House appearance, Fleming presented a 24-page document detailing the educational and professional qualifications of his staff, outlining the history of the agency, and giving an overview of projects undertaken.<sup>52</sup>

In opposition to the Fleming proposal, Senator Barkley said he did not concur that water pollution abatement was primarily a matter of civil engineering. Nor did he agree that projects should be deferred until some future depression in order to save money. " \* \* \* It seems to me [said Senator Barkley], we ought not to consider necessarily the amount of money involved when human life is involved." A witness for the Izaak Walton League suggested that the Fleming proposal was intended to "perpetuate the life of the agency," (and, in fact, it was shortly to be reorganized out of existence by the creation of the General Services Administration).<sup>53</sup> Moreover, he challenged the idea that water pollution was neither a public health nor a conservation matter, but a public works matter. Said this witness (Mr. Reid):

While we have long contended that treatment plants for the correction of water pollution represented a perfect natural for public works projects to relieve unemployment, and wherever needed should have top priority over any other public works, we strongly disagree with the theory that the need or lack of need from an unemployment standpoint should be the determining factor in the location and timing of treatment plants \* \* \*. A Federal works agency \* \* \* has no expert knowledge of the problem, or the means of orderly program for its correction.<sup>54</sup>

#### *Summary of positions of groups for and against the legislation*

Support for stringent antipollution legislation came primarily from 38 States, regional, and local public health and sanitation officials, and from spokesmen from the Izaak Walton League. Although several

<sup>50</sup> *Ibid.*, p. 217.

<sup>51</sup> *Ibid.*, p. 219.

<sup>52</sup> House hearings, 1947, *op. cit.*, pp. 305-330.

<sup>53</sup> Senate hearings, 1947, *op. cit.*, p. 187.

<sup>54</sup> House hearings, 1947, *op. cit.*, p. 194.

public health and sanitation officials were opposed to the bill, the principal opposition, in part, or whole, came from industrial and professional association spokesmen. Ten industrial and professional association witnesses and four State, local, and regional sanitation officials opposed the principle of Federal enforcement in the courts. One industrial spokesman proposed that State consent be made a prerequisite for Federal enforcement in any instance. Five industrial spokesmen opposed extending Federal loans and grants to public bodies; six State and local officials and engineering firms, took the same position. Unqualified rejection of the proposal in any form came from three State and local officials, two coal industry spokesmen, and one engineering firm.

*Final congressional action on 1948 water pollution control bill*

In reporting favorably on S. 418, July 8, 1947, the Senate committee told that body that the hearings had abundantly shown that water pollution had in many areas become "a matter of grave concern."

\* \* \* Its damaging effects on the public health and national resources are a matter of definite Federal concern as a menace to national welfare \* \* \*. The Federal Government should take the initiative in developing comprehensive plans for the solution of water pollution problems in cooperation with the States.<sup>55</sup>

The controls proposed, said the report, were purposefully gradual and progressive—

\* \* \* Enforcement procedures are to be initiated only after reasonable time is given to a State or interstate agency or industry to comply with the remedial measures recommended by the Surgeon General to abate the pollution and then only with the consent of the water pollution agency \* \* \* of the State in which the agency or industry is located.<sup>56</sup>

However, the report reflected some lack of confidence that a real solution had been found; it recommended that the legislation should be regarded as experimental, reviewed after a trial period, and revised on the basis of experience with its operation. But—

Unless the cooperative measures, and what the committee deems to be very reasonable enforcement procedures provided for in the bill, bring about the recognized needed results, it is reasonable to anticipate that a later Congress will enact very much more stringent enforcement legislation.<sup>57</sup>

The report also attributed Senate amendments in financial aid authority to the recognition of "the present favorable financial position of most political subdivisions \* \* \*" and to the beliefs that loans would be sufficient to stimulate construction and that Federal grants-in-aid were not justified if there were other available sources of financing. Amendments in committee lowered the grant authority, and also gave a share of responsibility to the Federal Works Agency. With little debate, the Senate then adopted S. 418, as amended by the committee July 16, 1947.

Almost a year later, April 28, 1948, the House Committee on Public Works reported S. 418 with its own amendments; the House committee version eliminated loans to private industry, increased the total funding, restricted grants to the States, authorized construction of a research center, and limited the authority of the act to 5 years. Later,

<sup>55</sup> U.S. Congress, Senate, Committee on Public Works, Stream pollution control, Report [to accompany S. 418], July 8, 1948, 80th Cong., 1st sess. Senate Rept. No. 462. (Washington, U.S. Government Printing Office, 1947), p. 2.

<sup>56</sup> *Ibid.*, p. 1.

<sup>57</sup> *Ibid.*, p. 6.

in conference, the differences in Senate and House versions were resolved somewhat in favor of the House. Then by voice vote the bill was passed by the House, June 18, and the Senate, June 19; it received Presidential approval June 30 as Public Law 80-845.

As passed, the measure provided a wide authority for planning and assistance to States and municipalities in planning for pollution control, including research into industrial waste disposal, facility design, watershed plans, promotion of interstate cooperation in maximizing all socially valuable uses of water, and adjustment of interstate disputes. It authorized construction of a research center. All these activities were to be supported by \$5 million in expenditures and \$22.5 million in lending authority annually, under the joint administration of PHS and FWA.

### III. GRADUAL EVOLUTION OF COMPREHENSIVE POLLUTION CONTROL

Abatement of pollution by Government stimulation went slowly in the 8-year interval between 1948, when the first experimental act became effective, and 1956, when the first permanent water pollution control measure was passed. This interval was one of maneuver and tentative efforts at control, and countervailing efforts of those resisting control. Funds appropriated to implement the PHS authorization to regulate pollution were a limiting factor. The commitment of President Eisenhower's Administration to the revitalization of the authority of the State Governments, and the encouragement of a climate favorable to private enterprise, tended to blunt these first tentative efforts at regulation.

After 1948, attention of supporters of water pollution control was directed toward the activities of the PHS; Federal efforts were expanded cautiously and not until September 29, 1960, was the first enforcement suit actually filed.<sup>68</sup> Some administrative and research progress was accomplished during these early years. After FWA was phased out in 1950, the PHS received oversight responsibility for construction. The Robert A. Taft Sanitary Engineering Center was constructed in Cincinnati, Ohio, in 1952. Plans were contributed by PHS to various river basin commissions for river pollution abatement under interstate compacts. PHS also created a consultative organ on industrial pollution—the National Technical Task Committee on Industrial Wastes.

Nevertheless, funds appropriated were insufficient to meet the tasks outlined in the act. Before extension of the act in 1953, President Truman included budget requests only in 1950 and 1951 for grants and loans authorized under the act. None of the \$22.5 million authorized for extension of loans for construction of abatement works was spent.

#### *National assessment of water needs and resources*

An analysis of the Nation's water pollution problem was completed in 1950 by the President's Water Resources Policy Commission. Reporting that "Our major streams are gravely affected and the problem

<sup>68</sup> "Federal Water Pollution Enforcement Actions." In U.S. Department of the Interior. Federal Water Pollution Control Administration, Program of the Federal Water Pollution Control Administration. Prepared by Office of Program Plans and Development. Federal Water Pollution Control Administration. July 1967. (Washington, U.S. Department of the Interior, 1967), p. 24.

is Nationwide," the committee recommended a six-point program of legislative action (summarized):<sup>59</sup>

1. "Thorough testing" of local-State-Federal cooperation for abating pollution.

2. Increase of previously "inadequate appropriations for the effective discharge by the PHS of its functions under the act" and for additional construction.

3. Appropriation of funds for and development of water pollution plans on the basis of comprehensive river basin development.

4. Study of and provision for funding of waste treatment plants to enable reuse of wastes.

5. If the existing pattern of control mechanism proves to be a failure within 10 years—enactment of legislation to provide for Federal enforcement without State consent.

6. "Further research is required on industrial waste treatment methods and dissemination of that knowledge throughout industry," and a concentrated effort to educate the general public in the hazards of pollution.

The first legislative response to these recommendations did not take place until 1956, and concerted action was delayed for a decade beyond that.

#### *Resistance to amending legislation, 1954-1955*

In 1954, the Department of Health, Education, and Welfare held further discussions on the need for improved water pollution control legislation with 14 national associations representing professional, industrial and conservation interests, the Association of State and Territorial Health Officers, and the Council of State Governments. A bill, based upon compromises reached in the conference and additional comments from Federal agencies, was drafted by the Department and later introduced in Congress as S. 890.<sup>60</sup>

It called for:

Matching grants to States and interstate agencies for general pollution activities;

Expansion of research;

Revision of enforcement subject to a public hearing before the Surgeon General; also elimination of provisions for State consent before instituting proceedings;

Development by States of Federal water quality standards for interstate waters;

Expansion of the advisory board to include representatives of the Atomic Energy Commission and National Science Foundation as recommended by the Bureau of the Budget; and

Elimination of loans for construction of sewage treatment plants.

The Izaak Walton League and other conservationist groups supported the bill but it found little support elsewhere. A poll reported in the *Engineering News Record*, March 17, 1955, of State pollution officials, found that only one gave his unqualified endorsement. Industry representatives objected primarily to the provisions relating to establishment of quality standards and liberalized Federal court procedures.

<sup>59</sup> *Ibid.*, p. 195.

<sup>60</sup> Introduced by Senator Martin (Pennsylvania), Feb. 1, 1955.

When the Senate Committee on Public Works held hearings on the bill, the following points were advanced in opposition to it (summarized):

1. States and interstate agencies were not sufficiently consulted in the preparation of the bill.

2. Authority for Federal grants to States and interstate agencies for water pollution control programs was unnecessary as grants were not needed by the States, was undesirable as it might mean Federal control of State programs and was an undependable source of funds which discouraged rather than stimulated increased State appropriations.

3. Authority for establishment of Federal water quality standards at State boundaries was unnecessary and was an unwarranted usurpation of State authority.

4. Modification of enforcement procedures authorizing Federal court action against an interstate pollutor without consent of the polluting State was an invasion of State's rights and sovereignty.

5. There was no provision for control of pollution from Federal installations.<sup>61</sup>

A compromise bill, meeting some of these objections was passed by the Senate and endorsed by the Public Health Service, but was not acted on in the House.

*Passage of the 1956 amendments; presidential reservations*

Following adjournment of the 84th Congress in 1955, State officials, industry and the Government held a series of conferences to develop proposed substitute legislation. Many of the compromises worked out were incorporated into legislation introduced in 1956. Additional hearings were held, and after extensive debate and conference committee action, S. 890, amended, was passed and signed by the President on July 9, 1956 (Water Pollution Control Act Amendments of 1956). In a press statement released upon his signing of the act, President Eisenhower indicated that the act went beyond the recommendations of his administration by providing funds for Federal grants for construction. He added that the bill was premature; the Department of Health, Education, and Welfare should first have prepared criteria for eligibility of applicants for Federal aid. Although a supplemental appropriation for the full amount of grants authorized was passed soon after the President signed the bill, the Bureau of the Budget waited 3 months before releasing the construction grant funds for allocation by the Department of Health, Education, and Welfare.

The 1956 act (70 Stat. 498) strengthened the Federal pollution authority of the 1948 law (which expired June 30, 1956) and extended it to 1971. The new measure brought in the concept of prevention as well as correction, and added protection of the wildlife environment as an objective. Collection and dissemination of basic data on water quality, and other research authority, were enlarged. A Water Pollution Control Advisory Board was created. Uniform antipollution laws in the States were encouraged. The expenditure of \$500 million was authorized for construction of municipal treatment facilities.

President Eisenhower continued to oppose Federal pollution control throughout his second term; in particular, he vetoed a 1959 bill

<sup>61</sup> U.S. Department of Health, Education, and Welfare, Water Pollution Control Act Amendments of 1955. Chronology of their development, Congressional and public opinion, Sept. 8, 1955. (Typed, in-house report), p. 11.

to expand and liberalize pollution grants.<sup>62</sup> However, in 1961 the views of President Kennedy favored enlarged Federal activity, and a series of additional legislative proposals for control of water pollution received strong endorsement by the incoming Chief Executive.

*Renewed activity in Federal control legislation after 1960*

In 1961, President John F. Kennedy called for strengthening of the Water Pollution Control Act. Legislation embodying most of his request was passed and signed into law as Public Law 87-88, July 20, 1961. This legislation modified the existing law in five principal ways:

1. At the request of a State Governor, the Federal enforcement authority could be extended to interstate waterways.
2. Construction and research grants were substantially enlarged.
3. Authority to extend grants to support State and interstate water pollution control programs was broadened.
4. Administration of the program was assigned to the Secretary of Health, Education, and Welfare.
5. The requirement that Federal suits against pollution offenders have previous approval of the State Governor was abandoned.

Other legislation, passed in 1965 and 1966 also strengthened the pattern of Federal regulation. The Water Quality Act of 1965 strengthened the administrative organization of Federal pollution control by creating an Office of Assistant Secretary of HEW to administer the act, and a Federal Water Pollution Control Administration to implement its instructions. It increased grants for construction, and for development of techniques for handling the storm drainage/sewerline problem. It provided for the establishment of water quality standards for interstate waters (the Secretary of HEW was to promulgate such standards in the absence of effective State action). It also encouraged the use of the device of pollution conferences to stimulate appropriate remedial action.

Further recognition of the need for a concerted large-scale effort to clean up the Nation's waterways came on February 28, 1966, when President Johnson reorganized Federal water pollution control activities. The Federal Water Pollution Control Administration was transferred to the Department of the Interior; the Secretary of Health, Education, and Welfare's responsibilities for public health aspects of pollution control were retained; and most other functions which had belonged to HEW were transferred to Interior. The purposes of the reorganization, according to the President, were to bring about elimination of duplication of activities, as well as to bring water pollution control activities under the jurisdiction of the agency having responsibility for river-basin planning, multiple-purpose water and related land resources projects, and water resources research.<sup>63</sup>

Another important measure was the Clean Water Restoration Act—Public Law 89-753—November 3, 1966, which expanded appropri-

<sup>62</sup> This was H.R. 3610, introduced Jan. 29, 1959, by Representative Blatnik.

<sup>63</sup> Reorganization Plan No. 2 of 1966. Prepared by the President and transmitted to the Senate and the House of Representatives in Congress, Feb. 28, 1966. In U.S. Congress, Senate, Committee on Government Operations, Reorganization Plan No. 2 of 1966 (Water Pollution Control). Hearings before the Subcommittee on Executive Reorganization of the \* \* \* on Reorganization Plan No. 3, of 1966, prepared in accordance with the provisions of the Reorganization Act of 1949, as amended and providing for reorganization of certain water pollution control functions, Apr. 6 and 7, 1966, 89th Cong., 2d sess. (Washington, U.S. Government Printing Office, 1966), pp. 5-11.

tions authorizations for water pollution control activities by \$3.66 billion over the \$245 million already authorized for programs under the Federal Water Pollution Control Act for fiscal years 1967-69.<sup>64</sup>

The act also strengthened the enforcement powers of the Secretary of the Interior, extended it to international waters, and provided incentives to States to impose water quality standards. Ceilings were eliminated on individual grants. Grants were expanded for the construction of sewage treatment plants, for research, and for demonstration projects.

*Significance of the 1948 act for subsequent pollution control*

The Water Pollution Control Act of 1948 was the first Federal effort to establish statutory controls to abate water pollution. It was experimental and partial. An abundance of evidence by the Public Health Service and others defined the scope, nature, and urgency of the need to deal with water pollution. Yet, as passed, the act contained only mild provisions for meeting the Nation's needs in research, regulation, and treatment. Those interests who were presumed to be the target of regulatory action, or who would have to bear the costs of effective research and treatment, opposed the bill in such terms as States' rights and belief in the effectiveness of State laws already in force, freedom and value of industrial expansion, natural riparian rights, and the harmless or even beneficial properties of particular pollutants for wildlife and public health.

Nevertheless, as passed, the 1948 act established the legitimacy of the Federal role in coming to grips with the problem of water pollution. It created an administrative mechanism to keep the Congress and the public informed as to the growing seriousness of the problem. It served warning on new industry to consider the possible implications of undue reliance on streams as waste disposal outlets. It created a nucleus for further amending legislation, as the need became better characterized, and as administrative and technological competence became better able to share corrective programs. It provided an organizational center for the further coordinated study of such problems as permissible levels of pollution, standards of water quality, identification of major sources of riverine pollutants, and the like.

However, the fundamental problem was not clearly expressed in the hearings before adoption of the 1948 act, and still remains unresolved in 1969. This is the question of relative national priorities of economic values and noneconomic values. Senator Barkley touched on this question when he suggested that human lives and safety warranted a higher priority than dollar economies. Other noneconomic values, however, received scant attention.

It has long been possible to express in dollar terms the tangible costs and benefits resulting from the activities that pollute streams and also the tangible costs and benefits of pollution abatement. But the incorporation into the cost-benefit equation of such noneconomic values as the human satisfactions derived from a healthier, cleaner, and more attractive environment, remains as intractable as ever.

<sup>64</sup> Congressional Quarterly Almanac, 1966, vol. XXII (Washington, D.C., Congressional Quarterly Service, 1967), p. 632.

## CHAPTER FOURTEEN—THALIDOMIDE: THE COMPLEX PROBLEM OF DRUG CONTROL IN A FREE MARKET

### I. INTRODUCTION

In an earlier chapter the generalization was offered that all applied research aims to improve the compatibility between man and his environment. The unique quality of applied research in the fields of medicine and drugs is that it aims to improve this compatibility by altering man himself. The subject of this chapter is the case history of the thalidomide episode, 1961-62, which concerned a drug that made modest contributions to general human compatibility with environment, but at a cost of selective but extremely grave incompatibility to some. The purpose of the study is to ascertain how information about this defective drug came to the Congress, and what responses were elicited by the information.

The thalidomide case involves a drug whose purpose was to overcome the relatively minor physiological inconveniences of insomnia and morning sickness. Its defect was that under some circumstances it produced delayed side effects of tragic and disastrous magnitude: in particular, it inhibited the formation and growth of arms and legs of unborn children. Longstanding methods of drug testing had not brought to light these adverse consequences, which were functionally related to the circumstances under which it was used. These consequences were not discovered until the drug had been introduced into wide commercial and prescription usage, both by itself and as an ingredient in drug mixtures.<sup>1</sup>

Owing to a chain of fortunate circumstances, the United States escaped almost unscathed from the consequences of the drug. However, the narrow escape was well publicized, and served to dramatize the need for strengthening public control over procedures for the introduction of new drugs into use.

#### *Medical and pharmaceutical ethics in a free enterprise economy*

Intractably complex and virtually unresolvable issues are raised in the political consideration of the control of biochemical prescriptions for sickness, or for the control over management and procedures in the drug industry. Various attempts, over the years, have been made to find a political solution to the contradictions growing out

<sup>1</sup> Once a drug has entered general use, its incorporation into other drugs can be extensive. Later hearings showed that this had happened with thalidomide. Eventually, it was found to be available in drugstores (with or without prescription) under different names and in different mixtures aggregating 100 or more forms. It is not evident that any of these forms were obtainable in the United States, but it is established that they were widely distributed elsewhere, and might come to the United States through nonmedical channels. For a discussion of this problem, see U.S. Congress, Senate Committee on Government Operations, Interagency drug coordination, Report of the \* \* \* made by its former Subcommittee on Reorganization and International Organizations, pursuant to S. Res. 27, 88th Cong., as amended, extended by S. Res. 288, 88th Cong., resolutions authorizing a study of "Interagency Coordination, Economy, and Efficiency." Activities of the Federal Government in drug research, regulation, clinical use, and purchases, 89th Cong., 2d. sess. S. Rept. 1153 (Washington, U.S. Government Printing Office, 1966), pp. 16-17. (Humphrey report.)

of the divided objectives of the proprietary drug industry. This industry strives, on the one hand, to earn a profit for its activities in the development, manufacture, and sale of its product. On the other hand, it strives to serve the public by making available an increasingly extensive array of biochemical means of treating disease.

In its efforts toward the former goal, the proprietary drug industry invites supervision along with all other major industries, as to its conformity with public policy regarding competition, pricing arrangements, tax and accounting practices, and the like. In its role as an adjunct of the medical profession, reinforced by its extensive interaction with physicians in the testing and evaluation of its new products, and the extensive employment of physicians for its leadership and research, the drug industry is confronted with public expectations of ethical standards, progress in the development of effective drugs, assurance as to the reliability of its products, and a share of the responsibility imposed on itself by the medical profession.

The interface within the drug industry itself, between the profit-making aspect and the medical aspect, presents untoward difficulties. The profitmaking aspect is reflected in a preoccupation with sales, dramatic innovations, advertising, "detail men" on the road, patent protection of unique features, and horse trading of licensing arrangements. The medical aspect is reflected by the involvement of the industry in the lives and recovery to health of human beings, the issuance of pure and reliable drugs, and in the intricate technical problem of insuring the effective and safe, restrained, medically controlled use of powerful new biochemical agents that induce major changes in human metabolism, resistance to disease, genetic transmission of characteristics, and organic and external physical structure. The commercial problem of introducing new product lines by techniques that build and sustain a healthy profit picture overlaps the medical problem of communicating to prescribing physicians the best available guidance as to the contributions, constraints, and side effects of these same new drugs to achieve the goal of a healthy public.

Emphasis on heightened economic motivation of the drug industry to insure to the consumer the benefits of intense price competition was the primary concern of the drug hearings that immediately preceded the thalidomide episode. Insistence on this aspect may not in the long run turn out to be compatible with the maintenance of tight control and high ethical responsibility of a national institution intimately involved with the health of the public.

#### *Background of the thalidomide episode*

For most of human history drugs came from nature, from the working of simple natural processes, and from common chemical substances. Thus, tannic acid (a treatment for burns) was leached from oak bark and acorns. Ethyl alcohol, both a drug and a solvent for many drugs, was produced by fermentation of sugar or starch, and distillation of the product. The two chlorides of mercury were useful as drugs, one as a physic and the other as a powerful and highly toxic disinfectant. A major source of drugs was alkaloids extracted by alcohol solution from plants, such as digitalis (foxglove), morphine (opium poppy), atropine (nightshade), quinine (cinchona tree), and strychnine (nuxvomica).

More sophisticated chemistry contributed importantly to the development of drugs in the 19th century. The first organic synthesis was reported in 1828, and toward the end of the century numerous drugs were being derived from the complex material, coal tar. For example, German chemists introduced aspirin (acetylsalicylic acid) as a specific for headache and fever in 1899. By the early 1930's the science of organic chemistry began to burgeon as laboratory techniques of synthesis were expanded and techniques for characterizing various structures of complex organic molecules were developed. It became possible to identify and characterize the active molecules in natural drugs, and to reproduce these molecules—or even deliberately designed variants of them—by synthesis in the laboratory. Most drugs today are analogies of natural compounds, with purposeful modifications.

Many remedies, medicines, and nostrums were available on the market by the beginning of the present century, when Congress found it necessary to regulate this traffic in the interest of national health and safety. The Pure Food and Drug Act, approved by President Theodore Roosevelt, June 30, 1906, forbade interstate commerce in adulterated or improperly labeled drugs. Laboratory findings were to be the responsibility of the Bureau of Chemistry of the Department of Agriculture. In 1912, this act was extended to the prohibition of false claims as to the therapeutic effects of drugs in interstate commerce.

Stronger legislation was proposed in 1933 by Senator Royal C. Copeland, former commissioner of health for New York City, in order to assure the proper testing of drugs before they were admitted to general use. In mid-1937, when the drug sulfanilamide came into use as an antibiotic, a chemist produced a liquid form of the drug by dissolving it in diethylene glycol, a toxic solvent. Before the "elixir sulfanilamide" had been withdrawn from the market, 108 persons had died of its effects. To prevent a repetition of this disaster, the Congress by an act of June 1938, embodying part of the Copeland proposal, required that before new drugs entered interstate commerce they must be qualified by the Food and Drug Administration as safe under the recommended conditions of use.

After 1940, the march of science in the practice of medicine, and in the synthesis of new therapeutic compounds by organic chemists, rendered the management and control of drugs increasingly complex and difficult. A veritable explosion in new drug development occurred during and after World War II. Penicillin, which had been discovered in 1928, became widely available commercially in 1944, and was shortly joined by a variety of similar antibiotic compounds. The steroids appeared, first in the form of cortisone in 1949, and prednisone and others soon after. The tranquilizers came into use about 1952, and quickly proliferated into a whole family of compounds with similar effects.

These and other new families of drugs have achieved unprecedented orders of effectiveness and potency, and are credited with major contributions to the practice of modern medicine. The ability to construct and modify complex organic molecules in purposeful ways resulted in the production of tens of thousands of compositions, with members of each group varying in slight degree, and with many subtle differences in their effectiveness as drugs, and also in their side effects. New molecules are continually being developed, in an attempt to reproduce the therapeutic effect of a prototype drug, while minimizing its adverse side effects. A wide range of individual responses of patients to these drugs is also characteristic, and a further complicating factor. Elaborate trade-off calculations are thus involved in drug development. Among the variables involved in these trade-off calculations are (a) the statistical probability of genuine curative effectiveness, (b) the statistical probability of any improvement in prognosis, (c) the statistical probability of any benefit, (d) the statistical dose-related toxicity, (e) the statistical probability of (sometimes dose related) adverse side effects, (f) the seriousness of the disease being treated in the light of the effectiveness and hazard of a particular drug in question, in relation to alternative drugs or other methods of treatment. Acceptance and sorting-out of all this new technology by the medical profession has posed problems without precedent.

Traditionally, the medical profession had learned to employ drugs as a major tool of the healing art by the accumulated and recorded experience of years of use in treatment. With perhaps 400 new drugs and drug combinations appearing on the market each year, this gradual, careful, and evolutionary development of experience with each new drug was no longer feasible. The spectacular effectiveness of the new antibiotics, compared with the slow and uncertain benefits of previous drugs that they replaced, compelled their expeditious acceptance by the medical profession and the public. Similar pressures for rapid acceptance occurred with other important categories of new biochemical agents.

The remarkable efficacy of some of the new drugs made them newsworthy, attracting public attention to these medical advances. The public began to expect, and even to demand, their benefits. To some degree, the writing of medical prescriptions was reported to be responsive to publicity about certain new "wonder drugs." A tendency was also reported for the public to expect to be given these drugs for ailments or conditions for which less potent drugs would suffice, and thereby to develop sensitivities to the more potent drugs that would obviate their use when they were really needed. Protection of the public against its own eagerness to serve as guinea pigs become an important added medical service.

Testing procedures for new drugs tended also to be less thorough than established practice called for: innovations appeared that were minor molecular modifications, or assertedly "synergistic" combinations, of known and well-tested compositions; when their performance conformed with expectations in some particulars, it was assumed throughout. Testing procedures could not possibly be maintained at optimal levels with so many candidate drugs for testing and only a limited number of appropriate patients in a limited number of institutions qualified to participate in drug trials. Even so, the reporting of

data on medical experience with treatment was so voluminous that no physician could reasonably be expected to maintain familiarity with an appreciable fraction of new findings, nor to evaluate and integrate the widely dispersed bits of fragmentary and partial data concerning some particular drug in question. According to one authority, "The legitimate medical journals have multiplied like insects; one must now seek his information from 5,000 journals (over 600 in the United States alone) containing about 100,000 articles a year." Moreover, one general journal publishes 6,000 pages of advertising a year and another medical specialty journal carries 1,300 pages. This authority then comments that "Little wonder that few physicians have the stamina to struggle with the overwhelming task of keeping abreast of new developments through their own medical literature."<sup>2</sup> It was indeed understandable that the tendency was reported for the medical profession to rely on the data collected by drug manufacturers respecting new products that they were introducing, and that the channels for such information included advertisements in medical publications, brochures mailed directly to individual physicians, and visits to individual physicians by traveling representatives ("detail men") of the drug manufacturers.

Traditionally, the physician has occupied a special and unique role of community leadership, concerned with the general health of all and the personal recovery of those who take sick. The ethical self-regulation by the profession has maintained extraordinary standards and has commanded general respect of the layman. Self-regulation has extended not only to medical practice, but to standards of education and training, supervision during apprenticeship, and to the maintenance of quality standards of the tools and medicines used in medical practice. To some extent, moreover, medical practitioners have entered the drug manufacturing industry, serving in such essential activities as testing of drugs, designing testing programs, establishment of quality standards, and sometimes in the management of companies and distribution of products. In consequence, the standards of ethics maintained by the physicians have tended to be transferred over to the management of the ethical drug industry. Government interference or regulation in the medical profession has been reluctant and tentative, partly because of the extent and quality of self-regulation by the medical profession. To some extent, governmental regulation of the drug industry has also been inhibited by these same factors.

By 1960, medical practitioners were being supplied with an enormous volume of literature about new drugs and combinations of drugs. Drugs were advertised to the profession by brand and trade name, so that a single generic drug might appear under many names, sometimes in slightly different form. Drugs underwent mandatory test

<sup>2</sup> Charles D. Day, M.D. Department of Pediatrics, College of Physicians and Surgeons, Columbia University, N.Y. "Selling Drugs by 'Educating' Physicians." Reprinted from *Journal of Medical Education*, Vol. 36, No. 1, January 1961. In U.S. Congress, Senate, Committee on the Judiciary, Drug Industry Antitrust Act. Hearings before the Subcommittee on Antitrust and Monopoly of the \* \* \* Pursuant to S. Res. 52 on S. 1552. A bill to amend and supplement the antitrust laws, with respect to the manufacture and distribution of drugs, and for other purposes, 87th Cong. 1st and 2d sess. Parts: Pt. 1, AMA and Medical Authorities, July 5, 6, 18, 19, 20, 21, and 25, 1961; Pt. 2, AMA and Medical Authorities (appendix); pt. 3, Patent Provisions, Oct. 16, 17, 18, 31, Nov. 1 and 9, 1961; pt. 4, Pharmaceutical Manufacturers Association, Dec. 7, 8, and 9, 1961; pt. 5, Government Agencies and Organizations, Sept. 13, 15, Dec. 12, 13, 18, 19, and 20, 1961; pt. 6, Advertising Provisions, Jan. 30, 31, Feb. 1, 6, and 7, 1962; and pt. 7, Advertising Provisions (appendix), (Washington, U.S. Government Printing Office, 1961 and 1962), pt. 1, pp. 959, 961.

before use, and the Food and Drug Administration required submittal of test data along with each application for release; however, if the FDA did not act in 60 days, the approval was automatic. The public acceptance of novel drugs, and the generally favorable experience of the medical profession with potent new formulations, meant that drugs had an assured market irrespective of price, as long as the prescribing physician could depend on the reliability of the drug houses, and as long as the drug houses could continue to meet the demand for new remedies. Since the market was limited to persons requiring medical care, the effect was to generate a highly profitable but very limited market for new drugs. The new market needed to be created and consolidated quickly. The process needed to be repeated as often as possible.

The situation that resulted from these various trends was one of potential hazard. Many physicians and pharmacologists were outspoken in their criticism of it. Leaders of the American Medical Association voiced concern and devised a new and more intensive control plan to improve the information available to physicians about new drugs. However, the understaffed FDA did not advise the Congress of the growing problem, nor did it seek stronger controls or larger staffing. And within the drug industry, technical quality and professional standards in the scientific sector were increasingly jeopardized by the urgency expressed by the business and merchandising sector, in the face of the very substantial financial rewards for good sales records.

## II. CRITICISM OF ETHICAL DRUG INDUSTRY IN ANTITRUST INVESTIGATION, 1959-61

A voluminous set of hearings directed at the financial aspects of the drug industry was compiled by the Subcommittee on Antitrust and Monopoly, of the Senate Committee on the Judiciary, under the leadership of Senator Estes Kefauver of Tennessee. By the time the report of this drug investigation was submitted, May 8, 1961, the subcommittee had accumulated 11 volumes (8,669 pages) of testimony and exhibits bearing on the management and operations of the drug industry in the United States.<sup>3</sup> The purpose of the investigation, according to the chairman, was to examine a number of typical industries thought to be characterized by "administered prices." In such industries, the question to be explored was "How to bring about an equitable distribution of the fruits of scientific progress" and, it was observed, on this matter "there is no existing public policy."<sup>4</sup>

<sup>3</sup> U.S. Congress, Senate, Committee on the Judiciary, Administered Prices, Hearings before the Subcommittee on Antitrust and Monopoly of the \* \* \* Parts: [Entitled] Administered Prices in the Drug Industry, Pursuant to S. Res. 57, 86th Cong. 1st and 2d sess. Pt. 14 (Corticosteroids), Dec. 7, 8, 9, 10, 11, and 12, 1959; pt. 15 (Corticosteroids—appendix), pt. 16 (Tranquillizers), Jan. 21, 22, 26, 27, 28, 29, 1960; pt. 17 (Tranquillizers—appendix), Pursuant to S. Res. 283, 86th Cong. 2d sess. Pt. 18 (General: Physicians and Other Professional Authorities), Feb. 25, 26, Apr. 12, 13, 14, 15, 1960; pt. 19 (General, Pharmaceutical Manufacturers Association), Feb. 23, 24, and Apr. 20, 1960; pt. 20 (Oral Antidiabetic Drugs), Apr. 26, 27, 28, May 3 and 4, 1960; pt. 21 (General: Generic and Brand Names), May 10, 11, 12, and 13, 1960; pt. 22 (The Food and Drug Administration: Dr. Henry Welch), May 17, 18, June 1, 2, 3, and 6, 1960; pt. 23 (The Food and Drug Administration: Dr. Henry Welch—appendix); pt. 24 (Antibiotics), Sept. 7, 8, 9, 12, 13, and 14, 1960; pt. 25 (Antibiotics—app. A); pt. 26 (Antibiotics—app. B), (Washington, U.S. Government Printing Office, 1960-1961), pp. 7837-16505.

<sup>4</sup> U.S. Congress, Senate, Committee on the Judiciary, Administered Prices, Drugs, Report of the \* \* \* made by its Subcommittee on Antitrust and Monopoly, Pursuant to S. Res. 52, 87th Cong. 1st sess., Together with individual views, to study the antitrust laws of the United States, and their administration, interpretation, and effect. Study of Administered Prices in the Drug Industry, 87th Cong. 1st sess. S. Rept. No. 448. (Washington, U.S. Government Printing Office, 1961), p. 2.

With particular respect to the drug industry, there were additional unique features: its critical bearing on public health and welfare, the fact that drugs were purchased by the patient but selected by the physician, the fact that demand for drugs was inelastic (not responsive to price changes), and the fact that large production was possible with small capital investment. Given these facts, the subcommittee asked, How well did the industry serve the public, and how competitive were its commercial practices?

In its final report, the subcommittee called attention to the wide spread between costs and prices of ethical drugs. The research efforts of drug manufacturers, adduced as justification for high prices, had yielded meager returns, while effort was wasted on minor molecular modification of drugs to get around patents. Wasted research was also evidenced by drugs of doubtful effectiveness, and drug combinations, turned into a source of income by promotional rather than medical skills.<sup>5</sup> The subcommittee was impressed with the outstandingly profitable nature of the drug industry, which had led all other industrial groups since 1956.<sup>6</sup> This profit picture was attributable to "control over the market" which, in turn derived from (a) the granting in this country of product patents on drugs, (b) intensive and costly advertising and sales efforts directed to the physician, and (c) the success of the drug companies in persuading physicians to write their prescriptions in terms of brand names rather than generic names.<sup>7</sup>

According to one authority, the total cost of direct mail advertising to physicians amounted to \$210 million a year. This same commentator compared the figure with an asserted \$194 million for drug research.<sup>8</sup>

The patent system in the industry led to such consequences as—

Emphasis on minor molecular manipulation to create new drugs;

Vigorous exploitation and promotion, while the exclusive patent right remained valid, and before the competition could come up with a patentable modification;

Speedy testing of new modifications;

A vast literature of test data concerning an enormous array of drugs that differed in slight degree.<sup>9</sup>

#### *Professional criticism of drug industry and drug control*

However, for the most part, the physicians who testified before the Kefauver subcommittee were not particularly exercised over the financial condition or the favorable profit picture of the drug industry. Rather, they were concerned over quite specific weaknesses in the total system for the control of the safety and efficacy of new drugs, and the reliability of the information that the prescribing physician received about them. For example, Dr. Louis Lasagna, of the Johns Hopkins University School of Medicine, said that "the average physician today is incapable of serving as an expert in evaluating the totality of advertising." He was "inundated" by advertising literature for several hundred new drugs each year, caught on the dilemma of being either out

<sup>5</sup> *Ibid.*, pp. 126-132.

<sup>6</sup> *Ibid.*, p. 55.

<sup>7</sup> *Ibid.*, p. 105.

<sup>8</sup> *Ibid.*, p. 163.

<sup>9</sup> *Ibid.*, pp. 105-154, especially pp. 127-130.

of date, or prescribing on the basis of insufficient information. "Adequately controlled comparisons" of drugs were "almost impossible to find." There was a "plethora of poor compounds, and of new mixtures of old agents." In short: "I think the physician today no longer serves as a satisfactory shield for the patient against drug toxicity, ineffective drugs, and high costs \* \* \*." <sup>10</sup>

Nathan S. Kline, M.D., director of research, Rockland State Hospital, Orangeburg, N.Y., said that some drug firms "seem to have adhered to the statement of ethics set up by the Pharmaceutical Manufacturers Association, but others [did not]." He said there was need for an authoritative source of information on new drugs, with particular respect to "psychopharmaceuticals." He concluded:

Misrepresentation of the properties of drugs can only contribute to the confusion of the general practitioner and ultimately discourage him entirely from their use. As a result, there are unquestionably thousands upon thousands of patients today who would show marked improvement if the appropriate drugs were adequately administered, but who are not being properly treated. The industry does do much by way of educating the general practitioner, and if the distortions could be corrected its service would be truly commendable. <sup>11</sup>

Many of the medical witnesses expressed variations on the theme that "no drug study is foolproof." <sup>12</sup> For example, there was always a considerable uncertainty factor which the layman did not generally appreciate.

But the amount of work that goes into testing any compound is almost incredible, and the amount of work that goes into the establishment of one simple scientific truth is enormous. People expect that everything will come out in black and white. Sometimes these are matters of judgment. That is to say, there is a certain amount of subjective evaluation.

Somebody is an enthusiastic observer and his results may be a little bit better. This is not to say that he is dishonest. He may be by his enthusiasm able to make his patients feel better without regard, say, to the specific pharmacologic effect of what he is giving. This is, I think, well recognized by most investigators. They try to back away as far as they can. They have got what they call the double blind-fold method of testing, so that a blank pill and an action pill are given under certain circumstances when neither the physician nor the patient knows when he is getting an active substance or something that is not active. Then after the results are in, the doctor finds out which way the patient reacted. Did this drug in fact produce the effect or was the effect nearly as good with inert material? <sup>13</sup>

There was an "almost unbelievable barrage" from the "advertising and public relations specialists" of the pharmaceutical firms to exploit the products of "questionable" research, primarily for profit, according to Dr. Haskell J. Weinstein, director of the Chest Hospital, Hope Medical Center, Duarte, Calif. One example was "the molecule manipulation intended to bypass patents \* \* \* which has resulted in the flood of 'me-too' products." <sup>14</sup>

The physician's problem [he went on] is further multiplied by the fantastic number of new drugs appearing constantly. Many of these are marketed before the definitive information about them is available. The physician's problem is complex and it is not fair, even impossible to demand that he bear almost the entire brunt of the defense of the patient from such an overwhelming onslaught. The pharmaceutical manufacturers must bear the burden of proof that their products are exactly what they say they are, and further that they will do what

<sup>10</sup> Administered prices. Hearings \* \* \* on Administered Prices in the Drug Industry, pt. 14, op. cit., pp. 8138-8141.

<sup>11</sup> Ibid., pt. 16, pp. 9319, 9321.

<sup>12</sup> "Administered Prices, Drugs." Report of the \* \* \*, op. cit., p. 182.

<sup>13</sup> "Administered Prices." Hearings \* \* \* on administered prices in the drug industry, pt. 16, op. cit., pp. 10341-10342.

<sup>14</sup> Ibid., pt. 18, p. 10242.

is claimed for them. The final responsibility will always be the physician's and cannot be shared. However, it is essential that he be given the best possible information in a reasonable, adult manner.<sup>15</sup>

It was more than a problem of guarding the patient from individual drugs of potentially dangerous effects, according to Dr. William Bean, of the School of Medicine, Iowa State University:

It is in the widespread use of new compounds which may have serious risk of cumulative toxicity, special sensitizing proclivities, or other effects where the problem is serious. Responsible persons in medicine, government, and industry must face these issues together, honestly and courageously, lest there be truth in the statement that the public is now screening new compounds so that pharmacologists in their laboratories know their toxicity before they study them in guinea pigs.<sup>16</sup>

There were now available, he said later, "a tremendous number of very powerful drugs whose therapeutic virtue runs almost in parallel with their danger." These were "chemicals which alter basic functions of the human organisms." As a result, he suggested, "perhaps the margin of safety is smaller."<sup>17</sup> Acute toxicity, he said, could be detected by ordinary clinical trials. But, "where the difficulty arises is when a delayed reaction, a cumulative reaction, or a sensitivity reaction occurs that could not be predicted." These could not be anticipated "\* \* \* except on a wider trial over a longer period of time."<sup>18</sup>

During the Kefauver hearings an illuminating controversy arose between the respective proponents of two alternative oral medications for diabetes. One compound, known generically as tolbutamide, had undergone extensive tests and evaluation since its original discovery in Germany. Brought to the United States for study, late in 1955, it had been tested in 38 major institutions, its effects studied with some 20,000 patients, and its therapeutic characteristics reviewed and evaluated by a succession of national conferences of leading physicians. At one of the final such conferences, under the sponsorship of the New York Academy of Sciences, some 100 physicians and scientists participated. The medication was submitted for review to FDA in March 1957, supported by 23 volumes of data of accumulated experience with it. On June 3, 1957, the drug was released by FDA for general prescription use.<sup>19</sup>

Before the same hearing, Dr. Henry Dolger, an internal medicine practitioner specializing in diabetes, attached to Mount Sinai Hospital, and past president of the New York Diabetes Association, praised the thoroughness of the tolbutamide testing program. However, he said, there had been another sulfonylurea derivative that had been introduced into the United States in 1957 under the generic name of chlorpropamide. He was critical of the developmental planning and testing of this compound.

In a very limited fashion [he said] the exploration of the effects of this particular agent was explored somewhat fitfully and attempts to arrive at appropriate dosage were accompanied by pharmacologic studies which revealed hitherto unknown delayed rates of excretion which made decreasing dosage imperative. At the time of application to the FDA some 2,000 case reports were submitted and despite the inclusion of 43 deaths and a number of instances of jaundice the drug was passed for public sale in 1958.<sup>20</sup>

<sup>15</sup> *Ibid.*, p. 10246.

<sup>16</sup> *Ibid.*, p. 10338.

<sup>17</sup> *Ibid.*, p. 10340.

<sup>18</sup> *Ibid.*, pp. 10346-10347.

<sup>19</sup> Account based on hearings, *ibid.*, pt. 20, pp. 11008-11015.

<sup>20</sup> *Ibid.*, p. 11146. Apparently Dr. Dolger later clarified this statement, explaining that only 8 of the 43 deaths were attributable to the medication referred to. See *ibid.*, pp. 11226-11227.

Dr. Dolger's criticism of the merits and development procedure of chlorpropamide was promptly challenged by an official of the company responsible for its development in the United States. He presented a detailed description of its test and evaluation history, and other physicians present—qualified as experts in diabetes—confirmed the present safety and efficacy of the drug. It had been the product of extensive laboratory research in organic chemistry. It had been tested extensively on dogs, then on rats and monkeys, for indication of chronic toxicity. Further test procedures had been blocked out by the company and reviewed by FDA; modifications were suggested and adopted. Four sets of further tests on dogs at different dosage levels were conducted for the company by an independent research group. Next the testing program proceeded to human pharmacology, to develop comparative data on the action of chlorpropamide in diabetic and nondiabetic subjects. After this, clinical studies by more than 100 independent physicians were arranged for, yielding 2,062 case reports of findings, to form the basis for recommendations on dosage, indications, and cautions. Studies were made of these reports. A new drug application was submitted to FDA, supported by 8,000 pages of case reports of clinical testing, chemical and pharmacological studies, and data covering a 1-year program of research. To acquaint the medical profession with the new drug, a symposium had been held jointly by the company and the New York Academy of Sciences, at which 68 papers by 168 physicians and scientists were presented on research and testing aspects of chlorpropamide. In particular, it was noted that the reports included results of "double-blind and cross-over studies." (These were defined in the hearing as follows: "A double-blind study is one in which the drug and placebos \* \* \* are given to patients with neither the physician nor the patient knowing which is the drug and which is the placebo. A cross-over study is one in which two or more drugs are given alternately to the same patients.") Emphasis was also placed on the information contained in the "package insert" and a pamphlet distributed by the company, containing information with respect to chlorpropamide on its chemistry, pharmacology, comparative potency and duration of effect, clinical studies, indications, patient selection, dosage, side effects, precautions, and contraindications. It was estimated that at the time of the hearing, more than 60,000 patients had received chlorpropamide therapy.<sup>21</sup>

The controversy over the respective merits—safety and efficacy—of tolbutamide and chlorpropamide usefully revealed the complicated nature of drug evaluation, and also the many uncertainties and judgment factors it involved. For example, tolbutamide had an excellent safety record; chlorpropamide sometimes caused undesirable side effects, especially with unnecessarily high dosage. Tolbutamide was more effective with a majority of patients who responded to this kind of medication, but had to be taken frequently; chlorpropamide was sometimes effective with patients who did not respond to tolbutamide medication, and remained longer in the system so that it could be taken less often.

Several days later, on May 3, 1960, another piece of medical testimony was presented by Dr. Samuel D. Loube, associate in medicine at the George Washington University School of Medicine, associate at the

<sup>21</sup> *Ibid.*, pt. 20, pp. 11104-11116.

University Hospital and the District of Columbia General Hospital, and past president of the Diabetes Association of the District of Columbia. Dr. Loube reported the results of an analysis of 15 volumes of case studies submitted to FDA by the company producing chlorpropamide. He concluded that the drug had been effective in some cases (excellent control in 196 and good in 123, of a total of 413 cases examined). He offered it as his personal opinion that both tolbutamide and chlorpropamide represented "valuable additions to our therapeutic armamentarium in the management of diabetes." The side effects of chlorpropamide were not "prohibitive of the effective use of this medication when properly administered." However, its side effects were "distinctly of sufficient importance to be carefully brought to the attention of any physician who plans to use chlorpropamide \* \* \*." <sup>22</sup>

Preceding Dr. Dolger's appearance that had triggered the episode, the subcommittee had taken testimony from Dr. Alexander Marble of Boston, associated with the Joslin Clinic, specializing in diabetes. He had observed that tolbutamide had been "remarkably free from important side effects," but that the "position of chlorpropamide had been difficult to evaluate." Dr. Marble deplored the paucity of "exact data as to the total number of cases (of jaundice induced by the drug)." He concluded:

Because of this initial success, it can be confidently predicted that as time goes on new and different oral hypoglycemic agents will be developed and introduced. With regard to each new compound as it appears, the physician must always ask the two questions mentioned earlier: (1) Does it work? (2) Is it safe? In the present age when advances are being made with such rapidity in the synthesis of new compounds which have a variety of effects in the body, it is imperative that all concerned use great caution in employing new agents in human beings. Chemical agents must first be evaluated thoroughly in animals. On the other hand, the application of knowledge gained in the laboratory and the cautious trial of new drugs in human patients must continue if advances in therapy are to be made. <sup>23</sup>

*The need for strengthening of arrangements for drug evaluation*

One of the last witnesses to appear before the subcommittee was Dr. Maxwell Finland, associate professor of medicine at Harvard Medical School. He suggested that there was a need for a more thorough, systematic, and objective arrangement for the testing and evaluation of drugs before their admission to general use. It was evident, he said, that "the evaluation of new therapeutic agents must be in the hands of individuals who are as competent, well trained, and well motivated as those engaged in any other research ventures and that they are as likely to turn up new fundamental findings as others with equal skills, but they are also more certain to provide useful results of immediate importance." He testified that he had tried to interest both the National Research Council and the drug industry "to set up subcommittees or panels in different medical areas for the independent evaluation of drugs, supported from funds provided either by the pharmaceutical industry as a whole, or by governmental or other nonprofit agencies but not tied to individual products or firms." <sup>24</sup>

An alternative approach might be the creation of study sections under the National Institutes of Health to fund testing centers, where there would be "an adequate supply of clinical materials, proper staff, and the necessary background for such activities."

<sup>22</sup> *Ibid.*, pp. 11185, 11326.

<sup>23</sup> *Ibid.*, p. 11138.

<sup>24</sup> *Ibid.*, pt. 24, p. 13932.

Under such auspices [he went on] the endorsement of inferior products that are not in the best interest of the public, is much less likely to occur than when the support for testing the product is furnished by the individual producer.

Some mandatory legislation or regulation would be required in order to get the products tested in this unbiased manner before approval, licensing, or certification. This would, of course, also include some safeguards for the interest of the inventor or producer and would not preclude arrangements privately made by the manufacturers with other groups. The same panels or similar ones set up to deal with different classes of drugs could also serve in an advisory capacity to the Food and Drug Administration for the licensing, certification and release of new pharmaceutical products.<sup>25</sup>

It was necessary to have both testing and evaluation of tests performed by a group that had no personal interest in the drug.<sup>26</sup> A weighty responsibility rested on those who evaluated test results because the judgment factor was paramount. He said: "Now you can give a drug to a lot of people, and get a lot of testimonials about its being of value, and never learn whether it is of value or is dangerous until it is examined by people who have competence in evaluating it, and this is the big difficulty."<sup>27</sup> Information provided by drug manufacturers was not all of uniformly high quality, although it was an important factor in determining which drugs were prescribed:

Dr. FINLAND. There can be no doubt that the representatives of the pharmaceutical companies have a great deal of influence on the prescription of drugs. And I think also that there cannot be any doubt that the quality of information that is given by different drug houses varies with the quality of the personnel in that drug house, and also with the integrity of the individuals in these drug houses.<sup>28</sup>

#### *Senate conclusions of drug investigation*

The final report of the long investigation into administered prices in the drug industry, May 8, 1961, centered on economic aspects. However, the minority—while disagreeing generally with the economic findings and conclusions of the report—took particular exception to the consideration and findings of medical and pharmacological aspects, as being beyond the scope and competence of the subcommittee and its staff (p. 362). Medical aspects were dealt with mainly in the discussion of "Advertising and Promotion" (pp. 155-222) and "Generic Names versus Trade Names" (pp. 223-253).

In the opinion of the majority of the subcommittee, the advertising and promotion aspects of the drug industry had contributed to a number of conditions the subcommittee judged to be inconsistent with the public interest which the drug industry was expected to serve. These disadvantages were: the advertising was costly, voluminous, unreliable (p. 165, sq.), time-consuming, encouraged the use of useless drugs, involved "seeding" (defined, pp. 176-177, as placing a drug with a medical center or influential physician before general release to establish the name and ability of the drug early), shotgun therapy (the use of drug mixtures), the misuse and overuse of drugs, the insistence of patients on inappropriate medication (pp. 183-184), the release of drugs inadequately tested or tested by unqualified personnel (pp. 187-190), and the subservience of "some medical journals" to the drug industry (pp. 180-181).

Two minority statements were included in the report, one by Senators Dirksen and Hruska, and the other by Senator Wiley. They ob-

<sup>25</sup> *Ibid.*, p. 13933.

<sup>26</sup> *Ibid.*, p. 13934.

<sup>27</sup> *Ibid.*, p. 13943.

<sup>28</sup> *Ibid.*, p. 13944.

jected generally to the airing of issues as to the efficacy of particular drugs (p. 358), and thought it was "pointless" to be concerned with the question of brand names versus generic names (p. 359). The role of the drug industry as a successful element in the national system of free, competitive, private enterprise was stressed throughout. Subsequently, Senator Dirksen epitomized the majority report as follows:

The majority view is a voluminous fantasy which appears to be nothing more than calculated review of choice quips, statements, and exhibits which were presented by biased witnesses rather than a judicious evaluation of all evidence presented, thereby making the majority views a boon to business haters and drug industry baiters.<sup>29</sup>

### III. PROPOSALS TO STRENGTHEN CONTROL OF NEW DRUGS 1961-62

Various efforts were initiated following the close of the Kefauver investigation, that may have been inspired by some of its findings. Although the purpose of the hearings had been to look into economic questions, the considerable emphasis by medical witnesses on the potential hazard of existing arrangements for the introduction of new drugs appeared to have diverted attention in that direction. Programs were initiated by the American Medical Association to strengthen the providing of new drug information for the medical profession. A review of the drug controls exercised by the FDA was undertaken by the National Academy of Sciences-National Research Council at the request of Arthur Flemming, Secretary of Health, Education, and Welfare. In the Congress, identical bills were introduced by Senator Kefauver (S. 1552) and Representative Celler (H.R. 6245), April 12, 1961, that dealt mainly with economic controls but were also substantially responsive to the appeals of the physicians for tighter controls over new drugs and drug information. The proposed bills provided, in part—

For FDA to pass on the efficacy as well as the safety of new drugs;

For assuring that physicians were fully and reliably informed about adverse as well as favorable effects of drugs;

For inspection and licensing of drug manufacturing plants;

For establishment by FDA of official or generic names of drugs, and making mandatory the use of such names in information and advertising literature.

#### *Improved drug information program of AMA*

In the the spring of 1961, the Kefauver subcommittee opened a new set of hearings, to consider legislation corrective of the conditions identified in the previous investigative hearings. The first witness to come before the subcommittee was Hugh H. Hussey, M.D., chairman of the board of trustees of the American Medical Association. Dr. Hussey told the subcommittee, July 5, 1961, that the AMA board of trustees had "recently (May 27-28, 1961) approved a greatly expanded drug information program \* \* \* to bring to physicians even more complete information and sound, considered opinions on drugs as currently, expeditiously, and scientifically as possible." The program had four parts:

<sup>29</sup> "Brief Summary of Administered Prices, Drugs—Minority Views by Senator Everett M. Dirksen." In Drug Industry Antitrust Act. Hearings \* \* \*. Pt. 1, op. cit., p. 16.

(1) Submission by drug manufacturers to AMA of the same data they supplied to FDA on new drugs;

(2) AMA analyses of these data (and others). Publication in the Journal of the American Medical Association (JAMA) of a preliminary report, with follow-on information in a column on "New drugs and developments in therapeutics."

(3) Inclusion of all such data in a monograph on "New and Nonofficial drugs," in hard cover, indicating for each drug after several months of its general use, the following categories of information:

Chemical or biological identity, including pertinent properties;

Actions and uses;

Associated side effects;

Toxicity and precautions; and

Dosage and routes of administration.

(4) Annual publication of an AMA Handbook on Drugs, presenting evaluated information for single-entity drugs and drug mixtures under class headings, to inform the physician on—

(a) The nonproprietary and trade name or trade names of the drug;

(b) The name of the manufacturer or manufacturers;

(c) A quantitative statement of composition by generic name or names;

(d) The claimed indications for the drug;

(e) The stated contraindications, side effects, and precautions;

(f) The manufacturer's recommended dosage;

(g) The available dosage forms; and

(h) An overall appraisal of the drug.<sup>30</sup>

In addition, the AMA board of trustees had proposed to the U.S. Pharmacopeial Convention a joint program on drug nomenclature, with provision for final authoritative decisions in case of failure to reach accord with the manufacturer. Provision would be made also for coordination of this program with international bodies having related functions.<sup>31</sup>

Objectives of the AMA were described by Dr. Hussey as follows:

We want all physicians to be well trained and fully informed on all aspects of the practice of medicine.

We want this body of knowledge and reservoir of skills to include a high degree of competency in the selection and proper use of drugs.

We want a continuing and expanding flow of useful drug products placed at the disposal of these physicians.<sup>32</sup>

It does not appear that the AMA program was responsive to the problem of the drug industry with the issue of economics versus professionalism. Its acceptance of the flow of new drugs into use was unqualified, as was its confidence in the capability of the medical profession to regulate both itself and the drug industry. Nevertheless, the measures proposed by Hussey seem to have been constructive, and to provide a starting point for national coordination of new drug safety.

Exception was taken to the AMA position—that drug efficacy was a matter for determination by the individual physician—by William B. Bean, M.D., professor of internal medicine, School of Medicine, Iowa State University. He believed efficacy was a subject that required determination on the basis of controlled clinical investigation by qualified investigators, followed by reasonable and expert evaluation. He continued:

Very few people, be they laymen or practicing physicians, have any groundedly learned comprehension of the extraordinary complexity and the great difficulty of establishing even the smallest scientific fact. Because of its very real and

<sup>30</sup> Drug Industry Antitrust Act, Hearings, \* \* \* pt. 1, op. cit., pp. 39-41.

<sup>31</sup> Description of this program is contained in a statement reprinted in full in *ibid.*, pp. 48-49.

<sup>32</sup> *Ibid.*, p. 39.

serious apprehensions of the centralization of Federal authority, the American Medical Association in its fear has euhred itself into the astonishing posture of supporting the position that it is better to have nonefficacious drugs or those whose efficacy is as yet unestablished released freely to the American physician and the American public, rather than have those made available only when their usefulness in therapy has been determined or its probability is of so high an order that no one could object.

As I understand Dr. Hussey's statement, he believes that the practicing physician, dealing with individual patients, should be the one who determines the efficacy, the reliability, and potency as well as the particular effect of a drug, realizing that the effect varies from patient to patient and in a given patient from time to time, depending on circumstances, as influenced by the biological and biochemical individuality of each person. It takes great experience and clinical wisdom to be able to dissect out the features of existence which are natural and those related to disease. It is a wise physician who can elevate the alterations, if any, and their direction and degree, as they are induced by a specific therapeutic regimen or the employment of a particular drug or combination of drugs in a single patient, and generalize his results. Granting with him that we frequently imply "on the average" when we speak in general terms, when we deal with a patient we are considering only one person. Let me emphasize a few difficulties of allowing the good old American do-it-yourself approach of using the wonderful yeomanry of practicing physicians and the mass of patients in the United States as a willing army of guinea pigs to determine the efficacy of new drugs or to specify the degree and nature of established ones. Every physician his own Pasteur.<sup>23</sup>

### *Recommendations of the National Academy of Sciences*

The review of FDA that Secretary Flemming had requested be made by the National Academy of Sciences-National Research Council, was completed and a report submitted September 27, 1960. It warned that "The increasing rate at which medical research is expanding and new and powerful drugs are being developed is multiplying the number of potential hazards to be controlled." Accordingly, the report offered 11 recommendations, of which five were of particular relevance to the thalidomide episode that was shortly to develop. These recommendations were:

(1) The FDA should be given statutory authority to require proof of the efficacy, as well as the safety, of all new drugs. Treatment of a patient with an ineffective drug in place of an effective one may jeopardize his recovery. This is true even though the drug may not be intrinsically harmful, and even though the specific condition for which the drug is given may not be ordinarily regarded as life-threatening.

(5) The committee believes that the information supplied to physicians concerning drugs should be not only accurate, but also complete, and that the date of such information is essential to its proper evaluation. It therefore endorses the proposed amendments to present labeling requirements published by the Commissioner in the Federal Register for July 22, 1960.

(6) The committee considers that the advertising of pharmaceuticals requires more careful regulation than that of products unrelated to the prevention and cure of disease. It therefore recommends that careful study be given to the problem of coordinating the supervision of labeling, promotional material, and other advertising of drugs, now divided among several agencies of the Government, and to means of ensuring that all information concerning drugs conveyed to the profession and the public by whatever media be in conformity with scientific fact.

(8) The staff members responsible for processing applications should be supported to the utmost in their efforts to obtain submission of truly dependable scientific information on the efficacy and safety of the products. The data initially submitted by the manufacturer are not always of sufficient quality and quantity to permit a sound decision as to the merits of the product.

(10) The committee urges the Commissioner to seek such authorization as may be necessary to establish an advisory organization of scientific and technical

<sup>23</sup> *Ibid.*, pt. 1, p. 267.

experts as a recognized resource for advice on criteria, procedures, and policies for the execution of the responsibilities of the FDA.<sup>34</sup>

All of the NAS-NRC recommendations were promptly endorsed by Secretary Flemming except item 6 which, he said, would require further study.<sup>35</sup> It is worthy of note that the NAS-NRC committee that developed these recommendations was made up of eight physicians, all associated with medical schools.<sup>36</sup> Their recommendations might be read as essentially an endorsement of the medical and drug efficacy-safety aspects of the Kefauver-Celler bill.

### *Senate hearings on Drug Industry Antitrust Act*

The hearing before the Senate Subcommittee on Antitrust and Monopoly (Kefauver) followed somewhat the same pattern as had the earlier investigative hearings. They were similarly compendious, with seven volumes (4,217 pages) of testimony and exhibits, 115 witnesses, and 28 days of hearings extending from July 5, 1961 through February 7, 1962. Emphasis, again, was on the economic and antitrust aspects of the drug industry while the medical witnesses generally focused on the aspects of drug safety and efficacy, and the troublesome question of generic names.

One notable difference in the second set of hearings was the tone of the testimony by a spokesman for the Pharmaceutical Manufacturers Association, (PMA). In the investigative hearings, the effect was that of a hostile confrontation, relative to the expressed purpose of the hearings. However, in the legislative hearings, the tone was conciliatory, and it was evident that the PMA was making every effort to cooperate in achieving generally acceptable and effective compromises. On the efficacy and generic names issues, in particular, the PMA appeared to be in full accord with the purposes of the proposed legislation.

The principal witness was Eugene N. Beesley, chairman of PMA and president of Eli Lilly & Co. He commenced his testimony by stating the proposition that "Our industry has a primary responsibility to maintain the most painstaking and exacting standards in every step of scientific research, development, manufacturing, and distribution. In fact, we believe that our own individual standards of excellence should be higher than any that might be imposed by law." He accepted the responsibility for changing any unsound practice, and for introducing improvements. He also urged that, "in view of the growing complexity of medical science and health care," the responsible Government agencies should be given more assistance in fulfilling their role, which was:

\* \* \* to establish minimum production and quality standards; to inspect periodically to insure that these standards are maintained; and to deter or punish any irresponsible producer who ignores such standards.

<sup>34</sup> Reprinted in *ibid.*, pp. 460-461.

<sup>35</sup> *Ibid.*, pp. 463-467.

<sup>36</sup> Members of the committee were:

Dr. C. Phillip Miller, Chairman, professor of medicine, University of Chicago School of Medicine.

Dr. John H. Dingle, professor of preventive medicine, Western Reserve University School of Medicine.

Dr. Maxwell Finland, associate professor of medicine, Harvard Medical School.

Dr. Colin M. MacLeod, professor of medicine, New York University College of Medicine.

Dr. Karl F. Meyer, director emeritus, George Willams Hooper Foundation, University of California Medical Center, San Francisco.

Dr. John R. Paul, professor of preventive medicine, Yale University School of Medicine.

Dr. Carl F. Schmidt, professor of pharmacology, University of Pennsylvania School of Medicine.

Dr. Wesley W. Spink, professor of medicine, University of Minnesota Medical School.

As to new legislation, he said, "we support, in substance, those provisions of S. 1552 which would serve to advance health progress." His organization also favored some additional proposals. The PMA position is summarized as follows [paraphrase]:

1. PMA "believes strongly that a drug should be effective for the uses which the manufacturer claims for it." Therefore the manufacturer should be required to submit to FDA "substantial evidence" that the drug was safe and that it produced the results claimed for it.
2. Drug manufacturers should be required to register with FDA.
3. Drug manufacturers should be "subjected to regular mandatory inspection by FDA at least once every 2 years \* \* \*."
4. FDA inspection powers should be broadened "to enable it to determine adequately whether there is a violation or potential violation of the Federal Food, Drug, and Cosmetic Act."
5. "Increased funds should be provided to enable FDA to undertake these broadened responsibilities."<sup>37</sup>

With respect to the issue as to whether "efficacy" of new drugs should be made a matter for FDA determination, Mr. Beesley offered the following observations: "In the entire realm of medical science," he said, "nothing is more difficult and more subject to honest differences of competent opinion than the determination of the therapeutic merits of drugs in human beings." He was concerned that "premature or arbitrary judgments, or judgments based on imprecise standards, could deprive the American people of many important health benefits." There were different schools of thought in medical practice; the FDA should not impose its own views on the medical profession, and therefore—

The only sound standard \* \* \* is that the drug must be safe and that there must be substantial—but not necessarily preponderant—evidence showing that the drug has produced the specific physiological effects claimed for it.<sup>38</sup>

Dr. Lasagna, who returned to testify at the second set of hearings, contributed further thoughts on the problem of drug safety:

It was pointless to divorce safety and efficacy. A drug's safety could not be judged in vacuo, but only in relation to its purpose.

One must have reliable evidence of therapy, just as one must demand adequate evidence of safety.

The history of medicine is, unhappily, replete with examples of useless drugs employed for years, decades, or centuries, by countless physicians before a few properly conducted experiments proved the drugs to be without value.

If a drug is very poisonous but may cure cancer, that drug should be on the market. If the drug is very poisonous but only may cure mild headache, it should not be on the market.

\* \* \* Modern therapeutics is too difficult and too dangerous for today's doctor to go it alone. He needs help, and from many sources, including the Government.

Dr. Lasagna described for the subcommittee the "unsatisfactory atmosphere now surrounding new drug developments."

At present, when a drug of unquestioned merit is put on the market, the company whose imagination and know-how has been responsible for the breakthrough is faced with the possibility that within a short period of time a half-dozen or more pharmacologic shadows will be introduced by competing firms, almost all of them representing minor advances or no advance at all, but one or more of which may purloin a good share of the market away from the first drug. The result is a fantastic pressure on drug houses to assemble data in a hurry and to market at the earliest possible date.

Were this pressure merely to speed up the process of drug development, no one would have any serious objection. But the stage is also set for hasty and

<sup>37</sup> *Ibid.*, pt. 4, pp. 1996-1997.

<sup>38</sup> *Ibid.*, pp. 1998-1999.

premature decisions based on inconclusive data of dubious merit. This unfavorable atmosphere is not, I might add, a mirage of my own imagination. It has been criticized by many responsible figures in the field of medicine, including such well-known medical editors as Dr. Joseph Garland and Dr. Walter Modell, who decry the "unnecessary expansion in the number of new products marketed each year" and the inability of the medical profession to "deal with the plethora of new drugs expertly, safely, effectively."<sup>39</sup>

It had been contended, he said, that all new variants of useful molecular configurations should be allowed because they might be useful with some patients. This, he said, was a "dangerous *reductio ad absurdum*."

First of all, it implies that all possible relatives of a useful drug should be marketed, since it is patently impossible to rule out the remote chance of benefiting one patient out of 100,000 in preliminary premarketing trials.

Second, this line of reasoning can lead to deterioration in medical care, because a large number of therapeutically similar drugs of varying merit may result in suboptimal care for those patients unlucky enough to be treated first not with the best drug of the group, but with the weakest.<sup>40</sup>

Dr. Walter Modell<sup>41</sup> agreed that a variety of drugs might be needed for some particular purpose, but too many (for example, 35) would "create nothing but confusion and harm."

Nothing but good [he concluded] can come of the application of restraints to the exuberant growth of new and poorly tested drugs and the extravagant claims made for them and to the barrage of confusion laid down by biased promotion and meaningless and distracting nomenclature. I believe it will benefit the health of the Nation, improve the practice of medicine and, strangely enough, increase the profits of the drug industry.<sup>42</sup>

No reference to thalidomide appeared in the seven volumes of the hearings before Senator Kefauver's subcommittee, which ended February 7, 1962. Although there had been an epidemic of phocomelia<sup>43</sup> in West Germany in the spring of 1961, and thalidomide had been tentatively identified as its cause by late November of that year, national attention was not drawn in the United States to the dangerous nature of the drug until mid-July 1962. The *New York Times*, in mid-April, had reported a lecture on this epidemic by Dr. Helen Taussig, delivered in Philadelphia before the American College of Physicians, and when this report was called to the attention of Senator Kefauver's staff, a researcher had been assigned to follow up on the story. Then, May 24, a graphic description (with slides) of the effects of thalidomide was presented before a House subcommittee chaired by Representative Celler and considering his bill (H.R. 6245) paralleling S. 1552. No notice was taken in the press of Dr. Taussig's testimony. In comment on this point, the principal staff member of Senator Kefauver's group working on S. 1552 was later quoted as remarking "I tried to talk Celler's people out of using Dr. Taussig." (And then:) "It's too early to spring this kind of story. All the various bills are still far from reaching the floor of either House, and it's clear that the thalidomide story, or something like it, is just what we need to ram through some legislation. In a situation like this, timing is vital."<sup>44</sup>

<sup>39</sup> *Ibid.*, pt. 1, p. 281.

<sup>40</sup> *Ibid.*, pt. 1, p. 282.

<sup>41</sup> Editor of *Clinical Pharmacology and Therapeutics*, editor of a biennial text, *Drugs of Choice*, member of the revision committee of the U.S. Pharmacopoeia, chairman of the formulary committee of the New York Hospital, director of clinical pharmacology, and associate professor of pharmacology at Cornell University Medical School.

<sup>42</sup> *Ibid.*, pt. 1, pp. 310, 329-330.

<sup>43</sup> Phocomelia. Literally "scal extremities." In phocomelia, the long bones (arm, leg) may be absent or deformed, and the hands or feet appear at the end of the shortened bone. There may be many variants and further complications.

<sup>44</sup> This account is taken from Richard Harris, "The Real Voice." (New York, the Macmillan Co., 1964, pp. 154-155, 160-161.)

## IV. THE THALIDOMIDE STORY

There are several accounts of the origin of the drug thalidomide.<sup>45</sup> According to Dr. Helen B. Taussig, an authority on the drug, she was told in Germany that "the drug was first conceived of as a sedative by a Swiss pharmaceutical firm, compounded by them in 1954, tried on animals and found ineffective and therefore discarded."<sup>46</sup> Subsequently, it was reinvented ("several years later") by Grunenthal. According to an official of the American company that sought to introduce the drug into the United States, the drug was "first synthesized by Chemie Grunenthal G.m.b.H., Stolberg, West Germany, in 1953."<sup>47</sup> The molecular structure of the compound was such that it was viewed as a candidate for usefulness as a sedative or sleep-inducing drug. Again, according to Dr. Taussig, Grunenthal tried the drug on animals, and found that it had no effect. However—

This firm went one step further and thought it must be a good drug. Perhaps it would be good for epilepsy. The company made and marketed the drug as an anticonvulsant. The drug was found worthless for epilepsy but it made man sleep. Thereafter it was sold as a sleeping tablet. It had a prompt action, gave deep natural sleep and left no hangover. It was a "safe" drug. Man could not commit suicide. The drug was manufactured "by the ton" and its sale was tremendous. By 1960 it became Germany's most popular sleeping tablet and tranquilizer.<sup>48</sup>

As told by the Merrell Co., "The drug was tested in animals and then in humans. Grunenthal found it to be highly efficacious as a sedative-hypnotic, producing normal sleep. The toxicity of thalidomide was extremely low in both animal and clinical testing. No LD-50 (median lethal dose) could be established."<sup>49</sup> It does not appear that thalidomide was introduced into the German market with undue haste. Although synthesized by Grunenthal in 1953 (or possibly 1954) it was not placed in commercial use until 1957.

The drug evidently caught on. It sold as a sleeping tablet, a sedative, a tranquilizer; as an additive along with other drugs it was used as a medication for grippe, neuralgia, asthma, and as a cough medicine; it was also found useful as an antiemetic in early pregnancy. Dr. Taussig noted that it was an excellent and inexpensive sedative, and that its sale was tremendous.

<sup>45</sup>The chemical characterization of the compound, as given by Frank N. Getman, William S. Merrell Co., is "alpha (N-phtalimide) glutarimide."

<sup>46</sup>Prepared statement of Dr. Helen B. Taussig on H.R. 6245. In U.S. Congress, House, Committee on the Judiciary, Drug Industry Antitrust Act, Hearings before the Antitrust Subcommittee (Subcommittee No. 5) of the \* \* \* on H.R. 6245, a bill to amend and supplement the antitrust laws with respect to the manufacture and distribution of drugs, and for other purposes. May 17, 18, 23, and 24, 1962. Serial No. 32. (Washington, U.S. Government Printing Office, 1962), p. 430.

<sup>47</sup>Circular letter "to all physicians" signed by Frank N. Getman, William S. Merrell Co. Included in pt. 1, p. 121, of U.S. Congress, Senate, Committee on Government Operations, Interagency coordination in drug research and regulation. Hearings before the Subcommittee on Reorganization and International Organizations of the \* \* \* agency coordination study. (Pursuant to S. Res. 276, 87th Cong., S. Res. 27, 88th Cong., and S. Res. 27, as amended, 88th Cong.) Review of cooperation on drug policies among Food and Drug Administration, National Institutes of Health, Veterans' Administration, and other agencies. (Washington, U.S. Government Printing Office, 1963 and 1964.) Pt. 1, Aug. 1 and 9, 1962; pt. 2, Supplementary exhibits and index to pts. 1 and 2, Aug. 1 and 9, 1962; pt. 3, the Bureau of Medicine in the Food and Drug Administration, Mar. 20, 1963; pt. 4, Testimony and exhibits (including subsequent correspondence) on specialized drugs and drug problems: (1) Drugs for mental illness; (2) Antibiotics; (3) Drug testing; (4) Neonatal pharmacy; and (5) Communication on drug emergencies, Mar. 21, 1963; pt. 5, Testimony and exhibits (including subsequent 1963-64 correspondence) on (1) Commission on Drug Safety; (2) Pharmaceutical Manufacturers Association; (3) Medical education on drug therapy and other drug issues, June 19, 1963; and pt. 6, Testimony and exhibits (including subsequent 1963-64 correspondence) on drug activities of the American Medical Association (hereafter referred to as Humphrey hearings, parts).

<sup>48</sup>Helen B. Taussig, M.D., "A Study of the German Outbreak of Phocomelia." JAMA. (Vol. 180, June 30, 1962, pp. 80-88.) Reprinted in Humphrey hearings, pt. 1, op. cit., p. 103.

<sup>49</sup>Circular letter, op. cit., in Humphrey hearings, pt. 1, p. 121.

Rights to market the drug were sold to pharmaceutical firms in many countries, and in one way or another the drug found its way into (among others) England, Canada, Australia, Hong Kong, Belgium, Holland, Finland, Spain, Norway, Denmark, Sweden, Switzerland, Italy, Turkey, Iran, Iraq, Palestine, Greece, Pakistan, India, Japan, and Brazil. (According to some accounts, it was widely used throughout many Latin American countries.)<sup>50</sup>

Thalidomide was sold under many trade names; in addition to its production by foreign companies under license, it was incorporated in many drug mixtures. An unconfirmed report, in Switzerland, described a list of nearly 100 drugs or brand names for preparations containing thalidomide. However, the accompanying list of 53 such items was collected by Dr. Taussig and presented in an article in the *New England Journal of Medicine*.

*Trade names under which thalidomide was marketed*<sup>51</sup>

Trade name, 5-100 mg. amount

Contergan	Sedimide	Lulamin
Distaval	Thalin	Sleepan
Softenon	Sedoval K17	Valgis
Kevadon	Isomin	Talargan
Talimol	Neurosedyn	Profamil
Imidene Ipnotico	Neurodyn	Sedisperil
Quetimid	Neosedyn	Sedin
Quietoplex	Noxodyn (40 mg.)	

Amount not known

Slip	Verdil	Imidan
Sedalis	Neurofatis	
Ondasil	Noccus	

Trade name, 20-25 mg. amount

Algosediv	Shin-Nibrol	Imidene
Bonbrain	Noctosediv	Sedatum
Glutanon	Sanodormin	Ulcerfan
New-Nibrol	Thailinette	

Small amount

Asmaval	Polygripan	Pro-Ban M
Admadion	Polygiron	Tensival
Enterosediv	Preli-Sediv	Valgraine
Grippex	Gastrinide	Peracon Expectorans

A particular virtue of thalidomide as a sleeping potion was that, unlike many other preparations for this purpose, it was not found harmful when taken in excess. According to the Merrell Co.—

Of particular importance, an overdose of thalidomide did not induce depression of respiration and heart action, which eliminated the possibility of accidental death and suicide through its use. Clinical reports have been published on 17 persons who survived following ingestion of excessive amounts of the drug. One intended suicide ingested 144 times the usual dose. There are unpublished reports on many other intended suicides. No deaths from overdosage are known.<sup>52</sup>

In retrospect, it seems altogether reasonable that an American company should seek the U.S. distribution rights to this successful Ger-

<sup>50</sup> Humphrey hearings, pt. 4, op. cit., pp. 1920-1923.

<sup>51</sup> Reprinted in Humphrey hearings, pt. 4, op. cit., p. 1921. Reference to Swiss list is on p. 1923.

<sup>52</sup> Circular letter, op. cit., Humphrey hearings, pt. 1, op. cit., p. 121.

man drug in 1960. Up to that time the drug had had some 5 years (or at least, three) of experimental testing and 3 years or more of wide commercial use without reported incident. In some countries, including Germany for 15 months, it had not even required prescription. According to Dr. Taussig, "at that time no one had reported any outward side effects from thalidomide."<sup>53</sup> In fact, later on, one of the difficulties encountered by investigators who tried to identify some drug as the cause of phocomelia, was that mothers of afflicted offspring did not remember having taken Contergan (the German brand of thalidomide); it was of no more consequence or more memorable than aspirin. It had been available (up to April 1961) without prescription. Moreover, ". . . nurses in German hospitals dispense sleeping tablets as freely as nurses in the United States give laxatives."<sup>54</sup> There was no reason to suppose it to be anything other than a safe, efficacious drug with no known side effects, and one that could properly be sold very widely with a minimum of control. In short, a highly profitable and useful product.

#### *Early evidences of thalidomide side effects*

No indication of adverse side effects of thalidomide appear to have been reported, according to Dr. Taussig, until the latter part of 1960, when German medical journals carried reports of a "new polyneuritis associated with long-term use of the drug."<sup>55</sup> At about this same time, a letter to the editor of the *British Medical Journal* described four parallel cases, all of whom had taken 100 mg. of Distaval (the British brand of thalidomide) daily for 18 months to 2 years. Symptoms included tingling and coldness of feet and hands, impaired muscular coordination, and nightly leg cramps. The symptoms apparently disappeared when the drug was suspended.<sup>56</sup>

A representative of the clinical research department of the British drug company producing Distaval responded, in a later issue of the same journal, to say that on the basis of 4 years of clinical investigations there had been no indication, from either animal experimental work or human clinical studies, to indicate "any significant toxic hazard." However, early in 1960, "isolated reports were sent to [the company representative] from various parts of the country describing symptoms and signs suggestive of peripheral neuritis occurring in patients receiving thalidomide regularly for periods of 6 months or more." While thalidomide had not been confirmed as the cause, the writer went on, the company had been including warning information about the possibility of this undesirable side effect in its literature since August of 1960.<sup>57</sup>

As time went on, apparently, this side effect was regarded by the medical profession in Europe with increasing apprehension. The question implicit in this concern (which was recorded explicitly in the American review of the drug's safety at about this time) was as to whether the drug's contribution to human comfort and well-being was enough to justify an evident but imperfectly defined medical

<sup>53</sup> Helen B. Taussig, M.D. "The Thalidomide Syndrome," *Scientific American*, (August 1962, vol. 207, No. 2), pp. 29-35. Reprinted in Humphrey hearings, op. cit., pt. 1, p. 110.

<sup>54</sup> *Ibid.*, p. 112.

<sup>55</sup> *Ibid.*, p. 110.

<sup>56</sup> *British Medical Journal*, (Dec. 31, 1960), p. 1954. Reprinted in Humphrey hearings, op. cit., pt. 1, pp. 17-18.

<sup>57</sup> *British Medical Journal*, (Jan. 14, 1961), p. 130. Reprinted in Humphrey hearings, op. cit., pt. 1, p. 18.

risk. In Germany, the question was "resolved" by requiring that it be decided in each individual case by a physician in attendance—in other words, by placing the drug under prescription. As Dr. Taussig said:

In April 1961, a new form of polyneuritis appeared: tingling of the hands, sensory disturbance, and later, atrophy of the thumb and motor disturbances. It was soon recognized that the long continued use of Contergan in adults was responsible for polyneuritis; furthermore, unless the drug was promptly discontinued, the polyneuritis was irreversible. Thereafter, the drug was placed upon prescription.<sup>68</sup>

*Medical determination that thalidomide was associated with phocomelia*

A more serious side effect of thalidomide gradually came to light during 1961–62, when statistically significant evidence was developed indicating that when the drug was taken during the first 3 months of pregnancy there was as much as a 50–50 chance (elsewhere, more than two chances in five) that the child would be deformed. The mechanism causing the deformity was not characterized at this time; it was suggested that the action of the drug was not positive, but indirect, because some expectant mothers exposed to the hazard were delivered of normal offspring. The tentative conclusion appears to have been that thalidomide was coupled with some fairly common genetic characteristic to bring about phocomelia.

The incidence of phocomelia occurred at different periods in different countries, depending on the availability of the drug to expectant mothers. Its effects were first evident in Germany, where the drug first came on the market. In retrospect, the medical profession seems to have been slow to appreciate the importance of this new disorder. There had been "perhaps a dozen cases of phocomelia in 1959, whereas in the preceding decade there had been perhaps 15 in all of West Germany." The numbers increased rapidly thereafter.

During 1960 almost every pediatric clinic in West Germany had seen infants suffering such defects. In Münster there had been 27, in Hamburg 30, and in Bonn 19.

In October 1960, at the annual meeting of the pediatricians of the Federal Republic of Germany, at Kassel, two extreme cases of phocomelia were the subject of an exhibit. The physicians who presented this exhibit "regarded it as a new clinical entity." Despite the considerable incidence of phocomelia in Germany during the preceding months, "the exhibit did not attract a great deal of attention."

When the German pediatricians gathered at Düsseldorf for their 1961 meeting, November 20, "almost all pediatricians were aware of the outbreak of phocomelia." Indeed, "almost every clinic in West Germany had admitted three times as many such infants in 1961 as in 1960.

<sup>68</sup> Helen B. Taussig, M.D. "A Study of the German Outbreak of Phocomelia." *op. cit.*, in Humphrey hearings, *op. cit.*, pt. 1, p. 103. Apparently Dr. Taussig's reference to the "new" form of polyneuritis was not intended to differentiate it from the form reported in England; however, her description of its symptoms and prognosis indicate that it was somewhat more serious than the earlier English accounts had suggested.

See table.<sup>59</sup> The clinical syndrome had been characterized by H. R. Weidemann.<sup>60</sup>

First medical suspicions that thalidomide was associated with phocomelia apparently occurred almost simultaneously in Australia and Germany. In Australia—

\*\*\* W. G. McBride, a physician in New South Wales \*\*\* saw three newborn babies with severe phocomelia during April 1961. In October and November he saw three more. From the histories of the mothers he found that all six had taken Distaval in early pregnancy. McBride notified the Australian branch of Distillers Ltd. and it cabled his findings to the London headquarters on November 27. This and the news from Germany caused the firm to withdraw the drug on December 3.

In Germany, the identification was made by Widukind Lenz of Hamburg, on the basis of questionnaires to the parents of deformed infants and their attending physicians, and subsequent followup interrogations.

On November 15 Lenz warned Grunenthal (the manufacturing company) that he suspected Contergan (the German name for thalidomide) of causing the catastrophic outbreak of phocomelia and he urged the firm to withdraw it from sale. On November 20, at the pediatric meeting, he announced that he suspected a specific but unnamed drug as the cause of the "Weidemann syndrome" and said that he had warned the manufacturer \*\*\*.

On November 26 Grunenthal withdrew the drug and all compounds containing it from the market. Two days later the West German Ministry of Health issued a firm but cautious statement that Contergan was suspected as the major factor in causing phocomelia.

It is unlikely that the total impact of phocomelia attributable to thalidomide will ever be determined with any degree of precision. The drug was distributed almost worldwide. Moreover, some of the factors that delayed original detection of the relationship between drug and

<sup>59</sup> Incidence of phocomelia in the various university pediatric clinics.\*

	1949-59	1959	1960	1961	In 3 years
Bonn.....		2	19	50	71
Bremen.....			4	20	24
Frankfurt.....		1	4	11	16
Gottingen.....		3	1	10	14
Hamburg (Lenzperson).....		1	16	57	74
Hamburg (Lenzletter).....		1	30	154	185
Heidelberg.....		2	5	9	16
Kiel.....		2	4	26	32
Munche.....		2	14	44	60
Munster.....	(1)	3	27	96	126
Birmingham.....			4	13	17
Liverpool.....			8	25	33
Stirling.....					10

\*"A Study of the German Outbreak of Phocomelia," op. cit., p. 101.  
14/year.

<sup>60</sup> Material and quotations in this selection except as indicated are taken from the two articles by Dr. Taussig, both cited earlier, in JAMA and Scientific American. The character of phocomelia was described by Dr. Taussig, based on the Weidemann source, as follows:

As in most malformations, the severity varies but the pattern is remarkably specific. The essential feature of the abnormality concerns the long bones of the extremities. The prehensile grasp is lost. The hand arises directly from the distal end of the affected bone. The radius is absent or both radius and ulna are defective; in some instances only one short bone remains; in extreme cases the radius, ulna, and humerus are lacking and the hand buds arise from the shoulders. Both sides are affected but not usually with equal severity. The legs may be affected in the same manner; in most instances the deformity of legs is less severe. The tibia fails to form. The fibula also may not form and the femur may be short. The hip girdle is not fully developed and there is a dislocation of the hip with external rotation of the stub of the femur. The feet are externally rotated. Polydactylism and syndactylia of the toes are common. In the extremely severe cases the arms and the legs are missing. In some instances the external ear is missing then the internal auditory canal is abnormally low. Usually hearing is not grossly impaired. Unilateral facial paralysis is relatively common. The vast majority of children are of normal mentality.

syndrome continued to obscure the magnitude of the disaster; these were:

Wide availability of the drug without prescription or record of use.

Absence of formal arrangements for the recording of births of abnormal infants.

Reluctance of parents to reveal infant abnormality.

Unprecedented medical character of the disaster.

Timelag between cause and effect.

Apparently innocuous nature of the cause.

The variety of different brand names and mixtures associated with the drug.

The absence of systematic national or international warning system.

The possibility that there were (and are) other causes of fetal abnormality than thalidomide, and the fact that thalidomide did not invariably cause abnormality even when taken in the "sensitive period" of fetal development.<sup>61</sup>

Numbers of cases are not meaningful by themselves because the extent of injury varied from minor to total. Apparently, about one-third of the deformed infants did not survive. However, the extent of physical and emotional wreckage that resulted was widespread.<sup>62</sup>

#### *Fortunate exclusion of thalidomide from U.S. markets*

An application for approval of "Kevadon" (the United States and Canadian name for thalidomide) as a new drug was received by the Food and Drug Administration from the William S. Merrell Co., September 12, 1960. The application was assigned to Frances O. Kelsey, M.D., of the FDA staff for processing. It was her first assignment. The application would receive automatic approval in 60 days—on November 13, 1960—if not previously acted upon. However, FDA could return the application on grounds of "insufficient data" which would have the effect of delaying the beginning of the 60-day period. Dr. Kelsey repeatedly exercised this option, which distressed the applicant. From the company's point of view, a drug in common use in other countries without any reported adverse side reactions was being arbitrarily blocked by bureaucratic officiousness. Later on, however, the company would have reason to be extremely grateful for this delaying action which was to save countless lives, prevent an epidemic of phocomelia of untoward proportions, and obviate the possibility of financial liability in the millions, even billions, of dollars.

Dr. Kelsey was later to explain that her repeated requests to the company for further information were motivated by the fact that thalidomide in the body "\* \* \* behaved rather differently from other drugs that were rather closely related: and furthermore, animal studies did not parallel human experience."<sup>63</sup> When she learned, by chance, of the first British report of peripheral neuritis, early in 1961 (from the

<sup>61</sup> This sensitive period was defined as "between the 28th day and the 42d day (inclusive) after conception or the 30th to the 60th day after the first day of the last menstrual period." (Helen B. Taussig, M.D. "Medical Intelligence," *New England Journal of Medicine* (July 11, 1963), pp. 92-94. Reprinted in Humphrey hearings, op. cit., pt. 4, p. 1920.)

<sup>62</sup> *Newsweek* magazine reported (Mar. 4, 1968), p. 80, that "of the 5,000 thalidomide babies born in Germany only about 2,600 are alive today. There are about 400 English thalidomide children still living." The article describes some of the prosthetic technology being devised to alleviate their physical incapacity.

<sup>63</sup> Humphrey hearings, op. cit., pt. 1, p. 15.

letter to the editor in the *Journal of Medicine*, issue of Dec. 31, 1960), Dr. Kelsey was even more concerned. It is probable that one factor in her initial consideration of the case was the fact that the drug was used to deal with minor disorders, but which would involve the prospect of enormous usage. Such a drug, if it had any inherent possibility of hazard, would unbalance the risk/benefit calculation, in terms of the potential range of unwanted consequences versus the relative unimportance of the desirable consequences. Moreover, there were already a number of drugs of proved effect on the market to deal with these same minor disorders. However, when the side effect of peripheral neuritis became known, her apprehensions seem to have been sharpened.

According to one account, Dr. Kelsey had discovered in the course of her World War II research on the effects of quinine on rabbits, that drugs that irritate the nerves of adults sometimes operate so as to deform and stunt a fetus when absorbed into the system of a pregnant female.<sup>64</sup> The first entry in Dr. Kelsey's FDA record of thalidomide transactions with the Merrell Co. that raises this possibility was for May 11, 1961. The entry reads in part:

\* \* \* regarding neurological toxicity \* \* \*. We discussed certain points as being ones on which more information was necessary. These included both animal studies and clinical information. It was at this conference that we specified a need for evidence that the drug would be safe during pregnancy. [Handwritten note on original reads: This was based on peripheral neuritis symptoms in adults.] At this time our concern was only on theoretical grounds.<sup>65</sup>

The impression that thalidomide was associated with phocomelia became general at the end of November 1961. The last entry in the FDA record on thalidomide before this time was a memorandum of a telephone interview by Ralph G. Smith, M.D., Dr. Kelsey's superior, with a medical representative of the Merrell Co., dictated September 6, 1961. It read in part: "After checking with Dr. Kelsey I informed him [the company representative] that other changes in labeling were required in connection with exclusion of use in pregnant women \* \* \*."<sup>66</sup>

Some criticism has been expressed because of timelags from the point at which the serious effects of thalidomide on the fetus were discovered and thalidomide was withdrawn from the German and British markets (Nov. 26 and Dec. 3, 1961) to the time at which it was withdrawn from the Canadian market (March 2) and to the time that the U.S. new drug application was withdrawn (March 8). There was also criticism, in Canada, of the slowness and incompleteness of the action—governmental and private—to halt sale of thalidomide (known there as Kevadon or Talimol). A feature article in MacLean's magazine, for example, indicated that the drug was still being sold—and even prescribed—as late as April 10, 1962.<sup>67</sup>

#### *The thalidomide testing program in the United States*

The concept and criteria of the conduct of experimental trials of new drugs was described to a Senate subcommittee by George P. Larrick, Commissioner of the FDA, on August 1, 1962, in a general congressional review of the process by which a new drug is introduced into the United States. Commissioner Larrick explained:

<sup>64</sup> Richard Harris, *The Real Voice*, op. cit., p. 185.

<sup>65</sup> Humphrey hearings, op. cit., pt. 1, pp. 78-79.

<sup>66</sup> *Ibid.*, p. 96.

<sup>67</sup> MacLean's, (May 19, 1962). Article reproduced in Humphrey hearings, op. cit., pt. 1, p. 277.

When a firm decides to use a new drug for experimental clinical trials, they have to get from the person to whom they want to ship this drug a statement purporting to show that he is an expert, and why—that he is connected with the principal hospital in a major State, that he has this facility and that facility. And then they have to keep a careful record of whom they shipped it to and how much they shipped.<sup>68</sup>

That information, he said “\* \* \* is available to us if we go and ask for it.” He added, later on, that “\* \* \* this whole business of drug testing has to be a very carefully watched procedure, and a very carefully balanced procedure, because on the one hand you can deny the public drugs for which they have much need for their health and safety, or you can make mistakes in the direction of doing great harm.”<sup>69</sup>

The FDA also attached importance to the question of pre-natal effects of drugs that might be taken by pregnant women.

\* \* \* One, [said Commissioner Larrick, in answer to a question] that the drug is specifically offered for pregnant women—each one of the doctors in the New Drug Section pays particular attention to the evidence that it is safe for those women. If it is silent on the question of pregnant women, and it is a drug which, by the very nature of the thing, would be taken by all women, pregnant or not, the New Drug people are requiring a specific statement in the literature to the doctor which says this has not been tested for this purpose. [And later] Food and Drug requires it, on each new drug application.<sup>70</sup>

The FDA also attached importance to the question of prenatal effects. This policy was in line with a recommendation by the Committee on the Fetus and Newborn, of the American Academy of Pediatrics, which had recommended:

(1) Existing drugs and agents that are developed in the future for use in the fetus and in infants must be subjected to more extensive preclinical investigation than is being carried out at the present time.

(2) In order to pursue these principles, it is recommended that drug labeling should specifically indicate the extent of existing information concerning the use of the agent in the fetus and the infant.<sup>71</sup>

Arrangements for the clinical testing of thalidomide were set forth in exhibit 42 of the hearings by Senator Humphrey's Subcommittee on Interagency Coordination in Drug Research and Regulations, under the title “Kevadon Hospital Clinical Program” of the William S. Merrell Co.<sup>72</sup> This exhibit included a manual which “\* \* \* had been used in connection with a meeting which the firm had held for its employees October 25 and 26, 1960.” Objectives of the program, as set forth in the manual, were:

(1) To contact teaching hospitals (any hospital having a resident-intern training program) and the chief and senior members of the departments of surgery, medicine, anesthesiology, and obstetrics-gynecology for the purpose of selling them on Kevadon and providing them with a clinical supply.

(2) To eventually accumulate a series of clinical reports on Kevadon's indications as they apply within different departments of a hospital.

(3) To perfect and develop the best possible detail story for the national introduction of Kevadon.

The scope of the planned program was to set up “approximately 800 established studies, averaging 20 patients per study.” Said the manual: “We are principally interested in contacting the most influential physicians who would have occasion to use Kevadon.”

<sup>68</sup> Humphrey hearings, op. cit., pt. 1, p. 42.

<sup>69</sup> Ibid., p. 43.

<sup>70</sup> Ibid., pp. 44-45.

<sup>71</sup> “The Effect of Drugs Upon the Fetus and the Infant.” *Pediatrics*, (October 1961, vol. 28, No. 24), p. 678, reproduced in Ibid., pp. 45-46.

<sup>72</sup> Ibid., pt. 1, pp. 259-267.

The manual included a word of caution to employees:

Bear in mind that these are not basic clinical research studies. We have firmly established the safety dosage and usefulness of Kevadon by both foreign and U.S. laboratory and clinical studies. This program is designed to gain widespread confirmation of its usefulness in a variety of hospitalized patients. If your work yields case reports, personnel communications or published work, all well and good. But the main purpose is to establish local studies whose results will be spread among hospital staff members. You can assure your doctors that they need not report results if they don't want to but we, naturally, would like to know of their results. Be sure to tell them that we may send them report forms or reminder letters but these are strictly reminders and they need not reply. Their reports or names would not be used without getting their express permission in advance.

At the beginning of your interview, don't be secretive—lay your cards on the table. Tell the doctor that present plans call for Kevadon to be marketed early in 1961. Let them know the basic clinical research on Kevadon has been done. Don't get involved by selling a basis [sic] clinical research program instead of Kevadon. Appeal to the doctor's ego—we think he is important enough to be selected as one of the first to use Kevadon in that section of the country.

Attention of employees was directed, in the manual, to the requirement of FDA that a "qualified investigator statement" must be signed by any clinician and be in the hands of the company before the company could legally ship Kevadon to the clinician. Moreover—

One of the prerequisites for obtaining an NDA is that the application contain full reports of investigations which have been made to show whether or not such drug is safe for use. In order to allow for the investigational testing of a drug, section 505(i) of the act was passed which provided that the Secretary of Health, Education, and Welfare may promulgate regulations for exempting from the operation of section 505(a) drugs intended solely for investigational use "by experts qualified by scientific training and experience to investigate the safety of drugs."

The Secretary has passed such regulations. The requirements that have been set forth are that the investigational drug bear a label carrying the statement—"Caution: new drug—limited by Federal law to investigational use," and that such shipment be made only to a qualified expert investigator. A further stipulation is made that the company that introduces new shipment into interstate commerce must obtain, prior to the shipment, a statement signed by such expert showing that he has adequate facilities for the investigation to be conducted by him, and that the drug will be used solely by him or under his direction.

Successive bulletins and communications to the "special Kevadon representatives" provide evidence that the company's estimate as to the interest of the medical profession in thalidomide was correctly foreseen. On November 8, 1960 it was announced that "In 1 week you have already established 162 studies, totaling 6,648 patients!" On November 15, the company had reached 55.3 percent of its "goal" with 418 studies, involving a predicted 15,373 patients. On November 29, it was announced that the program had achieved 762 studies involving 29,413 patients.<sup>73</sup>

The Humphrey subcommittee in its final report expressed criticism of what it called the "peculiar aspects of the 'test.'" The company had distributed 2½ million thalidomide tablets to 1,267 investigators, who distributed them to 19,822 patients including 3,760 women of child-bearing age, of whom 624 were pregnant. Fortunately, most of these received the drug late in pregnancy.<sup>74</sup> However, said the report:

<sup>73</sup> Exhibit 43 (consisting of internal correspondence of William S. Merrell Co., provided by FDA), in *ibid.*, pp. 270-273.

<sup>74</sup> Senate, Committee on Government Operations, "Interagency Drug Coordination," Report. \* \* \* S. Rept. 1153 (1966), op. cit., pp. 22-26. The figures are derived from an FDA press release, dated Aug. 23, 1962, and are reprinted in full in Humphrey hearings, op. cit., pt. 1, pp. 248-249.

[To distribute such a large quantity of] what was still in the United States an "experimental" drug exposed a very considerable number of potential patients to some degree of risk (p. 22).

Of the 1,267 doctors who received the drug, only 276 gave written reports to the manufacturers; 102 doctors gave verbal reports (p. 23).

[Of the 1,267], only 647 doctors stated that they had signed a statement of qualification (p. 23).

Hundreds of "investigators" failed, contrary to the traditions of science, to keep adequate records. They did not know which patient they had given the drug to, at what dosage, or when (p. 25).

In addition to drawing its own conclusions, the report also quoted the opinions of a number of other critics who vouchsafed such views as the following:

In some respects the pharmaceutical industry manifests a split personality. A most unfortunate example of this was the manner in which the clinical evaluation of thalidomide was conducted. While the clinical testing of this drug was managed by the medical department, it was handled in the usual professional manner. But when clinical research was taken over by business enterprise it became tainted with some of the worst features of commercialism.

It is unfortunately true, as the thalidomide incident so well illustrates, that the drug industry does not now always adhere to high standards, either in planning the investigation, selecting the investigators, or providing the investigators with full information about the hazards that may be expected in conducting the clinical trial.

Certainly, the most casual observer would reject the desultory returns from over 1,200 physicians, to whom was entrusted the clinical trial of thalidomide. Their results could have no scientific significance or validity. Yet, this formula for deriving new drug introduction and acceptance has obtained for many years.

The final toll of thalidomide was reported on by FDA for the subcommittee, September 28, 1963, as follows:

Our final figure for such deformity cases, in which the drug was taken or reportedly taken during the first trimester of pregnancy, is 17.

In 10 of these cases, the drug was produced in the United States and given by American investigators. The deformities which occurred in these cases were as follows:

Deformities:	Number
1. Absence of legs and forearms.....	1
2. Deformed hands and arms.....	2
3. Absence of arms and hands.....	1
4. Deformed arms and legs.....	2
5. Webbed toes, 3-chambered heart.....	1
6. Cleft palate, deformed sex organs.....	1
7. Absence of both arms and 1 leg; red birthmark on face.....	1
8. Deformed arms, hands and fingers, and feet; red birthmark on nose and upper lip.....	1

In the remaining seven cases, thalidomide from foreign sources was reportedly taken during the first trimester, and the resulting deformities were as follows:

Deformities:	Number
1. Absence of legs and forearms.....	1
2. Deformed hands and arms.....	2
3. Deformed arms and legs.....	1
4. Internal organs reversed, deformed heart.....	1
5. Deformed arms, hands, fingers, and feet; red birthmark on nose and upper lip.....	1
6. Underdeveloped right ear, no soft palate, heart murmur, facial paralysis.....	1

Commented the subcommittee report: "Thalidomide triggered a vast educational process which is still continuing \* \* \*."

The United States has been saved from mass disaster by the good fortune that a new drug application (1 of over 400 in any given year) had landed on the

desk of a particular reviewer; the existing system was not adequate to prevent a mass tragedy; serious flaws endangered the public safety.<sup>75</sup>

## V. CONGRESSIONAL RESPONSE TO THE THALIDOMIDE NEAR-DISASTER

The first formal congressional response to the appearance of the New York Times account of Dr. Taussig's findings about the German thalidomide disaster occurred, May 24, 1962, when Dr. Taussig appeared before Representative Celler's Committee on the Judiciary. She provided a detailed description of the history of German experience with the drug, including slide projection illustrations of infants born with the deformities called phocomelia.<sup>76</sup> The Taussig testimony received no particular attention or emphasis, however.<sup>77</sup>

Dr. Taussig's testimony developed the thesis that "it is awfully hard to really be safe." There was more danger from a widely used drug for minor disorders than from a more powerful drug used to treat an extremely serious disease.<sup>78</sup> As to thalidomide, the circumstantial evidence was "overwhelming" that the drug, "if taken during a sensitive period, may cause phocomelia."<sup>79</sup>

The thalidomide story became a "headline" in the United States when it was invested with drama in a front-page feature story in the Washington Post, by Morton Mintz, on Sunday, July 15. The account began:

This is the story of how the skepticism and stubbornness of a Government physician prevented what could have been an appalling American tragedy, the birth of hundreds or indeed thousands of armless and legless children.

The story went on to describe how Dr. Kelsey had carried out her duty, "living the while with insinuations that she was a bureaucratic nitpicker, unreasonable—even, she said, stupid."<sup>80</sup> Presented in these terms, the thalidomide story remained for some time a sensation, sustained not only by subsequent testimony in committees, and floor statements by Members of Congress, but also by follow-on human interest stories, such as that of a Phoenix, Ariz., housewife who vainly sought a legal abortion in the United States to escape the consequences of thalidomide medication in early pregnancy and subsequently journeyed to Sweden to obtain the operation.<sup>81</sup> In these ways, the emotional impact of the tragedy was sustained throughout the summer of 1962 while drug legislation was before the Congress.

<sup>75</sup> Senate, Committee on Government Operations, Interagency Drug Coordination, Report, \* \* \* S. Rept. 1153 (1966), op. cit., pp. 12-13.

<sup>76</sup> U.S. Congress, House, Committee on the Judiciary, Drug Industry Antitrust Act, Hearings before the Antitrust Subcommittee (Subcommittee No. 5) of the \* \* \* on H.R. 6245, A bill to amend and supplement the antitrust laws with respect to the manufacture and distribution of drugs, and for other purposes, May 17, 18, 23, and 24, 1962, Serial No. 32. (Washington, U.S. Government Printing Office, 1962), pp. 415-442. Hereinafter cited as House, Drug Industry Antitrust Act, Hearings (1962).

<sup>77</sup> According to the account by Richard Harris, *The Real Voice*, op. cit., p. 161: "To the astonishment of those who attended the hearings, not a word about Dr. Taussig's testimony appeared in the newspapers. There were some dark mutterings about a press blackout, but actually nothing so sinister had occurred. It was simply that Celler's staff had not announced that a witness was about to say something important. Several weeks later, when the thalidomide story suddenly hit the front pages of every newspaper in the country, a wire service reporter assigned to the Hill complained about (this lack of advance notice) \* \* \*."

<sup>78</sup> House, Committee on the Judiciary, Drug Industry Antitrust Act, Hearings, \* \* \* (1962), op. cit., pp. 424-429.

<sup>79</sup> *Ibid.*, p. 417.

<sup>80</sup> Morton Mintz, "Heroine" of FDA Keeps Bad Drug Off Market. *Washington Post* (July 15, 1962), p. 1.

<sup>81</sup> *The Real Voice*, op. cit., pp. 188, 201, 216.

*Presidential interest in drug efficacy and safety*

The lengthy investigative hearings by Senator Kefauver into the drug industry and the further lengthy hearings on S. 1552, had emphasized the enforcement of price competition and patent licensing. Similar emphasis had characterized most of the Celler hearing on the companion bill, H.R. 6245. However, President Kennedy had taken the position that the protection of the consumer with respect to drugs was primarily a matter of safety and efficacy, rather than prices. In a special message to the Congress on protecting the consumer interest, March 15, the President called for legislation to "strengthen regulatory authority over foods and drugs." New drugs were being placed on the market (9,000 in the last 25 years) with "no requirement that there be either advance proof that they will be effective in treating the diseases and conditions for which they are recommended or the prompt reporting of adverse reactions." He claimed that more than 20 percent of the new drugs did not live up to the manufacturer's claims. Accordingly, the President recommended legislation to authorize the Department of Health, Education, and Welfare (among other things), to—

Require a showing that new drugs \* \* \* are effective for their intended use—as well as safe—before they are placed on the market ;

Withdraw approval of any such drug \* \* \* when there is substantial doubt as to its safety or efficacy, and require manufacturers to report any information bearing on its safety or efficacy ;

Require drug \* \* \* manufacturers to maintain facilities and controls that will assure the reliability of their product ;

Require batch-by-batch testing and certification of all antibiotics ;

Assign simple common names to drugs.

The President also called for "legislation to authorize the Federal Trade Commission to require that advertising of prescription drugs directed to physicians disclose the ingredients, the efficacy, and the adverse effects of such drugs."<sup>82</sup>

Shortly after the Mintz article had appeared, the President alluded to the thalidomide episode directly. At a meeting with the Consumers' Advisory Council, July 19, he made reference to "the work done by one woman, Dr. Frances Kelsey \* \* \* in regard to saving thousands of babies from crippling deformities by failure to give approval to a suspicious drug."<sup>83</sup>

The President opened his August 1 news conference with an announcement that his administration was reviewing the steps that could be taken administratively to make the introduction or investigation of new drugs less dangerous. Also, a 25-percent increase in FDA staff and increased funding had been requested and provided by the Congress. Nevertheless, "additional legislative safeguards are necessary." As reported by the Senate Judiciary Committee, July 19, he said, S. 1552 "does not go far enough \* \* \*." He gave support to the "administration bill introduced by Congressman Oren Harris, of Arkansas, in the House." It contained such additional safeguards as the right of FDA to remove a new drug from the market immediately "where there is an immediate hazard to public health."<sup>84</sup>

<sup>82</sup> U.S. President (John F. Kennedy). Special Message to the Congress on Protecting the Consumer Interest, Mar. 15, 1962. In Public Papers of the Presidents, John F. Kennedy, 1962. (Washington, U.S. Government Printing Office, 1963), pp. 239-240.

<sup>83</sup> U.S. President (John F. Kennedy). Remarks at a meeting with the Consumers' Advisory Council, July 19, 1962. In *ibid.*, p. 564.

<sup>84</sup> U.S. President (John F. Kennedy). The President's news conference of Aug. 1, 1962. In *ibid.*, p. 590.

The administration bill, H.R. 11581, introduced May 3, was described by its sponsor, as follows:

H.R. 11581, referred to as "Drug and Factory Inspection Amendments of 1962," proposes to authorize the Department of Health, Education, and Welfare, first, to issue regulations requiring drug manufacturers to maintain facilities and controls that will assure the reliability of their products; second, to require a showing that new drugs and biologicals are effective for their intended use—as well as safe—before they may be marketed; third, to withdraw clearances granted on new drugs when there is substantial doubt as to the drug's safety or efficacy; fourth, to require manufacturers to advise the Food and Drug Administration of clinical experience and reports of any adverse reactions to new drugs and antibiotics; fifth, to require the same safety testing and certification procedures for all antibiotics as are now applicable to only a few antibiotics; sixth, to assign generic names to drugs; seventh, to establish an enforceable system of preventing the illicit distribution of habit-forming barbiturates and amphetamines; and, eighth, to institute more effective factory inspection for all projects subject to the act.

It would also authorize the Federal Trade Commission to require the disclosure of ingredients of prescription drugs, their efficacy and their adverse effects in advertisements directed to physicians.<sup>55</sup>

The President's reference at his news conference to the search for administrative measures to make safer the investigation of new drugs may have had reference to new regulations under study by FDA. On August 10, FDA announced a set of proposed regulations, which would require drug firms to indicate in advance their plans for the investigation of a new drug, to monitor closely the execution of the plans, and to report immediately any adverse findings; such investigations were not to be used for promotional or market development purposes.<sup>56</sup>

When, at length, the drug reform bill was signed by the President, October 10, he paid tribute to its sponsors, and to the bill which, he said, "is designed to provide safer and more effective drugs to the American consumer." He also took note of the role of the thalidomide episode in bringing about this result:

[Said the President:] The Congress is to be congratulated in moving so quickly. Fortunately, prior to the revelation of the dangers posed by drugs like thalidomide, the foundation for legislative action on drugs had been laid down in exhaustive hearings conducted by Senator Kefauver and others who introduced the present bill in its first version and in a legislative proposal on drugs and factory inspection introduced in the House by Congressman Harris.<sup>57</sup>

#### *The spate of drug testimony available to Congress*

A crushing weight of testimony had been accumulated, and continued to grow, in the committees of Congress concerning drug problems and legislative remedies. There had been the 8,669 pages of the first Kefauver investigation and the 4,217 pages of the second; Representative Celler's committee had accumulated a further 908 pages of evidence (4 days of hearings, 40 witnesses); another 709 pages of evidence (8

<sup>55</sup> U.S. Congress, House, Committee on Interstate and Foreign Commerce, Drug Industry Act of 1962. Hearings before the \* \* \* on H.R. 11581. A bill to protect the public health by amending the Federal Food, Drug, and Cosmetic Act to assure the safety, efficacy, and reliability of drugs, authorization standardization of drug names, establish special controls for barbiturate and stimulation drugs, and clarify and strengthen existing inspection authority with respect to any articles subject to the act; and to amend related laws; and H.R. 11582, A bill to protect the public health by amending the Federal Food, Drug, and Cosmetic Act to require a premarketing showing of the safety of cosmetics; assure the safety, efficacy, and reliability of therapeutic, diagnostic, and prosthetic devices; and amend the act with respect to cautionary labeling; and for other purposes. June 19, 20, 21, 22; Aug. 20, 21, 22, 23, 1962. (Washington, U.S. Government Printing Office, 1962), p. 1.

<sup>56</sup> The FDA proposed regulations are reproduced in *ibid.*, p. 219, sq.

<sup>57</sup> U.S. President (John F. Kennedy), Remarks upon signing the drug reform bill. October 10, 1962. In *Public Papers of the Presidents, John F. Kennedy, 1962*, op. cit., sec. 443.

days of hearings, 53 witnesses) had been recorded by the House Committee on Interstate and Foreign Commerce, chaired by Representative Harris; and Senator Humphrey had accumulated 774 pages of testimony and exhibits (2 days, 10 witnesses) on the management of the investigative phase of thalidomide in the United States. (His Subcommittee on Reorganization and International Organizations of the Committee on Government Operations would continue its agency coordination study, through further hearings in 1963, totaling 3,228 pages of documentation, and would issue its final report May 5, 1966.)

There was abundant evidence as to the need for strengthened legislation to control the management of prescription drugs in the United States. There was also a considerable consensus—among physicians, the pharmaceutical manufacturers, and their respective associations—as to specific provisions the legislation should contain. A major difficulty, however, lay in the fact that the initial sponsor, Senator Kefauver, had sought to combine drug and medical reform with economic reform. The Administration had been content to focus on the issue of drug safety and efficacy, giving almost no attention to the price and monopoly issues.

The various hearings presented many indications of interactions and conflicts between professional motives of medical health and economic motives of profit and competitive advantage. It might well have appeared to Senator Kefauver and his associates that part of the motivation for (or at least, acquiescence in) commercial promotion of drugs with insufficient attention given to formal requirements of drug safety lay in the highly profitable nature of the drug industry. However, this emphasis tended to create an adversary atmosphere in the Kefauver hearings, and to divert attention from the very considerable consensus on the fundamental requirements for drug safety. The latter set of correctives might perhaps have been regarded as useful to provide a “coattail” effect, to win congressional acceptance of the economic reforms. However, there were inherent difficulties in combining these two sets of legislative actions. The combining of them threatened to jeopardize acceptance of any legislation, it intensified the complexity of an already nearly unmanageable problem, multiplied the separate issues, and superimposed economic significance on issues in which there was sometimes no technical agreement among physicians themselves. Among the issues that emerged from the various hearings, the following aspects of medical health and safety seem to have been particularly salient:

1. The equivalence of generic drugs from various drug houses;
2. The amenability of the drug industry to control by the application of the free enterprise methods of profit and competition;
3. The desirability of a limitless number of additional drugs, differing in greater or less degree from those already available;
4. The competence of the practicing physician to judge for all his patients the efficacy, safety, and economy of any particular drug, and to decide on the trade-offs among these factors in view of—
  - Numbers of innovative drugs with minor differences;
  - Numbers of detail men from drug houses;
  - Numbers of tests, each inherently partial, of variant drugs;
  - Volume of information about medicine, and the need for specialization;
  - Increased pressures by patients to participate in diagnosis and treatment;
  - Pressures on physicians to work with brand names;
  - Tendency to associate drug quality with brand or drug house; and
  - Pressure on drug houses to expand and develop new markets.

However, there were many other questions that were more or less relevant to the question of drug safety:

1. Should the law require the physician to obtain a patient's consent before prescribing an experimental drug for him? Was this indeed feasible?
2. Should testing on animals be mandatory before experimental drugs are used on humans?
3. Should drugs be required by law to be identified and prescribed on a generic rather than on a brand name basis?
4. Should those conducting experimental testing or use of new drugs be formally qualified?
5. Should there be an approved "plan of investigation" of a new drug, before the testing phase was permitted to begin?
6. Should test reports, in writing, be made mandatory for all investigators of new drugs?
7. Should Government control be exercised over the selection of generic names for drugs?
8. Should drug investigators be required to register for each investigative assignment they accepted?
9. Should each individual investigator testing a new drug be required to report his results directly to a Government agency, like the FDA?
10. Should the review period before FDA approval of a new drug be lengthened substantially beyond the 60 days?
11. Should the Federal laws regarding medical and drug practice be clarified and doctors better informed as to what the law required?
12. Should drugs be tested for efficacy and safety, taken together, rather than tested for safety alone? (I.e., should drugs intended for an extremely serious disease or condition affecting a small portion of the population be accepted after less extensive testing than that required for a drug to treat a minor disease or condition affecting a large portion of the population?)
13. Should FDA have authority to compel a drug to be withdrawn from distribution or inventory, on grounds that it is found unsafe subsequent to having been approved for distribution by FDA?
14. Should FDA personnel have full access to premises and records of drug manufacturers, including their test data?
15. Should FDA (or some other agency of Government) have an approval function of drug advertising as well as drug labeling?
16. Should all previously FDA-approved drugs be reviewed anew, under some changed criteria, such as safety/efficacy? (I.e., should the safety/efficacy requirement be made retroactive, and if so, how?)
17. Should a formal (national, or even international) system of detection and communication be established to shorten the time of response to a drug-connected (or perhaps more broadly, general medical) threatened disaster?

Confronted by so many medical issues, and also the suggestive evidence of high drug prices, the Congress was given an unreasonably difficult task of sorting and evaluation. There was the practical difficulty of winnowing fact from more than 15,000 pages of testimony and exhibits—plus much additional interpretation and supplementary material appearing in the Congressional Record, the press, and in the releases supplied by interested parties. There was the intellectual difficulty that on some aspects and issues the medical profession was not in agreement within itself—for example:

As to the extent of reliance by practicing physicians on drug promotional literature.

As to the need for pharmacopoeial versatility versus maximum reliability through long experience with a lesser range of different drugs.

As to the proper combination of formal scientific testing and repeated empirical findings of general practice.

As to the clinical equivalence of generic drugs from different sources and brands, with differing marketing configurations.

Unmistakable throughout all the deliberations after July 15, however, was the persistent recognition that prescription drugs would

remain a serious menace as well as a magnificent boon to society, and that their risk needed to be kept from outstripping their benefits. As the report of the Humphrey subcommittee later observed, "most of the educational value from the thalidomide tragedy can be credited to the enterprise of American journalism." The Mintz article was singled out for praise. "However, the July 15, 1962, news article set off a chain reaction which is generally credited with having contributed to unanimous congressional approval of the Kefauver-Harris drug law."<sup>82</sup>

Burdened with so much information from so many witnesses about so many issues, the Congress performed remarkably in being able to frame so coherent and comprehensive a piece of legislation as the Drug Amendments of 1962. The emotional appeal of the thalidomide shock was undeniable, and a potent motivation toward passage of drug control legislation; but it did not impair the quality or rationality of the act that came out of the crisis. There has been abundant evidence since 1962 that drug control in the United States still presents many unresolved questions. But that incompleteness is attributable to the vastness and complexity of the subject, the persistent want of authoritative findings about many of its issues, and possibly the changing institutional nature of medical practice in the United States. It cannot be said that there was less than a total and dedicated effort to secure all of the information, from the best qualified sources, then available. And as President Kennedy observed in signing it, the 1962 measure that finally emerged was "very effective legislation."

#### *Provisions of the 1962 Drug Act for increased Federal control*

Shortly after the drug bill became law, an HEW (FDA) publication was issued summarizing its provisions. Its purpose was to insure the reliability of prescription drugs by imposing Federal controls to establish their safety and efficacy; these controls dealt with research, manufacturing, distribution, and use of drugs. (Paraphrase):

1. Adequate quality control measures were required in the manufacture of drugs to assure their safety, identity, strength, quality, and purity.
2. To be acceptable for prescribing and marketing, a new drug must meet the criteria of both safety and efficacy: it must be shown by "substantial evidence" that the drug will have the effect it is represented to have—which was interpreted to mean "adequate and well-controlled investigations, including clinical investigations, by experts qualified by scientific training and experience to evaluate the effectiveness of the drug involved, on the basis of which it could fairly and responsibly be concluded by such experts that the drug will have the effect it purports or is represented to have under the conditions for use prescribed, recommended, or suggested in the labeling or proposed labeling thereof."
3. A drug already in the market might be withdrawn by FDA order, if on the basis of reevaluation in the light of new evidence, it was found that there was a lack of substantial evidence of its effectiveness.
4. Approval for the marketing of a new, or an established drug, might be withheld by FDA on the basis of false or misleading labeling.
5. An established drug found unsafe might be immediately ordered off the market by FDA; this authority extended to drugs manufactured under unsatisfactory conditions of **quality control**.
6. FDA could also use the marketing disqualification authority to compel drug manufacturers to maintain proper records, and to provide FDA access to the records.
7. The time allowed for FDA consideration of an application for approval of a new drug was considerably loosened from the previous provision.
8. FDA was authorized to require the recording, and reporting promptly to FDA, of any adverse effects, relative to safety and effectiveness of new drugs, or

<sup>82</sup> Interagency Drug Coordination. Report (1966), op. cit., p. 28.

antibiotics already on the market. Full records of test data were to be kept by manufacturers.

9. "A firm and explicit statutory basis" was provided for the imposition by FDA of detailed procedures for the testing of new drugs, including such matters as preclinical tests and reporting of their results, close control over the use of new drugs by investigators on human subjects, certification of investigators, notification (where feasible) of patients that new drugs are to be used, maintenance of records of new drug use and results.

10. Authority to inspect drug manufacturing facilities, including all records (except financial data) and the records and facilities of consulting laboratories serving drug manufacturing firms on a fee basis; the inspection authority was extended to all establishments handling such drugs.

11. Drug firms were required to register with the Department of Health, Education, and Welfare annually and were to be inspected by FDA at least biennially.

12. Provision was made for the establishment by the Secretary of Health, Education, and Welfare of a standard "official" name of each drug, when desirable; such official names were to be used in any official drug compendium.<sup>89</sup>

13. All active ingredients of prescription drugs designated by brand name should be indicated, as to quantity contained, in the container label, and the established (i.e., official) name for the drug and each ingredient was to be printed in type at least half as large as the brand names used on the label.

14. The same requirement as in item 13 was to be imposed on all advertisements for prescription drugs; in addition, an accurate indication of adverse side effects, contraindications, and effectiveness of the drug should be included in such advertisements.

15. Batch certification and testing was required of antibiotic drugs, and 30 groups were added to the five required to be certified under previous legislation.<sup>90</sup>

## VI. AFTERMATH OF THE THALIDOMIDE EPISODE

So many ramifications developed out of the public agitation triggered by the thalidomide episode that it is not feasible to discuss them all. Undoubtedly, the Kefauver-Harris bill improved the level of national safety relative to national control of the introduction of new drugs and the use of drugs in medical care. Many constructive actions were taken, or initiated, to correct the weaknesses in the system that had been exposed by the near disaster. Commissioner Larrick, indeed, went so far as to say, March 24, 1964, before the House Committee on Government Operations, that the bill passed in response has "plugged all the known loopholes" in the Federal regulation of drugs. However, the sampling of developments since 1962, described in this section, conveys the impression that much remains to be done. The progress of medical and pharmacological science has enlarged the numbers and the complexities of problems associated with rendering man compatible with his environment.

### *Implementation of the Drug Amendments of 1962*

Even before the Kefauver-Harris bill became law, the FDA had drafted and circulated new proposed regulations to tighten Federal

<sup>89</sup> The statement enlarged on this authorization, as follows:

"With a view to the exercise of this authority, the Secretary is required to review the official titles of drugs in official compendiums within a reasonable time after enactment of the new law and at other times as necessary to determine whether revision is necessary or desirable. Before designating an official name, except when he does so upon request of an official compendium, the Secretary is required to invite the appropriate compendium to submit a recommendation. If the Secretary approves a name so recommended as useful, he is to designate that name as the official name. If no recommendation is submitted, or if he does not approve the name recommended, the Secretary may nevertheless designate an official name which he finds to be useful. Designation of an official name by the Secretary, after consultation with the appropriate official compendium, is to be by regulation promulgated after standard nonformal rulemaking procedure." (P. 7.)

<sup>90</sup> Paraphrased from U.S. Department of Health, Education, and Welfare, Food and Drug Administration, Summary of the Drug Amendments of 1962. (Washington, U.S. Government Printing Office, November 1962, reprinted October 1963, pp. 1-8.)

control over the testing and introduction into use of new drugs. The action prompted some inquires as to whether further congressional action was needed. However, upon passage of the act, the FDA further amended and strengthened its proposed regulations, based on the added authority the act conferred. The new regulations went into effect in February 1963, and an FDA conference with the drug industry was held February 15, 1963, to explain their purposes and terms.<sup>91</sup>

Some strengthening of FDA personnel and resources also followed passage of the 1962 measure. The agency was reorganized November 1, 1963, and during the fiscal years 1963 and 1964 it recruited 66 additional physicians and 654 other scientists. A medical director was appointed.

Significant new drug regulations [were] issued. Interagency coordination has been strengthened. Progress has been made in strengthening FDA relations with State regulatory authorities. A National Food and Drug Advisory Council has been appointed and has held its first meeting. A Medical Advisory Board is soon to be activated. Helpful discussion has been held with an important new Drug Review Board of the National Academy of Sciences-National Research Council.<sup>92</sup>

On the other hand, the Second Citizens' Advisory Committee on the Food and Drug Administration reported, October 25, 1962, a long list of recommended actions to strengthen FDA, and professed itself "deeply concerned" over the lack of response to earlier recommendations the Advisory Committee had presented. In particular, the establishment of a Food and Drug Institute under a scientific director was considered by the Committee as an urgent requirement.<sup>93</sup>

Criticism of the FDA, in 1966, in a report by the Government Operations Committee of the Senate, suggests that the agency had not yet responded fully to its enlarged charter of responsibilities. The report recommended:

- Further strengthening of interagency coordination on drug issues;
- Consider possible new Cabinet "Department of Health";
- Assure efficient, economical procurement of drugs by agencies;
- Make FDA a center of excellence;
- Review periodically the implementation of the 1962 drug law;
- Improve FDA teamwork with professional organizations;
- Foster greater responsibility by private scientists and professional organizations:
- Strengthen Federal intramural and extramural drug research, including key disciplines;
- Assure observance of patient consent to experimentation;
- Set up modern agency and interagency administrative information systems;
- Establish Federal network of information on the literature of science;
- Modernize patient records in Federal hospitals;
- Improve reporting and evaluation of adverse reactions and accidental poisonings;
- Foster specialized information centers on drugs;
- Improve reporting and analysis of maternity and birth records;
- Foster advances in undergraduate and postgraduate education and information on drug therapy;
- Establish nationwide, physician-to-physician telephone computer service for emergency needs;
- Strengthen Federal communication to practitioners;
- Protect privileged information; make available other scientific information;

<sup>91</sup> U.S. Department of Health, Education, and Welfare. Food and Drug Administration. Proceedings, FDA Conference on the Kefauver-Harris Drug Amendments and Proposed Regulations, Feb. 15, 1963. (Washington, U.S. Government Printing Office, 1963.) 85 pp.

<sup>92</sup> Interagency drug coordination. Report \* \* \* (1966), op. cit., p. 31.

<sup>93</sup> This report was reproduced in part in Humphrey hearings, pt. 2, op. cit., pp. 428-447. See especially pp. 440-441.

Strengthen communication to the public;  
 Encourage voluntary compliance and deter infractions;  
 Strengthen international teamwork on drugs.<sup>64</sup>

Eventually FDA set up a mechanism for the retroactive evaluation of drugs already in use, and began a project of nomenclature standardization, as well as tightening the arrangements for evaluating new drugs for both safety and efficacy. Some degree of control was also exercised over the promotion of new products by drug manufacturers. However, by 1968, the achievement of a generally acceptable, safe, efficient, and economical system of pharmacological service in the United States was still in the future, and many of the criticisms that had been voiced to the Kefauver subcommittee in 1959 and 1960 were being repeated to the Subcommittee on Monopoly of the Select Committee on Small Business (Nelson subcommittee).<sup>65</sup>

*Evaluation of efficacy, safety, and comparative merits of drugs*

An important feature of the Kefauver-Harris amendments was the requirement that FDA establish and apply criteria of both safety and efficacy in certifying the acceptability of new drugs, and in reviewing the acceptability (or requiring the withdrawal from the market) of drugs already established and in use.

With respect to new drugs, FDA regulations have been described by an FDA official thus:

Require the person who sponsors shipment of a new drug for clinical trial to report to the Food and Drug Administration, before the testing starts, the facts that satisfy him that it is proper to conduct the proposed test.

The report should include, among other things, evidence that adequate animal tests have been made to show the probable effects of the drug and the ill effects that should be watched for by the investigator; evidence of adequate chemistry and manufacturing control to assure a product of uniform and desirable composition; a showing that the clinical investigator has good information about the earlier tests so that he can make his decisions as to the desirability of administering the product to man, and the conditions of administration, on a sound scientific basis. The report should furnish assurance that the individuals selected as investigators are in fact qualified to investigate the safety or effectiveness of the drug, or both depending upon the nature of the experiment. There are certain recordkeeping requirements as there has always been a need for records in connection with sound scientific work. And especially important, the report must show that there is a sound plan for the investigation to be conducted.<sup>66</sup>

Among actions that FDA sought to halt were cases of gross failure to adhere to accepted principles of medical ethics \* \* \* in which there was essentially no preliminary animal testing" or an inadequate plan of investigation, or "a situation in which it appeared that a drug was in fact being marketed commercially under the guise of clinical testing."

Clearly (said the same speaker), measures designed to require adequate pre-clinical investigations, a sound plan for investigation and the use of properly trained clinical investigators by drug firms are calculated to upgrade the level

<sup>64</sup> Interagency Drug Coordination. Report \* \* \*. (1966), op. cit., pp. 3-8.

<sup>65</sup> U.S. Congress. Senate. Select Committee on Small Business. Competitive Problems in the Drug Industry. Hearings before the Subcommittee on Monopoly of the \* \* \* on Present Status of Competition in the Pharmaceutical Industry. Six parts: pt. 1, May 15, 16, 17, June 7, and 8, 1967; pt. 2, June 27, 28, 29, July 24, and Aug. 8, 10, 1967; pt. 3, Sept. 13, 14, 29 and Oct. 13, 1967; pt. 4, Oct. 31, Nov. 9, 15, and 28, 1967; pt. 5, Dec. 14, 19, 1967, Jan. 18, 19, and 25, 1968; and pt. 6, Nov. 29, 1967; Feb. 6, 8, 27, and 29, 1968. 90th Cong. 1st and 2d sess. (Washington, U.S. Government Printing Office, 1967 and 1968), 2752 pp.

<sup>66</sup> Winton B. Rankin, Assistant Commissioner of FDA. "Recent Legislation and the Development of New Drugs." Third Interscience Conference on Antimicrobial Agents and Chemotherapy, American Society for Microbiology. Washington, D.C. Oct. 28, 1963. Reproduced in Congressional Record. (Oct. 31, 1963), p. A6800.

of research in the United States. General acceptance of recognized procedures and curtailment of the poor or pseudo-research that has sometimes been followed will necessarily improve research on drugs to the benefit of science, the subjects of investigations, and society.

With respect to new drugs, FDA—after its expansion in staff—was able to keep up with the industry. However, the review of combined safety/efficacy of established drugs was an “overwhelming task.” Finally, in January 1966, Dr. James Goddard became commissioner of FDA and sought the assistance of the Division of Medical Sciences of the National Academy of Sciences-National Research Council to help FDA with the added task. In June a proposal was submitted and in July a contract was signed. During the summer of 1966, 180 experts in 30 panels were assembled, supported by a professional staff of 13. The drug industry was invited to submit briefs on all drugs that had entered the market from 1938 to 1962. When the project got underway, it was found that 237 firms had submitted 2,824 briefs covering about 3,600 drug formulations. About 85 percent of the formulations submitted were prescription drugs; 40 percent were combinations of two or more active principles. The assessment of these drugs entailed some 10,000 to 15,000 separate therapeutic judgments. Where there were many different brands of the same generic drug, the panels decided to assume “therapeutic equivalence.” (For example, there were 140-odd brands of reserpine, and to “ask for well-controlled studies on all brands would be to ask for the impossible.”) By November 11, 1968, 87 percent of the planned reports by the Academy had been made to FDA. Findings were that about 6 percent of drugs examined were “totally ineffective.” Some drugs were found effective for all claimed purposes; others were effective for some. It was important that “in respect of about two-thirds of all drugs reviewed, it has been recommended that important changes in labelling be made.”<sup>97</sup>

As the reports of the NAS-NRC drug evaluation panel were completed, they were turned over to FDA and in due course were acted upon, by the issuance of FDA findings. Drugs found ineffective would be withdrawn from the market, either voluntarily by the manufacturer or by legal proceedings if necessary. Manufacturers of drugs found “possibly effective” would be given an opportunity to provide the required “substantial evidence” to support labeling claims; if such evidence was not forthcoming, or was found insufficient by FDA, such drugs would also be removed from the market. According to Herbert L. Ley, Jr., who replaced Dr. Goddard as FDA Commissioner, “The one thing I’ve tried to make clear is that we’ve still got a big stick and, where appropriate, we will still use it.”<sup>98</sup>

The first NAS-NRC report on drug effectiveness concerned a group of bioflavonoid compounds, derived from citrus skins, and assertedly specific for various forms of bleeding. These the panel rated “ineffective” for the purposes alleged. The question as to what would happen when FDA attempted to effect the withdrawal of these compounds from the market on the basis of the panel finding was raised by one medical journal, which stated:

<sup>97</sup> Material in this paragraph derived from: R. Keith Cannan. *The Drug Efficacy Study of the National Academy of Sciences-National Research Council. Council for the Advancement of Science Writing*. Nov. 11, 1968. Evanston, Ill. Multilith, 15 p.

<sup>98</sup> Morton Mintz, *FDA Report Notes Sale of Many Useless Drugs During 1938-62*. Washington Post. (Sept. 15, 1968), p. A5.

The case of the bioflavonoids is highly significant for the future of the review. The question it poses is: What legal weight do the scientific judgments of the NAS carry? If the FDA, or a hearing examiner, or the courts were to rule that the drugs were even possibly effective, a great shadow of doubt would be thrown over the entire scientific credence of the review and would create a strong scientific backlash against the entire project.<sup>99</sup>

*The issue of generic versus brand-name drugs; clinical equivalence*

A persistent question concerning the regulation of prescription drug information is whether drugs should be identified, advertised, and promoted by brand name or by generic name. The issue involves both safety and economics. It was asserted, for example, that thalidomide had been marketed under something like 100 different trade names. The prolixity of aliases had seriously complicated the urgent and important task of tracking down and removing from the market all the different brands, which might or might not have had the word thalidomide appearing on the label. Attempts to warn the purchasers of such dangerous drugs encountered similar difficulties. A related question was as to whether physicians should be permitted, in collaboration with pharmacists, to identify prescriptions only by number (perhaps in order to withhold dangerous knowledge from the patient) or whether it should be mandatory to disclose the prescription to the patient. A further question was as to whether the disclosure (mandatory where feasible, under the Kefauver-Harris amendments) to the patient that an experimental drug was to be used, should include reference to the drug by generic name.

From the economic standpoint, it was claimed that when physicians prescribed, they frequently specified a particular brand, which denied the patient the opportunity of purchasing the least expensive available form of the generic drug. This raised the question as to the practical equivalence of different brands of the same generic drugs. It was demonstrated in the Kefauver hearings that the same drug was sold by brands at widely differing prices. It was also asserted by some physicians that they regarded some brands as more reliable than others, and that patients' reactions differed with different brands of the same generic drug.

The Kefauver-Harris amendments sought to correct the confusion over drug nomenclature by authorizing the Secretary of Health, Education, and Welfare to intervene to establish "official" generic names of drugs, and required that when such names had been established—by Government or other action—the names should appear on drug labels and in drug advertising.

Both major issues—the establishment of and prescribing by official generic name, and the issue of biological, clinical, or therapeutic equivalence of various brands within a single generic drug—were recently under review by the Nelson subcommittee. The chairman declared, at the opening of his hearings, May 15, 1967:

It has been frequently asserted by respected authorities that doctors quite commonly prescribe expensive brand-name drugs when cheaper equivalent generic drugs are available because the doctor is not informed that there actually is a cheaper equivalent available.

There has been a continuous and vigorous controversy over the question of the therapeutic equivalency of brand-name drugs versus generic drugs. This is an important question because for a substantial number of the most widely used

<sup>99</sup> The Hard, Long Look at 3,600 Older Drugs. Medical World News. (July 5, 1968). p. 34.

brand-name drugs there is a generic drug available at a substantially lower price.

Many manufacturers insist that generics are not equivalent. However, many expert authorities outside the drug industry insist they are equivalent.<sup>100</sup>

Differences among various brands of generic drugs were found in an investigation of the subject at Georgetown University School of Medicine. The investigation, conducted under an FDA contract, was reported in the *Journal of the American Medical Association*, August 26, 1968. It showed "significant differences in amount and rate of absorption" of different brands of the same generic drug, in the case of three antibiotics. Seven others were scheduled for future testing.<sup>101</sup> A continuation of research to "determine the biological equivalency of important chemical equivalents should be continued by the Department of Health, Education, and Welfare on a high priority basis" was recommended by the HEW Task Force on Prescription Drugs, August 30, 1968.

The issue of therapeutic equivalence is now stressed by FDA, which is requiring drug manufacturers who seek to produce a new version or brand of an established generic drug to prove that their new brand is equivalent in effect to the approved prototype.<sup>102</sup>

A report by the HEW Task Force on Prescription Drugs (which C. Joseph Stetler, president of the Pharmaceutical Manufacturers Association, called "an illusion") found that considerable saving to older patients would accrue from purchasing drugs by generic rather than brand name. The study, of 175 million prescriptions written for elderly people in 1966, indicated such savings could amount to \$41.5 million.<sup>103</sup>

#### *Problems in the exchange of drug information*

Deficiencies have been alleged to exist in almost every aspect of the communication system by which information is disseminated to physicians about drugs and the uses, as well as side effects, of new drugs. The thalidomide episode showed that a considerable number of tragic cases of drug injury could occur simultaneously in a number of clinics (in Germany) without attracting general attention, or sounding a general alarm. It also showed that international communication about a dangerous drug was unsystematic. Information essential to the managerial control of tests of new drugs was also shown to be sometimes laxly maintained. Medical reliance on drug advertisements and on the information provided by "detail men" whose employment depended on sales of brand name drugs of the drug houses they represented, was established as a significant factor in medical "education" in the use of prescription drugs.

The Kefauver-Harris amendments dealt with these deficiencies by requiring formal identification of generic drugs, and strengthening reporting arrangements for tests of new drugs. Other deficiencies seemed more amenable to administrative than legislative action. One early action, announced January 18, 1963, was taken by the World Health Organization of the United Nations, to assure international exchange of information at the official governmental level concerning

<sup>100</sup> Competitive Problems in the Drug Industry. Hearings, op. cit., pt. 1, pp. 2-3.

<sup>101</sup> JAMA (Aug. 26, 1968, vol. 205, No. 9), pp. 23-24, 30.

<sup>102</sup> "Hard Pill for Drug Makers To Down," *Business Week* (Aug. 10, 1968), pp. 59-60.

<sup>103</sup> "Brand-Name Drugs Cost Elderly \$41.5 Million More in 1966," *Washington Post* (Nov. 8, 1968), p. A-3.

dangerous new drugs, as well as proposing the establishment of "basic principles and minimum requirements" for evaluating the safety and efficacy of drugs.<sup>104</sup>

A Conference of Professional and Scientific Societies on Drug Safety, meeting in Chicago, 1963, under the sponsorship of the Pharmaceutical Manufacturers Association, led to a conclusion that there was a need for consolidation of pertinent, reliable information for groups of related drugs in review articles directed to physicians by field of special interest; and for a compendium of objective drug data in a single source book containing information pertinent to the specific clinical decision.<sup>105</sup>

A report on drug literature prepared for the Humphrey subcommittee by the National Library of Medicine, August 30, 1963, concluded:

It is difficult to try to summarize the findings of this report in terms which are simple, yet not simplistic. One can only say that there is a great amount and variety of publication in what may be called the "drug literature"; that there are a great many secondary sources of information; that no single source is all-embracing in the needs it serves. This is not surprising; a problem involving many complex substances, varied biological activities under varying circumstances, different aspects, different uses, different audiences, millions of words, dozens of languages, not to say differences of judgment and differences of interpretation, and a myriad nomenclature, is not a problem which is susceptible to easy solution, or solution that is readily apparent. It is probable that there is no solution, only solutions. It is certain that a wide variety of tasks remain to challenge the best talents which chemists, biologists, pharmacologists, physicians, documentalists, and libraries can bring to bear.<sup>106</sup>

Many of the recommendations of the Humphrey subcommittee dealt with the problem of information exchange: calling for strengthened medical education in drug therapy, information centers on drugs, modernized files of drug data, a Federal network of automated information management, reporting systems for adverse reactions, maternity and birth records, and "international cooperation in drug research, regulation, education, and information."<sup>107</sup>

In the field of drug advertising, the FDA has apparently been active in applying the powers conferred by the 1962 amendments. There were 33 formal public actions against 26 manufacturers, involving 45 drug products, under the regulations against false and deceptive advertising, mostly in 1967-68. More effective, according to one report, is the device of an obligatory "corrective letter" which the manufacturer agrees to send to correct a major untruth; these are mailed to 280,000 individual physicians in each instance. Between February 1967 and July 1968, 21 companies had sent 24 of these letters. (The alternative is for FDA to seize shipments of the drugs in question.)<sup>108</sup>

<sup>104</sup> "U.N. Group To Set Watch on Drugs." *New York Times*, West coast edition, (Jan. 19, 1963), p. 2.

<sup>105</sup> American Enterprise Institute for Public Policy Research, Special Analysis: The Drug Safety Problem. (Washington, American Enterprise Institute for Public Policy Research, Sept. 17, 1964, (Rpt. 12)), pp. 18, 21.

<sup>106</sup> U.S. Congress, Senate, Committee on Government Operations, Drug literature, Report prepared for the study of "Interagency Coordination in Drug Research and Regulation," by the Subcommittee on Reorganization and International Organizations of the \* \* \*. A factual survey on "The Nature and Magnitude of Drug Literature," by the National Library of Medicine, Aug. 20, 1963, 88th Cong., 1st sess. Committee print. (Washington, U.S. Government Printing Office, 1963), p. 39.

<sup>107</sup> Interagency Drug Coordination, Report \* \* \*. (1966), op. cit., pp. 5-8.

<sup>108</sup> Morton Mintz, "Drugs: Deceptive Advertising." *New Republic*, (July 6, 1968), pp. 19-21.

Although FDA, under existing legislation, had been able to exercise control over the advertising claims of drug producers, there had been found no comparable form of control over the so-called "detail man" who provided a linkage between the producers and the prescribing physicians. The role of such detail men had come in for criticism in the congressional hearings of 1960-62. While advertising could be used as evidence, the verbal presentations of detail men to doctors were less useful as evidence, and were presumably more subject to undetected misrepresentation. As one critic expressed it: "There is no foolproof method to scrutinize talks between a physician and a detail man, and no law purports to try." This source concluded that there were two alternative approaches to the problem of oral promotion, which is so extensive that there is one detail man for every 10 physicians in the United States:

Drug firms might be dissuaded from making any oral presentation about their drugs whatsoever, thus confining all advertising and promotion to the printed kind already strictly regulated by the Food and Drug Administration. Or Congress could devise a system modelled after county agricultural agents, whereby government experts would be dispatched to doctors with dispassionate news about drugs and with nobody's interest to serve but the public's.

The difficulty with the imposition of Government regulation of this kind, concludes this same critic, is that "unfortunately, detail men are highly respected by doctors." They were considered in one survey of medical opinion "the most informative source of data on drugs \* \* \*"<sup>109</sup>

*Proposals for an authoritative drug compendium*

The extremes of attitudes toward drug information are suggested by the attitudes reflected, on the one hand, in the decision of the New York Hospital's pharmacological group to stock fewer than 500 well-tried drugs for all purposes, and on the other hand, by the existence of an enormous range and variety of brands, increasing rapidly with each passing year. Illustrations of the number and increase are the existence of some 3,600 drugs (screened by the NAS-NRC review), the addition to pharmacological resources of some 400 new drug products a year, and the enormous numbers of variants of generic drugs, such as the 140 different brands of reserpine, etc. Given such an enormous volume of information about drugs, and the infinite range of subtle responses of individual patients to various treatments, one solution is to intensify pharmacological training of physicians.<sup>110</sup> Another approach is to reduce the "noise" in the system of drug information (i.e., to improve the signal-to-noise ratio) by eliminating the economic motivation for the dissemination of inaccurate or unreliable information about drugs.

<sup>109</sup> David Sanford. *The Drug Peddlers*. *The New Republic*. (Sept. 21, 1968). pp. 16-17.  
<sup>110</sup> The Task Force on Prescription Drugs, second interim report and recommendations, Aug. 30, 1968, devoted several pages to recommendations on improved drug information for prescribing physicians, one of which, (p. vii and p. 65) was that the Department of Health, Education, and Welfare should " \* \* \* provide expanded support to medical schools, enabling them to include a course in clinical pharmacology as an integral part of the medical curriculum." This should be followed by "continuing education to physicians on rational prescribing." (U.S. Department of Health, Education, and Welfare. Office of the Secretary, Task Force on Prescription Drugs. Second interim report and recommendations. Aug. 30, 1968. (Washington, U.S. Government Printing Office, 1968).)

Monitoring of drug advertisements by FDA may also be presumed to have a beneficial effect.<sup>111</sup> However, the achievement of all of these goals—or approaches—rests ultimately on the concept that information about drugs in medical practice can be systematically structured and compiled. The concept appears to be that pharmacology, like all science, is a matter of approximations toward reliability. Accordingly, it is possible to conceive of a drug or pharmacological compendium that—at any given time—presents the categories of most reliable information, and indicates the range of uncertainties regarding less reliable information. This concept emerged early in drug practice in the United States, with the development of the U.S. Pharmacopoeia. Interest in it was intensified during and after the Kefauver hearings; for instance, in 1964, a review of the drug problem observed:

Nor is there a single source book which supplies in concise, usable form pertinent information about drugs used and sold in this country. Information is found in a number of publications with varying coverage, comprehensiveness, and timeliness. Principal sources are: *U.S. Dispensatory, New and Nonofficial Drugs (AMA)*, *Modern Drug Encyclopedia and Therapeutic Index, American Drug Index, The Merck Index, Merck Manual, Physician's Desk Reference, American Druggist Blue Book, Drug Topics Red Book, Accepted Dental Remedies, Unlisted Drugs. The National Formulary, Pharmacopoeia of the United States of America, American Hospital Formulary Service, and Drugs in Current Use.* (The foregoing list is cited in the text to the Commission on Drug Safety, a study sponsored by the Pharmaceutical Manufacturers Association.) In general, the existing compendia are lacking in much of the information pertinent to any specific clinical decision and at the same time contain much that is irrelevant to such decision. One of the most widely used compendia is the Physician's Desk Reference which contains solely information supplied by the pharmaceutical manufacturers. In the case of new drugs, however, this information must contain the claims, warnings, and contraindications approved by FDA.<sup>112</sup>

Accordingly, sentiment appears to be growing for action by the Federal Government to sponsor publication of an authoritative and objective drug compendium. Such a program was specifically requested by President Johnson, in his special health message to the Congress, March 4, 1968. Said the President, on this topic: "The very abundance of drugs creates problems." When the consumer is a patient, he relies on his doctor's choice of the appropriate drug. Yet, "the doctor is not always in a position to make a fully informed judgment" because there was no "complete, readily available source of information about the thousands of drugs now available." Therefore—

To make sure that doctors have accurate, reliable, and complete information on the drugs which are available, *I recommend that the Congress authorize this year publication of a U.S. Compendium of Drugs.*

This compendium would be prepared by the Secretary of Health, Education, and Welfare, in cooperation with pharmaceutical manufacturers who would bear the cost of its publication, and with physicians and pharmacists.

It will give every doctor, pharmacy, hospital, and other health care institution complete and accurate information about prescription drugs—use and dosage.

<sup>111</sup> Dr. Philip R. Lee, Assistant Secretary of Health, Education, and Welfare and head of the Task Force on Prescription Drugs, told the Nelson subcommittee, Sept. 26, 1968, that doctors generally get "scant and insufficient" education in drug therapy while in medical school and in private practice tend to make little use of "comparative, objective data." He said that "many if not most physicians rely primarily" on the "advertising and promotional activities of drug companies." (Cited in Morton Mintz, "Doctors Seen Ill-Informed on Drugs," Washington Post, (Sept. 26, 1968), p. A-3.)

<sup>112</sup> Special analysis: "The Drug Safety Problem." Op. cit., American Enterprise Institute.

warnings, manufacturer, generic and brand names, and facts about their safety and effectiveness.<sup>113</sup>

Similarly, the FDA task force on prescription drugs recommended, August 30, 1968, that the Secretary of Health, Education, and Welfare should be "authorized to publish and distribute a drug compendium listing all lawfully available prescription drugs, including such information as available dosage forms, clinical effects, indications and contraindications for use, and methods of administration, together with price information on each listed product."<sup>114</sup>

On the other hand, Medical World News reported, August 16, 1968, that the Pharmaceutical Manufacturers Association was "cool to the idea" and, as a result of a personal survey of physicians, had found that 82 percent said that Physicians' Desk Reference was the compendium "they used most often for drug information." (Second choice was "personal experience.") The survey had been conducted for PMA by Opinion Research Corp.<sup>115</sup> The report, incidentally, made reference to the "7,000 or so drugs now available," and to "the top 600 drugs, which account for about 90 percent of all prescriptions written."

A series of articles in the Medical Tribune, by Joseph D. Cooper, a professor of political science at Howard University, explored in some depth the pros and cons of such a compendium, and concluded that for the collection to be of greatest usefulness it should be computerized with tape copies widely accessible to physicians, so that individual entries could be called out as needed.<sup>116</sup> The article presumed the rapid increase in accessibility and utilization of computerized information sources.

#### *Report on biochemical mechanism of phocomelia from thalidomide*

Before the American Chemical Society, at its annual meeting, September 12, 1968, Dr. Heinz M. Wuest, a New York chemist and consultant to the Sloan-Kettering Institute for Cancer Research, described research findings concerning the "teratogenic effects" (deforming of the fetus) of thalidomide. The mechanism, he said, involved the presence in the molecule of two particular acid radicals—those of phthalic acid and glutamic acid. He noted that glutamic acid, or "glutamine" is a common ingredient of many foods, but that phthalic acid was an extremely uncommon ingredient of chemicals for human use, and that both had to be present in the same molecule to cause the teratogenic effects. Dr. Wuest expressed the belief that "no one could have predicted" the thalidomide disaster, and that "tools are now available" to prevent a recurrence of such an event.<sup>117</sup>

## VII. THE CONTINUING PROBLEM OF SECURING AND USING SCIENTIFIC GUIDANCE ON DRUG ISSUES

The thalidomide episode provided a climax in a continuing congressional study of public issues related to prescription drugs. It diverted

<sup>113</sup> U.S. President (Lyndon B. Johnson). "Health in America." "The President's Message to the Congress Including Five New Major Goals in His Recommendations." Mar. 4, 1968. Weekly compilation of Presidential Documents. (Mar. 11, 1968, vol. 4, No. 10), pp. 431-2.

<sup>114</sup> Task force on prescription drugs, second interim report and recommendations, op. cit., pp. vii-viii.

<sup>115</sup> "FDA and Doctors Clash on Compendium," Medical World News, Aug. 16, 1968, vol. 9, p. 17.

<sup>116</sup> The series of five articles were reproduced in sequence in the Congressional Record, Nov. 1, 1968, pp. 9804-9809.

<sup>117</sup> Richard D. Lyons, "Thalidomide Effects Are Linked to Acids in Molecule of Drug," New York Times (Sept. 13, 1968), p. 30.

the emphasis of a regulatory bill, based on extensive hearings on prices and monopoly aspects of the drug industry, away from economics and in the direction of regulation of drug products for safety and efficacy. The change gratified the President whose primary concern was with health and safety. This changed emphasis was consistent, moreover, with much of the testimony given to the various congressional committees considering the legislation, by both medical witnesses and some spokesmen for the drug industry itself. Even in the investigative hearings conducted by Senator Kefauver, the medical people sought to draw attention to the existing imperfections in arrangements by which drugs were tested, introduced into use, and monitored thereafter. Witnesses also urged the strengthening of the FDA itself, as to—

Manpower requirements to implement the regulations for which it had long been responsible;

Enlarged manpower requirements to extend its functions and take up its new responsibilities in the interest of public health and safety;

Quality of professional people in upper level positions;

Ability to conduct scientific research to sustain and enhance its professional excellence; and

Management of the vast and complex task of scientific information exchange, with respect to drug literature and test data.

In dealing with such a large, complex, and changing problem as prescription drugs, the Congress could not reasonably have been expected to resolve all issues completely and permanently in a single act. The question does not seem to have been raised, however, as to whether the importance and technical difficulty of the field warranted the establishment of a separate and continuing committee or subcommittee to maintain surveillance over it. The subsequent activity of Senator Humphrey, himself a former pharmacist, as chairman of a Government Operations Subcommittee concerned with interagency drug coordination, met the immediate need to some extent. However, one of the recommendations of Senator Humphrey's subcommittee was for a congressional review of results under the 1962 amendments. Specifically, the report recommended:

Consider in the 89th Congress a review of results under the Drug Amendments of 1962. This might include not only analysis of experience under existing statutory authority, but the soundness of FDA's administrative implementation and the merit of pending proposals by Government, the professional community, and industry. As a first step, FDA should make a report to the appropriate committees of the Congress sometime soon after October 1965. At that time, Public Law 87-781 will have been on the statute books for 3 years. Such a report should be received in ample time for consideration by the executive and legislative branches of FDA's program and budget for the 1967 fiscal year.<sup>118</sup>

Undoubtedly, the thalidomide episode was ultimately beneficial to many aspects of drug management in the United States. It motivated—or helped to motivate—enactment of overdue Federal control legislation in which all (physicians, industry, and the public) seemed to have been in agreement; this agreement was reflected in the unanimous vote in both houses on final passage of the legislation. The episode stimulated a continuing inquiry by the Congress, and consequent further pressure on the administration, to seek further reforms in drug management. Government functions were enlarged in scientific research into

<sup>118</sup> "Interagency Drug Coordination," Report \* \* \* (1966), op. cit., p. 4.

drug characteristics. There was also a general public, and possibly also professional, education as to the dangers as well as the values of prescription drugs: leading to awareness of the need for improved social management of drug usage, and awareness that small concentrations of chemicals in the environment, over long periods of time, can have subtle but possibly dangerous effects on mankind.

Some important questions central to thalidomide appear to remain unanswered, however, in spite of the vigorous legislative and administrative efforts at correction. Eventually an apparently satisfactory solution must be found to the thorny issue of "human guinea pigs," necessary for the testing of new drugs, and to what extent there should be unrestricted resort to this process without the justification of an expectation of significant addition to medical capabilities.<sup>119</sup>

Unrestricted freedom of research in developing new drugs involves specific risks, not by those conducting it but by those who happen by accident to be appropriate subjects; moreover, the reward for success does not seem related either to those who perform the research or run its risks.

Another issue is that of the choice between a high degree of freedom of enterprise (with self-regulation by industry) in the development, testing, promotion, and sale of prescription drugs, versus a high degree of bureaucratic control of these activities. What combination of free enterprise and Government control best serves to optimize social and health values? What form of management of drug control is calculated to enable the physician to serve the patient best? Broadly speaking, drug control and management aims at an optimum balance of progress toward patient safety, medical effectiveness, medical convenience, least cost, and political acceptability of the system. It does not appear that any of these aspects can be stressed at the expense of the others—or ignored in the process of considering the others. It is also apparent that achievement of a perfect and steady state in any of these aspects is not feasible.

Moreover, drug management is not itself a final or ultimate goal, but rather one of many means employed by the medical profession toward the achievement of some measure of progress toward the remote and unattainable goal of making man compatible with his environment. The goal is unattainable because man is not himself in a "steady state," biologically speaking. His genetic heritage changes in the course of time and every generation encounters its own medical problems. Moreover, the environment of man changes as the human culture and its artifacts change—with new micro and macro insults to the environment. The biological response of man, himself changing, to these environmental changes, generates a never-ending problem for the physician. The safety and efficacy of drugs, as one of many medical tools, must be considered in this changing context. The multiplicity of drugs with their infinity of purposes, degrees of merit, and ranges of hazards, is merely one more complicating factor in the total problem.

<sup>119</sup> An amendment to the Kefauver-Harris bill attempted to deal with this problem in this language: (FDA) regulations shall provide \* \* \* that experts using such drugs for investigational purposes \* \* \* will inform any human beings (used as drug subjects) and will obtain the consent of such human beings or their representatives, except where they deem it not feasible or \* \* \* contrary to the best interests of such human beings." Public Law 87-781, sec. 505(1). Subsequently the amendment was administratively interpreted by FDA rulings and public policy memoranda from the Office of the Surgeon General. See Dr. Freeman H. Quimby. Medical Experimentation on Human Beings. Library of Congress. SP 151, Apr. 24, 1968.

The criteria of merit are relative for all these different sets of parameters.

A single criterion sometimes rises up as salient as was the case with sulfanilamide in 1938, and thalidomide in 1962. Social or political actions to rectify gaps or spur lagging parts of the total effort do not appear to arise in response to scientifically determined needs, but in response to the shock of recognition of real danger to high social values. This is perhaps mainly because the values themselves are not clearly arranged in any generally accepted scientific hierarchy, such as that a degree of improvement in one value, such as reduction in intensity of pain, is comparable with a degree of improvement in another, such as rate of recuperation or healing. In short, operationally the goals of medicine are seen as corrective, rather than progressive. This state of affairs does not seem likely to change until specific national goals are formulated, agreed to, and made instrumental in the field of medicine. Possibly this suggests the need for a study group or institution to look at medical organization in the United States in its entirety, relative to national goals of health—or, in a broader sense, at the arrangements for adapting persons in the United States to their environment. National goals of health may indeed be best achieved by more emphasis on improving and adjusting the environment to man (with his limited capability for adjustment to his environment) rather than by relying so heavily on the use of drugs and related medical strategies for adapting man to his environment. It is evident that the field is one in which values are deeply held, strongly expressed, and far from consensual. Objectivity is nowhere more needed, and more difficult to preserve. Decisions as to whether, on balance, a drug is meritorious involve the exercise of the highest degree of judiciousness, coupled with the systematic accumulation and evaluation of data generated under rigorously controlled circumstances. Ultimately, it is not possible to make such decisions without reference to the total question of the purpose of medicine. In this area, the formulation of national policy is perhaps at its most difficult.

At the very least, it can be observed that in view of the cost in time and effort to produce the tens of thousands of pages and uncounted thousands of man-days of congressional and professional effort required to produce the Kefauver-Harris bill, this arduous process can be employed only sparingly and for the resolution of grave and momentous questions. It would seem advantageous, also, to clear away the technical underbrush and to structure the issue with clarity, precision, and objectivity, before subjecting it to the ultimate processes of congressional resolution.

## CHAPTER FIFTEEN—THE INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT OF 1947

### I. INTRODUCTION

Chemical pesticides developed over the past two generations have been acclaimed as an indispensable tool of agriculture to produce food for the rapidly expanding population of the world; they have saved the lives of tens of millions of persons through control of disease-carrying insects. They have also been assailed for upsetting the ecological balance of nature, threatening some species with extinction, causing widespread injury to others, and progressively degrading man's environment. In regulating commerce and use of these chemicals, both sets of effects do not appear to have been considered together. Concern at first centered on the maintenance of their quality and on the safety of users; later, their undesirable secondary consequences received attention. This chapter examines testimony received by a congressional committee in 1946 and 1947 on pesticide regulation, to explore the reasons for, and the implications of, the lag in awareness of the adverse secondary consequences of the use of pesticides.

#### *An overview of public attitudes on pesticide regulation*

To arrive at the significance of this question, it may be helpful to approach the period in question by retracing subsequent events in reverse chronological order. By 1967, widespread attention was being given to the wholesale poisoning of the environment by pollutants. An important class of these pollutants was the chemical poisons—insecticides, fungicides, rodenticides, and the like. The impairment of the environment by these chemical poisons had provided the theme for an influential popular treatise by Rachel Carson, in 1962. Much of the subsequent concern over environmental degradation was attributable in some measure to the persuasive exposition of the case in Miss Carson's book, "The Silent Spring." Her book was based upon a large number of scattered reports mainly published in the 1950's, many of which indicated—sometimes quantitatively—the ways in which toxic pesticides reached beyond their intended target organisms to strike down others more useful if sometimes insufficiently appreciated. The question of regulating the new organic pesticides, with their unprecedented potency and effectiveness, had been dealt with by the Congress only a few years earlier. However, in the assessment that preceded adoption of the Insecticide, Fungicide, and Rodenticide Act of 1947,<sup>1</sup> the issue of adverse environmental effects of wholesale use of the new chemicals was undeveloped: it had no apparent influence on the form taken by the legislation nor on its acceptance by the Congress.

The thrust of this chapter is to consider the reasons why the technological assessment function of the Congress in 1946-47 did not encompass the broader social and environmental implications of pesti-

<sup>1</sup> Public Law 104, 80th Cong., 61 Stat. 163, approved June 25, 1947.

cides. The inquiry will deal with such questions, relative to the 1946-47 hearings, as the following:

Should the Congress, or the House Committee on Agriculture that held the hearings, have been able to sense the potential threat of mass application of pesticides?

Should those technical people in the Department of Agriculture who supported the act have recognized the need for action, and called this need to the attention of the Congress, not merely to provide standards of pesticide quality and user-safety, but also standards of the controlled use of pesticides?

Did any of the witnesses who testified in 1946 or 1947 on pesticide legislation identify the need for concern with the protection of the environment from the secondary effects of long-lived pesticides?

Was there available the scientific and technical knowledge at the time to forecast the growing importance of preserving the environment of man?

What circumstances or factors obstructed recognition of adverse consequences of the widespread use of new pesticides?

The sequence of cause-and-effect relationships that led to the dilemma that Miss Carson so graphically described in 1962, and which led to voluminous hearings thereafter, was overlooked in 1946.

#### *Trends in scientific agriculture after 1860*

Many factors contributed to make the pattern of agriculture in the United States sharply distinctive from patterns in the Old World. Characteristically, the United States possessed an abundance of well-watered, fertile, unused land, in a temperate climate. The limiting factors to production were mainly in labor and farm management. Since the settlement of the territory of the United States occurred during the latter stages of the industrial revolution, there was a continually expanding market demand in urban centers for food and fiber, the output of the farm. Thus, U.S. farms became characteristically factories in the field, with large acreages, capital-intensive production, and single-crop products. The focus of attention was on cost/effectiveness methods—on maximum output at least cost. At first, this concept was pursued on a short-term basis, and actual damage was done to the land, by taking nutrients out of the soil without replacing them. Later, as the fruits of national investment in agricultural research began to appear, the concept of sustained-yield agriculture became orthodox, involving mulching, fertilization, erosion control, and planting of ground cover in off seasons. All of these forms of treatment required the development of specialized equipment for mass application. More capital equipment meant more need for large acreages, to preserve the economic balance of the system. Management of the farm economy, like strip mining and early lumbering, tended to emphasize reduction of direct, short-term, out-of-pocket costs, while tending to ignore hidden costs, costs in noneconomic values, and costs borne by persons not participating in the production cycle.

Between 1850 and the close of World War II, the ecology of the United States, in consequence of the spread of large-scale agriculture, underwent significant alteration. The Nation's agriculture producers, with specialized machinery, hybrid seed, fertilization, mass processing

and marketing methods, and the use of aircraft for spraying and seeding, became enormously productive of food in relation to the man-hours of labor required. This scientific and technological agriculture provided the basis for a great increase in urban population, dependent for food on a small and dwindling number of farmers.

*Essentiality of pesticides in single-crop farming*

Cost/effectiveness considerations, however, reduced the number of different crops, and the number of different varieties within each crop. Single-crop acreages replaced the natural variety of wild growth in forest or prairie. Great acreages of land were occupied by unrelieved stretches of identical crops, all planted, ripening, and harvested over the same annual growing schedule. Simultaneously, this change reduced the protective shelter available for insect-eating birds, frogs, toads, and predator insects; and increased the food supply available for those insects that were specially attracted to it—wheat, corn, cotton, potatoes, tomatoes, and so on. Given an abundance of food, and an absence of natural enemies, the insects (or other pests, including rodents, injurious fungi, and even “pest” birds—like blackbirds and crows) multiplied prodigiously.

To overcome the menace of freely multiplying pests, farmers learned to use various poisonous materials. A new industry sprang up, to produce and market such commercial poisons as Bordeaux mixture (hydrated lime and copper sulfate), lead arsenate, Paris green (an arsenical copper acetate), and other poisonous salts. The new science of synthetic organic chemistry<sup>2</sup> began to create new families of pesticides with a wide array of special properties. During and immediately after World War II, these new pesticides came into enormous and worldwide application. For example, in 1946 the U.S. Army Air Corps sprayed 500,000 pounds of DDT solution (dichlorodiphenyltrichloroethane) in a single operation to curb an insect-borne epidemic disease in Egypt. Millions of pounds were applied in Europe.

Generous application of these effective new poisons served to control populations of pests. They may also have been safer than the extremely dangerous arsenicals they replaced. However, as time went on, reports began to appear of insect species that had developed immunity to one or another of the poisons, so that increased dosages—or new combinations of toxic agents—were needed for effectiveness. The chemical industry was kept active, searching for additional organic compounds with higher toxicities or special properties in this war against the insect world, and the legion of other pests in the environment.

*Alternatives to chemical control of pests*

Although the primary means of controlling pests was by the application of chemicals designed specifically to destroy them, a number of other techniques were selectively applied, with success, in pest control. Three general concepts evolved. These were: (1) devising a physical environment or environmental change effectively hostile to the target pest at a crucial point in its development; (2) encouraging the multiplication of otherwise harmless natural enemies of the target pest; (3) interference with the reproduction processes of the target pest. Examples of these three methods of control are: (1) lowering and

<sup>2</sup> See ch. 14 (thalidomide), pp. 359-360.

raising of the water level in reservoirs by 6 inches during mosquito-breeding season, to drown the larvae; (2) spreading of milky spore as a means of controlling Japanese beetles; (3) eradication of the screw worm fly by releasing large numbers of infertile males.

Of research in the direction of specific, biological controls, the PSAC 1963 Panel on Pesticides recommended that “\* \* \* this trend should be continued and strengthened.”<sup>3</sup>

### *Federal regulation of agricultural pesticides*

Emphasis on cost/effectiveness in agriculture extended naturally to the criteria for pesticides used by the farmer. Managers of large farms sought to find pesticides that would accomplish effectively the desired purposes of keeping pests down, but cheaply enough to keep their costs competitive. Cost/effectiveness in pesticides suggested such criteria as—

Low in acquisition cost, in terms of potency or killing power per unit of cost of material;

Low in application cost, in terms of compatibility with large-volume methods of dissemination in the target area;

Sustained effectiveness, in terms of chemical stability (retention of killing power), resistance to being dissolved away by rain water, and continued service of a single application for the entire growing season or even longer;

Low in implied costs resulting from undesired side effects, such as hazard to farmworkers and farm animals, absence of hazardous toxic residues on agricultural products, etc.

It was in the context of these criteria that the Insecticide Act of 1910 was passed. This act<sup>4</sup> prohibited manufacture, sale, or interstate commerce in adulterated or misbranded Paris greens, lead arsenates, and other insecticides, and also fungicides, to maintain the quality of commercial poisons in agricultural use.

The 1910 act was repealed by the Federal Insecticide, Fungicide, and Rodenticide Act<sup>5</sup> which substituted for it a considerable number of Federal controls over commercial pesticides. It provided for—

Registration of economic poisons before their introduction into commerce;

Appropriate labeling of poisons on the container, including instructions for safe use;

<sup>3</sup> U.S. President's Science Advisory Committee. Use of Pesticides: A report of the President's Science Advisory Committee. The White House, May 15, 1963. Exhibit 4 of pt. I, p. 57 of: U.S. Congress, Senate, Committee on Government Operations, Interagency Coordination in Environmental Hazards (Pesticides). Hearings before the Subcommittee on Reorganization and International Organizations of the \* \* \* Agency coordination study (pursuant to S. Res. 27, 88th Cong., as amended). Coordination of Activities Relating to the Use of Pesticides, 88th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1964). Eleven parts. Part I: (Including exhibits), May 16, 22, 23; June 4, 25, 1963; App. I to pt. I (basic documents submitted by the Department of Agriculture relating to the use of pesticides); app. II to pt. I (current research program in the areas of pesticides (Agricultural Research Service)); app. III to pt. I (selected departmental activities relating to the use of pesticides); app. IV to pt. I (information circulars of the World Health Organization and miscellaneous articles); app. V to pt. I (status report on Federal agencies' activities implementing recommendations of the President's Science Advisory Committee report on the use of pesticides); pt. 2: (including exhibits), July 17, 1963; pt. 3: (including exhibits), July 18 and 23, 1963; pt. 4: (including exhibits), Aug. 20 and 21, 1963; pt. 5: (including exhibits), Oct. 7, 1963; pt. 6: (including exhibits), Oct. 8, 1963; pt. 7: (including exhibits), Oct. 9, 1963; pt. 8 (including exhibits), Feb. 18, 1964; pt. 9: (including exhibits), Apr. 7, 8, and 15, 1964; pt. 10: (including exhibits), Apr. 16, 21, and 22, 1964; and pt. 11: (including exhibits), Apr. 30, June 29, July 28 and 29, 1964.

<sup>4</sup> Public Law 152, 61st Cong., 26 Stat. 331, approved Apr. 26, 1910.

<sup>5</sup> Public Law 104, 80th Cong., 61 Stat. 163, approved June 25, 1947.

Addition of coloring materials to poisonous white powders to distinguish them from harmless white powders;

Prohibition against misbranding of pesticides, defined as injurious to man, vertebrate animals, or useful vegetation, when used in accordance with instructions on the label;

Reports concerning delivery, movement, or inventory of economic poisons and pesticidal devices.

The requirement for registration was designed to correct an inadequacy in the 1910 act, under which the enforcing agency had no way to know what poisons were being marketed, except by field investigation. Sometimes the agency learned of new products only from reports of hazard or damage with their use. The 1947 act required that such poisons be made known to enforcement officials in advance of their being marketed, so that these officials could familiarize themselves with the formula, label, and manufacturer's claims in advance. This would help to prevent false and misleading claims, prevent the marketing of worthless preparations, and assure that a strong legal case was immediately available to punish violators of the registration requirement and remove their product from the market promptly.

Two subsequent changes were made in Federal law respecting fungicides after 1947. The first was an amendment to the Federal Food, Drug, and Cosmetic Act (the Miller pesticide chemicals amendment of 1954) which prescribed a method to control the extent of pesticide residues on marketed agricultural produce. The determination of questions of agricultural usefulness and probable residue levels involved in the establishment of tolerances was made a function of the Department of Agriculture, while the Department of Health, Education, and Welfare determined questions of public health. The act placed the burden of proof on persons desiring a change in permitted tolerances. Advisory services were to be provided by committees of experts designated by the National Academy of Sciences.<sup>6</sup>

The other legislative change was an enlargement in the scope of the act of 1947 to include various other toxic or potentially harmful pesticides.<sup>7</sup>

Later on, in 1962, when public agitation over the widespread use of poisonous pesticides was stimulated by the Carson book, the control mechanisms established by authority of the existing legislation was expanded and strengthened by administrative fiat. Arrangements were set up for coordination of the various agency programs related to pesticide control and use, and research into many aspects of pesticide toxicity and adverse effects was greatly expanded. Increasingly, after 1962, congressional concern over the pesticide control question became merged with a broader concern for the preservation and improvement of the human environment itself, in the light of the total range of ecological impairments resulting from human technology and culture.

#### *The dilemma of pesticide contamination and essentiality*

The difficulty posed by chemical pesticides in the mid-1960's can be illustrated by citing two studies prepared by the President's Science

<sup>6</sup> Public Law 83-518, 83d Cong., 68 Stat. 511, approved July 22, 1954.

<sup>7</sup> This was the Nematocide, Plant Regulator, Defoliant, and Desiccant Amendment of 1959, Public Law 86-139, 73 Stat. 286, approved Aug. 7, 1959.

Advisory Committee. The first, issued May 15, 1963, warned of the increasing hazards in the use of pesticides. It said:

The Panel believes that the use of pesticides must be continued if we are to maintain the advantages now resulting from the work of informed food producers and those responsible for control of disease. On the other hand, it has now become clear that the proper usage is not simple and that, while they destroy harmful insects and plants, pesticides may also be toxic to beneficial plants and animals, including man. Their toxic effects in large doses are well known and precautions can be taken to see that humans are never needlessly exposed. But we must now also take measures to insure that continued exposures to small amounts of these chemicals in our environment will not be harmful over long periods of time.<sup>8</sup>

Accordingly, the Panel recommended a number of measures to reduce the hazards inherent in the widespread application of toxic pesticides. Specifically, it recommended that the Federal Government and the States monitor residue levels in air, water, soil, man, wildlife, and fish; that the permissible tolerances of residual pesticides be authoritatively reevaluated; and that the use of persistent (i.e., long-lived) pesticides be reduced—except to control disease—and that “elimination of the use of persistent toxic pesticides should be the goal.”<sup>9</sup>

Another report of PSAC, May 1967, was a “Report of the Panel on the World Food Supply.” It warned that “there are more hungry mouths in the world today than ever before in history.” The problem of food/population unbalance had been approached piecemeal, but needed to be dealt with vigorously, comprehensively, and systematically, with due regard for all its complex ramifications.<sup>10</sup> One element in the program was the increase in food production. This increase required a large increase in the use of pesticides. Said the Panel:

Large increases in the use of pesticides are necessary to increase food production. All types of insecticides, fungicides, herbicides, nematocides, and rodenticides are needed. At the present time, only 120,000 metric tons are used in the developing world, excluding Mainland China. If food production is to be doubled, 700,000 metric tons will be required.<sup>11</sup>

The questions raised in this chapter center on this dilemma: If man tries to impose total control over pests by chemical means, he poisons his own environment and that of the myriad of natural life forms on which in many subtle ways the life of man depends. If man fails to control the parasitic pests that multiply by consuming his growing food, man faces mass starvation. Wise management of resources requires the achievement of a balance between these two opposite hazards. Only by increasing his understanding of the relationships within nature, and of the effects of pesticides on consequential forms of life and their interrelationships, can man progress toward this balance. This requirement is evident in 1969. What effect did it have on the framing of the Insecticide, Fungicide, and Rodenticide Act of 1947? What was the relative salience of the two opposite hazards of pests and pesticides?

## II—CONGRESSIONAL CONSIDERATION OF PESTICIDE LEGISLATION, 1946–47

Hearings were opened February 5, 1946, in the Committee on Agriculture of the House of Representatives on H.R. 4851, “A Bill To

<sup>8</sup> Use of Pesticides, op. cit., p. 38.

<sup>9</sup> *Ibid.*, pp. 55–59.

<sup>10</sup> U.S. President's Science Advisory Committee, “The World Food Problem”. A report of the \* \* \* vol. I. Report of the panel on the world food supply. The White House, May 1967. (Washington, U.S. Government Printing Office, 1967), pp. 4–5.

<sup>11</sup> *Ibid.*, pp. 86–87.

Regulate the Marketing of Economic Poisons and Devices, and for Other Purposes." The bill had been drafted by the committee, with the assistance of the Department of Agriculture and various members of the trade and industry. In 4 days of hearings, (84 pages of testimony) the committee heard 16 witnesses, including five representatives of trade associations of manufacturers of pesticides, one industrial producer, four associations of agriculturists, one representative of State government departments of agriculture, and one professional association (the American Association of Economic Entomologists).

No controversy of consequence developed during the hearings. The various representatives of manufacturers generally supported the bill, and suggested only minor technical changes in its provisions. The lead-off witness was S. R. Newell, Assistant Director of the Livestock Branch, Production and Marketing Division, Department of Agriculture. He described its purpose and indicated that it was not drastic and controversial:

It is my impression, Mr. Chairman, that the trade has desired a new bill. They have gone along on the general principles of this bill, and most of its provisions. There may be some points to which they would wish to take exception, but generally I think we have a bill here for which there is general acceptance all the way around.<sup>12</sup>

Other Government witnesses were Dr. E. L. Griffin, Assistant Chief of the Insecticide Division, Production and Marketing Administration, and two spokesmen for the Fish and Wildlife Service, Department of the Interior. Dr. Griffin urged that only preparations containing substantial proportions of poisonous materials should be reached by the law.<sup>13</sup> Donald J. Chaney, chief counsel of the Fish and Wildlife Service, testified as to the difficulty in establishing standards of effectiveness (i.e., toxicity) of poisons; he was accompanied by F. E. Garlough, senior biologist, who testified merely that the rodenticide known as red squill "varies tremendously in toxicity."<sup>14</sup>

Speaking for the American Association of Economic Entomologists, A. Edison Badertscher, chairman of the association's legislative committee, suggested that the authority given to the Secretary of Agriculture under the bill to define "pests" for purposes of the bill, be enlarged to include organisms that injured articles or substances (e.g., clothing and upholstered furniture) as well as plants, man, and domestic animals.

Although the bill, H.R. 4851, was reported favorably, no action was taken and the bill was reintroduced in 1947 as H.R. 1237, by Representative John W. Flannagan, Jr., who had also introduced the preceding bill.

#### *Hearings on H.R. 1237, the 1947 pesticide bill*

Committee consideration in 1947 under the chairmanship of Representative Andresen of a subcommittee of the House Committee on Agriculture, occupied only 1 day, April 11 (55 pages of testimony, communications, and text of the bill). There were 14 witnesses, including three from the Production and Marketing Administration,

<sup>12</sup> U.S. Congress, House, Committee on Agriculture, Federal Insecticide, Fungicide, and Rodenticide Act. Hearings before \* \* \* on H.R. 4851. (H.R. 5645 reported), A bill to regulate the marketing of economic poisons and devices, and for other purposes, Feb. 5, 6, 7, and 21, 1946. Serial J. 79th Cong. 2d sess. (Washington, U.S. Government Printing Office, 1946), p. 6.

<sup>13</sup> *Ibid.*, p. 11.

<sup>14</sup> *Ibid.*, pp. 9-10, 30, 73-75.

one from Fish and Wildlife Service, three from State departments of agriculture, one farm organization, four industrial trade associations, and two others. There were also five communications entered on the record. As in the previous year, no substantial controversy developed over the measure; witnesses offered detailed technical suggestions, and mostly expressed support for the bill.

Representative Andresen opened the hearing by presenting the text of a revised bill, H.R. 1237, "a bill to regulate the marketing of economic poisons and devices, and for other purposes," and then explained—

Extensive hearings were held on similar legislation in the 79th Congress and in view of the fact that the industry and distributors, and others; are in pretty much accord on this legislation, this hearing will be comparatively brief, in order to hear the views of those witnesses who have indicated that they wanted to be heard, and to receive suggestions for the record on this bill.<sup>15</sup>

He was followed by Harry E. Reed, director of the livestock branch, Production and Marketing Administration (accompanied by Dr. W. G. Reed, chief, and Dr. E. L. Griffin, assistant chief, insecticide division, livestock branch). Declaring his department in support of the proposed legislation, Mr. Reed indicated that the program under the 1919 act was budgeted at an annual \$294,000 and that the new measure would cost an additional \$285,000 annually. It would also entail a one-time outlay of \$80,000 in new laboratory equipment. His testimony included a plan of enforcement of H.R. 1237, which described the added responsibilities for the Department of Agriculture, presented a budget breakdown, and indicated briefly the assignments of enforcement responsibilities. Noted the statement:

In the enforcement activities, no basic research is contemplated. It will, however, be necessary to make sufficient investigations to determine the effectiveness of herbicides, rodenticides, and devices intended for the control of economic pests; to determine the toxicity of substances used in economic poisons and what dangers may be inherent in their use; to determine the necessity of and standard for coloring economic poisons; and to determine adequate directions for use of economic poisons.<sup>16</sup>

John D. Conner, general counsel of the National Association of Insecticide & Disinfectant Manufacturers, told the subcommittee that his association—

\* \* \* Feels that H.R. 1237, as presently drafted, is a well-balanced piece of legislation and will meet all the needs of the enforcement officials, as well as assure maximum protection to the consumer. Frankly, the association does not agree with several parts of this bill, but the bill as a whole has been approved, and no objection to these specific points is being raised so long as the bill remains in its present form.<sup>17</sup>

He was followed by L. S. Hitchner, executive secretary of the Agricultural Insecticide & Fungicide Association, who had testified the previous year on H.R. 4851. He said:

The preparation of this bill and the model State bill has been carefully considered for more than 2 years by Federal enforcement agencies, other Federal bureaus interested in pest control, many State enforcement officials, the Council of State Governments, the National Association of Commissioners, Secretaries and Directors of Agriculture, the American Association of Economic Entomolo-

<sup>15</sup> U.S. Congress, House, Committee on Agriculture, Federal Insecticide, Fungicide, and Rodenticide Act. Hearings before subcommittee of the \* \* \* on H.R. 1237. A bill to regulate the marketing of economic poisons and devices, and for other purposes. Apr. 11, 1947, 80th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1947), p. 8.

<sup>16</sup> *Ibid.*, pp. 11-12.

<sup>17</sup> *Ibid.*, p. 16.

gists, the American Phytopathological Society, industry and others. The bill is the result of many conferences and hearings. We believe this draft represents the most practical approach to a problem which not only is highly technical, but involves a variety of conflicting interests. The bill will definitely improve protection to the public, which is its principal objective.<sup>18</sup>

His views were seconded by Mr. J. M. George, representing the Interstate Manufacturers Association, and by W. N. Watson, secretary of the Manufacturing Chemists Association. Mr. Watson also observed:

This bill represents a long course of evolution. It is a very complicated affair. It has involved many controversies. The result of a great deal of study on the part of the administrative officials, State officials, and also members of industry. We submitted very detailed comments at the hearings held back on Feb. 6, 1946. I simply want to endorse this bill as now written. We think it will be a very real contribution to these rapidly expanding and increasingly important fields, and also will add to the tremendously important problem of uniformity.<sup>19</sup>

The other witnesses who appeared, and those who submitted statements, either favored the bill, or offered minor technical amendments. No significant opposition appeared.

The only comment in the entire hearing that suggested that control of the use of pesticides might be important for the preservation of the environment was that by William Heckendorn, representing the National Council of Farmer Cooperatives. The preceding year, Mr. Heckendorn in supporting the bill, had merely offered several technical amendments. In the 1947 hearing he again offered technical suggestions, and supported the bill. However, for his concluding point he suggested that it might be desirable to require the manufacturers of pesticides to indicate on the labels of their products, where appropriate, the warning that insecticides might kill useful as well as injurious insects. He said he recognized that this suggestion was premature—“\* \* \* I realize full well [that it] cannot be taken into consideration in this particular bill because we do not know enough about insecticides yet.” Nevertheless, he went on—

You recall a few years ago a group of us came before you, and asked for a special appropriation of \$12,500,000 for incentive payments in the production of legume seeds. Since that time, we have set up a program under the Agriculture Research Administration, trying to determine why it is that our yields of legume seeds have dropped so rapidly.

One of the reasons \* \* \* is the fact that our insecticides will kill everything. They kill both our beneficial insects as well as our harmful insects. And so far our development in insecticides has been to kill, it has not been to try and isolate and use certain insecticides that will protect our beneficial insects.

I feel the time is coming when we are going to be obliged to give more consideration to the type of insecticides which we use simply because we now find bee keepers are unwilling to place their bees in areas where certain insecticides are being used, simply because their colonies are being killed off.<sup>20</sup>

Heckendorn concluded with the observation that “I may be raising a question here that might create quite a controversy \* \* \*.” However, no further discussion of this point was recorded at the hearing.

#### *Legislative action on H.R. 1237*

The bill to provide control over insecticides, fungicides, and rodenticides was favorably reported from the House Committee on Agriculture, April 25, 1947. The report took note of the fact that—

Since 1910 great changes have occurred in the field of economic poisons, and the present law is now inadequate. New plant materials and synthetic chemicals

<sup>18</sup> *Ibid.*, p. 25.

<sup>19</sup> *Ibid.*, p. 32.

<sup>20</sup> *Ibid.*, p. 40.

developed through research by both private industry and the Government have greatly increased the number of economic poisons and the scope of their usefulness. An important example at the present time is DDT (dichlorodiphenyltrichloroethane), which is revolutionizing many phases of the insecticide industry. Herbicides are becoming increasingly important in the control and eradication of weeds as the result of the recent development of 2-4-dichloro-phenoxy-acetic acid and other synthetic materials.<sup>21</sup>

It noted that the scope of Government control, under the bill, had been extended to rodenticides, herbicides, and other pesticides. The control of these materials, in the interest of public safety, would be improved by seven provisions:

(1) A provision requiring the registration of economic poisons prior to their sale or introduction into interstate or foreign commerce.

(2) The inclusion of provisions for protection of the public against poisoning by requiring prominently displayed poison warnings on the labels of highly toxic economic poisons.

(3) A provision requiring the coloring or discoloring of dangerous white powdered economic poisons to prevent their being mistaken for flour, sugar, salt, baking powder or other similar articles commonly used in the preparation of foodstuffs.

(4) A requirement that warning or caution statements be contained on the label of the economic poison to prevent injury to living man, other vertebrate animals, vegetation, and useful invertebrate animals.

(5) A provision requiring instructions for use to provide adequate protection for the public.

(6) A provision declaring economic poisons to be misbranded if they are injurious to man, vertebrate animals, or vegetation, except weeds, when properly used.

(7) A provision requiring information to be furnished with respect to the delivery, movement, or holding of economic poisons and devices.<sup>22</sup>

It also noted that prevention of injury required that action be taken before toxic preparations went on the market—

Under this bill, any economic poison subject to the provisions thereof will be brought to the attention of the enforcement officials who will have an opportunity to become familiar with the formula, label, and claims made with respect to any such economic poison before it is offered to the public. It should be possible, therefore, in a great majority of instances, to prevent false and misleading claims, and to prevent worthless articles from being marketed, and to provide a means of obtaining speedy remedial action if any such articles are marketed. Thus, a great measure of protection can be accorded directly through the prevention of injury, rather than having to resort solely to the imposition of sanctions for violations after damage or injury has been done. Registration will also afford manufacturers an opportunity to eliminate many objectionable features from their labels prior to placing an economic poison on the market.<sup>23</sup>

The report concluded by listing the various Federal and State agencies, farm organizations, industrial trade associations, and others who favored passage of the bill.

The bill came to the floor of the House, May 12, Representative Andersen explained its purposes, drawing for his text from the report.

<sup>21</sup> U.S. Congress, House, Committee on Agriculture, Relating to the marketing of economic poisons and devices. Report (to accompany H.R. 1237). Report No. 313, 80th Cong., 1st sess. (Washington, U.S. Government Printing Office, Apr. 25, 1947), p. 2.

<sup>22</sup> *Idem.*

<sup>23</sup> *Ibid.*, p. 3.

Representative Keefe asked why the enforcement was placed with the Department of Agriculture rather than with the Food and Drug Administration. Representative Flannagan explained that the bill was an amendment of existing legislation, and merely extended previous authorization. Representative Andresen agreed that government reorganization was necessary, including a consolidation of functions, but that he hoped "in view of the emergency [nature] of the measure," that the question would not be pursued at that moment. Subsequently, the House passed the bill by a voice vote.<sup>24</sup>

The Senate gave the bill even more perfunctory consideration. The bill was reported by the Senate Committee on Agriculture and Forestry, May 26, without public hearings. The report consisted merely of a favorable recommendation, and the inclusion of the House committee report.<sup>25</sup> The bill was taken up on the Senate floor, June 16, Senator Ellender, chairman of the committee, explained its purposes and said it had received the unanimous approval of his committee. Then the Senate, without comment or debate, passed the bill by a voice vote.<sup>26</sup>

### III. GROWING AWARENESS OF IMPORTANT SECONDARY EFFECTS OF PESTICIDE RESIDUES

Following a series of specific investigations in 1943 and 1944 by the Bureau of Entomology and Plant Quarantine of the Department of Agriculture, and other agencies, a more elaborate series of field investigations into the toxicity and ecological effects of DDT were jointly undertaken in 1945 by the Bureau in cooperation with the Fish and Wildlife Service of the Department of the Interior. A condensed summary of the findings of the many reports that came out of this study was presented in Circular 11, DDT: "Its Effect on Fish and Wildlife,"<sup>27</sup> published by the Department of the Interior in 1946. The report contained such items as the following:

Spray drifting about 150 feet from the sprayed area to a small gravel-pit pond killed all the golden shiners and pumpkin-seed sunfish in it.

In one drained pond that had been sprayed with 0.1 pound to the acre, there was a loss of 43 percent among all species.

Within 48 hours after the application of DDT to the final portion of the area on June 1, the bird population (which had been 1.6 pairs to the acre before spraying) was much reduced. On June 13, the area contained only 0.5 birds to the acre.

Most of the crayfish on the area were readily killed by the DDT solution applied at 0.5 pound to the acre.

On July 18 reports were received of the dying of many edible crabs, which had appeared in the sprayed area: and on July 21, 150 dead or dying crabs were found over a 200-yard stretch, while those in adjacent upsprayed waters were healthy.

In all five of the mice that received 0.40 percent of DDT, violent tremors were observed at the beginning of the third day after the first exposure. Before the end of the third day, two of these mice had died. The last mouse lived until the 21st day, although decided tremors were evident throughout the period.

Of the quail fed mash containing 0.05 percent or more of DDT, all died.

<sup>24</sup> Congressional Record (May 12, 1947), p. 5054.

<sup>25</sup> U.S. Congress. Senate. Committee on Agriculture and Forestry. Regulating the Marketing of Economic Poisons and Devices. Report (to accompany H.R. 1237). S. Rept. No. 199, 80th Cong., 1st sess., May 26, 1947. (Washington, U.S. Government Printing Office, 1947), 8 p.

<sup>26</sup> Congressional Record (June 16, 1947), pp. 7007-7008.

<sup>27</sup> U.S. Department of the Interior. Fish and Wildlife Service. "DDT: Its Effect on Fish and Wildlife." Circular 11. By Clarence Cottam and Elmer Higgins. (Washington, U.S. Government Printing Office, 1946), 14 pp.

[In reporting an experiment in which wood frog egg masses were treated with DDT at the rate of 5 pounds per acre:] The experiment resulted in the killing within 3 to 5 days of all tadpoles treated with DDT. Those kept as controls or treated with oil only remained alive and healthy.

In grasshopper oil or unsalted butter fat, as little as five milligrams of DDT per kilogram of fish was usually lethal to fish starved for 4 days. When given in very small doses, symptoms were usually delayed 3 days or more, and death was often delayed 6 to 10 days.

It was discovered that toxicity was increased by higher water temperatures, by softer water, and by low dissolved oxygen. Younger fishes were more affected than the older ones.

The investigation went on; results of the work in 1946 were described in Fish and Wildlife Special Scientific Report 41.<sup>28</sup> A third report, issued in 1948 as Circular 15 of the Fish and Wildlife Service under the title, "Effects of DDT and Other Insecticides on Fish and Wildlife," described results of investigations conducted during 1947.<sup>29</sup>

The broader implications of this kind of information were brought out in several books that appeared in 1948. One was Fairfield Osborn's "Our Plundered Planet"<sup>30</sup> which warned that "\* \* \* the rub comes when we kill without knowing enough about the aftereffects." Man could not live, he declared, if all other living creatures disappeared.

As a somewhat extreme illustration, among many others, [wrote Osborn] take that form of life that man likes the least—of which the unthinking person would at once say, "Kill them all." Insects. Of the extraordinary number of kinds of insects on the earth—about three quarters of a million different species have already been identified—a small minority are harmful to man, such as the anopheles mosquito, lice, the tsetse fly, and crop-destroying insects. On the other hand, innumerable kinds are beneficial and useful. Fruit trees and many crops are dependent upon insect life for pollination or fertilization; soils are cultured and gain their productive qualities largely because of insect life. Human subsistence would, in fact, be imperiled were there no insects.<sup>31</sup>

Later that same year, William Vogt, an agricultural expert on the staff of the Pan American Union, further developed this same theme. Control of insects by potent insecticides, he observed, was both necessary and hazardous:

Many insects, such as those which pollinate fruit trees and parasitize destructive insects, are extremely valuable to man, which is one reason why biologists throughout the world are alarmed by the widespread and unselective use of DDT. Probably less than 5 percent of the known insect species can be considered a handicap to man's survival. Nevertheless, the small percentage that do attack his crops and forests wreak such havoc and are so costly to control by methods now known that they must be recognized as one of the most stubborn of all limiting factors. Unfortunately, as modern researches have shown, current agricultural methods often tend to increase damage. Furthermore, by his carelessness or unwitting spread of pests, man has greatly increased their effectiveness.<sup>32</sup>

To cope intelligently with the problems of environmental control, Vogt contended, would require a great increase in knowledge of ecology. Thus:

The limiting factors that hold down the numbers of desirable species, from nitrogen-fixing bacteria in the soil to rodent-controlling hawks, must be known

<sup>28</sup> U.S. Department of the Interior, Fish and Wildlife Service, DDT Investigations by the Fish and Wildlife Service in 1946, Special Scientific Report 41, By Arnold L. Nelson and Eugene W. Surber (May 1947) (processed).

<sup>29</sup> U.S. Department of the Interior, Fish and Wildlife Service, Effects of DDT and Other Insecticides on Fish and Wildlife, Summary of Investigations during 1947, Circular 15, By Joseph P. Linduska and Eugene W. Surber. (Washington, U.S. Government Printing Office, 1948), 19 pp.

<sup>30</sup> Fairfield Osborn, "Our Plundered Planet." (Boston, Little, Brown, and Co., 1948), 217 pp.

<sup>31</sup> *Ibid.*, p. 60.

<sup>32</sup> William Vogt, "Road To Survival." (New York, William Sloane Associates, Inc., 1948), p. 30.

if useful elements of the environment are to be increased. The normal relationships among the climates, soils, fauna, and flora that produced the environment invaded by modern man have scarcely begun to be studied—as they must be if man is not to boggle land management. The factors limiting fungus plant diseases, and destructive insects such as the locust hordes that ravage Central and South America, also need to be known in order that these numbers may be held as low as is desirable.<sup>33</sup>

Thus, as early as 1946 and increasingly thereafter, students of ecology were publicly expressing concern over the impact of pesticides on the environment. They showed awareness of the wide differences in sensitivity of various species to toxic pesticides. They recognized the wide variables in sensitivity reflecting differences in the carrier medium, wind, temperature, light and shade, duration of exposure, maturity of victim, and other factors. These preliminary data, however, were only a beginning. It was not enough to count carcasses of dead wildlife. The researches needed to go further: to show the intricate and subtle ways in which long-lasting pesticides spread into the natural environment and along food chains to cause lessened fertility of valuable species and reduced bioproduction for years after the initial application. Overgenerous and needless dissemination of these chemicals caused damage in nature uncompensated for by any advantage from their excessive use.

In the field of medicine, the complexity of responses of the human organism to organic poisons and drugs was beginning to be recognized also. The differences in response as between acute reacting to significant dosages, and the protracted chronic responses to trace quantities were gradually recognized also. However, these considerations were not brought out in the 1946–47 hearings.

#### *Medical interest in human response to insecticide toxicity*

The earliest experience with DDT suggested that it was not harmful to man. Medical attention was focused, instead, on the profound effect that the potent new insecticide had on disease-carrying insects. For example, one physician in 1947 proposed that an inexpensive way of distributing the powder was to throw it on the floors of public buildings where traffic is heaviest so that it would be tracked about. This means of distribution, he said, was “exceedingly effective in reducing the living fly population in that building.”<sup>34</sup>

A Department of Agriculture publication in 1960 commented that “\* \* \* this insecticide has been applied as a 10-percent dust inside the clothes of hundreds of millions of men, women, and children by military and public health officials, and has been applied as residual sprays in as many homes without one known case of serious toxic effects to individuals exposed to such intimate insect control practices.”<sup>35</sup> On the other hand, in 1963, DDT was reported to be “cancer producing according to presently available evidence.” It had been “incriminated \* \* \* in the production of benign and malignant tumors of the liver, cancers of the lung, and leukemias.”<sup>36</sup> These were suggestive of long-term effects; the short-term effects were generally agreed to be

<sup>33</sup> *Ibid.*, p. 159.

<sup>34</sup> JAMA (May 24, 1947, vol. 134, No. 4), p. 408.

<sup>35</sup> E. F. Knipling, *Nature and Fate of Chemical Applied to Soils, Plants, and Animals*, (Agricultural Research Services, U.S. Department of Agriculture, September 1960), p. 28.

<sup>36</sup> Statement by Dr. W. C. Hueper, National Cancer Institute, National Institutes of Health. “Toxic and Carcinogenic Hazards to the Human Population from Pesticides and Pesticide Residues:” In *Interagency Coordination in Environmental Hazards (Pesticides)*. Hearings \* \* \* op. cit., pp. 706–707.

negligible. The PSAC report on pesticides, also in 1963, cited an investigation into the toxicity of DDT in which a small group of volunteers had ingested "up to 35 mg. of DDT per day over a period of months" and yet was "reported to show no apparent ill effects during 18 months of gross observation." However, the PSAC report warned that "possible long-term effects" could not be predicted for DDT "on the basis of the limited clinical studies available."<sup>37</sup>

Although no short-term toxicity had apparently been manifested by DDT as applied to humans, and the effects of long-term exposure were controversial, there were many other pesticides on the market, some of which were indubitably toxic. An early warning was expressed in 1948, by the Council on Foods and Nutrition of the American Medical Association. It took note of the rapid increase in new, potent pesticides which posed indeterminate hazard to man. An editorial accompanying the warning spoke of the "phenomenal" introduction of "several thousand" brands of new insecticides, fungicides, and herbicides, introduced on the market, mostly since DDT. "Little is known about either the acute or chronic pathologic effects on man of these new insecticides." The editorial observed that "when pesticides are poisonous to insects they are usually poisonous to man." It noted that some of the new poisons were "\* \* \* incorporated in the plant tissues and cannot be removed." These were "particularly insidious." The editorial urged "prompt voluntary action by the industry" and, if necessary, "suitable legislation must be considered and effective means of [Government] control promptly established." Moreover:

Important is the detection of pesticide residues by practical methods in fresh as well as in processed foods. The metabolism of insecticide residues and their acute and pathologic effects on mammals must also be determined.

The editorial warned that—

Even though added controls may impede the development of pesticides, these are essential precautions which must be taken in order to avoid the danger of mass poisoning, which might well offset the potential benefits of the new agents.<sup>38</sup>

*Appearance of "Silent Spring"; wide impact of its message*

Late in 1962, the book by Rachel Carson appeared. More than a decade had elapsed since the appearance of the Osborn warning and the AMA statement. The message of the Carson book was simple and clear: In his conquest of pests, man's indiscriminate use of potent chemicals had already done great—perhaps irreparable—damage; it was threatening himself and destroying his environment. Backed by 55 pages of footnotes Miss Carson declared that, in substance—

Some pesticides had proved fatal to man after the slightest contact (p. 30).

Food chains (e.g., grain to hens to eggs; hay to cows to milk) sometimes concentrated stable insecticides to dangerous extents (p. 22).

Some insecticides were 40 to 50 times as toxic as DDT for bird life (p. 25).

The most toxic insecticides of all—the organophosphates—were being sprayed in huge quantities from airplanes and motorized blowers to control agricultural pests over large acreages (p. 30).

<sup>37</sup> Reproduced in Hearings \* \* \* Ibid., p. 45.

<sup>38</sup> JAMA (Aug. 28, 1948, vol. 137, No. 18), pp. 1604-1605.

Some organophosphates teamed up synergistically (their toxicity being thus "potentiated") to multiply their combined toxicity 50 times (p. 31).

Among the dangers of herbicides to man were induced tumors, metabolic disruptions, and genetic damage (p. 36).

Durable insecticides could spread throughout U.S. ground-water reservoirs, and much U.S. ground water was already thus contaminated (pp. 41-42).

Fish were particularly susceptible to poisoning from insecticides; fish-eating birds were poisoned by eating killed fish, or their eggs were infertile (pp. 48-49).

Fungicides might destroy essential microorganisms in the soil, on which food plants depend (p. 57).

From repeated spraying over the years, quantities of insecticides in the soil built up; peak accumulations had been reported of 15, 19, 26, 34.5, 60, 113 pounds per acre (p. 58).

There were a great deal more of this kind of detailed information, heavily footnoted, and all recounted in a powerful and moving prose style. In her conclusion, Miss Carson appealed for research to find ways of resolving the dilemma. She quoted Dr. C. J. Briejèr, director of the Plant Protection Service, of the Netherlands:

It is more than clear that we are traveling a dangerous road \* \* \*. *We are going to have to do some very energetic research on other control measures, measures that will be biological, not chemical. Our aim should be to guide natural processes as cautiously as possible in the desired direction rather than to use brute force* \* \* \*. (Italics in Carson text.)<sup>39</sup>

Indicative of a rising professional concern contemporaneous with publication of the Carson book is the increase in field studies of pesticide-wildlife relationships. An annotated list compiled by the Department of the Interior, of investigations by States and universities into pesticide damage to nature through 1964, showed an average of 10 entries per year, 1947-61; with 13 in 1961, 30 in 1962, and 63 in 1963.<sup>40</sup> Indeed, the interest in the Carson thesis was widespread—

The reaction to the raising of this issue extended throughout Government, the agricultural and chemical industries, conservation and naturalist organizations, and the scientific community. The Life Sciences Panel of the President's Science Advisory Committee began a study of the pesticide problem in the late summer of 1962. On April 4, 1963, Senator Humphrey announced that Senator Ribicoff would conduct a study on interagency coordination in environmental health.<sup>41</sup>

At a symposium held in Albany, N.Y., and sponsored by the New York State Joint Legislative Committee on Natural Resources, September 23, 1963, one speaker said that "The current furor about the deleterious effects of excessive and indiscriminate use of pesticides centers mainly around insecticides, as is evident in Rachel Carson's

<sup>39</sup> Rachel Carson, "Silent Spring" (Boston, Houghton Mifflin Co., 1962), pp. 275, 301-355, and as noted. (Portions of the book first published as a series of articles in *The New Yorker*).

<sup>40</sup> U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Pesticide—Wildlife Studies by States, Provinces and Universities: An Annotated List of Investigations Through 1964. (Washington, U.S. Government Printing Office, May 1965, 30 pp.) Circular No. 224.

<sup>41</sup> U.S. Congress, Senate, Committee on Government Operations, Interagency Environmental Hazards Coordination, Pesticides and Public Policy, Report of the \* \* \* Made by its Subcommittee on Reorganizations and International Organizations, (Pursuant to S. Res. 27, 88th Cong., as amended; extended by S. Res. 288, 88th Cong.) S. Rept. No. 1379, 89th Cong., 2d sess., July 21, 1966 (Washington, U.S. Government Printing Office, 1966), pp. 1-2.

book and the reactions to it.”<sup>42</sup> Another speaker at the same symposium presented an inventory of State pesticide laws. He said that 47 States regulate the marketing of pesticides, and 29 regulate their use. Many of these licensing acts, he noted, “\* \* \* were either passed or amended during the past two years.”<sup>43</sup> Many of the presentations at the session were implicitly in refutation of one or another of Miss Carson’s assertions.

Thus, some 15 years after the Congress had adopted without opposition or controversy a substantial piece of legislation to control commerce in new potent pesticides, a very vociferous protest arose over the assertedly indiscriminate use of these poisons. Why was the protest so widespread and intense in 1962, while in 1947 it was almost non-existent? Admittedly, the accomplished prose of Miss Carson was more powerful a stimulus than the modest demurrer of Mr. Hecken-dorn. It was also true that numerous indications had accumulated concerning the use and effects of the more potent new chemicals, and many additional formulations, dangerous to man as well as to pests, had to come on the market after 1947.

In the case of agricultural poisons, their effectiveness in wiping out pests was accompanied by the danger of their toxicity to humans; in the case of poisons used to control forest pests, their effectiveness for this use was accompanied by the disadvantages resulting from their toxicity against fish, birds, wild mammals, and sometimes against man.

Other factors that may have intensified the public response to the Carson book were: (a) The fact that the growing congestion of American society had heightened the value of remaining wilderness areas and made any impairment of nature in such areas more salient; (b) the fact that the growing concern over the hazard of radioactive fallout from nuclear tests may have provided an instructive analog of chemical poisons disseminated widely; (c) the sensational disclosures concerning the drug, thalidomide, that dramatized the difficulty of establishing without qualification, the safety of a new chemical formulations; (d) various well-publicized episodes, such as a national warning concerning pesticide-contaminated cranberries and a notable “fish kill” on the Mississippi, had brought the subject to public attention.

#### IV. CONVERSION OF PESTICIDE ISSUE INTO THE ISSUE OF TOTAL ENVIRONMENTAL PRESERVATION

Even before the appearance of “Silent Spring,” the National Academy of Sciences had established a Committee on Pest Control and Wildlife Relationships. At the annual meeting of the National Research Council, associated with the Academy, this Committee was invited to present a symposium on “the present status of the pest control and wildlife situation.”<sup>44</sup> During 1962 and 1963, the Committee prepared for issuance by the Academy three reports on various aspects

<sup>42</sup> W. E. McQuilkin. Economic and Science Problems in Maintenance of Rights-of-way. In New York (State). Joint Legislative Committee on Natural Resources. Pesticides—Their Use and Effect. Proceedings of a symposium. Albany, N.Y., Sept. 23, 1963. Sponsored by \* \* \* . (Albany, N.Y., 1963), p. 100.

<sup>43</sup> D. L. Collins. An Analysis and Comparison of Federal and State Legislation on Pesticides. In *Ibid.*, pp. 83, 98.

<sup>44</sup> The Committee had been appointed in May, 1960; its first meeting was June 14, 1960. Its objectives were to provide technical advice and guidance on its subject to government and others, to provide critical evaluation of information on pest control effects, to stimulate research, to foster cooperation, and to provide a forum for the discussion of problems in its field.

of pesticide management and effects.<sup>45</sup> These reports sought to place in proper perspective the issues that Miss Carson's book had raised, to propose a course of national regulatory action, and to identify areas in which further scientific research was urgently needed to improve pesticide management.

Also during 1962 and 1963, the President's Science Advisory Committee was asked by the President to examine the problem; it prepared a substantial report on the subject, which was issued May 15, 1963.<sup>46</sup> Subsequently, a vigorous effort was made by the staff of the House Appropriations Committee to restore perspective to the controversy.<sup>47</sup> A partial list of further contacts, extracted from the report, includes the following:

To obtain information concerning the use of chemical and nonchemical means of pest control, the staff interviewed officials of the Entomology Research Division, the Pesticides Regulation Division, and the Plant Pest Control Division of the Agricultural Research Service (ARS) of the U.S. Department of Agriculture (USDA). In addition, officials of the Agricultural Stabilization and Conservation Service, the Cooperative State Research Service, and the Forest Service of USDA, including the Division of Forest Pest Control and the Division of Forest Protection Research, were interviewed with respect to the use of pesticides.

Officials of the Bureau of Regulatory Compliance, the Bureau of Scientific Research, and the Bureau of Scientific Standards and Evaluation of the Food and Drug Administration (FDA), of the Department of Health, Education, and Welfare (HEW), were interviewed concerning the registration and establishment of tolerances and the research activities of FDA.

Officials of the Public Health Service (PHS) of HEW, Washington, D.C., including the Bureau of States Services and the Water Supply and Pollution Control Division, were also interviewed.

Officials of the U.S. Department of the Interior (USDI) were interviewed concerning USDI's pesticide programs and research.

In addition, a member of the panel on the use of pesticides of the President's Science Advisory Committee, members of the current Pesticide Residues Committee of the National Academy of Sciences-National Research Council, and members of the staff of the President's Office of Science and Technology were interviewed.

The staff visited and discussed operations of 16 laboratories of ARS.

The staff visited five of the 18 district offices of FDA and discussed matters relevant to pesticides and the various incidents investigated by the staff.

The staff visited two district offices of PHS; the research facilities of the Communicable Disease Center, at Atlanta, Ga., and Wenatchee, Wash.; the National Cancer Institute and the National Institute of Allergy and Infectious Diseases of the National Institutes of Health, Bethesda, Md.; and the Taft Sanitary Engineering Center, Cincinnati, Ohio.

The staff observed the research facilities and operations of the USDI at Denver, Colo.; Gulf Breeze, Fla.; and Laurel, Md.; and discussed with officials of these laboratories the USDI programs being conducted to ascertain the effects that pesticide residues have had on fish and other wildlife.

<sup>45</sup> A symposium on pest control and wildlife relationships. By Committee on Pest Control and Wildlife Relationships. Mar. 10, 1961, 25 pp. (publication 897); Pest Control and Wildlife Relationships, Pt. 1: Evaluation of Pesticide-Wildlife Problems (1962), 28 pp. (publication 920-A); pt. 2: Policy and Procedures for Pest Control (1962) 53 pp. (publication 920-B); and pt. 3: Research Needs (1963), 28 pp. (publication 920-C).

<sup>46</sup> "Use of Pesticides." A report of the President's Science Advisory Committee. The White House, May 15, 1963, op. cit.

<sup>47</sup> "Effects, Uses, Control, and Research of Agricultural Pesticides." (A report by the surveys and investigations staff). Apr. 19, 1965. Reproduced in: U.S. Congress, House, Committee on Appropriations, Department of Agriculture Appropriations for 1966, Hearings before a subcommittee of the \* \* \* pt. 1, 89th Cong., 1st sess. (Washington, U.S. Government Printing Office, 1966), p. 165. This inquiry was begun in 1964. The staff interviewed more than 185 outstanding scientists and 23 physicians, including officials of the American Medical Association and university medical school faculties, having knowledge of the properties, the uses, and the known and potential benefits and hazards of the use of pesticides. Included were biochemists, biologists, chemists, entomologists, nutritionists, plant pathologists, toxicologists, zoologists, and a geneticist, as well as experts in agriculture, conservation, and public health.

Officials of 15 State departments of agriculture, 11 State departments of conservation, five State departments of health, and the departments of health of the District of Columbia and of Dade County, Fla., were interviewed concerning the effects of pesticide residues on man, wildlife, and other animals, as well as the departments activities with residues in food. Officials of agricultural experiment stations of eight States and professors at 18 universities were also interviewed.

A major committee investigation of pesticide management was carried on for nearly 2 years by the Senate Committee on Government Operations.<sup>48</sup> As the decade of the 1960's neared its close, the issue of environmental preservation was becoming more and more acute. The limited aspect of pesticide management as such appeared to have been reasonably resolved (except for several local efforts to ban long-lived insecticides). But the broader issue of environmental preservation promised to remain alive for an indefinite future.

#### *Resolution of the chemical pesticide issue*

There appeared, as the controversy over pesticides subsided, to be a consensus on the following points: (a) pesticides presented varying degrees of serious danger to man and his ecology; (b) they were essential for agriculture and control of disease vectors; (c) their use should be cautious, selective, controlled, and disciplined; and (d) more knowledge was needed of their consequences for man and for the ecology. This set of conclusions had been the gist of the findings in the symposium of the National Academy of Sciences in 1961, which concluded on the following note:

No responsible wildlife biologist would advocate the abrupt prohibition of chemical pesticides, even if such a prohibition were within the realm of possibility. Properly used by responsible individuals, they serve an important purpose. All that the biologists ask is that a greater degree of caution and responsibility be demonstrated all the way from the manufacturer down to the spray-tank operator and an awareness on the part of all concerned of the potential dangers of overapplication. We also ask that more attention be given by Federal and State authorities concerned with pest control in developing methods that will be less hazardous to beneficial forms of life. When the chemists produce a product that is specific for individual pest species, as they have already done with the sea lamprey, they will find the wildlife biologists leading the applause.<sup>49</sup>

#### The 1963 PSAC report on pesticides observed:

Review of pesticides brings into focus their great merits while suggesting that there are apparent risks. This is the nature of the dilemma that confronts the Nation. The Panel has attempted to state the case—the benefits, the hazards, and the methods of controlling the hazards. It can suggest ways of avoiding or lessening the hazards, but in the end society must decide, and to do so it must obtain adequate information on which to base its judgments. The decision is an uncomfortable one which can never be final but must be constantly in flux as circumstances change and knowledge increases.<sup>50</sup>

Accordingly, the report urged expanded research in the relationship of pesticides to human disorders, more conservative control of the use of especially hazardous and persistent pesticides, the gathering of data on exposure levels of categories of the population in contact with pesti-

<sup>48</sup> Interagency Coordination in Environmental Hazards (pesticides). Hearings \* \* \*. Op. cit. This investigation accumulated 2,628 pp., covering 20 days of hearings, and 270 exhibits. It consulted 94 witnesses, including 55 representatives of Federal agencies, six of State agencies, 19 witnesses from private industry, and 12 scientists from academic institutions or unaffiliated. The final report of the investigation, July 21, 1966, took 86 pp.

<sup>49</sup> Ira N. Gabrielson, of the Wildlife Management Institute, In: "Symposium on Pest Control and Wildlife Relationships," op. cit., p. 25.

<sup>50</sup> Interagency Coordination in Environmental Hazards (pesticides). Hearings \* \* \*. Op. cit., p. 38.

cides, the gathering of data on residue levels, and the determination of residue tolerances of man and the ecology.

The staff report of the House Appropriations Committee suggested that Miss Carson's book had been one-sided and had "unnecessarily caused public concern over the ill effects of chemical pesticides on the public health." Nevertheless, the book had also been beneficial in "collecting information on the improper uses of pesticides and on the resulting possibilities of danger to public health."

Moreover, the author emphasized the need for greater public support of efforts to (a) discover selective chemical pesticides that would be poisonous only to the particular insect or other organism to be killed; (b) develop useful physical and biological pest-control methods; and (c) intensify the study of acute and chronic effects of chemical pesticides on man, fish, birds, and other animals. Greater effort has, indeed, been devoted to such problems since the publication of "Silent Spring."<sup>51</sup>

In the Senate hearings before the Government Operations Subcommittee, Miss Carson herself helped to restore perspective to the pesticide controversy. In a colloquy with Senator Ribicoff, who chaired the hearings, the following exchange occurred:

MISS CARSON. That is a fair statement; yes. It would not be possible, even if we wished to do so, to eliminate all chemicals tomorrow.

A great deal of the discussion of "Silent Spring" and of the issues has, as you say, been placed on an all-or-none basis, which is not correct. This is not what I advocated, sir.

SENATOR RIBICOFF. In other words, you recognize that many of these chemical poisons have produced many benefits both to public health in combating disease, and to nutritional health in improving the quality of our food supply.

MISS CARSON. They have produced benefits. My concern is about the serious side effects.

I think that we have had our eyes too exclusively on the benefits, and we have failed to recognize that there are also many side effects which must be taken into consideration. However, what I have advocated is not the complete abandonment of chemical control. I think chemicals do have a place. In fact, I have cited with great approval the coordination of chemical and biological controls such as is applied, for example, in the apple orchards of Nova Scotia.

SENATOR RIBICOFF. And am I correct, then, that your primary objection is against the indiscriminate use of pesticides and use where they are not necessary, and their excessive use even where they are necessary?

MISS CARSON. That is correct, and I think that instead of automatically reaching for the spray gun or calling in the spray planes, we must consider the whole problem. We must find out first whether there is any other method that can be used.

If there is not, then we should use chemicals as sparingly and as selectively as we can, and we should use them in such a way that we do not destroy the controls that are built into the environment.

SENATOR RIBICOFF. In other words, you do not believe that next spring will be the silent spring, but that injury to wildlife and to man himself will become an ever-increasing threat in the years ahead, unless proper safeguards are developed and new techniques, such as biological controls, are put into practice.

MISS CARSON. I think we must begin now to take account of the hazards to change our methods where and when we can.<sup>52</sup>

The final report of the Senate pesticide investigation, July 21, 1966, drew attention to the need to consider every technological innovation in the light of its benefits and risks. The Carson book had emphasized the risk side of the equation. In response to this emphasis, some witnesses—said the report—had urged that pesticides "should be virtually

<sup>51</sup> Department of Agriculture Appropriations for 1966, Op. cit., hearings, pp. 169-170.

<sup>52</sup> Interagency Coordination in Environmental Hazards (pesticides). Hearings \* \* \*. Op. cit., p. 220.

banned" while pesticide producers and users, in an overreaction to this response, had contended that "no problem whatsoever existed." Government witnesses concerned with administrative aspects of the problem, had "attempted to oversell their present work and to minimize past deficiencies."<sup>53</sup> Then the committee offered four groups of specific recommendations. These were:

1. To strengthen the present regulatory system:

(a) Enact legislation to prevent contamination of the environment by unintentional release of hazardous substances through industrial waste disposal, used containers, mislabeling, or faulty application. Such legislation should include registration with the Secretary of Agriculture of facilities for pesticide manufacture, compounding, processing or packaging, assurance of good operating practice and product quality control by factory inspection, sampling and analysis; provision for deeming "misbranded" any pesticide made in an unregistered or substandard facility; and Federal court injunction authority and civil penalties for enforcement of the law.

(b) Provide Federal grants to the States to promote uniform training, methods and equipment in monitoring pesticides in the environment and detecting residues in food stuffs.

(c) Emphasize the education and information requirements on manufacturers and Federal recommending agencies with respect to the nonagricultural or nonprofessional user of pesticides.

(d) Arrange international agreements on pesticide residue tolerances, detection and analysis techniques, monitoring networks and effects on migratory birds.

(e) Enact legislation providing uniform indemnification for bona fide injuries resulting from legal actions by the Food and Drug Administration, after accurately following recommendations of another Federal agency or due to good-faith mistakes by Federal officials performing inspection activities. The Federal Tort Claims Act now specifically excepts these claims.

2. To improve coordination of Federal programs which affect the environment:

(a) Provide legislative authority for the mission and activities of the present Federal Committee on Pest Control.

(b) Improve the quality and speed of translation of scientific information into policy terms, and from scientists to agency decisionmakers.

(c) Improve the coordination of research by requiring agencies to register programs with the Science Information Exchange; and obtaining annual budgetary summations of work in different agencies in a common framework of terminology.

3. To increase human health and longevity with respect to the debilitating effects of exposure to environmental contaminants:

(a) Encourage, within the DHEW, the rapid formulation of the environmental health program.

(b) Increase, by means of FDA or NIH grants, research in human pharmacology.

(c) Encourage the chemical industry to develop chemical pesticides which are safer for human beings.

(d) Accelerate the development of nonchemical pest-control methods.

(e) Enact legislation, if necessary, to provide good hygiene practice among agricultural workers with pesticides.

(f) Foster an awareness of possible danger from improper use of hazardous substances by educational programs on health in the chemical age.

4. To develop a more adequate basis for future national policy in environmental management:

(a) Establish, within the appropriate science based executive agency, a program to accumulate factual knowledge on the present and future status of the environment.

(b) Encourage, as public policy, the concept that Federal activities which affect the environment shall be administered to provide the greatest net gain for society in accomplishing broad national objectives.

<sup>53</sup> Interagency Environmental Hazards Coordination, Pesticides and Public Policy. Report \* \* \*. Op. cit., p. 65.

(c) Accelerate the interpretation of science to the public in order that the risks and benefits of new technology may be known by the public.

(d) Increase congressional oversight of the administration of the regulatory programs which concern those activities capable of affecting man's relationship to his environment.<sup>54</sup>

However, the essence of the report is perhaps best reflected in the following short passage:

The public debate over pesticides is but one facet of a wider debate which reflects a greater sensitivity to the fundamental questions raised by the continuing and accelerating pace of man's modification of his total environment. Pesticides are but one factor and we are increasingly aware that our environment is being altered even more dramatically by air and water pollution, atomic fallout, and the population explosion.

These are manifestations of the great issues of our time—man's relationship to the world around him. As we come to appreciate more keenly the significance of this vast, accelerating, irreversible alteration of our environment we recognize the need for stocktaking and the necessity of endeavoring to take into account all the multitude of complex relationships between man and his natural and artificial surroundings.<sup>55</sup>

#### *Pesticides as one of many pollutants of the environment*

Shortly before the Senate committee report appeared, another PSAC report was released by the White House, November 5, 1965. This was a study by an Environmental Pollution Panel, which dealt with pesticides as one of numerous factors degrading the human environment. It observed that arrangements to deal with pollution had evolved on a piecemeal basis, that consideration of side effects of some pollutants (such as pesticides) had been scant, and that it was essential to make advance evaluation of potentially major hazards before their effects became widespread.<sup>56</sup> Of 104 recommendations offered by the Panel, 11 specifically mentioned pesticides, and many others had obvious implications for the control of pollution caused by pesticides. Perhaps the best epitome of the report was its first recommendation, under "principles." This was:

*The public should come to recognize individual rights to quality of living, as expressed by the absence of pollution, as it has come to recognize rights to education, to economic advance, and to public recreation. Like education and other human rights, improved quality of life from reduced pollution will be costly to individuals and governments. [Italic in original.]*

It was evident that a considerable increase in official and public understanding of the pesticide problem had occurred between 1947 and 1965. However, it is also notable that this growing appreciation of the problem had not been accompanied by comprehensive legislative action. No comprehensive legislative enactment resulted from the agitation over the "Silent Spring." This was a "highly technical" matter in 1947; it was more so by 1962; and it was vastly more so by 1967 or 1968. Public insistence on action is most clear cut when the action proposed is clear and unequivocal. The public appeared ready to demand action when pesticides were identified as the villain of the piece, in 1962. But the public began to lose interest when the issue turned out to require a balance between opposites: either the unrestricted use of chemical pesticides or the absolute prohibition of chemical pesticides

<sup>54</sup> *Ibid.*, pp. 67-68.

<sup>55</sup> *Ibid.*, p. 66.

<sup>56</sup> U.S. President's Science Advisory Committee, *Restoring the Quality of Our Environment. Report of the Environmental Pollution Panel*, President's Science Advisory Committee, The White House, November 1965. (Washington, U.S. Government Printing Office, 1965), p. 14.

would have spelled disaster. The question was rather: How much regulation of what kind?

The answer to this question would change from year to year. Perhaps the law passed in 1947 was adequate at that time. The regulation it authorized has been found responsive to demands for stronger controls. At the same time, there will always be a need for more Rachel Carsons to demand better and more up-to-date decisionmaking in the balancing of benefits and risks, as performance tends to lag behind the standards the public expects or requires. Following the Government Operations Committee investigations, at the suggestion of the Department of Agriculture (by letter of August 13, 1965), Senator Ribicoff introduced proposed amendments ("Federal Pesticide Control Act of 1965," introduced August 30) to tighten the regulatory control over manufacturers of commercial poisons. However, no action was taken on the proposal. Other bills had called for the banning of long-lived insecticides and for a closer control over the use of pesticides in programs funded by the Federal Government. The Congress may have deferred action after 1963 in order to assess the effectiveness of administrative measures to tighten existing controls, corresponding efforts in the States, and the vigorous response of pesticide manufacturers toward self-regulation under the threat of further Federal action.

The enactment of legislation to restore or preserve the environment has become increasingly difficult precisely because more is known about the enormous complexity of the problem. The public has a stake in the outcome, but the issues of total environmental quality are not obvious or clear cut. Invariably, there are trade-offs of benefit and risk. Issues tend increasingly to draw into controversy more and more groups with special interests, who predictably react against each other with prejudiced reading of evidence toward foregone conclusions. As the balancing of benefit and risk becomes more delicate, and failure more dangerous, the need grows for the development of a new decision process which permits a degree of separation between the technological and political aspects of environmental questions. As technology advances, it becomes easier to imagine some new technology that prematurely bursts into wide public use before the established routines of public protection have discovered its concealed potential for disaster. In the words of another congressional document:

A well intentioned but poorly informed society is haphazardly deploying a powerful, accelerating technology in a complex and somewhat fragile environment. The consequences are only vaguely discernible.<sup>67</sup>

<sup>67</sup> U.S. Congress, House Committee on Science and Astronautics, *Managing the Environment*. Report of the Subcommittee on Science, Research, and Development to the . . . . Serial S. Committee print. (Washington, U.S. Government Printing Office, 1968), p. 6.

# CHAPTER SIXTEEN—CONGRESSIONAL DECISIONS ON WATER PROJECTS

## I. INTRODUCTION

The subject of this chapter is the development of information pertinent to decisions by the Congress as to whether to authorize particular water projects. This perennial task has been a vexing one for a number of reasons:

(1) Water is a flowing resource; therefore, it is in dynamic motion. This implies that the mathematics and the analytical problems of water are inherently complex and difficult.

(2) Water touches man's existence at many vital points, constituting both property rights and aspects of human survival and welfare. In this way, it generates many and deeply felt political issues.

(3) Water projects are large and costly, but are localized in particular communities; expenditures for such projects are a significant tax on national resources, but their impact is primarily restricted to regions where they are sited.

(4) Water, and the relations between man and water, are affected by many changes in the human condition: population numbers, political organization, and technology. Water problems thus need to be redefined and new solutions found for them by each new generation, invariably in a more complex setting.

Philosophically, it does not matter whether water is considered the ultimate resource, or whether soil, water, and air—taken together—comprise the ultimate and essential elements for human survival. Water is certainly central to man's existence and welfare. Life itself began in the water. Without water, human survival is impossible. Man himself is composed of some 70 percent water, and every living creature is more than half water. The surface of the earth is 71 percent water. Water is essential to sustain man—to support agriculture, forests, and animal life. The hydrologic cycle provides rain for the land, purifies the air, nourishes the rivers that flow back to the oceans, and replenishes the ground waters that underlie much of the surface of the land.

Water projects provide civilized man with many benefits; they impose some hazards; and they also alleviate some hazards of nature. (See illustrative table.)

EXAMPLES OF WATER PROJECT BENEFITS, HAZARDS OVERCOME, AND HAZARDS CAUSED

Project benefits	Hazards or costs alleviated by projects	Hazards or costs that may be caused by projects
Transportation.....	Floods.....	Permanent inundation.
Irrigation.....	Erosion.....	Project costs.
Power.....	Waterlogged land.....	Losses of local tax revenues.
Municipal water supply.....	Low flow.....	Losses of scenic values.
Recreation.....		Dislocations and removals.
Economic stimulus.....		Microclimatic impairment.
Additional habitat in reservoirs for water-fowl, etc.		Degradation of wild environment and wildlife habitat.

In short, water is broadly involved with human activity: with the sociology of human relations, the political science of joint human enterprises and decisionmaking, the economic considerations of property and value and work, the technological aspects of engineering design of human-built structures to serve dozens of separate and distinct purposes, and with the broad analytical, statistical, and technological problem of forecasting and responding to changes in all of these disciplines.

*Growing complexity of modern water management*

A resource so intimately involved with the survival and well-being of man inevitably reflects the growing complexity of the human condition. Each man's uses of water change its quality and its availability for successive uses. Human uses of water and needs for water change in response to the growing density and complexity of an industrial civilization.

Even the initial decision as to who should make decisions about water is complicated by the nature of water itself. The products and services resulting from public works to exploit water resources have universal value. But the values from any particular water project serve only some partial geographical segment. Water projects are characteristically of precisely defined geographic scope within a community or region. Since rivers are a primary geographical feature used to mark boundaries between political jurisdictions (nations, States, or communities), water projects frequently involve multiple political jurisdictions. Moreover, the infinity of ways in which water is important to man means that as the range of government programs in human security and welfare grows wider, an ever-increasing number of agencies and departments of government share in decisions regarding water management and development.

An unmanageably large volume of literature has been produced on the subject of water management. It would be impossible to sift all the available knowledge and thought about the technology and management of this resource. Yet, despite this abundance of data, there remain great gaps in available knowledge, and significant omissions in underlying theory. The interactions of water with man and with other aspects of ecology are endless: an enormous array of research goals must be achieved before anything approaching a definitive knowledge of the role of water in relation to man becomes available.

Thus, the effective management of water places requirements on basic and applied science to reveal more about the resource, and on the developing skills in information management to bring order and accessibility to the growing volume of information about it. Rather than yes-or-no decisions, water development is coming to present problems of choices among alternatives, conditioned by the particular circumstances prevailing in a particular environment.

It is becoming increasingly evident that a complete, precise, durable, and universally accepted set of principles governing the suitability of plans to exploit water is not feasible. Preferences—choices among alternatives—can be ascertained, although usually for limited periods of time, but there appear to be no positive laws that fix for all time the correctness of findings—

As to which projects should or should not be undertaken;

As to what priority should be assigned to each project;

As to the proper size and scope of services that should be rendered by any individual project;

As to the relative merits of economic products and qualitative values;

As to the organizational structure for water planning and management;

As to the charges to be levied on beneficiaries of such projects;

As to the effect of the passage of time on all of these variables.

Strong reliance on economic criteria has been a characteristic of 20th century government, whether applied by "liberal" or "conservative" leadership. Measurable contribution to industrial prosperity, the health and profitability of industry and commerce, rates of expansion of enterprise, wage and employment levels, tax revenues, and standards of living have been primary factors by which regional development programs have been judged. The constitutional goal of "welfare" has been interpreted largely in economic terms. Accordingly, a principal basis for evaluating water projects has been their economic benefits and costs. It was hoped that by a careful, and increasingly precise, totaling up of all the beneficial and adverse impacts of a particular project or assemblage of projects it would be feasible to ascertain whether or not to sponsor them.

The crediting of economic costs and benefits in the management of water is made complex, however, by the particular characteristics of water and water projects, such as—

The nature of water itself, as a material occurring in nature in enormous abundance, having no monetary value of its own, and valued more or less inversely according to the extent and undesirability of the impurities in it; also, as a material that is constantly replenished by the hydrologic cycle, generally in motion, and not consumed in the process of being used;

The nature of attitudes toward water, differing according to local social values, customs, and laws;<sup>1</sup>

The fact that some costs and benefits of water projects can be assigned quantitative values and some cannot;

The fact that some values of water projects have both quantitative and qualitative elements;

The fact that different benefits from water accrue to different parts of the total population;

The fact that some costs and some benefits of water cannot be monetized relative to those persons most directly affected;

The fact that some benefits result only from an increase in some costs, both quantitative and qualitative, and that benefits and costs are distributed differently;

The fact that an increase in some one benefit from a water project is often at the expense of a reduction in some other benefit.

The importance of water as a natural resource makes enlargement of its social utility an important function of Government. With advancing technology, the variety of the uses of water tends to increase. With increasing population, the intensity of the use of water

<sup>1</sup>For examples, reprocessed sewage is nowhere recycled into reuse, even though its quality can be raised to acceptable levels; water from the Hudson River is unacceptable for use in New York City, although water from the Delaware River is acceptable to Philadelphia, under parallel circumstances; water law is conditioned regionally by its importance in use on the land; and although quality is the primary consideration in the utility of water, it is not assigned any differential monetary valuation to users on this basis.

tends to increase. With increasing variety and intensity of use of water, its degradation by any particular user—municipal, industrial, agricultural, or powerplant coolant—tends to have an adverse impact on a wider reach of other users and on the ecology or environment. Accordingly, there has been a progressive tendency in the United States for an increasing scope, scale, and intensity of exploitation and control of its uses by the Federal Government. Along with this trend, the problem has become more critical as to the decisionmaking function on water projects. Techniques have been sought to solve such problems as—

The allocation of tax revenues as between current outlays and investment in capital expansion ;

The allocation of capital investment funds among competing claims, including water projects ;

The determination, for any given water project, of cost distribution among the various benefits that are to accrue from it ;

The evaluation of comparative importance of joint values, some of which are qualitative and cannot be monetized, in recognition of the competition among values in the planning of any particular project ;

The administration of charges for services rendered by water projects, to systematize direct repayment for some part of the investment, from such sources as—

Power revenues ;

Charges for irrigation water ;

Use taxes or admission fees for recreational uses of facilities.

Recognition of the relationship to water projects of such indirect charges or sources of revenue as—

Increased local or regional income tax revenues ;

Stimulus of new capital formation to national economy and tax revenues ;

Esthetic enhancement of the environment.

The Congress is confronted with the need for answers to these problems, not only to determine the ultimate mode of payment in return for capital investment in water resource development projects, but also to determine the relative claims of various projects (or various regions seeking such projects) in order to establish a rational priority among many claimants. Decision-making is rendered critical by such trends as the expanding range of water services, the increasing costs of providing these services, the increasing needs of the population for such services, the public demand for progressively higher quality of services, and the limitations imposed by the finite volume of the basic resource (which is itself undergoing degradation both functionally, as it moves through successive uses, and chronologically as more users and uses appear).

## II. EVOLUTION OF U.S. POLICY IN WATER RESOURCE MANAGEMENT

A primary consideration of almost all human society and organization is the use and development of water. New York City grew great because of its harbor and the Erie Canal that opened transportation to the hinterland. Los Angeles began its period of rapid modern expansion when, in 1916, the Los Angeles Harbor was completed, the Pan-

ama Canal was opened, and the Owens Valley aqueduct began to bring water from the eastern slopes of the high Sierras into the metropolitan area. A primary purpose of the Louisiana Purchase was to open the Mississippi River to the world's ocean traffic, and to bring the vast inland basin into the world's economic orbit. Major cities grew up along the Nation's watercourses: Pittsburgh, St. Louis, Omaha, Richmond, Little Rock, Cincinnati, Kansas City, Sacramento, Des Moines, Shreveport, Dallas, Albany. During the early years of the 19th century, industrialization meant the establishment of factory cities along the fall line, the point at which eastward-flowing rivers dropped from the Appalachian plateau to the tidewater. Exploitation of waterpower at this point enabled the settlers to operate the spindles and shuttles of early textile machinery, to mill flour, shape furniture on turning lathes, and the like, at Richmond, Norwich, Passaic, and down the valleys of the Blackstone, the Roanoke, the Connecticut, the Susquehanna. Even before the founding of the Republic, colonial leaders were concerned with the development of water transportation to open the inland empire to the sea. It is said that the Constitutional Convention itself grew out of the efforts of George Washington and his Virginia associates to construct a canal to link the Potomac hinterland to ocean commerce.<sup>2</sup>

Earliest action by the Federal Government in water development concerned the construction of canals and removal of obstructions to river navigation. Annual appropriations for such work became routine, 1826-1839, lagged thereafter until the close of the Civil War, and were revived in 1866. The first postwar rivers and harbors bill contained an early explicit recognition of the need to couple benefits with costs; it required cost estimates for each project, and also stipulated that:

[Surveys should indicate] as far as practicable, what amount of commerce and navigation would be benefited by the completion of each particular work \* \* \*.<sup>3</sup>

Flood control became a Federal function with the granting of land to Louisiana in 1849, proceeds from the sale of which would be used for this purpose.<sup>4</sup> In the following year, a study program of flood control for the Mississippi River was authorized<sup>5</sup> but no immediate action was taken on its findings. After a disastrous flood in 1874, a Mississippi River Commission was established to prepare plans to ". . . prevent destructive floods and promote and facilitate commerce, trade, and the postal service."<sup>6</sup> Thereafter flood-control activity gathered momentum.

The first hydroelectric power system began operation in 1882 and, in 1890, to resolve the possible threat of conflict between navigation and power dams, the Congress required that its approval of any such structure be obtained in advance.<sup>7</sup> From this point onward, the issue was joined between the conservationists and the advocates of private power. The former held that land and associated water resources should be classified by their actual value and leased, a method of management which would enable Federal officials to determine priorities and regu-

<sup>2</sup> This episode is traced in Cleveland Rodgers, *American Planning, Past-Present-Future*. (New York, Harper & Bros., 1947), pp. 99-103.

<sup>3</sup> Act approved June 23, 1866, 14 Stat. 70, 73.

<sup>4</sup> Act of Mar. 2, 1849, 9 Stat. 352.

<sup>5</sup> Act of Sept. 30, 1850, 9 Stat. 539.

<sup>6</sup> Act of June 28, 1879, 21 Stat. 38.

<sup>7</sup> River and Harbor Act of Jan. 27, 1890, 26 Stat. 454.

late the conditions of use. The latter favored a laissez faire policy of exploitation for profit. Differences between the two Houses of Congress obstructed legislation to resolve this controversy. The House of Representatives generally favored the conservationist position and the Senate was more inclined to favor private entrepreneurship. Eventually, in 1920, the Federal Water Power Act was passed, reserving to the Congress the right to decide whether the Federal Government should undertake to construct any recommended project.

The right of exploitation of surface water for irrigation in arid parts of the country was initially relinquished to State or local control by an act of July 26, 1866. Federal encouragement of private irrigation projects followed in 1877. Finally, the Reclamation Act of June 17, 1902, provided for construction of irrigation works by the Federal Government with repayment by users of the water into a revolving fund so as to amortize the principal in 10 years (with no interest charged). Irrigated acreage in a single farm was limited from the outset. The acreage limitation remained thereafter, but the payment time to complete amortization, without interest, was extended by steps up to the present 40 years (plus 10 years of initial development).

Early in the 20th century, it became apparent that in many instances entire rivers were the best unit for planning, and that systems of dams, locks, and powerplants could be designed to manage such streams as a whole.

At about the same time, the idea gathered force that dams and water systems could be designed to serve such multiple purposes as flood control, navigation, and power production all together—thereby integrating benefits while telescoping costs. Congressional insistence on the concept of multipurpose planning of water projects was first evidenced in the Federal Power Act of 1920, which instructed the Federal Power Commission to issue licenses for the construction of dams only when—

\* \* \* best adapted to a comprehensive scheme of improvement and utilization for the purposes of navigation, of water power development, and of other beneficial public uses \* \* \*.<sup>8</sup>

Then, in the early 1920's, a plan was developed for a huge multipurpose project on the Colorado River below the Grand Canyon. The plan, advanced in the "Weymouth Report," of which a preliminary version was published as Senate Document 142, 67th Congress, Second Session, proposed five sets of benefits:

- (1) Flood control;
- (2) Power;
- (3) Silt reduction downstream;
- (4) Stabilization of low flow (for eventual downstream irrigation and municipal use);
- (5) Recreation.

Approved in the Boulder Canyon Project Act of 1928, the Hoover Dam met all of these goals.

The most elaborate water program under single management, before World War II, was the Tennessee Valley Authority, in which

<sup>8</sup> Act of June 10, 1920, 41 Stat. 1063. Earlier, in the Rivers and Harbors Act of 1917, the Congress had authorized creation of a Waterways Commission whose purpose was to coordinate water studies to resolve questions relating to navigation, irrigation, drainage, forestry, arid and swamp land reclamation, desilting, flow stabilization, flood control, power, erosion control, and municipal, industrial, and agricultural water supply. (Act of Aug. 8, 1917, 40 Stat. 250.)

multiple purpose projects were coordinated in the comprehensive development of an entire river basin, toward goals expressed in terms of benefits to the people of the region and the Nation, rather than in terms of quantitative accomplishment of engineering functions. The TVA was given a wide charter as a Government corporation to construct dams and transmission lines, to produce and sell electric power to consumers or to wholesalers of its own choosing, to use power to operate experimental fertilizer production facilities and sell fertilizer, to develop river commerce, encourage industry and agriculture, and to help develop all natural resources in the region. The purposes of TVA as stated in the Act were :

To improve the navigability and to provide for the flood control of the Tennessee River ; to provide for reforestation and the proper use of marginal lands in the Tennessee Valley ; to provide for the agricultural and industrial development of said valley ; to provide for the national defense by the creation of a corporation for the operation of Government properties at and near Muscle Shoals in the State of Alabama, and for other purposes.<sup>9</sup>

The TVA Act itself had such novel features as force account construction, development of recreation facilities, construction of shipping terminals, adjustment of dislocations of populations and community facilities, and technological demonstration programs. The act also provided that costs of all facilities acquired by TVA should be “. . . allocated and charged up to (1) flood control, (2) navigation, (3) fertilizer, (4) national defense, and (5) the development of power.”

#### *The search for coherence in water planning*

Unprecedented activity occurred in the field of water projects during the 9 years immediately preceding World War II, mainly as a means of alleviating unemployment. In addition, the “multiplier” effect of public capital formation and investment, as described by John Maynard Keynes, was beginning to win credence.<sup>10</sup> During these years, TVA undertook a series of major construction projects. Several great dams were built on the Columbia River, and others on the Missouri, in the Central Valley of California, and elsewhere. Elaborate programs of flood control were initiated.

As a component of a very extensive planning program, a great deal of planning of water resource development went on throughout the depression years under the auspices of the National Resources Committee (later the National Resources Planning Board; this planning program was terminated when the Congress withheld further funding for the fiscal year 1943). This organization accepted many of the approaches to river development that had first received practical and intensive demonstration in the TVA: the idea of total planned engineering of a river basin, full use of multipurpose projects in such a system, recognition of the functional interaction of land and water, and participation in the planning process by State and local “grassroots” representatives. However, the committee did not explicitly embrace other TVA concepts, such as (a) the use of a separate, semiautonomous, Government corporation as planning and operational instrument in each river basin; (b) programs of research

<sup>9</sup> Tennessee Valley Act of 1933, approved May 18, 48 Stat. 58.

<sup>10</sup> John Maynard Keynes, *The General Theory of Employment, Interest, and Money*. (New York, Harcourt, Brace & Co., 1935.) See especially ch. 10.

by such corporations in applied technology for the region, along with data-gathering and economic/technological studies; (c) demonstration programs of agricultural, silva-cultural, and industrial technology, related to the development of regional resources.

The National Resources Committee, in one illustrative document on Public Works Planning<sup>11</sup> discussed 17 major drainage basins of the United States. It attacked "orderless, unintegrated treatment of water problems" and declared that "sooner or later, the maximum supply of water that can be made regularly available in each drainage basin must be put to its best coordinated use."<sup>12</sup> The report stressed that plans needed to be flexible, in order to be adaptable to changes in technology and in requirements:

No fixed or final water plan is possible. Future water requirements in most areas can be estimated only approximately and for comparatively short periods. They will be affected by changes in density of population, in land use, in industry, and in social conditions. From time to time emphasis doubtless will be placed upon different uses and problems of water. The nature and extent of future changes of these kinds will be influenced in turn by the supply of water. The supply now available may be insufficient even for present needs. The extent to which it can be increased may be unknown for lack of basic data on precipitation, infiltration, stream flow, and the like. Such data are lacking to greater or less degree on both the surface and underground waters of almost every drainage area. The general removal of these deficiencies in hydrologic data will require many years even if adequate action to that end is initiated promptly, since long-term records are indispensable for many major purposes. The total supply of water that can be made available in a given drainage area may change through the operation of natural processes or through modification of surface conditions by human action. For these reasons, any water plan, no matter how frequently revised, must remain forever incomplete. Continuous planning is necessary.

In calling for a "sound water policy" for the Nation, the committee offered seven recommendations, as follows (recommendations 1-6 are paraphrased, and 7 is quoted in its entirety):

1. The concern is not with water but with promotion of public safety, health, convenience, comfort, economic welfare, and living standards.
2. Promotion of integrated use and control of water, recognizing changing "considerations of technical feasibility and of economic and social justification."
3. Treatment of drainage basins as complete units.
4. Observance of the rights of the States.
5. Planning based on thorough fact-finding and definitive study.
6. Costs of projects distributed to correspond with benefits, as far as possible.
7. In determining whether or not water projects are justifiable, and in distributing the costs of meritorious projects among the beneficiaries, it will take properly into account social benefits as well as economic benefits, general benefits as well as special benefits, potential benefits as well as existing benefits, wherever they are involved. Some of these benefits are not capable of measurement, and accordingly they commonly have been ignored in the past in evaluating certain types of enterprises. They are subject to reasonable appraisal, however, and their intangible nature will not justify their neglect in the future. In great measure, they concern the public at large. A public water policy should assiduously conserve and promote public interests. To this end, social accounting must take its place with economic accounting. As effective water planning proceeds year after year without interruption—planning based on fundamental and exhaustive engineering, economic, and social studies that cover all relevant conditions—there inevitably will result not only a clearer understanding of what constitutes the public interest, but also a greater opportunity to promote it through equitable control and orderly development of water resources.

<sup>11</sup> National Resources Committee, *Public Works Planning*, December 1936. (Washington, U.S. Government Printing Office, Dec. 1, 1936), pt. II, *Drainage Basin Problems and Programs*, pp. 25-35.

<sup>12</sup> *Ibid.*, p. 32.

The criteria used by the committee in selecting projects were (in paraphrase):

- (1) Projects yielding information on which later expanded programs could be based;
- (2) Projects for which adequate data were already available;
- (3) Projects with highest ratio of benefits to costs;
- (4) "Multiple-purpose projects having relatively high social values for comparatively large numbers of people;"
- (5) Urgent projects;
- (6) Projects presenting no legal or other complications to prompt initiation;
- (7) Projects probably compatible with future comprehensive plans;
- (8) Projects already authorized by the Congress.

However, the committee admitted that these criteria led to contradictory guidance. It was not practicable—indeed, it was "undesirable"—to "assign absolute priorities to projects for the country as a whole, for regional groups of drainage basins, or even for individual basins." Moreover, "in the final analysis much depends on the judgment of the investigators \* \* \*." <sup>13</sup>

The National Resources Committee said it had been hampered by the sparseness of data regarding river basins. Fortunately, however, a growing body of information had been accumulating since 1927 on the rivers of the United States. These were the "308 Reports" of the Corps of Engineers, responsive to specifications in House Document 308, 69th Congress, first session, and authorized in the Rivers and Harbors Act of 1927.<sup>14</sup> According to Theodore M. Schad, these were "the first reports of a comprehensive nature on most of the rivers of the United States and \* \* \* have formed the foundation for a great deal of multiple-purpose river basin development in the United States."<sup>15</sup>

During the early months of World War II, long-range water project planning was suspended. Projects already under construction were halted or accelerated, depending on their relevance for war production. (TVA's Fontana Dam was completed in record time during this period.) But as the war neared its close, several countervailing themes became dominant with reference to water resources policy. On the one hand, there was a reaction, especially in the Congress, to the centralization of Government functions resulting from depression and war: this was expressed in a move to transfer resources planning functions, political decisionmaking, and control to the States. On the other hand, there was a recognition of the national obligation to avert future depressions by sustaining employment at a high level; capital construction was generally regarded as an important feature of programs for this purpose. Water development in particular was firmly established as an important function of the Federal Government, with basin-wide programs of multipurpose projects generally favored. Agency responsibilities remain vested: in the Corps of Engineers for flood control

<sup>13</sup> *Ibid.*, p. 34.

<sup>14</sup> Act of Jan. 21, 1927, 44 Stat. 1010.

<sup>15</sup> Theodore M. Schad, *Current Perspective on National Water Resources Planning*, Feb. 21, 1962. Paper prepared for presentation to hydraulics division, American Society of Civil Engineers, Houston, Tex. (mimeo. 1962), 48 pages.

and navigation; in the Department of the Interior for irrigation and reclamation; in the Department of Agriculture for erosion control; and in the Federal Power Commission for dam authorization. Dam construction and power production was performed by both the Corps and the Bureau of Reclamation. Both agencies also engaged in extensive planning of large multipurpose projects and basin studies, such as the Pick (Corps of Engineers) and Sloan (Bureau of Reclamation) plans for the Missouri River Basin.

Thus, by 1945, planning leadership in water development was divided between local and national political jurisdictions with respect to a multijurisdictional resource; water functions were divided among agencies, despite the great emphasis on total basin planning; and purposes remained uncertain as long as all participants in the planning represented different regional jurisdictions and agencies with different functional interests. Thereafter, two main lines of approach were used to provide coherence: (1) the development of methods for the formal evaluation of water projects nationally on strictly or essentially economic terms; (2) efforts to define national purposes and goals for water development, and to relate individual projects to these goals. Over the next 17 years, nine major studies of water problems and administration were sponsored by the Federal Government to resolve the issues involved in these contradictions and conflicting goals.

*Emphasis of Truman administration studies on social goals*

Various attempts had been made to rationalize the management of Federal projects associated with river basin development, before 1945. For example, in the 1944 Flood Control Act the Secretary of War was to issue regulations for the use of storage capacity for flood control or navigation at Federal dams, while the Secretary of the Interior was responsible for the marketing of electric power, and management of irrigation works supplied with water from Army dams. In 1943, a Federal Inter-Agency River Basin Committee was formed by agreement among the Departments of Agriculture, War, Interior, and the Federal Power Commission (later joined by Commerce and the Federal Security Administration—precursor to the Department of HEW). However, when the first Hoover Commission reported February 15, 1949, it found “glaring defects” in the organization and coordination of Federal agencies concerned with water development and use. For example, there was “\* \* \* no effective agency for the screening and review of proposed projects to determine their economic and social worth.” There was “\* \* \* duplication and overlap of effort, and policy conflicts \* \* \*.” There was “\* \* \* considerable doubt as to the proper assignment of capital costs as between irrecoverable costs attributable to flood control and navigation, on the one hand, and recoverable capital to be reimbursed from reclamation and sale of water and power, on the other.”<sup>16</sup> Accordingly the Commission recommended:

\* \* \* The creation of a Board of Impartial Analysis for Engineering and Architectural Projects which shall review and report to the President and the Congress on the public and economic value of project proposals by the Department. The Board should also periodically review authorized projects and advise

<sup>16</sup>The Commission on Organization of the Executive Branch of the Government (First Hoover Commission). Reorganization of the Department of the Interior. A report to the Congress, March 1949. (Washington, U.S. Government Printing Office, 1949), pp. 26-27.

as to progress or discontinuance. The Board should comprise five members of outstanding abilities in this field and should be appointed by the President and included in the President's Office.

*Growing importance of qualitative criteria*

Intangible and nonmonetary benefits of water projects have long been recognized as significant factors in decisions to proceed with such projects. Saving of lives as well as reduction of risk of property loss has certainly been a factor in flood control programs. Provisions for tourism were made at such major earlier projects as Hoover Dam and TVA—along with attention to architectural attractiveness of structures. The Report of the Subcommittee on Benefits and Costs to the Federal Inter-Agency River Basin Committee on Proposed Practices for Economic Analysis of River Basin Projects, issued in May 1950 (the so-called "Green Book"), dealt mainly with quantitative economic factors of project evaluation. However, it also took notice of the fact that some effects "cannot be evaluated in monetary terms" and that these should be "\* \* \* described with care and should not be overlooked or minimized \* \* \*."

Such effects in the field of costs may involve the possible loss of a scenic or historic site in connection with a proposed dam. On the other hand, intangible benefits may embrace such effects as the strengthening of national security and the national economy, the substitution of power from replenishable water resources for power produced from limited and nonreplaceable fuel resources: the encouragement of a more widely dispersed industry; the provision of opportunities for new homes and new investment; and the provision of new avenues for the enjoyment of recreation and wildlife.<sup>17</sup>

The study therefore recommended that all project effects should be fully considered in making project recommendations. Moreover, said the report:

Project effects which cannot be given monetary values should be recognized and considered apart from the analysis of monetary values. If intangibles are considered sufficiently significant to influence either project formulation or selection, it is important that intangible benefits and intangible costs be considered to a comparable extent. Since there may be general intangible effects from any economic activity, any intangible benefits or costs from using economic resources for project purposes must be considered in the light of those that would arise in the absence of the project, that is, from their use for other expected purposes. If specific intangible effects are considered important enough to influence the recommendation for or against a project or the recommended degree of project development, the minimum value attached to such specific intangible effects in determining the recommended degree of development should be clearly indicated. This may result in either curtailing or expanding the scale of development as compared with that justified by tangible effects.<sup>18</sup>

Inasmuch as the first Hoover Commission had been concerned with the restoration of the administration to a peacetime footing, on the basis of its existing goals and functions, it made no extensive examination of the objectives of the executive branch. It dealt instead with the assignment and distribution of functions already in being. In the field of water resources development, the question of basic objectives and means for their achievement became the subject of a different commission, established by the President by Executive order, January 3, 1950. After some 11 months of activity, this advisory group, the

<sup>17</sup> Federal Inter-Agency River Basin Committee on Proposed Practices for Economic Analysis of River Basin Projects. Report to the \* \* \*. Prepared by the Subcommittee on Benefits and Costs. (Washington, U.S. Government Printing Office, May 1950), pp. 26-27.

<sup>18</sup> *Ibid.*, p. 27.

President's Water Resources Policy Commission, made its report.<sup>19</sup> It was a voluminous set of documents: Volume I ran to 445 pages, and two supporting volumes ran respectively to 801 and 793 pages. Unlike the even more voluminous but more particularized Hoover studies, the Water Policy Commission dealt with basic national objectives, policies, and programs within its scope. Water objectives were summarized by the report in these terms:

\* \* \* The maximum sustained use of lakes, rivers, and their associated land and ground water resources, to support a continuing high level of prosperity throughout the country. They should include the safeguarding of our resources against deterioration from soil erosion, wasteful forest practices, and floods; the improvement and higher utilization of these resources to support an expanding economy and national security; assistance to regional development; expansion of all types of recreational opportunity to meet increasing needs; protection of public health; and opportunity for greater use of transportation and electric power.<sup>20</sup>

The report contained few surprises, and was evidently a compromise between two opposing concepts, that of strict cost and benefit analysis, and that of welfare. Thus, the report proposed that the "same standards and methods" should be applied to the evaluation of all river basin programs "to assure uniformity in the application of evaluation procedures." On the other hand, said the report:

The evaluation procedure should also provide that, where the sum of the benefits so estimated is not sufficient to balance the direct and indirect costs, the final decision by the basin commission on the merits of the project should include a judgment as to whether the balance of general welfare benefits and detriments contributes sufficient additional value to warrant construction of the project.<sup>21</sup>

Representatives of the Bureau of the Budget were subsequently called before the Subcommittee on Irrigation and Reclamation of the House Committee on Interior and Insular Affairs, to interpret the Commission report. The chairman of the subcommittee, Representative Clair Engle, said he had been "a little disappointed, at least a little confused at times, as I have looked at this report."<sup>22</sup> In response to a question from Representative D'Ewart of Montana, a witness for the Bureau of the Budget (Mr. Melvin Scheidt, an engineer-economist) replied:

I think the report contemplates a system of financing in which, by agreements with State and local governments with respect to certain secondary benefits by the establishment of charges based on actual costs including interest for vendable commodities and by assessing or determining values of general-welfare benefits, a formula would be devised whereby a project would be paid for in part from revenues received from the sale of vendable commodities on a cost basis, revenues received from water users on an ability-to-pay basis, ad valorem taxes or other assessments received from special districts or local governments; possible contributions from State governments, as a result of their interest in certain aspects, including perhaps broad flood-control programs and finally

<sup>19</sup> The President's Water Resources Policy Commission, "A Water Policy for the American People." The report of the \* \* \* 1950. Vol. I: General Report. (Washington, U.S. Government Printing Office, December 1950), 445 pages.

<sup>20</sup> *Ibid.*, p. 10.

<sup>21</sup> *Ibid.*, p. 11.

<sup>22</sup> U.S. Congress, House, Committee on Interior and Insular Affairs, An interpretation of the recommendations of the President's Water Resources Policy Commission. Hearings before the Subcommittee on Irrigation and Reclamation of the \* \* \* on an interpretation of the recommendations of the President's Water Resources Policy Commission, May 18, 21, 22, 1951. Serial No. 6. (Washington, U.S. Government Printing Office, 1951), p. 3.

a meeting by the Federal Government of all additional costs on a straight appropriation basis.<sup>23</sup>

However, he said later on, "this report, like the Bible, can be used as an authority by taking any passage out of it and lifting it out of context \* \* \*"<sup>24</sup>

It was notable that the President's Commission had tried to integrate many new values along with the conventional financial values of water development. For example, it said of "evaluation" in chapter 4 :

No aspect of multiplepurpose water resources development has been more productive of confusion and controversy than the treatment of social, or intangible, values. This is a relatively recent issue; it was not present in earlier single-purpose projects constructed \* \* \* solely for the realization of primary, tangible benefits, most of which could be assigned directly to individual beneficiaries.

Increasingly, when the Federal Government undertook large-scale multiple-purpose basinwide developments, social values became a significant factor in project evaluation and authorization, allocation of joint costs, assignment of benefits, and the determination of reimbursement requirements. At this juncture it soon became apparent that prevalent patterns of thought and methods of analysis were quite inadequate to cope with this new problem.

The positive social values inherent in water resources were immense and vital, as were also the negative values, in terms of floods, erosion, and pollution. There were social values of the highest order in regional balance, in assured permanence of the resource base, in the "widespread sense of well-being, hopefulness, confidence in the essential soundness of existing institutions \* \* \* along with a sense of responsible participation." Also important was the demonstration to the world " \* \* \* that a democracy can control its own destiny and can manage its resources for the good of all the people." This, said the report, "is the ultimate social value for our generation." And such values "are actually more real and more vital [than material considerations 'which heretofore have dominated our thinking about water resources development'] because they constitute the motivation for social action and the ultimate test of social survival."<sup>25</sup>

A different approach was taken by the President's Materials Policy (Paley) Commission, that reported in June, 1952, in response to the question: Has the United States of America the material means to sustain its civilization? <sup>26</sup>

The primary interest of the Paley Commission was whether essential requirements of industry for quantity and quality of water could be met in the foreseeable future.

Supply was mainly a regional matter. However, "supplying industrial water in 1975 \* \* \* will constitute a major problem." For example, the requirements of water for condenser cooling in steam electric generating plants (44 percent of consumption use in 1950) was expected to triple by 1975. To increase water supply, the report recommended four approaches:

(1) Total usable supply in an area may be increased. (By evening out supply by impoundment and ground cover.)

<sup>23</sup> *Ibid.*, p. 45.

<sup>24</sup> *Ibid.*, p. 67.

<sup>25</sup> A water policy for the American people. The report of the \* \* \* 1950, op. cit., pp. 56-58.

<sup>26</sup> The President's Materials Policy Commission, Resources for Freedom. A report to the President by \* \* \*. Vol. 1: Foundations for Growth and Security. (Washington, U.S. Government Printing Office, June 1952), 184 pages.

(2) Quality of a water may be improved through treating water just before use, or by removing or reducing sources of contamination. (Desalting of sea water, for example.)

(3) Industrial users of water may cut consumption or modify requirements. (Such as by resort to corrosion-resistant equipment to tolerate water containing corrosive impurities.)

(4) In many areas available water can be better apportioned among different types of users. (For example, less water might go to irrigation and more to industry.)

The report proposed five principles, in addition to its general endorsement of the findings of the President's Water Policy Commission:

(1) Planning and developing water resources must comprehend all aspects of collection, conservation, and use.

(2) The varied and complex problems of water can be attacked best by integrated action in each major drainage basin, under general national policy for use of water resources.

(3) Highest economic use must be made of scarce supplies.

(4) Benefits must exceed costs.

(5) Known beneficiaries should help pay for improvements.

Federal action, the report recommended, should be enlarged in the areas of (a) basic studies and technological research, (b) the integration of programs, and (c) the abatement of pollution.

On the subject of pollution control, the Commission conceded that complete abatement was "not an attainable goal" but that even to achieve moderate improvement would entail investment of \$9 to \$12 billion, and: "Clearly it will pay the Nation to do more than it is now doing." Industrial pollution control measures required cooperation of Government and industry, but "to the greatest practicable extent private sources of pollution should be eliminated at private expense." Although taking note of the enactment of the Water Pollution Control Act of 1948,<sup>27</sup> the Commission questioned its adequacy and suggested such stronger measures as (a) a tax on pollution-causing industries, and (b) augmented budget for construction grants and loans to both municipalities and private industries.<sup>28</sup>

*Allocation of costs and benefits: the role of economic analysis in planning*

As long as water projects were devoted to a single purpose, decisions as to whether or not any particular project should be built, the fixing of priorities among projects and arrangements for relating payments among beneficiaries, though difficult, were manageable. But when projects began to be undertaken to serve multiple (and sometimes conflicting) purposes, decisions became vastly more difficult. Direct costs and benefits were still relatively specific as criteria—as for example in the planning of Hoover Dam. However, the problem became enormously complicated when entire river basins were included in the scope of single projects, and when an array of secondary and intangible benefits were taken into account.

<sup>27</sup> See ch. 13.

<sup>28</sup> Resources for Freedom—Vol. I: Foundations for Growth and Security, op. cit., pp. 50-56.

The General Dam Acts of 1906 and 1910 had envisioned Federal contributions to private water power dams, to provide for the direct costs of locks or other navigation facilities. The idea of joint assumption of joint costs, and separate assumption of the costs of specific parts of multipurpose structures was advanced in connection with the Muscle Shoals development on the Tennessee River, on the eve of World War I.<sup>29</sup>

However, the first project in which cost/benefit calculations began to approach their ultimate order of complexity was the TVA. On this project, the purpose of the cost/benefit calculation was mainly to provide a basis for the establishment of electric power rates. The act had provided that TVA should make a finding as to the portion of the total capital investment that was attributable to power generation, and that this portion of the outlay should be amortized by the sale of power. The solution, as described by TVA Chairman Gordon Clapp, was to use the "alternative justifiable expenditure method" for the allocation of TVA power charges:

That method \* \* \* is this: That portion of the common cost of a multiple-purpose project which any one of the purposes served should bear is of the same ratio to the total as the maximum amount which that purpose could justify, assuming a project were being built to serve that purpose alone, is to the sum of the amounts which each of the several purposes could so justify.<sup>30</sup>

Although this method was apparently adequate for the limited purpose required, it was less suitable as a tool in the analysis of program priorities, or to guide decisions as to whether or not any individual facility should be built. According to one student:

Insofar as rational economic administration of water resources is possible (and desirable), the objective should be maximization of the complex of benefits relative to costs rather than maximization of any particular benefit. We have found no need for allocations of joint costs in the planning of multiple purpose enterprise. Indeed, the danger is not inconsiderable that allocations would accomplish more harm than good by becoming confused in the issues of project or purpose feasibility. The feasibility of a project is contingent simply upon the relation of total project cost to total benefits; the feasibility of a purpose at a project is contingent upon direct cost for the purpose relative to purpose benefits \* \* \*. We must conclude that apportionment of [joint cost] is at best a meaningless ritual. [Moreover] the difficulties of achieving \* \* \* accurate appraisals are so great that we question whether it is possible to formulate a program of water resource development according to strict cost/benefit relations. We believe the effort is doomed to fail. In the end social considerations and public policy rather than hypothetical benefit valuations will be found to provide the more honest and satisfactory guides for public water planning.<sup>31</sup>

After World War II, the conceptual approach became firmly established that Federal programs of water development should encompass entire river basins, with each planned facility to contribute in balanced fashion all available benefits. The need for an orderly and systematic method of characterizing and comparing costs and benefits for each facility and each basin quickly became apparent. Accordingly, in April 1946, the Federal Interagency River Basin

<sup>29</sup> Joseph Sirera Ramsmeier, *The Tennessee Valley Authority, A Cost Study in the Economics of Multiple Purpose Stream Planning*. (Nashville, the Vanderbilt University Press, 1942), pp. 192-195.

<sup>30</sup> U.S. Congress, House, Committee on Public Works, *The Allocation of Costs of Federal Water Resource Development Projects*, Report to the \* \* \*. From the Subcommittee To Study Civil Works, Dec. 5, 1952, 82d Cong., 2d sess. House Committee Print No. 23 (Washington, U.S. Government Printing Office, 1952), p. 12.

<sup>31</sup> Ramsmeier, *op. cit.*, pp. 420-421.

Committee<sup>32</sup> established a Subcommittee on Benefits and Costs "for the purpose of formulating mutually acceptable principles and procedures for determining benefits and costs of water resources projects."<sup>33</sup> After a year of effort (involving some 6,600 man-hours of staff work and 50 meetings), the subcommittee produced a first progress report; the following year, it issued a second; eventually, May 25, 1950, on an accelerated basis, a semifinal report was completed by the subcommittee and adopted by the parent committee—

\* \* \* as a basis for consideration by the participating agencies as to application in their respective fields of activity in river basin development.<sup>34</sup>

A reason for issuing the document at this time was to provide a coordinated expression of agency opinion to the President's Water Resources Policy Commission, then considering the subject, as to uniform evaluation of the various purposes and functions of water development projects. Purposes of the so-called Green Book ("Proposed Practices for Economic Analysis of River Basin Projects") were not to provide an arbitrary and exclusive method for determining whether projects should or should not be constructed, nor even to establish a relative priority among projects. On the contrary, the report sought merely to establish that when quantitative data were collected and analyzed, the procedures should be systematic, consistent, and theoretically sound, so as to yield comparable estimates of benefits and costs.

The status of the Green Book as a general standard of agency practice was described in 1952 by a House subcommittee in the following language:

Assuming that the Federal Interagency River Basin Committee should arrive at proposed uniform standards of evaluation, there is no requirement that any agency adhere to the findings of this voluntary group. It is reported at the present time that the Committee is experiencing considerable difficulty in resolving differences among the agencies as to the evaluation of secondary or indirect and intangible benefits.<sup>35</sup>

It was notable that the participating agencies were not willing to make consistent use of this framework. For example, 2 years later Secretary of Agriculture Brannan complained that there was "an increasing tendency in the direction of burdening power investments with costs not related to power development \* \* \*" although he added, somewhat inconsistently, that "it is a common practice to allocate the costs of multiple-purpose development to the nonreimbursable functions \* \* \*." Speaking for the Department of the Interior, Undersecretary Searles said that policies regarding the allocation of costs to reimbursable and nonreimbursable purposes were governed by economic considerations which "are not subject to a mathematical formula."

This is one reason [he went on] why we do not believe in the 50-year amortization period but in amortizing on the basis of the service life of the project.

<sup>32</sup> A voluntary organization of representatives of the Corps of Engineers, U.S. Army; the Departments of the Interior, Agriculture, and Commerce; and the Federal Power Commission, formed in 1943.

<sup>33</sup> "Proposed Practices for Economic Analysis of River Basin Projects," report to Federal Interagency River Basin Committee, May 1950, op. cit., p. III.

<sup>34</sup> *Ibid.*

<sup>35</sup> U.S. Congress, House, Committee on Public Works, Economic Evaluation of Federal Water Resource Development Projects, report to the \* \* \* from the Subcommittee to Study Civil Works, Dec. 5, 1952, 82d Cong., 2d sess., House Committee Print No. 24. (Washington, U.S. Government Printing Office, 1952), p. 2.

Chairman Buchanan of FPC sought to have his agency relieved from responsibility for the determination of rates of power produced at Government dams, and recommended "That the Congress be more definite in laying down the standards, particularly with respect to cost-allocation procedures and periods for amortization of investments \* \* \*." <sup>36</sup>

A review of water project cost/benefit allocation policies was conducted in 1952 by a subcommittee to study civil works of the House Committee on Public Works. This subcommittee obtained the views of all the agencies interested in water projects, and was critical of what it found. It declared that "the approach to the problem differs with nearly every agency and the agencies themselves do not approach each example consistently." Moreover—"The absence of clearly enunciated elements of policy is a major contributing factor to interagency conflicts and to many of the demands for executive reorganization and for the establishment of an additional board for coordination and review."

The Subcommittee identified and described the various methods of cost allocation, such as :

Benefit method.

Alternative justifiable expenditure method.

Separable costs-remaining benefits method.

Use of facilities method.

Separate projects method.

Equal apportionment method.

Priority-of-use method.

Incremental method.

Direct-costs method.<sup>37</sup>

It examined the various ways in which projects had been analyzed according to some of these approaches. It then recommended—

1. That all costs of a water resource development project be allocated so that each authorized purpose of the project will bear its own fair share of these costs and share equitably in economies or savings resulting from the use of a multiple-purpose development.

2. That the proposed allocation of costs for a project to the various purposes of water resource development be initiated by the pertinent construction agency and that the comments of agencies properly concerned with the allocation or the project be made on such proposed allocation.

3. That the Bureau of the Budget, Executive Office of the President, be designated as the agency of the executive branch to approve both tentative and final allocations of costs to the various purposes of water resource development projects.

4. That hereafter all reports to Congress recommending the authorization or adoption of a water resource development project or in view of an authorized project include an allocation of all estimated costs together with an explanation and justification of the method of allocation proposed by the principal reporting agency and a statement of views thereon of each agency properly concerned with the allocation or the project.

5. That in the event a change in the method of allocation or the purposes of allocation is considered desirable subsequent to a report such as contemplated in paragraph No. 3, supplemental report thereon be submitted to Congress for consideration by the committees responsible for oversight of the project prior to any firm commitments by the executive agencies on behalf of the Government based on the revised allocation, such report to be included as a part of any more comprehensive report required to be made on the project.

6. That final allocations of capital cost be made only after completion of construction when all investment costs are known.<sup>38</sup>

<sup>36</sup> House, Committee Print No. 23. (1952, op. cit., pp. 9-11).

<sup>37</sup> *Ibid.*, pp. 1-4.

<sup>38</sup> *Ibid.*, pp. 30-31.

The House subcommittee recommendations, made on December 5, 1952, were followed by a quick response from the Executive Office of the President. Near the close of the administration of President Truman, December 31, 1952, the Bureau of the Budget issued Circular No. A-47, " \* \* \* designed to set forth the standards and procedures which will be used by the Executive Office of the President in reviewing proposed water resources project reports and budget estimates to initiate construction of such projects, submitted in accordance with existing requirements." It declared that "all reports submitted after July 1, 1953, \* \* \* must conform to the requirements of this Circular." This circular required that least cost alternatives should be considered. Costs and benefits should be expressed in monetary terms as far as feasible. Amortization of capital outlays should be for periods of 50 years or less. A method was specified for determining interest rates into the future. Power costs were to be fully reimbursable, and reclamation deficits should be identified as a "subsidy" to irrigation. Moreover, reclamation projects should be reviewed by the Secretary of Agriculture as to their relevance to national needs for production from the area to be developed.

An agreement, March 12, 1954, involving the Bureau of Reclamation, the Corps of Engineers, and the Federal Power Commission, committed these agencies to use of principal criteria of Circular A-47 in developing recommendations to the Congress on multipurpose water projects.

Further emphasis was placed on tightening the precision of quantitative cost/benefit analysis, by the Commission on Organization of the Executive Branch of the Government (second Hoover Commission, in 1955). This advisory body offered three basic recommendations concerning national water policy (paraphrase):

1. Full exploitation of water resources for national economic growth, strength, and general welfare, organized by local and regional drainage areas, primarily relying on State and local initiative; " \* \* \* before Congress authorizes or appropriates funds for Federal participation in any water resource project, it should have substantial evidence that the project is economically justified and financially feasible, and that such project is essential to national interest;" consolidation in one agency of hydrologic data collection, and in FPC the regulation of rates for Federal power; all power revenues to be covered into the general fund of the Treasury.

2. Creation of a Water Resources Board of Cabinet and public members, in the Executive Office of the President to determine broad policies and devise methods of coordination within the Government.

3. Strengthened evaluation of the merits of water development projects in the Bureau of the Budget.<sup>39</sup>

The report of the Commission proper was supported by a three-volume task force report on water resources and power, running 1,783 pages in length, that explored the subject in considerably deeper detail. It stressed the need for fuller accounting of the costs involved and for a more rigorous screening of asserted benefits from water projects. It also suggested that priority should be given to projects "preponderantly reimbursable" and that under conditions of high-level employment the benefit/cost ratio should exceed 1:25 to 1.<sup>40</sup>

<sup>39</sup> Commission on Organization of the Executive Branch of the Government. A Report to the Congress, Water Resources and Power, Vol. 1, June 1955. (Washington, U.S. Government Printing Office, 1955), pp. 36-39.

<sup>40</sup> Commission on Organization of the Executive Branch of the Government. Task force report on water resources and power, June 1955. Three volumes. (Washington, U.S. Government Printing Office, 1955), vol. 1, pp. 104-110.

It asserted that:

The Federal Government has used water resources and power development projects, which should be undertaken exclusively for economic purposes, to accomplish indirect social and political ends.<sup>41</sup>

Moreover—

The Federal Government has paid too much of the costs of water resource and power development and has required too little of the beneficiaries.

The Federal Government has planned, constructed, and paid for water resource and power development projects which are economically unsound and hence waste the national wealth.

From the standpoint of financial return to the Federal Government, Federal water resource and power projects which produce, or could produce, revenues are not operated according to sound business principles, and do not produce a return fairly related to their value; nor does the Federal Government uniformly require adequate contributions, either for the use of its money for capital outlay or for operation and maintenance costs.<sup>42</sup>

Further support for the position taken by the Second Hoover Commission was given by a Presidential Advisory Committee on Water Resources Policy that reported December 22 of the same year.<sup>43</sup> This report, rendered by the Secretaries of Agriculture, Defense, and the Interior, urged decentralization of water projects, with a larger share of their funding provided locally. Specifically, it recommended:

(a) That, as a general policy, all interests participate in the cost of water resources development projects in accordance with the measure of their benefits; that the Federal Government assume the cost of that part of projects where benefits are national and widespread and beneficiaries are not readily identifiable; that power and municipal and industrial water users pay the full cost of development; that where projects are primarily local, and the beneficiaries are clearly identifiable, the Federal Government's contribution should be limited, with non-Federal interests bearing a substantial portion of the construction costs of the project as well as the replacement, maintenance, and operation costs; and that under certain conditions the Federal Government may bear a higher proportion of the costs.

(b) That the Federal Government encourage non-Federal assumption of responsibility for construction of water resources projects by such means as the payment of costs which would have been nonreimbursable had the projects been federally constructed, and the making or guaranteeing of loans to non-Federal interests for certain purposes under proper safeguards.

Application of the principles advanced in Circular A-47 of the Bureau of the Budget, coupled with the principles enunciated by the Hoover Commission and the President's Advisory Committee, came under considerable criticism because of a damping effect on new starts. Criticism centered on:

(a) The inclusion of tax losses incurred by the construction of a project as a cost;

(b) The arbitrary imposition of a 50-year amortization ceiling on projects presumed to have a longer life;

(c) The emphasis on tangible benefits;

(d) The criterion that projects not incorporate power generation features unless power could be produced from them more cheaply than by any alternative federally financed source;

(e) The shift from the incremental method to the separable

<sup>41</sup> *Ibid.*, p. 13.

<sup>42</sup> *Ibid.*, pp. 14, 17, 22.

<sup>43</sup> U.S. Presidential Advisory Committee on Water Resources Policy. *Water Resources Policy. A Report by the \* \* \* on Water Resources Policy.* Dec. 22, 1955. (Washington, U.S. Government Printing Office, 1955.)

costs-remaining benefits method of figuring costs and benefits of hydroelectric plants.<sup>44</sup>

Dissatisfaction was expressed in the House of Representatives over the stringent application of Circular A-47, during 1955, and in 1956 the Senate adopted a resolution, Senate Resolution 281, July 26, authorizing an investigation by the Committees on Interior and Insular Affairs and Public Works—

In consultation with other appropriate committees and executive agencies, and to design and to formalize a comprehensive and particularized set of standards and overall criteria for the evaluation of all proposed projects for the conservation and development of land and water resources.

As a result of joint committee study pursuant to Senate Resolution 281, the chairmen of the two committees proposed that recommendations for new water projects be accompanied by factual (where feasible, quantitative) data as to direct and indirect costs and benefits, assurances of physical feasibility, cost allocations (calculated by at least three methods) over 50- and 100-year time spans, evidence of interest in the project by Federal, State, and local government agencies, reimbursement schedules, and probable effects of the project on State and local governments, including tax revenues and taxes foregone. They also suggested that schedules of planning activities and projects for river basin developments be provided.<sup>45</sup>

This recommendation was explained in the joint report of the Committee on Interior and Insular Affairs and the Committee on Public Works pursuant to Senate Resolution 281, 84th Congress. It noted that—

The Congress has, in general, established policies and criteria for the land and water resources program through enactment of specific authorizations. In this manner, modifications and extensions of policy have been evolved by the Congress to meet changing conditions and needs. Possibly, the increased magnitude and technical complexity of the land and water resources program might warrant congressional reexamination or more explicit statement of criteria and requirements. Whenever such reexamination or restatement appears to be needed, it is a proper function of the executive branch so to recommend to the Congress. Regrettably, this course has not been pursued. Instead, the executive branch apparently has instituted changes without congressional approval, and sometimes apparently without informing the Congress that such changes are made.

The report went on to observe that there had been a "tendency for the Congress to lose, in part, its responsibility for determining the land and water resources program." The causes were executive definition and delimitation of the program and lack of information on potential projects until they had received "clearances" within the executive branch.

Subsequently, the recommendations of the joint committee study were embodied in Senate Resolution 148, which was agreed to January 28, 1958. In contrast with the findings of the President's Cabinet Committee, which had advocated a tightening of standards, local cost sharing, and centralization of policy control in the executive branch, Sen-

<sup>44</sup> Congress and the Nation, 1945-64. A review of government and politics in the postwar years. (Washington, Congressional Quarterly Service, 1965), p. 832.

<sup>45</sup> U.S. Congress, Senate, Committees on Interior and Insular Affairs and Public Works. Conservation and development of water resources. Supplemental memorandum of the chair-85th Cong., 1st sess. Committee Print No. 4 (Washington, U.S. Government Printing Office, 1957), 65 pages.

ate Resolution 148 proposed a liberalization of standards, accelerated approval of projects, and increased participation by the Congress in the decisionmaking process regarding individual projects, rather than to have such projects arbitrarily screened out in the budgetary process before they came to the Congress.

Resolution 148 focused attention on the wide gap in thinking between the Congress and the President, and appears to have set the stage for a much more extensive examination of the issues of water resource development that began 2 years later. This investigation, which will be discussed in the next section of the chapter, provided the principal source of information on which water policy and legislation were based during the Kennedy-Johnson presidential years. By 1958, however, with executive branch and legislative branch controlled by opposing political parties, and with a host of unresolved issues, problems of formulating and executing a coherent national policy in water resource management had become almost hopelessly complicated. There was a limited consensus as to principles—

That planning and development of water resources should deal with drainage basins as a whole;

That all resource benefits should be recaptured;

That benefit/cost ratio was relevant to decisionmaking;

That some degree of uniformity of method was needed in the evaluative process;

That some degree of flexibility should be maintained in basin development plans, to accommodate them to changing needs, national conditions, and technology.

On the other hand, many major issues remained unresolved—

As to the respective decisionmaking roles of Congress and the Chief Executive;

As to the division of responsibility and the exercise of leadership as between the Federal Government and the States;

As to whether a single coordinating organization should be established by the Federal Government for all national water policy;

As to the respective interests and claims of competing agencies with water resources responsibilities (especially the Corps of Engineers and the Department of the Interior);

As to the extent to which intangible benefits and costs should be considered along with tangible benefits and costs (in other words, as to whether scope or precision of benefit/cost considerations was of greater importance);

As to whether (and in what form) administrative organizations should be established for each river basin;

As to the source of standards and criteria of evaluation.

It was becoming increasingly evident, at this same time, that the growing population of the United States was placing heavier burdens on available water supplies and also on recreational areas. There was concern with the growing hazards of water pollution. There was increasing recognition of the serious research gaps that existed in the field of water science and technology. In the fields of political decision-making and administration, social invention had not kept pace with need. The enormous complexity of interests in conflict required clear-cut policy guidance, rigorous factual evidence, and sensitive capability to weigh alternative policies and programs as to both tangible and

intangible benefits and costs. These interests were held by competing economic groups, property owners, functional agencies, political jurisdictions, competing exploitive users of water, and those with conflicting philosophies of political economy.

The benefit-cost ratio appears to be central to many of these issues. The collection, organization, and consideration of quantitative factual information about costs and benefits is an essential element in decision-making, in choices among various alternative approaches to the development of particular resources, provision of particular requirements, and applications of limited financial resources to new capital construction on competing projects. However it has rarely if ever been the wish of the Congress to be guided exclusively by such quantitative information. Many intangibles and qualitative values also need to be considered. The relevant questions in the use of the quantitative information seem to be:

What relative weight it should receive, as against qualitative values and considerations?

Whether a rigorous budgetary screening process tends to over-emphasize the quantitative values at the expense of intangibles?

Whether a proper balance can ever be achieved as between national and regional interests that involve both tangible and intangible benefits and costs?

Whether specific procedures traditionally used for evaluating a particular value (such as irrigation or flood control) as a part of total national expenditures continue to be suitable when incorporated into an analysis of all benefits and costs of a river basin project (where it is, in effect, in competition with other functions of development in that area)?

Whether, in dealing with entire basins, it is sufficient that the total benefits outweigh costs, or whether each function should separately pay its own way in full? (Or, conversely, whether one paying function should be called on to subsidize a nonpaying or deficit function?)

Whether, indeed, the policies suitable in one river basin are equally applicable to all? (Or, conversely, whether such considerations as need for irrigation water, importance of pollution control in populous areas, and specialized water law, require adoption of different policies peculiar to each particular river basin?)

Or, more broadly, should requirements for water be served in accordance with priorities established nationally or regionally?

### III. SENATE INVESTIGATION INTO NATIONAL WATER POLICY

The widening of the differences between the Congress and the White House regarding water policy, and an asserted paucity of new starts on water development, motivated a strong effort in the Senate to provide a sounder foundation for a national consensus in this field.<sup>46</sup> A

<sup>46</sup> In the 84th, 85th, and 86th Congresses, these differences in outlook were notable. The proposed Rivers and Harbors and Flood Control Act of 1956 (H.R. 12080) was (pocket) vetoed, Aug. 10, 1956. A similar bill, passed by Congress in 1958 (S. 497) was again rejected by the President, Apr. 15, 1958, and was eventually modified to gain his approval, July 3. A presidential "no new starts" policy was in effect, 1958-60, in public works appropriation requests by the administration, while Congress in this period repeatedly insisted on the enlargement of water project budgets and plans. In 1959, the President denounced congressional addition of 65 unbudgeted new project starts, before signing the Public Works Appropriation Act; the act for 1960, which included 67 unbudgeted new starts, was vetoed, slightly modified, vetoed again, and overridden, Sept. 10, 1959. See Theodore M. Schad, "An Analysis of the Work of the Senate Select Committee on National Water Resources, 1959-61." *Natural Resources Journal*, (August 1962), pp. 229-231.

vigorous investigative effort was set underway by Senate Resolution 48 of the 86th Congress, agreed to April 20, 1959. It called for the establishment of a Select Committee on National Water Resources, directed to study—

\* \* \* the extent to which water resources activities in the United States are related to the national interest, and the extent and character of water resources activities, both governmental and nongovernmental, that can be expected to be required to provide the quantity and quality of water for use by the population, agriculture, and industry between the present time and 1980, along with suitable provision for related recreational and fish and wildlife values; to the end that such studies and the recommendations based thereon may be available to the Senate in considering water resources policies for the future.

*Manning and staffing of the investigation*

The Select Committee on National Water Resources was to be made up of 17 Members of the Senate, supported by a staff of four, with an initial budget of \$175,000 to engage the services of outside consultants and research groups.

Members of the select committee were drawn from four standing committees: Interior and Insular Affairs, Public Works, Interstate and Foreign Commerce, and Agriculture and Forestry. Its membership was:

Robert S. Kerr, Oklahoma, *Chairman*

Thomas H. Kuchel, California, *Vice Chairman*

Dennis Chavez, New Mexico	Frank E. Moss, Utah
Allen J. Ellender, Louisiana	James E. Murray, Montana, Ex
Warren G. Magnuson, Washington	Officio
Clinton P. Anderson, New Mexico	Milton R. Young, North Dakota
Henry M. Jackson, Washington	Andrew F. Schoeppel, Kansas
Clair Engle, California	Francis Case, South Dakota
Philip A. Hart, Michigan	Thos. E. Martin, Iowa
Gale W. McGee, Wyoming	Hugh Scott, Pennsylvania

Composition of the select committee, drawn mainly from the arid Western States, indicated both a regional and an irrigation emphasis. However, the assurance of a broad approach was provided by the manning of the staff. By agreement, staff liaison assistants were provided from each standing committee represented. Additional advisory assistance was provided by a number of staff members of water resources agencies of the executive branch. The formal professional staff organization of the committee was widely representative of the water sciences:

The staff director was Theodore M. Schad, of the Legislative Reference Service, Library of Congress, supported by the following consultants:

Dr. Edward A. Ackerman, executive officer of the Carnegie Institution of Washington, and formerly director of the water resources program of Resources for the Future, Inc.

W. G. Hoyt, retired hydrologist, formerly with the U.S. Geological Survey.

Dr. Abel Wolman, Johns Hopkins University, and internationally recognized consulting engineer in sanitary engineering, water supply, and public health.

Dr. Gilbert F. White, chairman of the department of geography, University of Chicago, an authority on flood control damage prevention.  
Col. H. C. Gee, a consulting engineer, formerly with the Corps of Engineers.

*The time-phased program of committee operation*

At a series of organizing meetings (April 27, 1959; June 11, 1959; July 9, 1959; July 30, 1959; August 18, 1959), the plan for the select committee investigation was blocked out in detail. It consisted of five phases:

PHASE I—BACKGROUND DATA COLLECTION AND PLANNING

Preparation of an outline of studies  
Solicitation of views of Federal and State agencies on existing problems  
Requests to State Governors for statements of water problems and recommendations  
Definition of interest scope of U.S. water-related agencies  
Requests for initial projections of water and water-related requirements  
Arrangements for collation of data in terms of major U.S. drainage basins

PHASE II—PROCUREMENT OF NON-GOVERNMENTAL TECHNICAL SUPPORT

Arrangement for objective projection of future power demands (a potentially controversial subject)  
Arrangement for technical study of prospects for reclaimed water  
Arrangement for information on technological innovation in water supply and use in integrated multi-purpose water development  
Cooperative arrangement with Resources for the Future, Inc.<sup>47</sup>

PHASE III—DATA COLLECTION BY SELECT COMMITTEE

U.S. Geological Survey report on water use and availability, July 9, 1959  
Commerce Dept. report on capital requirements for water resource facilities by 1975, July 30, 1959  
Bureau of the Budget report on water resources development in relation to the Federal budget, July 30, 1959

<sup>47</sup>According to Schad, "An Analysis of the Work of the Senate Select Committee on National Water Resources, 1959-61," Op. cit., pp. 236-237:

As the committee's program began to take form, it was found that Resources for the Future, a nonprofit research foundation affiliated with the Ford Foundation, was planning to undertake a study of water supply-demand relationships in the United States \* \* \*. Aside from the time schedule, the objectives of Resources for the Future were very near those of the select committee. Therefore, it was possible to negotiate an agreement whereby Resources for the Future would prepare for the committee an interim report on its overall project, meeting the committee's specifications, in return for the committee furnishing data and projections being developed by the Federal agencies for each of the various purposes for which water is used. The agreement called for the preparation of a report on water supply-demand relationships in the various water resource regions of the United States, to provide answers for the committee on questions of how much, when, where, and how water resources should be developed; what levels of cost and expenditure are justifiable for future water development; and what are the economic limits of water development.

In effect, the staff assigned by Resources for the Future to the preparation of its report functioned in almost the same way as would additional members on the committee staff.

## PHASE IV—FIELD HEARINGS BY SELECT COMMITTEE

Hearings during October-December, 1959: (22 hearings, in 19 States, with 800 witnesses giving more than 3,000 pages of testimony)  
 Hearings in 1960: (2 field hearings; 3 days of public hearings in Washington, D.C.; 161 witnesses)<sup>48</sup>

A summary of the testimony of the witnesses (aside from support for specific project authorizations) has been prepared by T. M. Schad, as follows:<sup>49</sup>

\* \* \* The following suggestions were among those most frequently made: (1) the small watershed program of the Department of Agriculture, under Public Law 566, as amended, should be speeded up by making more funds and survey crews available, and should be liberalized by broadening the fields of benefits considered under the program; (2) the Federal program of water pollution abatement grants should be expanded along the lines of the bill which has already passed the House and Senate and was then in conference between the two bodies; (3) a loan program for water supply facilities should be established by the Federal Government to enable municipalities to borrow money at favorable interest rates for construction of municipal and industrial water supply facilities; (4) research on all phases of water resources development should be stepped up; (5) the bill to establish a Council of Resources and Conservation Advisers in the Executive Office of the President, and a Joint Committee on Resources and Conservation in Congress should be enacted; (6) full consideration should be given to recreational benefits in planning of multiplepurpose developments; and (7) more adequate consideration should be given to fish and wildlife conservation in the planning of water resources projects.

The Indianapolis hearings attracted many statements in behalf of inland waterway navigation, with particular reference to the Ohio River. At the hearings in Washington, D.C. a number of suggestions on the broader aspects of water resources development policy were received. The printed hearings contained over

<sup>48</sup> The record of public hearings of the select committee, taken from—

U.S. Congress, Senate, Select Committee on National Water Resources, Report of the \* \* \* Pursuant to S. Res. 48, 86th Cong. together with supplemental and individual views, 87th Cong., 1st sess. Senate Report 29. (Washington, U.S. Government Printing Office, 1961), p. 77, is as follows:

Location of hearing	Date	Number of witnesses	Part number of printed hearings	Page numbers
Bismarck, N. Dak.	Oct. 7, 1959	43	1	1-152
Laramie, Wyo.	Oct. 8, 1959	48	2	153-333
Billings, Mont.	Oct. 9, 1959	19	3	335-424
Missoula, Mont.	Oct. 12, 1959	24	4	425-543
Boise, Idaho	Oct. 13, 1959	45	5	545-685
Sacramento, Calif.	Oct. 15, 1959	30	5	687-839
Los Angeles, Calif.	Oct. 16, 1959	27	6	841-955
Huron, S. Dak.	Oct. 27, 1959	26	6	957-1047
Sioux Falls, S. Dak.	Oct. 28, 1959	23	7	1049-1099
Detroit, Mich.	Oct. 29, 1959	44	8	1101-1317
Philadelphia, Pa.	Oct. 30, 1959	33	9	1319-1447
Topeka, Kans.	Nov. 18, 1959	83	10	1449-1676
Des Moines, Iowa	Nov. 19, 1959	31	11	1677-1840
Denver, Colo.	Nov. 20, 1959	20	12	1841-1908
Albuquerque, N. Mex.	Nov. 23, 1959	38	13	1909-2101
Salt Lake City, Utah	Nov. 24, 1959	39	14	2103-2276
Fort Smith, Ark.	Nov. 28, 1959	21	15	2277-2316
Oklahoma City, Okla.	Nov. 30, 1959	60	16	2317-2427
Alexandria, La.	Dec. 1, 1959	56	17	2429-2657
Jacksonville, Fla.	Dec. 3, 1959	37	18	2659-2771
Augusta, Maine	Dec. 7, 1959	29	19	2773-2914
Boston, Mass.	Dec. 8, 1959	35	20	2915-3048
Indianapolis, Ind.	Feb. 5, 1960	66	21	3049-3233
Columbia, S.C.	May 13, 1960	32	22	3235-3353
Washington, D.C.	May 24, 25, 26, a.m., 1960.	56	23	3355-3682
Do	May 26, p.m., 1960		7	2683-3920

<sup>49</sup> Schad, *An Analysis of the Work of the Senate Select Committee on National Water Resources, 1959-61*, op. cit., p. 238.

3,900 pages, and 972 witnesses were heard or permitted to file testimony, on subjects ranging from the use of atomic explosives for the creation or improvement of aquifers to dowsing as a means of locating underground water supplies.

PHASE V—TECHNICAL STUDIES ISSUED AS COMMITTEE PRINTS

The select committee prepared and issued 32 committee prints, comprising some 2,000 pages, and including 92 reports by Federal, State, and private groups. There were three general types of report (see Table for enumeration): general background studies, projections of future demands for water and water-related activities, and reports on new techniques and means for meeting demands.

LIST OF COMMITTEE PRINTS ISSUED BY THE SELECT COMMITTEE ON NATIONAL WATER RESOURCES, U.S. SENATE, 1959-60, UNDER THE TITLE "WATER RESOURCES ACTIVITIES IN THE UNITED STATES."<sup>50</sup>

1. "Water Facts and Problems," pictorial charts by U.S. Geological Survey.
2. "Reviews of National Water Resources During the Past 50 Years," report by Legislative Reference Service, Library of Congress.
3. "National Water Resources and Problems," report by U.S. Geological Survey.
4. "Surface Water Resources of the United States," maps and tabulations by U.S. Geological Survey.
5. "Population Projections and Economic Assumptions," report and tabulations by Census Bureau, committee staff, and resources for the future staff.
6. Views and comments of the States. State reports on their water resources and problems.

*Projections of Future Needs*

7. "Future Water Requirements for Municipal Use," report by Public Health Service.
8. "Future Water Requirements of Principal Water-Using Industries," reports by Business and Defense Services Administration and Bureau of Mines.
9. "Pollution Abatement," report by Public Health Service.
10. "Electric Power in Relation to the Nation's Water Resources," reports by Federal Power Commission, Rural Electrification Administration, Edison Electric Institute, American Public Power Association, and Resources for the Future.
11. "Future Needs for Navigation," report by Corps of Engineers, U.S. Army.
12. "Land and Water Potentials and Future Requirements for Water," report by Department of Agriculture.
13. "Estimated Water Requirements for Agricultural Purposes and Their Effects on Water Supplies," report by Department of Agriculture.

<sup>50</sup> Select Committee on National Water Resources. Report (1961), op. cit., pp. 74, 75.

14. "Future Needs for Reclamation in the Western States," report by Bureau of Reclamation.
15. "Floods and Flood Control," report by Corps of Engineers, U.S. Army.
16. "Flood Problems and Management in the Tennessee River Basin," report by TVA.
17. "Water Recreation Needs in the United States," report by National Park Service.
18. "Fish and Wildlife and Water Resources," report by Fish and Wildlife Service.
19. "Water Resources of Alaska," report by U.S. Department of the Interior.
20. "Water Resources of Hawaii," report by U.S. Department of the Interior.

*Techniques for Meeting Needs*

21. "Evapo-Transpiration Reduction," reports by Department of the Interior and Department of Agriculture.
22. "Weather Modification," reports by Weather Bureau and Dean A. M. Eberle.
23. "Evaporation Reduction and Seepage Control," report by Bureau of Reclamation.
24. "Water Quality Management," report by Public Health Service.
25. "River Forecasting and Hydrometeorological Analysis," report by Weather Bureau.
26. "Saline Water Conversion," report by Office of Saline Water, Department of the Interior.
27. "Application and Effects of Nuclear Energy," report by Atomic Energy Commission.
28. "Water Resources Research Needs," report by Department of Agriculture.
29. "Water Requirements for Pollution Abatement," report by Prof. George Reid, University of Oklahoma.
30. "Present and Prospective Means for Improved Reuse of Water," report by Abel Wolman Associates.
31. "The Impact of New Techniques on Integrated Multiple-Purpose Water Development," report by E. A. Ackerman & Associates.
32. "The Supply of and Demand for Water in the United States," report by Dr. Nathaniel Wollman, Resources for the Future

PHASE VI—FINAL REPORT OF THE SELECT COMMITTEE

The final report of the select committee, January 30, 1961, consisted of 147 pages of text: The report proper, 19 pages; substantiating material, 54 pages; summary of committee activities and summaries of studies, 58 pages; acknowledgements, 5 pages; and supplemental

views, 11 pages. T. M. Schad has described the mechanics of preparing the report.<sup>51</sup>

*The findings and recommendations of the select committee*

The final report of the select committee identified five major categories of effort "needed in the future for meeting prospective demands on a long-range basis so as not to inhibit national or regional economic growth." These were: (1) regulating stream flow, (2) improving quality of streams through pollution abatement, (3) improved use of underground storage, (4) conservation in use of water, (5) artificial means of increasing availability of water. The committee found that the increasing complexity in development and management of water resources required progressive emphasis on science and technology to meet future requirements. Moreover:

Without question, the number, complexity, and difficulty of the decisions confronting the Congress and public officials concerned with water development and management will multiply as the range of choice of alternative methods for dealing with water problems becomes broader.<sup>52</sup>

Although many technical issues remained to be studied, this was no reason for postponing action. Moreover, decisions should not be made by the National Government in Washington on detailed aspects of river basin management and development. There should be State participation in planning, and the views of State and local agencies should be considered in connection with the formulation and operation of all Federal water resources programs.

The meat of the select committee report was contained in its recommendations, presented as five items (although not the same five as given in the findings). Although concisely written, each recommendation covered not only broad policy but specific approaches and action programs. The five points, taken together were in fact a comprehensive program for national water management, involving coordinated efforts at all levels of government, all levels of science and tech-

<sup>51</sup> In "An Analysis of the Work of the Senate Select Committee on National Water Resources," 1959-61, op. cit., p. 240, Schad writes:

By late spring, 1960, most of the studies being undertaken for the committee had been received and made available to the consultants for study. Each study was quickly printed and given wide distribution, so that the committee could profit by the feedback of ideas thus stimulated. The committee staff met with the consultants often as the studies were being completed, and in late May a preliminary draft summarizing the results of the studies then completed was prepared by the staff for submission to the committee. Portions of this report were necessarily blank, as the overall water supply-demand study was not yet completed, but it served to put the staff's general ideas before the committee.

The staff report was the basis for the committee's discussions at several meetings held during June 1960, and the members were asked to contribute their ideas for the final report of the committee. At this point the session was interrupted for the presidential nominating conventions, and it was not until August 12, 1960, that the Committee was again able to meet and approve an outline for its final report. A subcommittee was authorized to meet and work on the report during the interim period prior to convening the 87th Congress. That subcommittee considered the draft which the staff had prepared in accordance with the committee's outline, and at a meeting held December 10, 1960, gave its directions for the preparation of the final committee report. This was approved by the full committee at its meeting held Jan. 12, 1961, with additional changes of wording agreed to by the committee. At that time, also, the committee authorized printing of additional material that had been furnished in rebuttal to statements presented in the earlier hearings and in the committee prints, and that material was published as a committee print.

<sup>52</sup> Select Committee on National Water Resources, Report \* \* \* (1961), op. cit., pp. 15-19, especially p. 16.

nology, and all uses of water, for a long-range future period. The recommendations are accordingly presented in full, as follows:

1. The Federal Government, in cooperation with the States, should prepare and keep up to date plans for comprehensive water development and management for all major river basins of the United States. Such plans should take into account prospective demands for all purposes served through water development giving full recognition to non-revenue-yielding purposes such as streamflow regulation, outdoor recreation, and preservation and propagation of fish and wildlife, and keeping in mind the ultimate need for optimum development of all water resources. All practicable means of meeting demands should be considered. The executive branch should be requested to submit plans to the Congress in January 1962, for undertaking and completing such studies in all basins by 1970. Once prepared, the plans should be brought up to date periodically. Reports on individual projects submitted to the Congress for authorization should specify how the project fits into the comprehensive long-range program, and the range of alternative purposes that might be served by the resources needed for the recommended projects.

2. The Federal Government should stimulate more active participation by the States in planning and undertaking water development and management activities by setting up a 10-year program of grants to the States for water resources planning. A minimum of about \$5 million in Federal funds should be made available annually for matching by the States for use in the preparation of long-range comprehensive plans for water resources development along the lines recommended in No. 1 above.

3. The Federal Government should undertake a coordinated scientific research program on water. This should include both research into ways to increase available supplies, and ways to increase efficiency in the use of water required to produce manufactured goods and crops. The Committee recommends that existing programs be strengthened by taking the following action:

(a) Expanding the programs of basic research dealing with atmospheric physics, solar activity, hydrology of ground-water movement and recharge, the physical chemistry and molecular structure of water, photosynthesis, climatic cycles, and other natural phenomena associated with water in all its forms. Such research is essential to a major breakthrough in such fields as short- and long-range weather forecasting, weather modification, efficient management of underground reservoirs, evaporation reduction, desalinization, and pollution abatement, as well as to major improvements in works for the storage and control of water.

(b) Providing for a more balanced and better constructed program of applied research for increasing water supplies through desalinization, weather modification, and evaporation and evapotranspiration reduction.

(c) Providing for an expanded program of applied research for water conservation. Special emphasis should be given to research on improved waste treatment methods, on ways of increasing efficiency in the agricultural use of water,

on fish and wildlife needs, and on methods of system planning for the optimum development of water resources of river basins.

(d) Evaluating completed projects with a view to determining modifications to enable them more effectively to meet changing needs, to provide better guidelines for future projects, and to better determine their effect on the local, regional, and national economy.

The executive branch should be requested to review present research programs in the field of water and to develop a coordinated program of research designed to meet the foregoing objectives. This should be submitted to Congress in January 1962, so that it can be considered along with the budget estimates for the 1963 fiscal year.

4. The Federal Government should prepare biennially an assessment of the water supply-demand outlook for each of the water resource regions of the United States, as a means of informing the Congress and the public of current and prospective public action needed to meet future demands. The executive branch should be requested to submit the first such report to the Congress in January 1963.

5. The Federal Government in cooperation with the States should take the following steps to encourage efficiency in water development and use:

(a) Regulate flood plain use as a means of reducing flood damages whenever such regulation provides greater net benefits to the national economy than would be provided through other methods of preventing flood losses. Additional steps should be taken to delineate flood hazard areas so that the public will be aware of the risks involved in occupying flood plains.

(b) Study the emerging water problems of the areas in which water shortage will be most acute by 1980, with a view to finding ways that these water shortages can be dealt with in such manner as to minimize adverse effects on the economy of the area.

(c) Study the future needs for major storage reservoirs for river regulation for all purposes, and report to the Congress with specific recommendations as to steps that should be taken to preserve any necessary sites so that they will be available for use when needed at minimum cost.

(d) Provide for public hearings to be held in the vicinity of federally sponsored water resources facilities whenever such facilities are proposed for development or whenever any major change in works or policies is to be made. Prior to the hearings, the proposed change or development should be made public, and comments should be solicited from State and local agencies and from organizations and individuals affected.

The committee hopes that appropriate legislation to implement these recommendations will be introduced in the Senate and considered by the appropriate legislative committees.

*Committee rejection of restricted cost effectiveness formulas*

The final report of the committee did not explicitly discuss Circular A-47, the Green Book, or other formulas for determining whether water projects should or should not be supported. Indirectly, the report rejected a policy of detailed cost/effectiveness of water projects, with each function at each site specifically paying its own way. The rejection took several related forms:

First, the emphasis on State and local needs and interests tended to contradict the earlier concept that there should be a national standard of costs and benefits. The report noted that the dimensions of the water problem tended to vary from place to place, with many alternative solutions; this seemed inconsistent with any formula. With respect to time, also, it was impossible to maintain a fixed solution. Indeed, the report stated:

It is unlikely that the Nation will ever have a uniform policy covering the details of all water resources activities in all parts of the country. Conditions vary from place to place, and from year \* \* \*.

The earliest Federal internal improvements in the water resources field were in response to social pressures for economic expansion and development. In a later period the emphasis was placed on Federal development as a means of counteracting concentration of economic power or monopoly in private interests. At another time public desire for the conservation of renewable resources became an important motivation for Federal activity in water resources development.

\* \* \* In the future the increasing trend toward urbanization may bring about needs for Federal participation in ways that cannot be foreseen at this time. Therefore, rather than to attempt to define the boundaries of Federal participation, the committee believes that its task is to point out ways for the Nation to prepare itself to perform the tasks which will become increasingly obvious as the years go by.<sup>53</sup>

Clearly, urgency of need might become extremely acute, at some time or in some area, thereby invalidating precise dollar-formulas of cost/effectiveness.

From another point of view, the emphasis of the committee on total river basin solutions, and plans for maximum utilization, seem to have been inconsistent with the cost/effectiveness formula approach. Instead of developing a fixed approach, the committee seemed to be advocating continuing study of resources and requirements, so that policies could be adapted to changes in circumstances. Said the report:

The eventual need for full regulation of surface water supplies has led to suggestions that all reservoirs should be designed and constructed to the point of optimum development of the site. This might involve making investments in additional storage before economic justification could be shown by our present methods of computing benefit-cost ratios. Flexibility would have to be worked into the design of the dam and control works so that they could be readily adapted to use for various purposes at different periods during the life of the structure.

As a means of resolving some of these questions having to do with possible future needs for reservoirs, the committee believes it would be desirable for a detailed study to be made by the water resources agencies of the Federal Government, in cooperation with appropriate State agencies, of the future needs for reservoirs and availability of reservoir sites in the United States.<sup>54</sup>

On the question of the use of formulas for the allocation of costs paid in return for benefits from water projects, the report took an equally relaxed and flexible attitude. It noted that Federal investment in water facilities tended to be primarily for unrecoverable or

<sup>53</sup> *Ibid.*, p. 22.

<sup>54</sup> *Ibid.*, p. 47.

intangible benefits. These should receive more emphasis in Federal planning of water projects. Techniques should be designed to measure such benefits, so that they could become better understood and appreciated. However, said the report :

The committee is not overly concerned with the cost sharing aspect of our water resources problems, because it believes that the present policies tend to even out the sharing of costs over the long run, among all the people.<sup>55</sup>

#### IV. IMPACT OF THE SELECT COMMITTEE'S REPORT

From the standpoint of political impact, the report of the Select Committee on National Water Resources was effectively timed. Advocating an active program of stewardship of national resources in a changing world, the report appeared 10 days after the accession to office of a newly elected President who had campaigned on an activist platform. Understandably, President Kennedy soon endorsed the findings of the report. In a special message to the Congress on Natural Resources, February 23, 1961, he praised the "very excellent and timely report of the bipartisan Senate Select Committee on National Water Resources issued 3 weeks ago." He urged the Congress to authorize the establishment of river basin commissions, promised a "progressive, orderly program of starting new projects to meet accumulated demands," declared that increased attention should be given to municipal and industrial water and power supplies, and identified the need for stepped-up efforts in pollution control, saline water conversion, and development of water-related recreation.<sup>56</sup>

Later the President followed this statement with a letter to the President of the Senate and to the Speaker of the House, transmitting a water resources planning bill that would—

Establish a Water Resources Council (composed of the Secretaries of the Interior, Agriculture, Army, and Health, Education, and Welfare), whose first task would be to "establish \* \* \* standards for formulating and evaluating water resources projects;"

Authorize regional or river basin commissions to prepare and keep up-to-date plans for development of water and related land resources;

Provide for grants to the States for water development planning purposes.

When delays developed in the enactment of the requested legislation, the President sent memoranda individually to the proposed members of the recommended Water Resources Council, October 6, 1961, asking them to "review existing standards for the formulation and evaluation of water resources projects and to recommend any necessary changes." In response, the ad hoc Water Resources Council drafted a statement, "Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources." May 15, 1962.<sup>57</sup> This report the President promptly

<sup>55</sup> *Ibid.*, pp. 22-23.

<sup>56</sup> U.S. President (John F. Kennedy). Special Message to the Congress on Natural Resources, February 23, 1961. In *Public Papers of the Presidents, John F. Kennedy, 1961*. (Washington, U.S. Government Printing Office, 1962), pp. 114-118; 120-121.

<sup>57</sup> U.S. Congress, Senate, *Policies, Standards, on Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources*. Prepared under the direction of the President's Water Resources Council. Together with a statement by Senator Clinton P. Anderson of New Mexico, 87th Cong., 2d sess., S. Doc. 97. (Washington, U.S. Government Printing Office, 1962), 13 pp.

approved, "for application by each of your Departments and by the Bureau of the Budget in its review of your proposed programs and projects." The new criteria were circulated to Government agencies in mimeographed form, and were printed for general use, May 29, 1962, as Senate Document 97.

*Easing of departmental criteria for projects*

In a number of significant ways the new criteria departed from the earlier Circular A-47, toward policies recommended by the select committee:

1. Emphasis was shifted from tangible to intangible benefits, although the concept that benefits should exceed costs was maintained;
2. The period of analysis was extended from 50 years to 100;
3. Insistence on use of the "separable costs-remaining-benefits method of allocating costs among functions was dropped;
4. Costs attributable to "taxes foregoing" were to be ignored;
5. Recreation might be treated as a major purpose in water development;
6. Standards for construction of power facilities in multipurpose projects were significantly eased;
7. Greater emphasis was placed on multipurpose planning of water resource development;
8. Irrigation standards were eased;
9. Important emphasis was placed on "water quality control benefits" as contributing to public health, safety, economy, and effectiveness in use and enjoyment of water.

In various ways the new President sought to stimulate actions contributing toward the stewardship approach to natural resources. In his special message, he insisted that "We reject a 'no new starts' policy concerning water projects." But although the President urged an easier screening of new projects, the backlog of water construction contracts in force from 1961 to 1964 rose only slightly (from \$3.157 to \$3.187 billion). In several other fields, more progress was achieved. Thus, the rate of expenditures for research into desalting techniques was increased almost tenfold, by amendments at this time.<sup>58</sup> Progress was also achieved in the control of water pollution: the Federal Water Pollution Control Act Amendments of 1961—

Made pollution control an explicit consideration in the determination of storage capacity of reservoirs:

Authorized expanded research in sewage treatment, source and nature of pollutants, and evaluation of augmented flow to control pollution.<sup>59</sup>

Other aspects of water research were also stressed by the President.

*Increased attention of Kennedy administration to water research*

In his special message, the President had said he intended to "ask the National Academy of Sciences to undertake a thorough and broadly based study and evaluation of the present state of research underlying the conservation, development, and use of natural resources, how they are formed, replenished, and may be substituted for, and giving particular attention to needs for basic research and to projects that will

<sup>58</sup> Public Law 87-295, 75 Stat. 628. Approved Sept. 22, 1961.

<sup>59</sup> Public Law 87-88, 75 Stat. 204. Approved July 29, 1961.

provide a better basis for natural resources planning and policy formulation." At the same time, the Federal Council for Science and Technology would review Federal research in these areas in an effort to "strengthen the total Government research effort relating to natural resources."

The select committee's third recommendation had proposed research objectives for water, and had suggested that the executive branch review its current work and develop a coordinated program. Examples of specific fields needing research, according to the committee, were:

- (a) Reducing evaporation from the surface of reservoirs.
- (b) Elimination of water-loving vegetation (phreatophytes) along the edges of reservoirs and watercourses.
- (c) Changing or modifying forest and vegetative cover on watersheds to reduce evapotranspiration.
- (d) Reducing seepage losses in irrigation canals and other water distribution systems, and other wasteful irrigation practices.
- (e) Reduction of dilution requirements for pollution abatement by development of improved methods for treatment or control of waste materials that are disposed of in water.
- (f) Waste water salvage.
- (g) Reuse, recycling, and elimination of wasteful water use by industry.
- (h) Desalting of saline or brackish water.
- (i) Weather modification.
- (j) More accurate quantitative forecasting of meteorologic events.
- (k) Application of nuclear products in research.
- (l) Improved use and control of ground water.

On March 4, the President by letter asked Dr. Detlev W. Bronk to have the National Academy of Sciences undertake an evaluation of national research needs concerning water resources. There were two separate responses from the Academy. One was a general report, "Natural Resources," that contained a section on water. It recommended that research be addressed to the most promising sources of water or fields of conservation of water (ground water, waste treatment, use of brackish water, and reduction of losses by evaporation and transpiration), stressed the importance of "sophisticated techniques" of analysis in the complex management of water in entire basins, and called for more researchers qualified in scientific disciplines relevant to water.<sup>60</sup>

Another Academy study, limited to consideration of research on "Water Resources," was prepared by Dr. Abel Wolman, who had earlier participated as consultant in the select committee's investigation. He stressed the same problems and approaches cited in the other Academy report, but provided considerable detailed information in support of his findings.

The Federal Council for Science Technology had encountered difficulty in completing its review of ongoing Federal research in water, and in September 1962. Dr. Wiesner, the President's science adviser and also Chairman of the Federal Council and Director of the Office of Science and Technology, convened a task group to assist the Coun-

<sup>60</sup> National Academy of Sciences-National Research Council. Committee on Natural Resources. *Natural Resources: A Summary Report to the President of the United States.* (Washington, D.C., National Academy of Sciences-National Research Council, publication 1000, 1962), pp. 6-10.

cil in its task. This group, chaired by Dr. Roger Revelle, then science adviser to the Secretary of the Interior, prepared a report on Federal water research, which the Council accepted at its meeting on December 20, 1962. The report was transmitted by the President to Congress, February 18, 1963. It reviewed Federal research in water, proposed six measures to increase the availability of trained research personnel, seven measures to support outside research, and seven measures to improve the coordination of Federal agencies whose programs overlapped, because of the pervasive nature of water problems. In particular, the report said:

The task group found a need for a continuing independent mechanism, representative of the views of the scientific and engineering community interested in water resources research, to advise the Federal Council in identifying longer range objectives and needs in water resources research and education.<sup>61</sup>

The need for expanded research, identified by the select committee, the two Academy studies, and the Federal Council, eventually led to a legislative response. This was the Water Resources Research Act of 1964.<sup>62</sup>

This act—

Provided Federal funding support for State water resources institutes, to plan and conduct, and train personnel to conduct, research related to—

Aspects of the hydrologic cycle

Supply and demand for water

Conservation and best use of available supplies of water

Methods of increasing such supplies

Economic, legal, social, engineering, recreational, biological, geographic, ecological, and other aspects of water problems;

An expanded program of water research by the Department of the Interior;

Coordination and federally supported State research;

Establishment of a water research data center;

Assignment to the President of continuing management responsibility, including:

Continuing review of the adequacy of research;

Identification and elimination of duplication and overlap;

Identification of technical needs for research;

Allocation of technical effort among Federal agencies;

Review of manpower needs for water research;

Review of management policies in water research; and

Actions to facilitate interagency communication.

#### *Coordinated development of drainage system water projects*

The main thrust of the select committee report had been a call for planned, coordinated efforts at all levels of government, to apply available technology in a concerted effort to maximize the uses of water for social purposes in total river basins, to meet changing circumstances and future needs. Legislation proposed in anticipation of this recommendation was introduced (as H.R. 3704, 86th Cong.) by Chairman Wayne Aspinall of the House Committee on Interior and Insular Affairs, January 29, 1959. It called for creation of river basin commissions, and the adoption of uniform methods of evaluating water products, and allocating their costs among functional benefits. No action was taken in 1959 or 1960 on the Aspinall proposal.

<sup>61</sup> U.S. Congress, Senate, Federal Water Resources Research Activities, Memorandum of the Chairman to the Committee on Interior and Insular Affairs, U.S. Senate, transmitting the report to the President on water resources research prepared by the Federal Council for Science and Technology, Committee print, 88th Cong., 1st sess., Mar 25, 1963 (Washington, U.S. Government Printing Office, 1963), 213 pp.

<sup>62</sup> Public Law 88-379, 78 Stat. 329, approved July 17, 1964.

The report of the select committee, and its prompt presidential endorsement, revived legislative interest in the concept of comprehensive water project planning. Companion bills were introduced in both Houses<sup>63</sup> to provide for grants to the States, administered by the Department of the Interior, for comprehensive water resources planning. A separate bill by Senators Kerr and Case (S. Dak.), introduced May 3, 1961, called for establishment of a Water Resources Planning Board, representing interested departments of the Federal Government, to distribute grants to the States to support the planning of water development projects.

Eventually, the President sent his own recommendations to the Congress, July 3, 1961. Introduced July 14, as S. 2246, by Senator Anderson with 15 cosponsors, it called for—

A Water Resources Council (consisting of the Secretaries of Agriculture, Army, HEW, and Interior), to formulate national water policy, review river basin plans, and administer grants to the States;

Establishment of river basin commissions:

A system of State grants-in-aid for water resources planning. Between 1961 and 1965, when a Water Resources Planning Act was finally signed into law,<sup>64</sup> the subject of water planning remained under active consideration in the Interior and Insular Affairs Committees of both Houses of Congress. The general features of the proposed legislation appeared to be noncontroversial, following the lines recommended by the select committee. There were a number of technical issues, however, such as:

The preservation of water rights;

Division of Federal and State responsibility and authority;

Participation in river basin commissions;

Specialized requirements of urban areas;

Commission decision-making arrangements;

Authority for prescribing standards and other aspects of the relationship between the proposed Council and basin commissions; and

Inclusion of the Federal Power Commission as a member of the proposed Water Policy Council.

Further testimony was sought and obtained mainly from interested Federal agencies, and from representatives of the States, on these issues. The Federal-State division of responsibility and authority was an especially thorny one. Eventually, however, the Anderson bill was accepted by the Senate without a record vote, December 4, 1963. Hearings were then held by the House Committee on Interior and Insular Affairs, during the spring of 1964, and the bill was reported September 2. No further action occurred before the session was adjourned. In the 89th Congress, the water planning measures were re-introduced in slightly different form in the two Houses of Congress (as S. 21 and H.R. 1111), passed both Houses unanimously (in the Senate on February 25; and in the House, March 31): the differences were ironed out in conference, and the bill went to the President July 16.

<sup>63</sup> S. 1629, 87th Cong., by Senator Anderson with 15 other sponsors, and H.R. 6487, by Representative Peterson of Utah, Apr. 19, 1961.

<sup>64</sup> Public Law 89-80, 79 Stat. 244 (S. 21), approved July 22, 1965.

In its final form, the Water Resources Planning Act<sup>65</sup> established the policy of the Congress—

In order to meet the rapidly expanding demands for water throughout the Nation, \* \* \* to encourage the conservation, development, and utilization of water and related land resources of the United States on a comprehensive and coordinated basis by the Federal Government, States, localities, and private enterprise with the cooperation of all affected Federal agencies, States, local governments, individuals, corporations, business enterprises, and others concerned.

The act established a Water Resources Council, composed of the Secretaries of Interior, Agriculture, Army, and Health, Education, and Welfare, and the Chairman of the Federal Power Commission. Its functions would be (paraphrase) :

To maintain a study (and report biennially) on the adequacy of regional water supply;

To study the relation of regional or river basin plans to the requirements of larger regions, and the adequacy of organization for coordination of water plans and policies;

To establish principles, standards, and procedures for Federal participants in the preparation of comprehensive river basin plans, and for the formulation and evaluation of water projects;

To review plans prepared by river basin commissions (also provided in the act), with special regard to—

(1) The efficacy of such plan or revision in achieving optimum use of the water and related land resources in the area involved;

(2) The effect of the plan on the achievement of other programs for the development of agricultural, urban, energy, industrial, recreational, fish and wildlife, and other resources of the entire Nation; and

(3) The contributions which such plan or revision will make in obtaining the Nation's economic and social goals.

The act provided that the President might create river basin water commissions, at the recommendation of the Council or the States concerned. These commissions would coordinate the development of plans for the regional basin, keep them up to date, make studies necessary for this purpose, and recommend priorities for projects. The principal task of the commissions would be the submission of a comprehensive, coordinated, joint plan for the region.

Finally, the act provided for Federal aid to the States "to assist them in developing and participating in the development of comprehensive water and related land resources plans."

Administrative support was provided in 1968 by a further congressional enactment, the National Water Commission Act,<sup>66</sup> creating a seven-member National Water Commission, with an executive director, and staff, to "submit simultaneously to the President and to the U.S. Congress such interim and final reports as it deems appropriate \* \* \*." These reports were to result from the Commission's assignment of scope and responsibility as delineated in section 3-a of the act, which said:

The Commission shall (1) review present and anticipated national water resource problems, making such projections of water requirements as may be

<sup>65</sup> Public Law 89-80, 79 Stat. 244-254, approved July 22, 1965.

<sup>66</sup> Public Law 90-515, approved Sept. 20, 1968.

necessary and identifying alternative ways of meeting these requirements—giving consideration, among other things, to conservation and more efficient use of existing supplies, increased usability by reduction of pollution, innovations to encourage the highest economic use of water, interbasin transfers, and technological advances including, but not limited to, desalting, weather modification, and waste water purification and reuse; (2) consider economic and social consequences of water resource development, including, for example, the impact of water resource development on regional economic growth, on institutional arrangements, and on esthetic values affecting the quality of life of the American people; and (3) advise on such specific water resource matters as may be referred to it by the President and the Water Resources Council.

## V. OBSERVATIONS ON THE RESOLUTION OF THE WATER POLICY ISSUE

In the evolution of water policy in the United States, a succession of additional benefits, one by one, became incorporated into the design of ongoing water projects. First navigation, then flood control, then electric power, irrigation, silt control, low-flow augmentation, recreation, and other valuable returns were added to the performances expected of individual structures. At the same time, the geographic scope of water projects also expanded; functional benefits came to be considered in terms of entire river basins, and specialized as well as multipurpose projects came into use as system components. Some projects of low intrinsic benefit were found necessary to round out these systems (an upstream silt-control dam, for instance, to extend the useful life of a downstream reservoir). Changes in technology impacted on the design of water projects; plans needed to be kept flexible and short range, to enable them to adapt to further changes as they appeared. On the other hand, the large and costly structures required for water projects sometimes yielded tangible financial benefits so nearly marginal that to demonstrate an excess of benefits over costs required calculation of returns over extended periods (50 or even 100 years) at assumed risk-free rates of interest on the invested capital. The resolution of conflicting interests of many classes of beneficiary overtaxed the decisionmaking system. Traditionally, there were the issues of private versus public development of economic resources, the issue of conservative evaluation of benefits and insistence on a substantial predominance of benefits over costs versus a generous attitude toward the balancing of costs and benefits coupled with strong emphasis on additional intangible values. It became evident, moreover, that there were intangible costs as well as benefits: losses of scenic values as well as expanded opportunity for recreation, losses of unspoiled wilderness as well as increased density of tourism and forest camping.

By the close of the Eisenhower administration, these conflicts, complexities, and uncertainties presented impossible obstacles to rational or equitable legislating of water development projects. Multiple structures were found to have multiple shared, and competing benefits. River basin systems, with a limited number of dam sites, offered an infinite array of alternative choices relative to an infinite variety of local and regional impacts, values, hazards, opportunities, and property rights. There were agreements as to some principles, disagreements as to others, and a general uncertainty as to a third group. There was a general agreement as to the essentiality of water development under

Federal sponsorship, but great divergence of views as to the rules to be followed in applying the principle. The uncritical approach of general simultaneous development was rejected. The close-pricing approach frustrated regional aspirations. Multipurpose projects with many intangible benefits were judged profligate by hard-headed realists; single-purpose projects based on a substantial preponderance of tangible benefits over costs were judged wasteful by conservationists.

Presentations to the Congress of proposals for new projects dealt in specifics related to individual competing projects. Evidence of merit of individual projects presented by interested parties from the region concerned would always be suspect. Congresses disposed toward enlarged development activity might accept such evidence, especially in connection with a general sympathy for equitable geographic distribution of projects among States or districts. Congresses less generous, or confronted with a greater need for economies, might have more difficulty in choosing among candidate projects, and would reasonably resort to the harder but more restrictive evidence of tangible costs and benefits. The policy of total basin development ran counter to both approaches, by calling for regional systems in which projects might be concentrated in favored (or lagging) basins, and in which support for individual projects was based on their contributions to total system performance, rather than item benefit/cost ratio relative to some project elsewhere.

Individual projects were inherently local or regional. Decisions favoring single projects were accordingly local in effect, although of course the total effect of a generous or a frugal attitude in Congress toward all such projects had significance for the national economy, defense, employment, and productivity, as well as on inflation, the national debt, the stability of the dollar, and on the availability of tax revenues for other social purposes. In this way, national policies and standards for the assessment of water projects had both a regional and a national impact. Conversely, projects had to satisfy two sets of criteria: suitability within the region, and superiority in competition with other projects for limited national investment capital, under varying conditions of relative lenience toward new starts.

Different specific aspects of water projects were emphasized by the succession of study groups and commissions on water before 1958: balanced economic development of regional subdivisions of the Nation was stressed by the National Resources Committee in 1936. Availability of adequate quantity and quality of industrial and urban water where and when needed was the concern of the Paley Commission in 1952.

The first Hoover Commission in 1949 addressed its attention to the problem of coordinating national water policy, while the second, in 1955, sought tighter and more cost/effective decisionmaking. The President's Water Policy Commission, in 1950 sought to maximize the total utility of water for social purposes. Each study had its own constraints and preoccupations.

Events during the Eisenhower administration tended to transfer responsibility for decisionmaking on water projects and policy to the legislative branch. Thus, within the National Government, the President referred decisions on policy standards to the Congress. Moreover, his effort to restore some extent of resource development to private initiative, and his further effort to return some Federal initiative

to the States, carried the implication that private initiative and the States would assume both decision and cost burdens, and responsibility for actual performance. To the extent that this did not happen, on projects that were ardently sought by local communities and regions, the pressure for action was redirected toward the Congress to assume the initiative. Moreover, some spokesmen for State governments also urged the Congress to act.

Another factor militating toward congressional assumption of policy responsibility was the difficulty encountered by the executive branch in resolving internal differences among agencies. These inter-agency conflicts were in turn based on built-in differences in organic law and long-standing professional commitments to specialized water functions. Complex projects required balanced emphasis on all useful functions; they also required a unity of planning that could not be achieved by a consortium of relatively independent agencies; and any single agency charged with the planning of a project could not avoid giving priority emphasis to the function for which it had exclusive responsibility. Under these conditions, neither agreement on functional emphasis, nor leadership in the formulation of water policy could reasonably be expected to be provided by the executive branch.

Nor was there available any useful national consensus as to water policy. One obstacle to the formulation of such a consensus was the essentially local character of water resources, such that each region and each locality was pitted against all others in the quest for project support. Moreover, the extremely difficult and abstruse technical problems of technologically advanced management of water made public understanding hard to achieve. Finally, there was the long history of conflict among interest groups with competing plans for uses of water or affected (favorably or adversely) by its development: the coal and power industries, railroads, conservationists, irrigation farmers, waterway construction industry, public power advocates, farm organizations, and others.

Toward the close of the decade of the 1950s, there was apparent a growing need for the Congress to participate more actively in the formulation of water policy. The need for resolution of the water policy issue was becoming pressing. There was a general sense of the national need for a stepped-up rate of investment in public capital. A rising population of an increasingly urban character was creating new requirements for municipal and industrial water supplies, and at the same time was raising unprecedented problems of pollution. These new aspects were superimposed on a long list of older considerations of the control and use of water.

When the select committee was formed, its membership was drawn mainly from constituencies deeply concerned with water problems. There was a strong motivation to arrive at a set of findings that would provide a basis for action. The committee was aided by a highly qualified supporting staff, objectively constituted and largely without previous agency commitments.

The select committee was able to exploit the fortunate circumstance that a nationally recognized research institution specializing in resource policy problems had its own plan of investigation that was

closely compatible with that of the select committee. This institution was able to provide the committee with a wealth of documentation and studies in depth that could not have been obtained otherwise except at great expense, serious loss of time, or both. Moreover, Resources for the Future, Inc., had additional significance as a participant in the study in that it enjoyed wide professional contacts with the academic community, and was able to draw on almost the total non-governmental expertise of the Nation in a specialized field that has been chronically undermanned.

The select committee made a systematic effort of its own to collect data at both the official and professional staff levels of Federal agencies concerned with water. It made a systematic effort to collect data at the State level from both the Governors' staffs and the professional planning levels. It conducted a comprehensive series of hearings at the local level to obtain an indication as to what problems and views were shared from one region to another.

It began to appear that the problem was not one of further increasing the complexity of the technical process of water management or increasing the arbitrary regulation of projects under national policy. Instead, the committee recognized that there were local and national policy issues, and that these needed to be differentiated.

Then, the need was identified for a mechanism by which a single agency could decide the national issues, apart from historical commitments, and supported by such analytical tools as the issues required for resolution.

Third, the need was identified for a regional mechanism, to elicit local views as to needs and aspirations, to resolve systems problems concerning single coherent basin programs, and to coordinate national with regional efforts.

Finally, the need was identified for a general strengthening in the research activity and professional resources required for water resource planning: mechanisms for managing data, conducting research, increasing the availability of trained researchers, developing and presenting data to users, developing useful criteria for determining the relative advantages of alternative solutions to regional problems, and bringing about a progressive increase in public understanding of the needs and opportunities of water management.

It was apparently assumed that when these needs were met, the Congress itself would be able to rely on the new administrative mechanisms created to meet these needs, to provide more authoritative, better structured, more uniform and systematic information bearing on proposed projects. The projects themselves might still be undertaken by the agencies with traditional responsibilities in flood control, irrigation, or power development. The primary representations to the Congress in support of their authorization might also be by the established agencies. But undoubtedly the Congress would find beneficial the added information resources available in an agency charged with total water policy formulation and coordination, an agency charged with responsibility for the planning of water development in an entire river basin, and an agency charged with responsibility for sponsoring research in all aspects of water science and technology.

The findings of the select committee included an identification of need for mechanisms for managing research data in water science and technology, developing and presenting to the Congress comprehensive coordinated plans for development of entire river basins, developing criteria for priorities of projects and allocations of costs to functions, ensuring State-local-regional interests a voice in planning, maintaining surveillance of national and regional supply and requirements, support for State research institutes, programs to expand the availability of water from new sources, and programs to reverse the trend toward pollution of surface water.

Effective planning for national water policy required that the Congress would in the future be informed of all aspects and issues of water—as to proposed major programs and contributory projects; standards and criteria: needs, resources, and proposed corrective actions; interests of all affected groups, jurisdictions, and agencies; and recommended decisions to mediate among interests in conflict.

Manifestly, the problem of deciding issues regarding water had become unmanageable within the framework of existing agencies and laws. The executive branch had been unable to resolve conflicts within itself. The technical complexity of substantive problems of river basins presented the Congress with an impossibly detailed set of issues not amenable to resolution through the usual processes of legislation. The problem of water, it was abundantly documented, was becoming not only more complex but also more urgent.

The central information instrumentality that provided the foundation for these congressional conclusions was the select committee. Its focus was not on the solution of the countless issues presented to it. Its finding on these issues was merely that some of them were urgent and crucial, so that their resolution commanded a high priority. What was of concern to the Congress was to insure that the great array of technical issues (scientific research directions, management of research data and findings, reconciliation of agency differences, coordination of local and national planning) was delivered for resolution into competent and objective hands. Issues that could not be thus resolved, but which required resolution by means of the traditional “adversary process,” could be beneficially prepared for this process by the same objective mechanisms of staff analysis, factfinding, and recommendations.

The select committee made no effort to make a final decision regarding the policy standards for new projects. But by identifying the need for specific technical machinery of factfinding and analysis at both the national and the regional level, and by presenting its recommendations at a time and under circumstances that made likely a recommendation by both the President and the Congress, the select committee helped to provide the tools by which acceptable criteria and standards could be devised and brought to bear.



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**PART II**

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SUMMARY



# CONTENTS

## PART II

### SUMMARY

	Page
I. Introduction.....	473
The conceptual framework: Decisionmaking in Congress.....	473
Congressional management of issues in process.....	473
The kinds of information required for decisionmaking.....	474
Acceptance of a problem for decisionmaking.....	474
Preparation for structuring the problem for decision.....	474
Structuring and deciding the issue.....	475
Differences between scientific and political decisionmaking.....	475
Differences between scientific and political information.....	475
Procedures and methodology used in the study.....	476
Scientific and political behavior in contrast.....	479
II. Fields of congressional concern in science policy decisions.....	480
Political identification of incompatibilities of man with his environment.....	480
Determination of political goals and their relative priorities, in improving the compatibility of man with his environment.....	480
The forecasting of technology.....	480
Establishment of technological goals and priorities.....	480
Establishment of related basic and supporting research goals and priorities.....	481
Applied technological system building.....	481
Technological assessment.....	481
Technological control.....	481
Technological transfer.....	481
Management of technological obsolescence.....	482
Science policy factors relevant to cases studied.....	483
III. The technical information function in political decisionmaking:	
The cases summarized.....	484
Case 1: The AD-X2 battery additive.....	484
Case 2: The point IV program.....	485
Case: Inclusion of the social sciences in the National Science Foundation (1946).....	486
Case 4: Project Camelot.....	488
Case 5: Mohole.....	489
Case 6: The Test Ban Treaty.....	491
Case 7: The Peace Corps.....	492
Case 8: High energy physics.....	493
Case 9: The Office of Coal Research.....	495
Case 10: The Salk vaccine.....	497
Case 11: Water Pollution Control Act, 1948.....	499
Case 12: Thalidomide.....	500
Case 13: Federal pesticide control, 1947.....	502
Case 14: Criteria for water projects.....	504

	Page
IV. Some elements of technical information for political decisionmaking---	506
Priority of a technical issue embedded in a political issue-----	506
Some obstacles to the receiving by Congress of technical information---	507
Hypotheses-----	507
Sensationalism-----	507
Outstanding personalities as witnesses-----	508
A list of "near impossibilities"-----	508
Technical differences of opinion-----	509
Administration versus Congress-----	509
V. Technical information-gathering methodologies useful for the Con-	
gress-----	510
Congressional information sources on technical issues-----	511
Congressional requirements for technical information-----	513
Ways to secure information pertinent to the issue-----	513
Assuring authoritative, accurate, objective, technically sound	
information-----	514
Authoritative-----	514
Accurate-----	514
Objective-----	514
Technically sound-----	515
Arrangements to assure completeness of technical information-----	515
Staff functions-----	516
Classes of witnesses-----	517
Modes of information gathering-----	518
Data analysis-----	518
Iterative nature of the process-----	519
Achievement of maturity and full development of structured informa-	
tion-----	519
Organization of a system to achieve and maintain technical perspec-	
tive-----	519

## I. INTRODUCTION

The purpose of this study is to shed light on the processes by which the Congress secures information from the scientific or technological community in order to decide political issues with a substantial scientific or technological content. The assumption is that a set of detailed historical accounts of congressional decisions, selected to provide a variety of illustrations of different subjects, problems, procedures, and outcomes, will afford useful guidance about how the Congress obtains and uses scientific information, and how to strengthen these processes.

### *The conceptual framework: Decisionmaking in Congress*

The functions of an elected legislature in making decisions on scientific and technological issues are assumed to include the following:

Balance operational goals of the Government with the philosophical goals of the society being governed.

Maintain an overall view of the present condition and trends of society, relative to the operational goals.

Identify various sets of available options for correcting deficiencies or to exploit opportunities, so as to bring the real condition of society closer to its declared or accepted goals.

Establish a priority among the various sets of options, and within each set, within the limits of (1) available resources, (2) attention capacity of the decisionmakers, (3) technological feasibility, and (4) political feasibility. Political feasibility, in particular, is related to such social motivations or criteria as the expressed desires of the public and the total cost/effectiveness potential of the action under consideration.

### *Congressional management of issues in process*

Before an issue can be settled in the yes-or-no terms of the political decision process, subsidiary issues must first be cleared away. This usually means achieving agreement that one alternative is better than the various other possibilities entertained. Or, in the contemporary jargon: the preferred alternative is that which best satisfies the cost/benefit criteria drawn from the value systems of the combination of individual decisionmakers participating in the process.

Congressional decisions are usually structured by committees that specialize to some degree in the subject matter of the decision. These committees also serve as focal centers for the receipt of formal and informal communications from agencies and outside groups interested in the issue, of testimony from authoritative or interested sources, of published comment, and of formal and informal expressions from other Members of Congress interested in the issue. When the two Houses of Congress arrive at different legislative decisions, the device of the conference committee is used to mediate the difference—to search for a middle ground acceptable to both. Modification of the legislation within limits is negotiable in the conference process.

Many political forces and elements are germane to the negotiations that lead to the final structuring of the decision into yes-or-no form, and to the decision itself. The question examined in this study is the process by which the Congress obtains and uses the scientific and technological information and advice it needs from the scientific community in order to structure and then decide the yes-or-no issue.

A number of variables influence the decision process. Some of these are: the way the issue arose (and whether it was a routine matter or a "sensational" public issue), how the issue came to Congress, the availability of reliable information about it and how the information was used, the point in the system at which the decision was rendered, and what form the decision took. It is also of interest to observe how the decision was implemented and what the later consequences were. All of these variables are identified in the cases considered.

In making decisions on political issues, the Congress (and its committees) can take action in a wide variety of ways. It can enact legislation, create an agency, establish regulations, specify a policy, appropriate funds for a purpose, make funds available to States and municipalities, call for reports, arrange for interagency coordination, recommend future action, require that a subject be studied, provide advice, bring about an internal review by an agency of its organization and procedures, cause a reassessment of a program, make some official of Government responsible for a decision, or withhold action altogether.

#### *The kinds of information required for decisionmaking*

In the congressional decision process three kinds of information are needed. These are (1) information to enable a decision as to whether to accept the problem into the decisionmaking system; (2) information on how to prepare to structure the problem into an issue; and (3) information bearing on how to structure and then to decide the issue. Examples of the kinds of questions to elicit these three classes of information are as follows:

1. *Acceptance of a problem for decisionmaking.*—The questions are:
  - What is the problem?
  - Can congressional action help to solve it?
  - Is it important enough for the Congress to spend time on it?
  - Who is interested in solving it, or having it solved?
  - Which groups want it solved which ways?
  - Which groups prefer no action be taken to solve it?
  - How does the problem relate to other concerns of the Congress?
  - How urgent is it to solve the problem?

2. *Preparation for structuring the problem for decision.*—The questions are:

- What information is needed to solve the problem?
- Where can the needed information be found?
- How can it be obtained?
- What are the right questions to elicit the best, complete information?
- What is the proper role of the Congress in decisionmaking on the issue?
- Where will the decision ultimately be rendered?
- What form is the decision most likely to take?

3. *Structuring and deciding the issue.*—The questions are:

What alternative solutions have been advanced?

What are the probable costs and undesirable side effects of each alternative?

What are the probable values and useful side effects of each alternative?

What are the economic and technical considerations relative to each alternative?

Are the various alternatives feasible technically, economically, politically?

Are all apparent alternatives politically or technically unacceptable, thus requiring that additional alternatives should be searched for?

What are the implications of each alternative for the short and long term?

What contradictions are contained in the information as received?

What biases and indications of unreliability prejudice the information?

What are the relative weights of the technical conclusions and the information about political values pertaining to the various alternatives after bias and unreliability have been screened out?

What are the relative costs and benefits of adopting the preferred alternative or of not taking action?

*Differences between scientific and political decisionmaking*

Scientific decisionmaking tends to be imposed by the method of science—rather than arrived at by group dynamics. It is structured in terms of the measurable data of experiment and observation. The decision is delayed until a working or useful consensus is possible from the available data. Until the consensus is firm, the method requires that the information-gathering process continue. Decisionmaking by a political group, on the other hand, is structured more by external considerations. The preferences of concerned groups are often the most important consideration. If a political decision depends upon a prior decision by a scientific group, the scientific group needs time to achieve consensus. It takes longer to achieve consensus than to obtain a majority vote. Urgency of the timing of the political decision process may require decision without the first achievement of the scientific consensus.

*Differences between scientific and political information*

Scientific testimony tends to be factual, descriptive, quantitative, and circumstantial; political testimony tends to be value-oriented and group-preference-oriented. The strength of technical witnesses—the validity of their testimony—is in the credence they command, by virtue of reputation and past performance, within the scientific community. Examples of scientific advice or testimony are: identification of alternative courses, and estimated technical costs and benefits of each; the probabilities of various possible outcomes; and the probable cost/benefit of each.

The problem of witness bias is universal; in evaluating testimony by scientists it involves such considerations as the following: How senior and how authoritative is the witness within his own field? Is his

judgment accepted by others in his discipline? Is his knowledge of the subject up to date? Does it encompass the particular matter at issue? Is the witness a proponent of an unorthodox view in his own discipline? Does he aspire to advance some particular field of research? Does his own career or academic preferment depend on his success in advancing a particular technical or scientific outcome, or a political decision favoring such an outcome? Is there some particular political interest group whose views are congenial to the scientific course he advocates? Does his discipline share an identifiable interest with some economic institution or faction?

Government scientists are a special case. In addition to their disciplinary bias, they also have an agency affiliation, a commitment to agency orthodoxy, and an obligation to support agency policies and programs. They also have an obligation inherent in all civil servants to assist the Congress. It would seem to be difficult for both the witness and the congressional committee to keep clearly in mind the complications of such testimony, when witnesses are simultaneously expected to observe the canons of scientific objectivity, agency loyalty, and personal commitment.

In addition to their scientific obligations and affiliations, scientists cannot help bringing to an issue some measure of political value-judgment. Scientists vote and affiliate in political parties. They possess social values. They are members of one or more interest groups with objectives and programs. They have personal ambitions and favor particular national goals. In his own field, the scientist can usually learn to screen out these sources of bias, but in testifying more generally on scientific matters related to a political issue, the scientist may unwittingly testify mainly as a citizen rather than as an objective and disciplined expert. Even if he is summoned to testify as an expert, he is often invited to express his views as a citizen as well.

#### *Procedures and methodology used in the study*

On the basis of a survey of the literature of congressional decisions since World War II, 14 cases were selected for the study. The criteria for selection were that the cases should have evoked some debate, involved a definable issue on which a definable decision was reached, had substantial scientific or technological content, and presented technical difficulties. It was also important that the cases be broadly representative of subject areas, kinds of decision mechanism, and kinds of decisions. The following 14 cases were selected:

1. AD-X2 battery additive
2. The point IV program
3. Inclusion of the social sciences in the National Science Foundation
4. Camelot (applied social science research)
5. Mohole (National Science Foundation project in earth science)
6. The Test Ban Treaty
7. The Peace Corps
8. High energy physics
9. The Office of Coal Research
10. Distribution of the Salk vaccine

11. The Water Pollution Control Act of 1948
12. The Thalidomide case
13. The Insecticide, Fungicide, and Rodenticide Act of 1947
14. National criteria for water projects

The categories of scientific application level, project magnitude, and broad disciplines involved in the 14 cases are shown in the accompanying chart of Categories of Scientific Activity. The second chart indicates for the 14 cases the kinds of congressional action taken.

## CATEGORIES OF SCIENCE ACTIVITY

Ad-X2 battery additive, 1952-53  
 Point IV program, 1949-50  
 Social Sciences in National Science Foundation, 1945-46  
 Project Camelot review, 1965  
 History of Project Mohole, 1961-66  
 Senate hearings on Test Ban Treaty, 1963  
 Peace Corps legislation, 1960-61  
 High-energy physics sponsorship, 1954-68  
 Establishment of Office of Coal Research, 1956-60  
 Distribution of the Salk vaccine, 1955  
 Water Pollution Control Act, 1945-48  
 Thalidomide: Drug control legislation, 1959-62  
 Federal control of pesticides, 1946-47  
 Criteria for water projects, 1959-60

Basic research		X		X		X							
Applied research			X			X		X					X
Engineering application		X		X				X		X			X
Big Science				X		X							
Little science			X										X
Physical sciences				X		X							
Biomedical sciences									X	X	X	X	
Social sciences		X	X	X		X	X						



After the cases were selected, a literature search was conducted on each successive topic, and an overview of the case obtained. The central focus of the issue or case was identified. The external circumstances bearing on the case were examined—and the historical events leading up to the emergence of the issue, including the way in which the case was presented as an issue for resolution by the Congress. Then the various legislative proposals offered as alternative possible solutions were examined. An overview was obtained of the congressional hearings on the issue—including sometimes both investigative hearings and hearings on legislation. Examination was made of the qualifications of witnesses who gave testimony with scientific or technological content, and as to the kinds of information they provided. Attention was given to the ultimate structuring of the issue for final decision, to the decision itself, and to its implementation. Finally, an examination was made of subsequent developments relating to the decision, to provide a basis for assessing the effectiveness of the information process, the decision process, and the decision rendered, in each particular case.

*Scientific and political behavior in contrast*

The general impression gained from these cases is that the Congress expects the scientist to be positive, to deal in quantitative information, to supply authoritative answers to questions of fact and reliable recommendations on matters of policy. In point of fact, the scientist deals in probabilistic quantities and probabilistic facts; when he recommends political policy he steps beyond being a scientist because policy depends on considerations beyond the scope of science. As a professional man, the scientist accepts the obligations of his discipline—including the degree of self-restraint required by the scientist to hold himself within the bounds of his subject.

Scientists sometimes disagree as to the facts; when this happens, the matter is resolved by the accumulation of more facts to confirm or refute—to make the weight of the evidence adequately conclusive in one direction or another. Scientists frequently disagree as to the correct interpretation of the facts; when this happens the matter is resolved by further review of the rigorouslyness with which the data were collected, the examination of the data by additional scientists, and perhaps the accumulation of more data or a finer sensitivity and precision of observation of data.

To the scientist, factual quantitative relationships define general principles. These are not invented, but discovered. When the data are insufficient to narrow the possibilities down to a single principle, alternative hypotheses may be held. Scientists may search for further confirming evidence of each possible hypothesis, until all but one are eliminated. Scientists, being also human, are inclined to favor the hypothesis in which they are investing their effort. The discipline of science requires, however, that they recognize this bias, and be prepared to accept contrary evidence. This is a process that Dr. Jeffries' panel on battery additives of the National Academy of Sciences-National Research Council described as the test "in the marketplace of ideas." However, the ability to analyze scientific evidence and draw

valid conclusions is not evenly distributed among scientists. Those best qualified to judge tend to influence others. Yet those best qualified to judge can still sometimes err. Scientists do not decide a scientific question by voting on it: they decide by reaching a consensus. In short, science is no royal road to truth; it is, however, the only method of opening up, objectively, the secrets of nature. In the same way, the democratic process of political decisionmaking is imperfect and inefficient—yet it is the best way we know of allocating costs and values in a society. The difference between these two ways of mobilizing human society is an important one. It needs to be understood if the political world is to draw upon the scientific world for information and guidance.

## II. FIELDS OF CONGRESSIONAL CONCERN IN SCIENCE POLICY DECISIONS

The management of the political aspects of technology—or of the technological aspects of national policy—involves successive interactions of the technical and political systems. Political decisions involving technology deal with practical and specific issues of science and government that touch on the following 10 fields of concern:

(1) *Political identification of incompatibilities of man with his environment.*—It is hard to find any example of applied science that is not concerned with the goal of improving the compatibility of man with his environment. Incompatibilities are indicated by the evidences of human dissatisfactions and impairments of human well-being. One main response of the political system is to enlist science and technology to effect specific improvements.

(2) *Determination of political goals and their relative priorities, in improving the compatibility of man with his environment.*—There are always more needs and opportunities for feasible contributions of science and technology to the correction of environmental incompatibilities than society can marshal its resources to exploit. Some incompatibilities are more salient, severe, injurious, offensive, or unpopular than others. Decisions as to the priorities society will assign to their correction is a foremost task of the political system. These decisions may rank incompatibilities in order of (a) amounts of resources to be assigned to correcting them; (b) technical urgency of their correction, in terms of physical consequences of failure to do so and prospects of physical advantage of doing so; (c) political urgency of their correction, in terms of the publicly perceived and expressed need for corrective action.

(3) *The forecasting of technology.*—It is important for the political decisionmaker, as well as for the technological planner, to look ahead—to anticipate in various time frames what is likely to be technically feasible, what changes are likely in the pattern of technological applications, and what gaps can be foreseen in needed technology for the future.

(4) *Establishment of technological goals and priorities.*—In view of the fact that political priorities for correcting environmental incompatibilities are continually undergoing revision in response to the

changing condition of man, and because technological capabilities for modifying either man or his environment are continually evolving and changing, it becomes necessary to make frequent new determinations as to which specific tasks of science and technology are the most urgent and deserve the largest allocations of resources.

(5) *Establishment of related basic and supporting research goals and priorities.*—Every environmental incompatibility to be corrected requires initially the selection of a preferred course of action from various possible alternatives. In all cases, this selection calls for more research. In addition, further research is necessary to relate the problem to the broader environment, to secure detailed information about the nature and mechanisms of the incompatibility, and to refine technologically the course of action to correct it.

(6) *Applied technological system building.*—The effective application of technology in the solving of important social problems—the correcting of important environmental incompatibilities—suggests that a systematic approach be taken. The direct and indirect impacts of the preferred course of action need to be incorporated into a cost/effectiveness analysis. The exploitation of opportunities for additional benefits needs to be explored. The total technological package needs to be assembled conceptually and looked at as a complete, working entity.

(7) *Technological assessment.*—Before, during, and after the building of a technological system, it is necessary to identify and study the consequences of its operation. The objective is to improve the management of the total technological society, including the minimizing of consequences which are unintended, unanticipated, and unwanted. Assessment includes forecasting and prediction, retroactive evaluation, and current monitoring and analysis. Measurements involve non-economic, subjective values as well as direct, tangible quantifications. Above all, assessment requires that catastrophic consequences of each proposed new technology be foreseen and avoided before the new technology becomes entrenched in the socioeconomic complex of human organization.

(8) *Technological control.*—In the application of a new technological system, there are usually some effects that offer short-term economic benefits at the cost of serious long-term social disadvantages. Some effects may benefit one social group at disproportionately greater costs to another, or to society at large. Or the use of the system without certain explicit precautions may impose unacceptable risks on society. In order to exploit the benefits of the system, it is therefore necessary to establish and apply methods of directing, encouraging, or inhibiting aspects of its technology. Control may have a considerable scientific content. It may also need to apply the findings of the social sciences—the measurement of human satisfactions and dissatisfactions, the design and application of economic controls, and the objective characterizations of levels of human well-being.

(9) *Technological transfer.*—Successful introduction of a useful technology at one point in the social system can serve usefully as a practical test demonstration. It may generate a desire to have the

technology extended elsewhere. However, each region, State, and community has its own particularities, so that a technology that serves one region well may not be equally compatible with the economy, law, or customs of others. The successful transfer of technology may require considerable advance study of these obstacles; adjustments may be needed not only in the technology being transferred but also in the political or cultural climate of the region accepting the technology.

(10) *Management of technological obsolescence.*—A socioeconomic structure is built up in response to every major technological advance. When, eventually, an aging technology begins to be threatened by a more viable system, uncomfortable adjustments are imposed on the socioeconomic structure that is related to the aging technology. Obsolescence may imply the dismantling of a considerable system, the retirement of a large element of economic activity, the transfer of numbers of people to new employments, declining value of capital, and many changes in economic and social patterns. Science may be called on to ease the conversion, defer it, or find new uses for the obsoleted resources. Costs of introducing new technology sometimes omit taking account of the costs of liquidating the technology rendered obsolete in the process.

The following analytical matrix shows the relevance of the 14 cases studied for the 10 categories of policy factors of science and technology listed above. It should be recognized that the inclusion of a factor in the consideration of an issue carries no implication as to the quality of treatment. Also, in practice, the 10 factors have a considerable degree of interrelationship; the separate consideration of some of them in the management of an issue carries no implication as to the extent to which the different factors were articulated or harmonized. Those who wish to pursue one of the 10 categories through some of the 14 cases, in order to see the factor in operation, or to assess its importance, can identify from the chart which cases are appropriate to consult.

(The chart referred to follows:)



### III. THE TECHNICAL INFORMATION FUNCTION IN POLITICAL DECISION- MAKING: THE CASES SUMMARIZED

This section recapitulates briefly the essential features of the cases discussed at length in chapters 3 through 16.

#### CASE ONE: THE AD-X2 BATTERY ADDITIVE

*Background.*—Mismanaged storage batteries failed prematurely; scrapped batteries were in demand because of a shortage of lead.

*Problem.*—A vendor of an additive powder to prolong battery life was challenged by the Post Office Department and the Federal Trade Commission (FTC), based on laboratory findings by the National Bureau of Standards (NBS), that such additives had no merit.

*Access to Congress.*—The vendor appealed to many Members of Congress and to the Senate Select Committee on Small Business that he had been unfairly treated. He claimed that he had many satisfied customers, that NBS tests were unsound; and that battery manufacturers had inspired the campaign against him.

*The facts.*—The additive had no fixed composition. It was sold in a package containing instructions on battery management. There were many satisfied customers. NBS tests of the additive had yielded negative results; tests by other laboratories showed results either inconclusive or interpreted by the vendor as favorable. NBS staff members had been in direct communication with the National Better Business Bureau that circulated criticism of the additive, encouraged by battery manufacturers. One panel of scientists recommended NBS reorganization and an end to contacts with interested parties relative to testing of products. Another panel of scientists found NBS battery-testing procedures sound and the additive wanting in merit. The Post Office dropped the case against the vendor, and FTC ruled in his favor.

#### *Sources, kinds of technical information for Congress.*—

NBS Director: Principles and procedures in battery-additive testing, assessments of findings of tests, worthlessness of testimonials, varied composition of AD-X2, explanation of apparent differences in test results, and description of findings of various NBS tests of AD-X2.

Vendor: Personal narrative, literature prepared by his scientific consultant, test data from commercial laboratories, correspondence with NBS and others, testimonials, and repeat orders.

Vendor's salesman: Personal narrative.

Various technologists: Personal narrative descriptions of experience in using the additive (mainly favorable), and some test data.

MIT chemical engineer: Description of tests of AD-X2 (inconclusive and not interpreted), personal narrative, and comments on laboratory versus field tests.

Chemist (formerly vendor's consultant): No testimony; consultant to committee, and interpreted MIT tests as favorable to vendor's product in a draft report for the committee.

*Decision.*—No finding as to the merits of the additive; urged fair treatment of the vendor, taking into account the reasonable doubt generated by the testimonials.

*Decision locus.*—Committee and committee staff.

*Assessment.*—Committee review and pressure generated by it strengthened NBS research function and reduced its activity in the testing of consumer products. It ended direct NBS contacts with interested parties to tests. Also, it freed the vendor to merchandise his product.

*Commentary.*—Committee expertise was unequal to the task of scientific interpretation of voluminous and detailed technical test data. Relevance of much of the evidence was questionable. Limited jurisdiction of the committee obstructed consideration of the political question at stake: whether a Government research laboratory should be used to support regulation of advertising or protection of the consumer against fraud. The final result was that Government interest in such regulation was somewhat reduced.

#### CASE TWO: THE POINT IV PROGRAM

*Background.*—After World War II, U.S. policy called for positive efforts to encourage development of lagging economies to halt the spread of communism. Historically, U.S. experience with aid to developing countries had been meager.

*Problem.*—Although restoration of war-torn economies in Europe had been successful at moderate cost to the United States, the costs of effecting corresponding gains in the many lagging economies of the world in the same way would have been prohibitive; an alternative approach was needed.

*Access to Congress.*—President Truman, in his 1949 inaugural address, proposed a "bold new program" to export technological expertise to developing countries. Subsequently, State Department staff members prepared studies and plans to flesh out the President's proposal. These were submitted to Congress.

*The facts.*—Two basic concepts were evolved; one (mainly in the Senate) called for the loan of technologically trained individuals to developing countries, and the other (mainly in the House of Representatives) stressed the underwriting of private capital investment abroad. The program was represented as short range. Proposals in the Senate for background studies to lay the groundwork for a soundly based, long-range program were rejected. The assumption was generally accepted by both the Congress and the administration that the transfer of new technology to a developing country with a distinctly different culture offered no difficulties. It was also believed that no extensive research was needed to design a successful program of foreign aid to these countries.

#### *Sources, kinds of technical information for Congress.*—

State Department witnesses: outlines of 18 program areas, with estimated funds and personnel requirements; recipient countries identified.

Other administration witnesses: Reaffirmed expertise and availability of U.S. technicians with experience in overseas development.

Private businessmen: Opposed Government participation in foreign area economic development, asked for tax incentives or guarantees of private capital investment abroad, and offered assurances of their experience in foreign area development.

Religious mission witnesses: Offered participation by their experienced personnel.

Labor, trade, and agriculture organization witnesses: Offered assistance in manpower training programs; asked for development of overseas programs in labor-management relations and labor standards.

*Decision.*—Presidential proposal to encourage export of technology became main feature of the bill as passed. Congress added the important element of investment guarantees to encourage export of private investment capital. The measure was regarded as essentially exploratory; provision was made for annual oversight.

*Decision locus.*—Conference committee.

*Assessment.*—This was the first major legislation explicitly aimed at aid to developing countries. It set in motion a major activity of Government that has continued thereafter. It expected private business to undertake an important share of the program.

*Commentary.*—The problems presented by the President's proposal were not well thought through by the Administration. The Congress was not advised of important obstacles to effective transfer of technology, such as cultural resistance. Many specific problem areas were not explored. U.S. personnel resources and development expertise were overstated. The need for Government investment in transportation, communications, and other "social overhead" capital items was not recognized. Subsequent controversies arose over the implementation of the program. Some of the difficulties later encountered were foreseen in the professional literature while the aid measure was under legislative consideration.

#### CASE THREE: INCLUSION OF THE SOCIAL SCIENCES IN THE NATIONAL SCIENCE FOUNDATION (1946)

*Background.*—In World War II, applied science was mobilized in support of U.S. military strength. As the war ended, ways were sought to exploit this same expertise in support of peacetime programs of the Government. Postwar proposals were advanced for a Government institution to sponsor basic research as the seedbed of applied scientific creativity. The United States had traditionally been more apt in applied science than in basic; the concept was that a National Science Foundation (NSF) would support basic research directly, and thereby stimulate applied research indirectly. Initial studies of the concept were concerned with the physical, biological, and medical sciences. Later, the role of the social sciences came into question.

*Problem.*—Should the scope of the proposed NSF extend to the social sciences?

*Access to Congress.*—In his special message on reconversion, September 1945, President Truman requested creation of a science foundation. He explicitly recommended that the social sciences be included within its scope of interest.

*The facts.*—At the request of President Roosevelt, Director Vannevar Bush of the Office of Scientific Research and Development, a wartime scientific agency, had prepared a report on postwar science needs. This report, made public in July 1945, called for creation of an agency to sponsor basic research in peacetime. The Bush report

dealt with the physical, biological, and medical sciences; it did not discuss the social sciences. When the social science issue was raised by President Truman, the science community in general was not enthusiastic; inclusion of the social sciences within NSF was viewed as a possible obstacle to congressional acceptance of the NSF itself. The physical scientists appeared to favor a separate agency for the social and behavioral sciences. There was some sentiment in Congress for an omnibus scientific agency, and a bill to this effect was reported by the Senate subcommittee that had held hearings on the issue. However, after a conference of Senate leaders with Dr. Bush and some of his associates, the full committee dropped the mandatory social science provision in favor of a permissive arrangement. A revised bill incorporating the compromise was reported favorably. Amending proposals were beaten back in the Senate, and the House concurred. Although the legislation failed of enactment from 1946 until 1950 (for unrelated reasons), all subsequent bills reported or voted on during this period adhered to the compromise formula for the social sciences, including the bill that became law in 1950.

*Sources, kinds of technical information for Congress.—*

The President of the National Academy of Sciences opposed any Government agency to sponsor basic science; as an alternative, he favored tax credits to encourage expanded scientific effort by private industry.

Leading personalities in the disciplines of the physical, biological, and medical sciences were strongly favorable to creation of an agency to sponsor basic science; lukewarm on inclusion of the social sciences; questioned whether it was possible to define these as "sciences." (They lagged behind other sciences.)

Leading personalities in the social science disciplines suggested that because they lagged behind other sciences, the social sciences needed Government support most. They were needed to identify needs for new technology, and to assess the effects on society of technological change. There were many important "social inventions" but these rarely received the kinds of recognition or rewards given to inventors in the physical science disciplines.

Military spokesmen gave mild support for applied social sciences as useful in the development of hardware systems, and as important for the intelligence function of strategic assessment of foreign military capabilities.

*Decision.*—Social sciences were not to be included explicitly in the new NSF at the outset. The agency would be permitted to add other divisions (including one for the social sciences) when study by NSF established the need for them.

*Decision locus.*—Informal conference of leading physical scientists with chairmen of Senate Committees on Military Affairs and Commerce devised a compromise that was subsequently incorporated in a committee bill and reported. The plan was approved by the Senate by a record vote, and concurred in by the House in subsequent actions.

*Assessment.*—Congressional skepticism as to the scientific methodology of the social sciences had much to do with the decision. Testimony by the social scientists had apparently not relieved these uncertainties. The disciplines and the products of the applied social sciences

were not clearly distinguished from the routine considerations of the Congress itself. It was not made clear which was "science" and which was merely "commonsense." Physical scientists had more concrete evidence of the potential value of their contributions.

*Commentary.*—Mistrust of the social sciences still persists. However, NSF early resolved the question of the relevance of the disciplines in its program. Selective sponsorship of unmistakably "scientific" social science projects led to the expansion of this phase of NSF activity, and probably furthered its eventual formal endorsement by Congress. Initial congressional reservations also had a salutary effect on the social sciences themselves, resulting in an increase in the rigor of their methodology. Finally, the application of scientific methodologies to social problems in many expanding fields of Government activity stimulated the various social science disciplines. By 1969, the role of the social sciences was beginning to be acknowledged generally as important in the support of the other sciences, and in technological goal-setting, development, assessment, transfer, and control.

#### CASE FOUR: PROJECT CAMELOT

*Background.*—The foreign policy of the United States after World War II involved support for governments of developing countries threatened with forcible overthrow by internal insurgent forces led by Communist-trained cadres and aided by Communist-supplied munitions. U.S. military preparedness to assume these obligations required advance indication of areas likely to seek U.S. help.

*Problem.*—What policy should be established for Government use of applied social science outside of U.S. territory?

*Access to Congress.*—Newspaper revelation that military-sponsored research had resulted in criticism of the United States prompted congressional investigation by the House Committee on Foreign Affairs.

*The facts.*—Project Camelot was a study of political instability and potential for revolution in developing countries. It was administered by the special operations research office, (SORO), at The American University, with the cooperation of social scientists elsewhere. Disclosure of SORO's activities in Chile provoked criticism by public opinion media in that country. The U.S. Ambassador cabled home an inquiry about the project. The inquiry became public. Members of Congress expressed concern as to the potential for disruption of U.S. foreign policy inherent in the kind of operation represented by Camelot. Subsequently the issue was broadened into an examination by the Congress of the policy questions involved. In Congress, the issues were as to the need for interagency coordination, and the proper sponsorship of applied research in the social sciences abroad. Among the social scientists, the issues were as to the ethics of performing undisclosed research, military sponsorship, and the Government-science relationship.

*Sources, kinds of technical information for Congress.*—Military research administrators asserted the need for research in social and political conditions abroad. Spokesmen for the State Department attested to lack of interagency coordination.

*Decision.*—Camelot was canceled but the military need for sponsorship of such research was accepted as valid. Interagency coordination and formal guidelines for such research were established administratively.

*Decision locus.*—Congressional committee and executive branch, without enactment of legislation.

*Assessment.*—Pressures on the executive branch generated by committee interest in the episode prompted cancellation of the project. It also led to a strengthening of interagency coordination mechanisms, a debate among societies of social scientists on the ethics of performing classified Government research in sensitive areas, and formation of social science advisory groups in the National Academy of Sciences. Increased interest in the Congress regarding the uses of the social sciences in Government led to legislative proposals for a National Social Sciences Foundation. Supporters of the proposal said that if established, the proposed Foundation would “civilianize” federally sponsored social science research and give the social sciences the special visibility, support, and direction needed to promote rapid growth. Moreover, the Foundation could support social policy-oriented research, which was not supported elsewhere in the Government. However, an alternative approach was adopted. This was to instruct the National Science Foundation to accord the social sciences more emphasis, and to extend its sponsorship to some applied research projects. Supporters of the NSF alternative said that the existing NSF mechanism could valuably support growth of the social sciences. They held that the NSF already had experience in supporting such research and that the similarities in methodology and policy utilization between the social, physical, and biological sciences necessitated unified direction. Subsequently, NSF created a panel to assess the status and prospects of Federal utilization and support of the social sciences.

*Commentary.*—Criticism of the extent of interagency coordination evidenced by the management of Project Camelot focused congressional attention on the need for more direction and coordination in Government use of the social sciences. The outcome was probably beneficial to the relationship of the social sciences to Government.

#### CASE FIVE: MOHOLE

*Background.*—Disciplines within the physical sciences attracting Government sponsorship and able students were those with active, challenging, and creative research programs—particularly if they were also in competition for world leadership with Soviet scientists in similar disciplines.

*Problem.*—Whether a spectacular and costly program to drill to the deep underlying mantle of the earth, sponsored by the National Science Foundation (NSF), should be supported at the level recommended by NSF, slowed, redirected, or denied funds entirely.

*Access to Congress.*—The program was initially described to the House Committee on Merchant Marine and Fisheries, in May 1961. Thereafter it received periodic reviews as a part of NSF appropriation proceedings in the Senate and House Appropriation Committees.

*The facts.*—The plan was conceived in a meeting of geophysicists reviewing proposals to NSF for research projects seeking sponsorship. It was matured by a group on an ad hoc basis. Subsequently, the group affiliated as a committee within the National Academy of Sciences (NAS); it sought and obtained an NSF grant to conduct a feasibility test of deepwater drilling. The ultimate objective was to reach the heavy rock mantle underlying the earth's crust. The mantle is closest to the surface under the deep ocean so that drilling could best be performed through the ocean floor. Initial tests proved successful. The NAS group turned to studies of the next step, while NSF assumed management of the project. The NAS Mohole staff withdrew and formed an independent company. NSF chose Brown & Root, Inc., a Texas firm with marine and construction experience, to manage the Mohole project. The role of the original Mohole team at NAS diminished. Extension of a drilling capability to reach the earth's mantle gradually became questioned as beyond the existing state of the art of drilling hardware and materials. A contract was placed for construction of a large and costly drilling platform while development of drilling hardware continued. The NAS panel was reorganized; the new chairman declared that an intermediate drilling system should precede attempts to reach the mantle. The Office of the President continued to support the program. A review committee convened by NSF endorsed the plan to proceed directly to build the "ultimate" drilling platform, with which to develop "intermediate" drilling hardware. Estimated costs mounted steeply. Onset of hostilities in Vietnam began to impact on domestic expenditures. Political complications arose. Congressional support waned, especially in the House Committee on Appropriations. Finally, with evidence of disagreement among scientists as to the feasibility of the project and as to the scientific merit of the expressed objective, the Congress terminated its funding and the project was dropped. In the meantime, a consortium of universities and research foundations, with NSF support, had begun a substantial program to take core drillings from the ocean floors on a systematic basis at moderate depths.

*Sources, kinds of technical information for Congress.*—Information to Congress about the project was accumulated gradually between 1959 and 1966. Early testimony, by geophysicists, stressed feasibility and underestimated technical difficulty and costs. Subsequent testimony by NSF director and staff members represented the project as important, rewarding, and feasible basic research, proceeding in good order. There were many direct and indirect references, unconfirmed by evidence, to a "race to the mantle" involving U.S. and U.S.S.R. scientists. As opposition in Congress grew, information supplied by NSF, the contractor, the President's Science Adviser, the President of NAS, and interested academicians became more detailed about the scientific merits of the program. Particular emphasis was on the many disciplines that would benefit from discoveries expected from Mohole. It had an important place in the Nation's science program and was being watched by the rest of the scientific world.

*Decision.*—In the summer of 1966, Congress withheld further funding of the project.

*Decision locus.*—House Appropriations Committee; decision endorsed by Conference Committee on Appropriations and accepted by both Houses of Congress.

*Assessment.*—Mohole had floundered between objectives—generating controversy among the scientists themselves, weakening the case for the project, and raising questions about the validity of “big science” under Government sponsorship.

*Commentary.*—Early confusions resulting from the divided management of the project persisted; this may perhaps be attributed to the absence of close and continuous congressional scrutiny. The management goal of the contractor was too narrow to allow for a proper scope of research. Precisely why costs rose so steeply was never explained; original underestimates were explained away as having been made by enthusiastic scientists rather than by qualified engineers. Congressional opposition produced an increased but belated flow of substantiating information. A possible interpretation of the project is that “big science” needs to be insulated from the profit motive—that it is safer to draw upon consortia of universities or research foundations for the management of such projects. A stronger case for the project might have been made had the Congress insisted on having detailed plans for full exploitation of the projected hardware to yield all possible scientific values, and if the relevance of the design for such exploitation had been fully explained.

#### CASE SIX: THE TEST BAN TREATY

*Background.*—Numerous test explosions of atomic devices had increased the level of radioactivity in the atmosphere. The intensifying arms race, and the possibility of nuclear proliferation, prompted consideration of the utility of unrestricted development of weapons of mass destruction. Efforts at arms control agreement since 1946 had been unfruitful.

*Problem.*—Whether the Limited Nuclear Test Ban Treaty should be approved for ratification; whether the military-technological inhibitions prescribed in the treaty contained unacceptable risks, or were adequately overmatched by the expected political and diplomatic benefits of the treaty.

*Access to Congress.*—Members of the Senate had periodically volunteered views on test ban issues and had participated in deliberations with the Administration leading up to the treaty negotiations; however, the formal point of access was the President’s request for Senate approval of ratification of the treaty.

*The facts.*—The treaty was considered in the Foreign Relations Committee, while separate hearings were held by a subcommittee of the Senate Military Affairs Committee.

*Sources, kinds of technical information for Congress.*—Before the Foreign Relations Committee, the Secretary of State described the terms of the treaty, the Secretary of Defense gave assurances of its safety, the Chairman of the Atomic Energy Commission told the committee that much promising research would still be permitted under it, and the Joint Chiefs of Staff (JCS) found it acceptable, provided four sets of safeguards were maintained. A number of scientific wit-

nesses also testified, mostly in favor. Their main points were that violations of the treaty could be detected outside the violating country, that adequate offensive weapons could be developed without further testing of warheads, and that defensive weapons had small prospect of success. One opponent, Dr. Teller, said he opposed it because of its inhibiting effect on the development of defensive weapons, weapons testing, and peaceful uses of atomic explosives. In the hearings before the Military Affairs Subcommittee, witnesses were technical or military. Emphasis was on ways in which the treaty would impair prospects for future U.S. weapons development. In both sets of hearings the public apprehensions about fallout were discounted as exaggerated.

*Decision.*—After being favorably reported by the Foreign Relations Committee, the treaty was debated in the Senate for 3 weeks (during which the Military Affairs Subcommittee recommended against it), and was then approved by a vote of 80 to 19. However, during these proceedings, the opinion was expressed by several members that the approval of the treaty was a foregone conclusion.

*Decision locus.*—Formally, by the Senate.

*Assessment.*—Approval of the treaty may have paved the way for other arms agreements to ease international tensions and reduce the intensity of the arms race. It established criteria for acceptability of arms control agreements. Compliance probably resulted in some reduction in fallout. Implementation of the JCS safeguards required a substantial and continuing outlay.

*Commentary.*—The process of approving the treaty did not solve the problem of equating its effects on military technology with its effects on political or diplomatic status of the United States. It revealed obstacles in the obtaining of technological information through the filter of security classification. It also revealed the difficulty of obtaining concrete evidence of political and diplomatic benefits of an arms treaty.

#### CASE SEVEN: THE PEACE CORPS

*Background.*—Over the years there had been various proposals to enlist into voluntary public service the motivation and zeal of young people—especially recent college graduates. Foreign service was a particularly appealing feature.

*Problem.*—Could foreign aid programs be effectively supplemented by a minimum-budget program to send young volunteers abroad as technological missionaries to developing countries?

*Access to Congress.*—The Peace Corps proposal received initial impetus within Congress itself; later, after the Corps had been established by Executive Order, the President asked Congress to give it legislative sanction.

*The facts.*—The Peace Corps idea gathered currency and substance through numerous speeches by Members of Congress, studies by ad hoc panels at the request of candidate John F. Kennedy, and a research study requested in 1959 by Congress and performed by the Research Foundation at Colorado State University (CSU). It aroused much interest on many college campuses. An Executive Order of the new President created an agency to demonstrate the concept in actual operation, and also to supply information to Congress when the

President's request for Peace Corps legislation was taken up. Members of Congress later expressed gratification at the quality and quantity of this information. The new agency was ratified legislatively with little delay. It was generally successful and well regarded.

*Sources, kinds of technical information for Congress.*—To design the new social invention required information on preparation and training of volunteers for service, structure and policies of the supporting agency at home and in the field, relations and functions of volunteers in site countries, overall specifications for the program, plans for evaluation of its work, and reactions to the concept by the U.S. public and in interested countries. Sources of much of this information were Peace Corps Director and his staff (overall program, selection and training, identification of cultural obstacles to technology transfer and ways to overcome them, analysis of deficiency in middle-level technological manpower in site countries that volunteer personnel would correct); conferences organized by Representative Reuss (discussion of alternatives, review of detailed questions, indication of public consensus); CSU Research Foundation (need for research as basis of program, need for postaudit evaluation program; public consensus, views of leaders in potential site countries); other supporting materials (eyewitness accounts of training program given by Members of Congress, public opinion polls, newspaper editorials and articles, and extensive expressions of support within the college community).

*Decision.*—Enactment of legislation authorizing the Peace Corps as requested by the President; acknowledgement of its experimental nature; \$40 million appropriation authorization.

*Decision locus.*—The legislative process.

*Assessment.*—Favorable reception of the plan was helped by long-standing congressional interest in the subject and by the intensive program analysis made available. Some effort was made to examine cultural problems of technology transfer.

*Commentary.*—Acceptability was preconditioned by large favorable consensus. Extensive preparation had helped eliminate potential problems and increased its acceptability. The preparation, undertaken by a temporary agency, was aided by the findings of a preparatory study authorized by Congress. Current criticisms of the Peace Corps program have identified lack of needed research and evaluation capability, and the need to improve the technical training of volunteers who characteristically have liberal arts backgrounds. The former problem was foreseen during the 1961 hearings but not dealt with; the latter has evolved subsequently. It is possible that congressional oversight of Peace Corps operations in the future might benefit from evaluations made by social scientists and professional consultants in technical assistance.

#### CASE EIGHT: HIGH ENERGY PHYSICS

*Background.*—Enthusiasm for Government sponsorship of basic scientific research after World War II was high. Achievements in the field of applied atomic science, based on prewar basic research into the atomic nucleus, exemplified the potential values and importance of basic investigation.

*Problem.*—How to decide on the funding level to support costly basic research in high energy physics vis-a-vis research in other basic disciplines; in “big science” versus “little science”; and in basic versus applied science.

*Access to Congress.*—Periodically, reports on proposals for costly new research facilities in high energy physics emanated from the President’s Science Advisory Committee, and from advisory groups to the National Science Foundation and the Atomic Energy Commission. The Joint Committee on Atomic Energy maintained statutory surveillance over atomic matters, including most of the proposals for high energy research outlays.

*The facts.*—The discipline of high energy physics takes its name from the fact that penetration of the very short intranuclear region by fast-moving particles for research purposes requires very high energies. The projected particles need to have velocities measured in billions of electron volts. Accelerating particles to these energies calls for expensive installations. The cost of this program to the United States has risen from \$3.9 million in 1945 to more than \$150 million in 1968. The 200-Bev accelerator currently under construction at Weston, Ill., will cost an eventual \$280 million to build and some \$100 million a year to operate. Although the United States has achieved world leadership in high energy physics, interest elsewhere is keen, especially in the Soviet Union and Western Europe; any indication of a tapering off in the rate of increase of U.S. support is criticized by U.S. high energy physicists as relinquishment of this leadership. The field commands high world respect as a science, attracts some of the ablest research talent, and is asserted to deal with the most fundamental questions of science. The social return from the Government investment in this field is described in terms of (a) information about the ultimate composition of matter, (b) training of researchers in the skills of problem solving. Although no claims are advanced that discoveries will be economically or militarily important, the possibility is not completely discounted. One panel suggested that the United States and the Soviet Union might join forces on research in this area: President Johnson encouraged further exploration of ways to internationalize this science.

*Sources, kinds of technical information for Congress.*—In the presenting of a case to the Congress for Federal funding, no field of basic research has surpassed high energy physics in the volume, scope, variety of forms of presentation of data, detail of coverage, and number, and eminence of advocates. Notable use has been made of advisory panels to assemble information and technical recommendations for consideration. Reports of such panels generally call for stronger Government support for the discipline, emphasize its fundamental significance, stress the ripeness of the field for deeper penetration and important discoveries, suggest the ancillary benefits, outline schedules of additional hardware to be built, and assess the relative status of U.S. and foreign research.

*Decision.*—No major issue has arisen in the discipline that has called for a decisive action; decisionmaking has been evolutionary and gradual, with outlays increasing year by year without radical change in emphasis or direction.

*Decision locus.*—A key role is occupied by the Joint Committee on Atomic Energy, because of the continuity of its exposure to the tech-

nical briefings resulting from its statutory obligation for approving of budgets for atomic research.

*Assessment.*—The enthusiasm for this field among many eminent physicists is unmistakable. Congressional support has been maintained at an increasing rate. The quality of factual information about research programs, hardware requirements, time phasing of expansion, and expected results, has been consistently high, specific, and coherent. Few issues or dissents have occurred.

*Commentary.*—The indication is that as required energy levels of accelerators rise, funds allocated to the field will be concentrated in a declining number of installations, with fewer students, more specialized technologists, and a select group of highly qualified researchers. No ultimate goal can be foreseen; the quest appears endless, with costs continuing to rise. There is always the possibility that invention of some new principle of particle acceleration will render obsolete the large investments in existing research hardware. Members of a panel of scientists that discussed in 1965 the problem of setting the level of Government support for high energy physics took notice of the fact that every scientific discipline had a practically unlimited capacity to absorb funds, while the available resources for all remained finite. One paper proposed that the criteria of social gain resulting from basic research might become more relevant in the future.

#### CASE NINE: THE OFFICE OF COAL RESEARCH

*Background.*—U.S. mining and processing of coal as a source of thermal and electrical energy declined after 1947, in markets, employment, and numbers of producing units. Competing fossil fuels and atomic energy threatened to reduce its share of markets still further. Hard-hit coal-producing areas sought relief. Enormous reserves of coal remained available in the United States. Vigorous Government-sponsored applied research had made possible an abundance of atomic energy at competitive prices.

*Problem.*—To encourage applied research programs to improve the competitive position of coal in traditional markets, and to develop new economically viable uses for it.

*Access to Congress.*—The President's National Materials Policy (Paley) Commission had recommended development of a research plan for coal. Several other presidential commissions had also called for this action. Impetus within the Congress developed from implementation of a resolution by Representative Saylor, whose Pennsylvania constituency included many coal mining communities, for a congressional investigating committee on coal research.

*The facts.*—Representative Saylor's resolution authorized a special subcommittee of the House Committee on Interior and Insular Affairs to investigate the need for a coal research program and how to establish it. On the basis of a substantial investigation, the subcommittee recommended, August 1957, creation of an independent coal research and development commission to find new uses for coal, expand existing uses, reduce production and distribution costs, and aid smaller producers. An Office of Coal Research (OCR) was created in the Department of the Interior, by an act of July 1960. A year later, little action had been taken to implement the measure but by 1968 the agency had

placed 58 research contracts and was concentrating its efforts on developmental engineering of five pilot plant projects.

*Sources, kinds of technical information for Congress.*—From the Department of the Interior, four members of the staff of the Bureau of Mines, one from the U.S. Geological Survey, and the Assistant Secretary for Mineral Resources, provided historical and technical data, a research plan, and a survey of U.S. coal reserves. Field hearings drew testimony from 35 witnesses, including 13 coal producers, five spokesmen for local chambers of commerce, four officials of State governments, four representatives of academic institutions, three labor leaders, three coal association representatives, and an electric utility spokesman. At concluding hearings in Washington, staff members of the Bureau of Mines returned to testify again; other testimony was taken from three railroad officials and two spokesmen for the National Coal Association. The evidence and testimony indicated that the coal industry was financially ill equipped to fund its own research, that Federal research had not significantly improved coal marketing or product development, that there was a compelling need for a greatly expanded research and development program for the coal industry, and that Federal funding was necessary to sponsor it. The coal industry itself proposed an independent agency as the solution.

*Decision.*—Action was delayed in hope that the Department of the Interior would take action under its existing authority to expand research in coal utilization. When no such expansion occurred, a bill was passed by both Houses in 1959 to establish an independent agency for this purpose; it was vetoed by the President as administratively unsuitable, and in 1960 agreement was reached on a substitute measure.

*Decision locus.*—The legislative process, in response to a decision on inaction in the executive branch.

*Assessment.*—The Special Subcommittee on Coal Research provided the basic data on which the subsequent legislation depended. It presented a hypothesis as to the need for action, and challenged specialists in the administration to propose a program. From the regions most concerned, the subcommittee obtained sociological data, and opinions as to the political urgency of action. A broad spectrum of coal producers, consumers, and technological authorities identified the range of research actions that might be taken and the preferred form of management. Technologists in the industry and academic authorities engaged in coal research advised the subcommittee as to the scope and possible economic consequences of a vigorous program of applied research in coal. Finally, the subcommittee presented an opportunity for both the specialists of the Bureau of Mines and the association of the coal producers to react to the evidence and refine their own earlier testimony.

*Commentary.*—It is probably too early to draw any firm conclusions as to the contributions of OCR in meeting the objectives for the coal industry identified in 1957 by the special subcommittee. If enough of the pilot plant programs of the agency mature into economically practicable and successful industries, then it might become the prototype for other public investment in the large-scale application of science and technology to the resources of nature. Although contro-

versy arose during the hearings, and in subsequent reviews of the operation of OCR, as to whether applied research should be deliberately short range in character, subsequent experience suggests that all new technology matures on its own built-in time schedule, and that attempts to force it more quickly to exploitation tend to be costly and wasteful. Evidence is still not available that the impact of applied research can be beneficial to the coal industry in measurable terms.

#### CASE TEN: THE SALK VACCINE

*Background.*—Infantile paralysis or poliomyelitis afflicted increasing numbers of people in the early 1950's. Originally considered a childhood disease, it was attacking increasing numbers of young adults. Polio reached an annual peak in midsummer, sometimes approaching epidemic proportions. Prognosis tended to be increasingly unfavorable with increased age of victims. A national voluntary campaign, funded by the annual March of Dimes, had been maintained since the early 1930's to prevent and treat the disease, and rehabilitate crippled victims.

*Problem.*—The Congress was asked whether Government assistance should be provided to make a promising new polio vaccine available on a national basis before the midsummer peak in the disease. The double issue was raised: (1) how should the vaccine be distributed? (2) was it safe?

*Access to Congress.*—At first, the President recommended only a limited Federal role in distribution of the vaccine; later, upon receiving the recommendations of a Department of Health, Education, and Welfare (DHEW) National Advisory Committee, he submitted a revised proposal for Federal funding of distribution without a means test.

*The facts.*—Successful testing of the Salk vaccine had been announced in April 1955 over national television. It was declared safe and 60 to 90 percent effective as a preventive, on the basis of a national test involving nearly 2 million children in 44 States. The manner of announcement was unorthodox; usual medical procedure was to circulate reports about new medical experience or tests in the professional journals so as to bring professional criticism to bear systematically on claims of improved procedures. Immediately after the announcement of the test results, Secretary Hobby, of DHEW, announced that six manufacturers had been licensed to produce it. Dr. James Shannon, Assistant Director of the National Institutes of Health (NIH), recommended tightening of Public Health Service (PHS) safety standards for the new vaccine. Some of the vaccine was found to produce polio in those inoculated. All manufacturing and distribution was halted pending a hastily undertaken PHS investigation. The cause was eventually attributed to improper manufacturing methods used by one producer whose vaccine was withdrawn from the program. PHS tightened safety standards, and manufacturing and distribution were resumed. In the Congress, bills were introduced in May 1955, offering the alternatives of: grants to the States to aid in vaccine distribution, arrangements for Federal distribution, and regulatory controls on vaccine distribution and use. Three committees held hearings on the bills.

Initially, the question was as to Federal versus State distribution: later, in the House Commerce Committee, the question of vaccine safety was explored.

*Sources, kinds of technical information for Congress.*—The distribution issue was not considered in primarily technical terms. Most witnesses favored Federal aid to the States, to support State and local distribution. The witnesses were Government officials in DHEW, State health officers, and spokesmen for the American Medical Association. As the hearings progressed, evidence appeared of confusions within DHEW over the safety of a vaccine being offered for mass national distribution under Government sponsorship. In the Commerce Committee, a series of questions on this issue was raised in advance of hearings. These were discussed by physicians representing DHEW, supplemented by a DHEW report on the new vaccine. The strengthened PHS standards were described. Discussion addressed the relative safety of inactivated (Salk) versus attenuated (Sabin) vaccine. A panel of 13 leaders in virology and public health was organized for the subcommittee by the National Academy of Sciences: it was chaired by Dr. John R. Paul, of the Yale University School of Medicine. The panel explored the various aspects of safety of the Salk vaccine, and agreed that the highly virulent Mahoney strain should be dropped from the group of strains used to prepare it. The panel was divided as to whether the national program of distribution should be pursued. (Pressed for a vote, the panelists reluctantly divided as follows: for continuation, eight; for discontinuance, three; abstentions, three.) It was made clear that the use of any vaccine involved risk, that acceleration of the introduction of the Salk vaccine increased its risk, that any mass medical program had some statistical probability of a number of adverse reactions, and that a vaccine tended to become safer as experience accumulated about its production and use, and as results were reported of further research into its standardization and medical effects.

*Decision.*—Legislation was enacted to provide \$34.5 million to the States for the fiscal year 1956, to distribute vaccine without a means test. (The House Commerce Committee expressed satisfaction with PHS improvement of review and surveillance procedures.)

*Decision locus.*—There appeared to be a consensus on the general principle in committees and floor votes of both Senate and House.

*Assessment.*—The emergency, and congressional interest in it, generated pressures that caused a review of administrative organization and procedures within PHS dealing with certification of vaccines for national use. Subsequent introduction of other vaccines was handled with less confusion and more systematic provision for public safety.

*Commentary.*—The risk inherent in any new vaccine was intensified in the case of the Salk vaccine by the unorthodox manner of its announcement. Political pressure caused a further telescoping of the time sequence of its distribution, owing mainly to the short time before the annual peak incidence of the disease would occur. Risk was present regardless of whether or not the vaccine was used; but benefit could come only if it was used. Accordingly, the relative risks involved in use or nonuse became a political question, although one that only the medical profession was qualified to examine. The question remaining is whether the "adversary proceeding" of the panel discus-

sion helped the Congress to decide on its role. It did become evident that responsibility was primarily placed on the individual physician administering the vaccine, secondarily on State medical organizations that distributed it, thirdly on PHS for licensing its preparation, and finally on Congress for funding the distribution. Improved coordination of these shared responsibilities and an improved and increased concern by PHS for the technical details of assuring vaccine safety appear to have been among the outcomes of the case.

#### CASE ELEVEN: WATER POLLUTION CONTROL ACT, 1948

*Background.*—Population expansion and industrial growth had contributed to increased pollution in many U.S. waterways. Numerous bills had been introduced in Congress since 1900 to provide Federal anti-pollution control. None had passed. Demands for action came from conservationist groups, presidential study commissions, and the Public Health Service.

*Problem.*—To define the Federal role and determine the required level of effort in pollution control.

*Access to Congress.*—Representatives of State governments, in a 1946 national conference on pollution, prepared a recommended program which was the basis of a legislative proposal introduced in 1947 by Senators Barkley and Taft; it proposed to extend loans and grants to States and municipalities for pollution control programs, and to authorize the U.S. Surgeon General to promulgate regulatory standards and to exercise enforcement.

*The facts.*—The issues were technical, economic, and political. The technical issue concerned the relation of pollution to public health and welfare, the measurement of pollution, establishment of pollution standards, and the technology of reducing pollution. The economic issue concerned the allocation of costs and benefits of pollution reduction in the light of costs and benefits from waterway uses that caused pollution. The political issues involved the question of Federal versus State jurisdiction, the right to pollute, and the assignment of Federal agency responsibility. Hearings were held on these matters by the Public Works Committees of the House and Senate.

*Sources, kinds of technical information for Congress.*—The debate on pollution legislation reflected long-held positions. Interests that might be considered targets of regulatory control, or who would be expected to bear the costs of research and abatement action, opposed the legislation. Their opposition cited States' rights, satisfaction with existing State legislation, freedom of restraint of industrial expansion, natural riparian rights, and alleged harmlessness or virtues of particular pollutants. Advocates of Federal control cited social and economic consequences of pollution, public health hazards, and the need for protection of esthetic and recreational values. Particular positions taken were:

Public Health Service: Descriptive and statistical material on health hazards, dislocation of industry, and ineffectiveness of State laws. Analysis of legislation needed and long-term costs.

Izaak Walton League (a conservationist group): called for even more stringent legislation based on comprehensive river basin planning.

Local, State public health and sanitation officials: While citing pollution hazards, many felt States already had ample statutory responsibility to ameliorate the problem; others felt local costs would be prohibitive.

Federal Works Agency: Felt the problem could best be handled as an engineering problem under joint jurisdiction of the Public Health Service and the Federal Works Agency; Also recommended that implementation of antipollution program await depression cycle in the economy.

Oil, paper pulp, coal, and mining interests: Cited their own efforts to solve the problem; impossibility of solving the problem; value of some pollutants for the environment and prohibitive costs of industrial efforts to clean up effluent.

*Decision.*—Enactment of experimental and temporary legislation that declared pollution a national problem, encouraged interstate cooperation, gave planning aid to States and municipalities, and established a Federal research facility.

*Decision locus.*—The two Public Works Committees, the legislative process, and Presidential acquiescence (withheld on a previous occasion).

*Assessment.*—The 1948 pollution control legislation was the first Federal venture into this field. It contained compromise arrangements to satisfy the claims of industrial and States rights opponents. Nevertheless it established the precedent of Federal responsibility in the field. In passing the act, the Congress made explicit its intention that further legislative action would be forthcoming as the need was demonstrated.

*Commentary.*—Probably the most significant feature resulting from the 1948 act was the assurance that thenceforth a Federal agency would share jurisdiction, and be available to advise the Congress on the status and needs of national pollution abatement measures. The 1948 legislation was concededly tentative, but it contained a potential for growth, which the Congress subsequently demonstrated by making the Federal function permanent in 1956, and by expanding its role still further in 1961, 1965, and 1966.

#### CASE TWELVE: THALIDOMIDE

*Background.*—Advances in synthetic organic chemistry before and during World War II had led to a great proliferation of potent drugs. The procedures for testing new drugs were elaborate and costly. The market for any particular medication was limited by the numbers of persons whose ailment it could ease. New drugs for many purposes were causing a high rate of obsolescence in drugs generally. Exploiting such a perishable market required aggressive marketing and a short-range pricing policy. The success of a campaign to market any single drug might depend on the length of time between its approval by the Food and Drug Administration (FDA), and its becoming obsolete. Maximization of return could be achieved by setting the price at a high level; by deferring the obsolescence of the drug by further innovation, packaging, or combination; by telescoping the preparatory marketing by combining it with the testing phase; by es-

tablishing habits of brand loyalty among prescribing physicians; and by dividing up the drug specialities among producers so that in each category of medications only a small number competed. It was a peculiarity of the practice of medicine that expenditures for drugs were made by the patient but selection was made by the physician.

*Problem.*—To decide whether (and what kind of) Federal control of the drug industry, its commerce, and its products, should be imposed for the protection of the public as patients or consumers.

*Access to Congress.*—Senator Kefauver took the initiative to organize a subcommittee investigation of administered prices in various industries, including the production of prescription drugs. The investigation afforded opportunity for expressions of professional criticism of existing standards of drug safety and testing, and led to legislative proposals for reform in these areas.

*The facts.*—Testimony about the drug industry and drug control collected by Senator Kefauver's subcommittee, 1959-61, took some 8,000 pages of testimony and exhibits; hearings on the resultant drug bill, 1961-62, took another 4,000 pages. The investigation was spurred by an initial observation that the markup of prescription drugs was considerable. The subcommittee reported that drug prices were unreasonably high, that patents were used to support monopolistic positions, that profits in the industry were exorbitant, that the proprietary drug industry was heavily commercialized, that the use of generic names of drugs would benefit purchasers, and that advertising of drugs was costly, voluminous, unreliable, time consuming, and encouraged numerous abuses. A bill aimed at economic aspects of the drug industry was introduced by Senator Kefauver. A number of other bills were also introduced, including one in the House, with President Kennedy's endorsement. The President's main concern was the safety aspect. Drug safety became a headline issue, July 15, 1962, with the appearance of a sensational news account describing the disastrous side effects of a German sedative, thalidomide, and the fact that it had been kept from the U.S. market by the skepticism and stubbornness" of a "heroine" in FDA. The emotional impact of the story was maintained by followup accounts of experiences with thalidomide. The story was credited generally with motivating passage of drug reform legislation, which the President approved, October 10.

*Sources, kinds of technical information for Congress.*—A crushing weight of testimony accumulated in congressional committees on drug problems. Witnesses spoke for the FDA, the American Medical Association (AMA), drug manufacturers, and pharmacology departments in hospitals and medical schools. AMA spokesmen stressed the capability and value of medical self-regulation; the medical school pharmacologists questioned the ability of the individual physician to derive proper guidance from the voluminous and unselective drug literature; drug manufacturing representatives defended their economic structures but agreed as to the desirability of closer regulation of drugs in the interest of public safety. The thalidomide episode was not touched upon in either the investigative or legislative hearings by Senator Kefauver's subcommittee; in the House, Representative Celler obtained detailed testimony from Dr. Helen B. Taussig about

the impact of the drug on German infants, during testimony on drug reform bills before the House Judiciary Committee. However, Dr. Taussig's appearance attracted no publicity at the time. Subsequently, the thalidomide story was influential while the bills were awaiting floor action in both Houses.

*Decision.*—Passage of Drug Amendments of 1962.

*Decision locus.*—This was a process involving successive stages of negotiation: For the inclusion of drugs in the study of administered prices; between the industry and Senator Kefauver as to the substance of the proposed legislation; between the administration and Senator Kefauver as to the relative emphasis on economics and safety; within the Senate and the House as to the extent of regulation toward both sets of objectives; and, finally, in conference on adjustment of differences between Senate and House versions. (After the thalidomide story gained national prominence there appeared to be general agreement that some sort of legislation should be adopted.)

*Assessment.*—Despite the enormous volume of testimony on drug legislation, 1959–62, and on management of Government controls and drug information, 1962–64, it is evident that many issues remain unresolved. Although much committee staff work was done in anticipation of the initial investigation, the shift in emphasis from economic control to medical safety made it largely irrelevant. The qualifications of the staff in economic analysis were excellent but the issue was medical. The medical safety question was not well structured, and the aspects of it that were amenable to legislative reform or suitable for congressional investigation were not defined.

*Commentary.*—The highly technical and complicated nature of drug regulation suggests that there are three prerequisites to effective congressional action in this field: (1) a competent professional staff with specialized knowledge of pharmacology to identify the questions to be examined and analyze the evidence turned up, (2) a continuing committee specially devoted to the subject and gradually building a solid expertise in it, (3) the periodic use of panels of professional pharmacological advisers representing a range of different interests and views to react with each other in the presence of the committee. It is also apparent that there needs to be a careful division of labor between Members of Congress engaged in formulating policy in this field and members of the medical profession, whether in Government or not, who are engaged in the endless task of improving the technology of medical practice, development of medication, information evaluation, and other specialized functions.

#### CASE THIRTEEN: FEDERAL PESTICIDE CONTROL, 1947

*Background.*—Scientific farming in the United States required crop specialization, a favorable environment for the multiplication of pests. Legislation in 1910 had provided Federal standards of effectiveness of commercial poisons for farm use. Developments of synthetic organic chemistry, by 1946, had produced many new pesticides of unprecedented effectiveness and low cost. These were highly beneficial in controlling agricultural pests and carriers of epidemic diseases. They replaced dangerous arsenical compounds previously used. But the simple quality control arrangements previously judged adequate for a

small number of mineral poisons were incapable of assuring quality or safety in the use of the numerous pesticides entering the market by 1946.

*Problem.*—Federal control to assure quality and safety of commercial pesticides.

*Access to Congress.*—Consultations of staff members of the Department of Agriculture (USDA) with the House Agriculture Committee, after consultations by USDA with the pesticide manufacturing industry and pesticide users.

*The facts.*—A bill was introduced and hearings held, in early 1946, "to regulate the marketing of economic poisons and devices." There was no controversy over the bill. It was favored by the industry and by farm groups. No chamber action was taken that year and the bill was again introduced in 1947. The second year, testimony was brief, the bill was favorably reported, was passed without debate in both Houses of Congress, and became law.

*Sources, kinds of technical information for Congress.*—In hearings before the House Agriculture Committee testimony was presented by spokesmen for the Production and Marketing Administration of USDA and the Fish and Wildlife Administration of the Department of the Interior; by spokesmen for the manufacturing industry; and by farm organizations and representatives of State departments of agriculture. The testimony dealt only with minor technical issues; there was general agreement on the desirability of the legislation. The questions as to (a) the hazards of residual quantities of pesticides on foods, and (b) the impact of long-lived, broad-band, high-potency pesticides on the ecology were virtually untouched.

*Decision.*—The 1947 Act provided for Federal controls over commerce in pesticides including registration of economic poisons before their introduction into commerce; mandatory labeling of poisons, including instructions for safe use; and reports on delivery, movement or inventory of economic poisons.

*Decision locus.*—House Committee on Agriculture, endorsed by chamber actions.

*Assessment.*—The administrative arrangements provided under the Insecticide, Fungicide, and Rodenticide Act of 1947 were expanded in scope by subsequent amendment, and supplemented by creation of an interdepartmental coordinating committee; a separate congressional action provided for control of pesticide residues on foods. With these tools, the agencies concerned were able to exercise control over pesticides in use by 1969.

*Commentary.*—Evidence of the far-reaching, complicated, and delayed effects of long-lived ("non-bio-degradable") organic insecticides (especially DDT) on wild species continued to accumulate. A powerful indictment of the effects of the new pesticides on the natural ecology appeared in 1962. Protracted investigation by several congressional committees led to the general conclusion that pesticides were both essential and hazardous. Research had been needed to place pesticides in proper perspective—as to their complicated and indirect effects on nature. This research had been lacking in 1947. Existence of a warning system to assess this research and the technology concerned, to determine Government policy, would have enabled the orderly development of controls. By 1969 it was becoming apparent

that pesticides were only one of many additions by man to degrade his environment.

#### CASE FOURTEEN: CRITERIA FOR WATER PROJECTS

*Background.*—Water is broadly involved with human activity as an essential to life. Government concern with water began early, and progressed successively to include transportation, flood control, irrigation, electric power generation, recreation, municipal water supply, and wildlife protection. Decisions became more complex as Government water functions and water project goals multiplied. Interest in water policy became differentiated at local, State, regional, and national levels. Controversies arose over priorities of use as between agriculture and industry, over priority of function of competing Government agencies, over State versus National jurisdiction, over the relative claims of competing regions seeking development, and over the relative merits of conflicting interests of economic groups. Many presidential, agency, and congressional studies were performed in an attempt to define national policy in this field. By 1959 it became apparent that a fresh approach was required.

*Problem.*—The establishment of technically sound and politically acceptable criteria for the allocation of funds to the construction of water projects. (This problem was subsequently interpreted as: Construction of a system of research, planning, and coordination to develop information to facilitate the allocation of funds to water projects on a technically sound, politically acceptable basis.)

*Access to Congress.*—Congressional interest in water projects and policy has been sustained. Whether primacy in water policy belonged in the legislature or with the executive branch sparked lively controversy in the 1950's. A succession of congressional policy studies led to the adoption in April 1959, of a Senate resolution creating a Select Committee on National Water Resources, to undertake a more definitive study of water policy for a 20-year future period, to maximize uses of water in the national interest.

*The facts.*—Various landmarks in the evolution of national water policy after 1920 included the concept of the multiple-purpose project (Hoover Dam), the total river basin approach (TVA), comprehensive national development of water resources (the National Resources Committee and the President's Water Policy Commission), standardized criteria of water plans (the second Hoover Commission and the Green Book), and close cost/benefit allocation of Federal capital investment in water projects (Bureau of the Budget Circular A-47). Congressional committees periodically sought to inform themselves on water policy issues. The House Committee on Interior and Insular Affairs in 1951 attempted to have the Bureau of the Budget explain the significance of the reports of the President's Water Policy Commission. The House Committee on Public Works explored the methods of cost/benefit analysis and allocation in connection with water project planning in 1952. An investigation of water project criteria was jointly undertaken in the Senate Committees on Public Works and Interior and Insular Affairs, in 1956-57. This led to a Senate resolution, in 1958, calling for a liberalization of standards governing the selection and approval of water projects. Members in both Houses of Congress

were at odds with the administration on water policy during much of the period 1952-60. Partly to lay to rest this conflict, a vigorous investigative effort was set underway by Senate Resolution 48 of the 86th Congress, in April 1959. The data and findings resulting from this action contributed significantly to subsequent development of water legislation in the Congress.

*Sources, kinds of technical information for Congress.*—The Select Committee on National Water Resources, pursuant to Senate Resolution 48, was made up of 17 members drawn from four standing committees, supported by a staff of four qualified professionals. It was also supported by a research foundation specializing in natural resources policy. The committee called upon professional personnel in Government departments and agencies, and on State and private advisory resources. A total of 92 reports were contributed to the committee by these outside resources. The committee held many field hearings, and also hearings in Washington, D.C. A total of 961 witnesses testified. Upon completion of its information-gathering phase, the staff in consultation with the committee spent more than 6 months in analyzing the findings and preparing the final report.

*Decision.*—The recommendations of the select committee covered five broad policy areas, each supported by detailed program specifications. The five basic recommendations were:

- (1) A national effort to prepare and keep up-to-date, comprehensive, basin development plans for all major U.S. rivers;
- (2) Aid to States for long-range planning of water development;
- (3) Coordinated Federal research on water utilization;
- (4) Biennial supply/demand analyses of U.S. water resources; and
- (5) Measures to improve efficiency of water development and use.

*Assessment.*—Over the next 8 years, a concerted legislative effort resulted, in which action was taken on all of these recommendations. The President promulgated liberalized standards for water resource projects; research in desalting technology was stepped up; new water pollution control legislation was passed; and action was taken in the Water Research Act of 1964, the Water Resources Planning Act of 1965, and the National Water Commission Act of 1968.

*Commentary.*—The outgrowth of the recommendations of the select committee was that the Congress developed authoritative sources of data, mechanisms for generating planning of water projects and use at all jurisdictional levels with the effort coordinated within each basin. Moreover, the effort was coordinated nationally among all basins on the basis of national criteria of urgency of need. The effect was to rationalize the decision process. At the same time, research emphasis was provided to expand the availability of water and to intensify its utility. Political criteria would still be applied in the ultimate congressional decisionmaking process, in which funds would be appropriated for specific basin projects and programs. But to facilitate this process, the Congress had assured itself of a continuing flow of reliable, coordinated and comprehensive technical data that reconciled the interests of all parties.

#### IV. SOME ELEMENTS OF TECHNICAL INFORMATION FOR POLITICAL DECISIONMAKING

This section offers some observations drawn from the case studies that may provide insights into the problem of securing and applying technical information bearing on political issues.

##### *Priority of a technical issue embedded in a political issue*

In the management of a political issue with substantial scientific or technological content, the political issue is always larger in scope than the scientific question within it. In principle, the scientific question needs to be dealt with first. It is important that the scientific question or issue be carefully framed so that the answer to it provides a useful and significant piece of evidence for guidance in the consideration of the broader political issue.

All of the cases examined in this study involved this situation. As a general rule, when the technical question was not firmly resolved in advance, the political resolution of the broader issue tended to be defective. For example, the Point IV decision would have produced more effective and durable results had the technical problem of technology transfer and the anthropological problem of technology acceptance first been defined and studied. The Mohole project would have been subjected to more effective review, had the nature of its engineering risk and the limitations of the existing state of the art been identified for the Congress at the outset. In the development of the Office of Coal Research, considerable attention was given to the kinds of research that the industry recommended, but no attempt was made to translate these into potential future specific impacts on the markets or technology of coal. In the Salk vaccine case, the primary problem was distribution, but not until the technical issue of safety was resolved could the distribution issue be resolved.

The important point is that the identification of a technical issue embedded in a political issue is frequently difficult. It is easier to see the technical issue or problem afterwards; but at the time it can be very difficult to detect. In the AD-X2 hearing, the underlying technical issue seems to have been the use of NBS to test consumer products for quality and truth in advertising: Could a great national laboratory perform routine testing to support Government regulations for consumer protection without impairing the quality of its scientific research program? Another important technical question was to the comparative validity of laboratory tests versus user testimonials. The broader political issue was the general question of protection of the consumer versus the right of the entrepreneur to meet the test of the marketplace. All the technical details about the chemistry and testing of the battery additive were irrelevant to the political problem of consumer protection versus the rights of business enterprises to market an unproved product that offered no positive hazard to the consumer and might be beneficial. The committee could not knowledgeably make a finding as to the technical merits of the additive, nor did it do so, although it tried. But the investment of time and attention in this question diverted the committee from the questions that were germane to its function, and to the underlying political issue of Government regulatory policy and procedures.

In the case of the high-energy physics program, an understanding of the goals, plans, and methodology of the discipline was essential to reasonable decisionmaking in the allocation of research support. The Joint Committee on Atomic Energy needed to be satisfied that an orderly process of planning had been carried out, and what the future costs were likely to be. However, jurisdictional situation in this case afforded no opportunity for the opposition to be heard. To the extent that funds invested in basic research in high-energy physics were taken from other disciplines, the competing claims of these other disciplines could not be brought to bear on the committee's decisions.

*Some obstacles to the receiving by Congress of technical information*

There seems to be a kind of natural law that few politicians are scientists and few scientists are politicians. Since, in congressional investigations, they tend to be on opposite sides of the table, it may be helpful to identify some of the obstacles to the flow of communications from one group to the other. Reference was made earlier to congressional difficulties with scientific jargon and terms of measurement. There are many other obstacles.

*Hypotheses*

One example is the different treatment given to hypotheses. Scientific discipline requires that unproved generalizations, or hypotheses, be rigorously identified and evidence marshaled for and against them. The degree or probability that a hypothesis is valid needs to be shown. Only when the weight of supporting evidence is overwhelming does the hypothesis become a law or general principle. On the other hand, in the field of political realities it is necessary to operate on the basis of many unproved hypotheses, and to treat them as valid. However, when a politician needs to resolve a technical issue in order to come to grips with a political issue, his methodology needs to be compatible with the canons of science. There were a number of examples observed in the study in which the acceptance as valid of unproved hypotheses in technical areas led to unsatisfactory decisions. Some of these were:

User experience is a valid test of the merit of a product.

A developing economy will readily accept unfamiliar, advanced technology.

The study of human behavior cannot be approached scientifically.

Investment in applied research automatically yields quick, tangible benefits.

Environmental pollution can be abated by qualitative measures.

It would appear almost axiomatic that when a large Government program is being formulated on the basis of a hypothesis, a foremost technical question is to identify, challenge, and confirm the hypothesis.

*Sensationalism*

Another obstacle concerns the relationship of a technical issue to sensationalism. Frequently, issues with a technical content come to the attention of the Congress as a result of (or in connection with) a

sensational news story, event, or episode. Among the cases studied, a number had this feature. They were:

- AD-X2 (journalist's story).
- Camelot (newspaper disclosure).
- Mohole (the initial success).
- Salk vaccine (the television announcement).
- Thalidomide (newspaper story).
- Pesticide Controversy (Rachel Carson's book).

The effects of sensationalism on the congressional decision process are mixed. Sensationalism has a number of valuable consequences. For example, it sets in motion a series of policy and procedural reviews which usually result in an administrative strengthening of the system of government. It makes visible to the public and the Congress some defect that has previously escaped attention, and motivates prompt corrective action. On the other hand, sensationalism has many disadvantages. It tends to represent a defect in terms out of proportion to the fact. It is one sided. It generates an emotional reaction when sometimes what is needed is a calm and deliberate examination of hard evidence. It tends to create a demand for hasty action when a better answer might lie in further study of the problem. It may stress the consequences of the defect, and thereby obscure the important technical issue of the causes. It attracts many new participants into the decision process, who may be highly motivated by the situation, but have not had long previous experience with the technical circumstances involved, and lack the background for sound decisionmaking.

#### *Outstanding Personalities as Witnesses*

Similar in effect is the selection of technical witnesses on the basis of their recognition by the public as outstanding or sensational personalities. Such witnesses serve the valuable function of making visible the issue that is the subject of their testimony. Witnesses are sometimes called upon to make frequent appearances, because of their recognized eminence, high quality of judgment and experience, and intellectual versatility; such witnesses win the confidence of the Congress and facilitate the decision process. On the other hand, an outstanding personality may have the effect of diverting attention from the technical issue. It is natural for witnesses to try to be helpful on an issue even when their qualifications lie in another direction. The judgment of a senior scientist may be of foremost quality, but his experience with the technical issue at hand may be remote in time or subject matter. As senior scientists broaden their contacts and fields of interest, there is a tendency for perspective and generalization to grow at the expense of familiarity with detail and depth of specialization.

#### *A List of "Near-Impossibilities"*

Some kinds of technical information sought by Members of Congress in the cases studied are peculiarly unavailable. The interface between science and politics contains a number of questions that are impossible or nearly impossible to answer in technical terms. For example:

Proving that some elemental feature or fact is unimportant, inoperative, or harmless;

Proving that a particular field of basic research will be devoid of useful applications in the future;

Attaching economic values to the results of future basic research;

Equating dollar values with social or esthetic values;

Equating the cost/effectiveness of basic and applied researches;

Identifying the total cost/benefit factors of a new or future technological application;

Identifying all impacts of a given technology on the environment;

Justifying a particular ceiling on level of scientific effort; and

Eliminating all possibility of error, so as to achieve a 100-percent probability.

Much effort can be consumed unfruitfully in the quest for answers to the questions implied in this list, or others of like nature. In particular, the last item on the list presents frequent difficulties. Science does not deal in certainties but in probabilities. Scientific relationships are relative, and are usually accompanied by a range of probability or a margin of error. Thus, when Dr. Astin, Director of the National Bureau of Standards, was asked, in the AD-X2 case, whether the NBS analysis of the battery additive had been sufficiently accurate to confirm the nonexistence of a beneficial mystery ingredient, he replied in probabilistic terms that he thought it was. The chance of such an ingredient existing at all was small; the chance that NBS had failed to detect it in an analysis was small; the chance that even if such an ingredient existed and was beneficial, that its existence in undetectable quantity would be significantly beneficial, was small; and the chance that if it did exist and was beneficial even in unmeasurable quantities, that NBS would be unable to detect the beneficial effect, was small. The four improbabilities, multiplied together, made for an extremely small, ultimate possibility. But not a certainty.

#### *Technical Differences of Opinion*

A recurring problem is the situation in which witnesses with outstanding technical qualifications take opposite sides on a technical issue. Members of Congress experience an understandable sense of frustration when they find themselves obliged, as in the Test Ban Treaty case, to decide on a complex technical matter that ranged outstanding scientists against each other. The problem in that case was that the two sets of scientists favored two conflicting hypotheses. Those opposed to the treaty supported the hypothesis that further scientific investigation would reveal phenomena that would enable development of a workable defense against ballistic missiles. Those favoring the treaty supported the hypothesis that the technical problem of overcoming a defensive technology was inherently much simpler and less costly than designing a defense—and that therefore the offense would always keep well ahead of the defense. While there may be many non-scientific reasons for a bias in a technical witness, there are many occasions on which the witnesses disagree over unproved—and sometimes unprovable—scientific judgment. In such cases, the disagreement itself is illuminating.

#### *Administration Versus Congress*

Mention was made of the particular difficulty of screening out bias of technical civil servants who come before congressional committees

as proponents of technical legislation or programs sought by the executive branch. It is important to distinguish between cases in which the Congress took the initiative on the issue and cases in which the initiative came from the Administration. In four cases (Camelot, Office of Coal Research, Thalidomide, water project criteria), the Congress took the initiative over some degree of resistance by the executive branch; in each of these cases, a very searching inquiry developed with the taking of voluminous testimony, with many witnesses, and much useful information. In four cases (Point IV, the Test Ban Treaty, high-energy physics, pesticide bill), the executive branch took the initiative, with the presentation of a legislative package; in these cases, there was a tendency for the Congress to raise fewer questions. Testimony did not always resolve the technical issue involved.

#### V. TECHNICAL INFORMATION-GATHERING METHODOLOGIES USEFUL FOR THE CONGRESS

Congressional decisionmaking on political issues that have a substantial scientific or technological content, generally requires that a technical issue be resolved first in order to provide the basis for dealing with the political issue. To resolve the technical issue requires that it be: (a) Identified and defined, (b) separated out from the broader political issue, (c) analyzed to determine subsidiary technical questions, (d) structured for information-gathering, (e) illuminated by factual information, and (f) analyzed in the light of the information.

Once the issue has been processed by steps (a) through (d) a search is then made for persons with sound qualifications to provide the needed information. The information can be elicited from these persons in many ways:

By staff literature searches and abstracting of previously recorded expert opinion and factual evidence;

By interrogation in unstructured hearings;

By communications and prepared statements;

By submitting lists of questions to be answered in writing or in person;

By bringing together persons of conflicting views to engage in a dialog, either structured by advance questions or by a moderator, or unstructured and relying on inadvertent development of a controversy.

By assembling a group of persons with various qualifications to testify in sequence, with opportunity for subsequent rebuttals;

By assembling a panel or roundtable discussion of persons with a variety of views, to discuss prepared questions, a provocative, staff-written paper, an outline of issues, etc.;

By contracting for a prepared study in depth;

By arranging for a panel or working group representing a learned society or professional society to examine an issue, a set of questions, or a problem, and to prepare an analysis with recommendations.

The accompanying checklist indicates illustrative information sources tapped by congressional committees in connection with the 14 cases studied; it also indicates some devices and techniques employed by the committees in information gathering.

Congressional information sources on technical issues 1		AD-X2 battery additive, 1952-53	Point IV program, 1949-50	Social Sciences in National Science Foundation, 1945-46	Project Camelot review, 1965	History of Project Mohole, 1961-66	Senate hearings on Test Ban Treaty, 1963	Peace Corps legislation, 1960-61	High-energy physics sponsorship, 1954-68	Establishment of Office of Coal Research, 1956-60	Distribution of the Salk vaccine, 1955	Water Pollution Control Act, 1945-48	Thalidomide: Drug control legislation, 1959-62	Federal control of pesticides, 1946-47	Criteria for water projects, 1959-60
<b>A. Congressional initiatives:</b>															
1. Member study.....		X													
2. Committee staff study.....				X	X										
3. LRS studies.....															
4. GAO study.....															
5. Ad hoc review of special problem.....		X	X												
6. Expert consultant to committee or member.....		X													
7. Field investigation by committee or committee staff.....															
<b>B. Information supplied by executive branch:</b>															
1. PSAC reports.....															
2. Statutory reports from agencies.....															
3. Reports by interagency committees.....			X												
4. Agency reports based on procured studies.....				X											
5. Ad hoc presidential commission reports.....															
6. Ad hoc agency commission reports.....															
7. Agency data supplied to justify appropriation requests.....															
8. Information supplied for congressional oversight.....		X													
9. Agency testimony on new legislation or other issue.....			X												
10. Formal letters commenting on new legislative proposals.....			X												
11. Voluntary studies for Congress by agency personnel.....			X												
12. Supplementary data supplied by agency on request.....			X												
<b>C. Information contributions by nongovernmental persons:</b>															
1. Authors of landmark studies.....		X		X											
2. Nationally recognized authorities.....		X		X											
3. Nationally recognized personalities.....		X		X											
4. Persons identified as having special qualifications.....		X		X											

See footnote at end of table, p. 512.

Congressional information sources on technical issues <sup>1</sup>		AD-X2 Battery additive, 1952-53	Point IV program, 1949-50	Social Sciences in National Science Foundation, 1945-46	Project Camelot review, 1965	History of Project Mohole, 1961-66	Senate hearings on Test Ban Treaty, 1963	Peace Corps legislation, 1960-61	High-Energy physics sponsorship, 1954-68	Establishment of Office of Coal Research, 1956-60	Distribution of the Salk vaccine, 1955	Water Pollution Control Act, 1945-48	Thalidomide: Drug control legislation, 1959-62	Federal control of pesticides, 1946-47	Criteria for water projects, 1959-60
D. Institutions specifically equipped to provide information:															
1. National Academy of Sciences-National Research Council.															
2. Not-for-profit corporations and research foundations.		X													
3. Universities.		X													
4. Research agencies of State governments.															
5. Specialized associations or categories of State government officials.															
6. Lobbies and trade associations.															
7. Societies representative of specialized scientific disciplines.															
8. Public opinion polls and broad questionnaires.		X													
9. Private businesses.															
E. Information devices and media:															
1. Investigative hearings with prepared testimony and interrogation.		X													
2. Legislative hearing with prepared testimony and interrogation.															
3. List of questions from committee to agency.		X													
4. Staff consultations with information sources.		X													
5. Seminars and roundtable discussions.															
6. Multiple witnesses in structured hearings.															
7. Staff-planned and staff-structured investigations.		X													
8. Advance questions to witnesses to structure testimony.															
9. Reports abstracting pertinent literature for committee.															
10. Field hearings.		X													
11. Communications received on the issue.		X													
12. Exhibits and outside submittals to the committee.															

<sup>1</sup> The assembling of this table involved the exercise of judgment. Although every effort was made to enhance its accuracy, some degree of error is inescapable in a matrix of this scope. Some witnesses testified in one particular capacity, although their appearance might reasonably be identified in several. When a witness testified in several capacities, each was noted. In some cases, the cell is irrelevant to the item in question, and no entry was noted.

*Congressional Requirements for Technical Information*

Information gathered from many such sources needs to be processed in forms suitable for use by the Congress. Congressional needs for technical information bearing on political issues are at two levels: factual detail for the "specialists" and the accurate summary for the "generalists." On any given issue, those who are active members of the interested legislative committees tend to become "specialists." Other Members are "generalists" with reference to the particular issue. The information needs of the two groups are different. The specialists require sufficient detail to enable them to participate in the resolving of the technical issue; they need to bring the technical findings to bear on the resolution of the political issue, in order to report the recommendations of the committee to the total membership of the Congress. The general membership, on the other hand, needs to be satisfied that the committee has given to the technical issue competent and full consideration, and that it is reflected in the political decision.

The specifications for the information on technical issues that will best serve the requirements of the Congress in decisionmaking are that it must be—

- (1) Pertinent to the technical issue, and to the subordinate technical questions involved;
- (2) Authoritative, accurate, reliable, unbiased, technically sound;
- (3) Complete, within the limits of germaneness;
- (4) Fully developed and structured; and
- (5) Adequate in scope to reflect relationships with other public goals, programs, interests, and institutions.

Each of these five sets of criteria has its own implications as to the appropriate ways required to meet it.

*Ways To Secure Information Pertinent to the Issue*

The first step in securing pertinent information is the preparation of a precise definition of the technical problem or issue; the delineation of its scope; identification of subordinate, related questions; and tabulation of the information requirements to deal with it. The operation usually includes—

- Initial reconnaissance of the issue;
- Definition of the issue;
- Determination of the subordinate questions;
- Informal consultation within the staff on approaches;
- Informal consultations by the staff with informed persons outside;
- Preparation of a staff study; and
- Preparation of a preliminary list of detailed questions about the issue.

An important distinction exists between investigative and legislative hearings. A legislative hearing is largely structured by the legislative proposal before it, and questions or information not pertinent to the proposal tend to be discouraged. On the other hand, in the investigative hearing the quest for information about the need for legislation, the way a program or agency is functioning, the nature of a problem, and so forth, is open-ended and needs to be structured by careful advance planning. Even so, more latitude is needed in an investigative hearing, by its very nature.

Qualifications of the staff people who prepare the preliminary study and questions are important in assuring that the information sought is pertinent to the issue. They need to be familiar with the issue: possessing mature skills in receiving, interpreting, and evaluating information in the technical discipline or disciplines related to it; and skilled in the analysis of information relating to technical issues in general.

#### ASSURING AUTHORITATIVE, ACCURATE, OBJECTIVE, TECHNICALLY SOUND INFORMATION

No hard-and-fast rules determine for all cases what kinds of information sources meet all or some of these five standards. For this reason it is important that the staff that organizes the information-gathering process have the qualifications to identify, by its own analysis of the technical issue, the best sources for the particular purpose.

##### *Authoritative*

In general, the requirement for "authoritative" information suggests the need to draw upon the most respected and influential leaders in the appropriate discipline, who have recently published in subjects close to the issue. The most authoritative source may be a person uniquely qualified by experience to give some piece of essential information. Persons having a formal obligation to maintain standards of quality of information, such as compilers of census data or persons whose income depends on the accuracy of their store of information, may on occasion serve as most authoritative sources. It is suggested that insufficient use is made of working researchers in the field or laboratory, and that information is drawn more often from scientific "communicators" than from scientific "researchers." The former can present a more lucid overview: the latter are likely to have a closer and more up-to-date command of the facts.

##### *Accurate*

It is a question as to whether any single source can provide accurate information. The implication of this requirement is that accuracy is obtained by the comparison or cross-checking of information from a number of sources of comparable quality. When conflicting data come from several such sources, two questions arise: (1) What is the truth of the matter? (2) Why does the discrepancy exist? Answers to these questions can come from a confrontation or adversary proceeding, or by calling in further witnesses with comparable qualifications.

The body of data accumulated by the investigation needs to be internally consistent. Anomalies cannot be tolerated; when they occur, further investigation is needed. An important staff function is the scrutiny of the growing body of data to identify and investigate every apparent inconsistency. Systematic elimination or clarification of such inconsistencies is essential to assure that the information is reliable.

##### *Objective*

Since bias is inherent in all testimony, the elimination of bias automatically calls for a multiplicity of sources of information. The bal-

ancing of information sources to cancel out bias is difficult. Those who testify have many different classes of bias—personal, political, economic, ethical, intellectual, institutional, social, associational, relational, etc. Those who select the witnesses also have biases. Since only the most extreme forms of bias are obvious, it is not feasible to select witnesses according to any precise calculus of bias balancing. Indeed, a person selecting witnesses is sometimes oblivious to the biases of a candidate whose biases he happens to share. The only feasible answer to the problem of witness bias is a plurality of witnesses with known differences in views; when such witnesses confront one another in an adversary proceeding they tend to ferret out each others' biases and expose them to other observers. However, mere numbers of witnesses testifying as a panel offer no assurance per se of eliminating bias: when all members of a group share a bias, the tendency is for the group to take a more biased position than would be taken by any single member alone. Finally, those who evaluate the information also have biases. To cancel out evaluative bias, it may be useful to circulate staff summaries and reports of the results of information gathering to outside persons with technical qualifications in the field concerned. Their reviews of the reports can help to increase the objectivity of the findings and conclusions.

### *Technically Sound*

Since all scientific and technological testimony deals in relativistic, probabilistic subject matter, it is important that the technical witness both possess and communicate information in properly weighted and evaluated form. The witness needs to be knowledgeable about quantitative relationships within his discipline, familiar with the language of his discipline, and skilled in interpreting the data of his discipline. The essential truth is presented in the form of approximations. Orthodox positions need to be challenged: unorthodox positions must bear the burden of proof. When technical witnesses with comparable professional qualifications offer conflicting testimony, it is necessary to analyze their testimony and supporting evidence, in order to determine whether they are operating on the basis of different hypotheses. If so, the testimony of additional witnesses with comparable qualifications may be helpful to shed light on the relative validity of the conflicting hypotheses. Basically, assuring technical soundness is an iterative process of successive closer approximations.

### *Arrangements To Assure Completeness of Technical Information*

The importance of dealing thoroughly with technical issues is paramount. Failure to anticipate the hidden dangers in a new technological situation can be catastrophic. Plausible decisions can set in motion irreversible processes that cause irreparable damage. The concluding quotation in the report on the Pesticide Case warrants reproduction here:

A well intentioned but poorly informed society is haphazardly deploying a powerful, accelerating technology in a complex and somewhat fragile environment. The consequences are only vaguely discernible.

Clearly, it is the function of the decisionmakers to satisfy themselves that all the essential questions have been asked and answered. This does not imply that Members of Congress need to make them-

selves into scientists and engineers. It does suggest that every technical decision that provides the underpinning for a major political decision should receive adequate professional consideration, and that the outcome and its justification need to be expressed in terms meaningful to those responsible for the political decision. It is, of course, a matter of judgment as to how much time to devote to any particular technical issue, always being mindful that the congressional day is already desperately short. But it is also true that the quality of the decision on a technical issue depends on the quality of the preparation for examining the issue, the number of different—and differing—qualified witnesses presenting their views about it, the variety of different ways in which testimony is obtained, the length of time the issue remains exposed to professional debate, and the length of time the assembled evidence remains under evaluation by a staff that is familiar with the discipline, steeped in the testimony, and skilled in analytical techniques. Further discussion of the problem of achieving completeness of information is presented, in terms of (1) the functions of the congressional staff, (2) the classes of witnesses helpful to provide information on a technical issue, (3) useful modes of information gathering, (4) the process of data analysis, and (5) the iterative nature of the total information-gathering process.

### *Staff Functions*

The functions of the congressional staff in the collection of information bearing on a technical issue clearly imply that the staff needs to have, collectively, a demanding array of qualifications. It must be familiar with the political context of the issue, and also with the technical context. It can advantageously bring a multidisciplinary outlook into the process. It needs skills of technical analysis, and a capacity for filtering out nonessentials. A knowledge of the social organization and hierarchies of relevant technical disciplines is indispensable. Equipped with these resources, the staff is able to perform the essential functions of insuring completeness of assessment and resolution of the technical issue, which include the following elements:

- (1) Identification of the essential technical issue involved;
- (2) Identification of the subsidiary technical issues;
- (3) Establishment of the political importance of resolving the technical issue;
- (4) Preparation of an initial study or staff report containing appraisal, analysis, and definition of scope of the technical issue;
- (5) Identification of witnesses best able to contribute information (meeting established criteria) pertinent to the technical issue;
- (6) Recommendation for appropriate modes of information gathering;
- (7) Participation as consultants in the process of information exchange to insure that all pertinent questions are asked and that responsive answers are received;
- (8) Analysis of information received, to determine its completeness;
- (9) Procurement of further required information, outside evaluations, corrected testimony, and supplementary statements;

- (10) Analysis of data for interpretation and conclusions;
- (11) Report on alternative possible resolutions of the technical issue, and the comparative cost/effectiveness of each, suitably documented from the information received;
- (12) Preparation of objective documentation of cost/effectiveness of the preferred alternative resolution of the issue; and
- (13) Securing of external policy review to filter out inadvertent staff bias.

### *Classes of Witnesses*

Witnesses have traditionally been categorized with reference to their assumed bias or motivation. Traditional classification of witnesses has distinguished those favoring one or another political party, Government versus nongovernmental, the industrial (profit motive oriented) versus the academic (disinterested in profit), those with technical qualifications versus those with liberal arts backgrounds, and so on. In a highly technical and mobile society, it is suggested, the traditional ways of classifying witnesses are inexact, inappropriate, and misleading. Partisan affiliations are irrelevant to most technical issues. Consulting activities of many academicians tend to remove the distinction between academic and business affiliation. The frequent movement of persons from employment in Government to business to academic to Government again, plus the widespread identification of mutual interests on the part of those sponsoring programs and those performing them, tends to render meaningless any categorization of witnesses as "Government, business, or academic." Nor is there an important distinction between "technical" and "nontechnical." The post-sputnik emphasis on technical aspects in the curriculums of public education, plus military service, work experience, and indoctrination courses, tends to blur the distinction. It is suggested that a suitable set of categories for present-day witnesses is not available. It is possible that a more useful classification might take such a form as—

Mission oriented versus discipline oriented;

Short-range objective oriented versus long-range objective oriented;

Task oriented versus system oriented;

Economic emphasis versus ecological emphasis;

Technocratic versus antiscience; and

Specialist versus generalist.

In the absence of a useful, current classification system of witnesses, perhaps the best that can be done is to recognize (*a*) that each technical task relates to a set of scientific or technological disciplines, and that some witnesses are needed to express the views and contribute the knowledge relevant in each; (*b*) that some input is needed from other, unrelated disciplines for purposes of cross-fertilization and stimulus of fresh ideas; (*c*) that some integrating information is needed from scientific generalists familiar with the broad spectrum of science and technology, and the relation of both to politics; and (*d*) that the interaction of man and the machine implies the need for witnesses representing the social sciences to provide information about the politics of human factors, and the impact of technology on political man.

*Modes of Information Gathering*

An unlimited number of different kinds of situations, processes, and devices can be conceived of as useful for congressional information gathering. It is likely that the quality of information received is influenced by the situation, and that different witnesses respond best to different situations. Two hypotheses are suggested by observations drawn from the present case study. One is that adversary proceedings tend to be more illuminating and produce more information than do consensus presentations. Another possibly useful hypothesis is that the more different modes of information gathering that are used, the more complete and satisfactory will be the information secured. Unfortunately, none of the cases (with the possible exception of the Salk vaccine panel discussion) illustrates a deliberate attempt to structure an adversary proceeding. A valuable inadvertent instance, however, occurred in the drug testimony reported in the thalidomide case. The concluding case, concerning criteria for water resources projects, illustrates best the hypothesis as to the benefits of a variety of modes of information gathering.

*Data Analysis*

An important element of the task of assuring completeness of technical information on an issue is the analysis by the staff of the collected information. Information gathering requires that the staff have adequate grounding in the relevant disciplines to receive technical information understandingly; analysis requires that the staff also have sufficient knowledge and perspective in the relevant disciplines to focus on essentials, detect and investigate anomalies, record essential agreements among technical witnesses, and refine the quantitative data on comparative cost/effectiveness of the technical alternatives. However, many other purposes can be served.

The analysis can identify subsidiary issues with scientific content that may require political resolution, and certify to the adequacy of technical information needed for such resolution. It can identify those questions on which the science community sees a need for further accumulation of data. It can identify aspects on which, in the judgment of the staff, insufficient technical information has been secured, and pursue these back to the technical data sources. It can obtain guidance as to how to insure that further research is conducted that is needed to provide answers in the future to enable a progressively improving resolution of the scientific issue. It can identify those interfaces with the political world that are of particular interest or concern to the Congress.

Two modern developments are particularly relevant to the analysis stage in the technical information function for political decision-making. One is the systems approach, which imposes on the analyst a disciplined rigor of procedure, forcing him to think rigorously about many aspects and relationships within the issue he is studying. The other is the digital computer with its capacity for storing very large numbers of bits of information and retrieving selected categories of them on instruction. The systems approach enables an orderly analysis of the dynamic features and interfaces of the issue; the computer makes possible the manipulation of the information to yield insights and reveal quantitative relationships and elements of sensitivity.

*Iterative Nature of the Process*

It is seldom possible to plan an investigation so completely that it can be carried out from start to finish as a straight-line process. Each additional element of data tends to alter the direction and emphasis of the findings. Each time the growing body of data is analyzed, new questions arise that necessitate further consultations with technical sources, and the acquisition of further data. The evaluation of a complete study is inherently and desirably a process of repetition and review. It is desirable because the end product of such an iterative operation is more compatible with all objectives and constraints, and takes account of more variables and opportunities for error. Ideally, when the final report has been written, it would be desirable to circulate it to all persons who contributed information to the project, soliciting their second thoughts and supplementary papers. These comments would then be subjected to the same analytical process, and a more mature and acceptable report would almost certainly result. There is no substitute for time. Time and patient analysis and repetitive search for information are indispensable in the maturing of understanding of a complex technical problem within an infinitely more complex human society.

*Achievement of maturity and full development of structured information*

The problem of maturity, of allowing for time to ripen the understanding of a technical issue, is a critical one in the congressional context. Pressures of urgency and competing demands make difficult the preservation of continuity of congressional attention. Issues cannot be given the attention and time they need to ripen and develop. Every Member of Congress is both a generalist and a specialist. The obligations of office compel him to decide on many issues. His opportunity to devote the time needed to become a specialist in a chosen area of legislative concern is limited by the other demands on his time and attention.

One answer, often proposed, is that the business of Congress be scrutinized to find ways of eliminating low priority and needless thieves of time. The computer, work simplification surveys, and other modern tools suggest themselves in this connection.

A second answer is to increase the reliance on the staffs to Congress—making them larger, giving them more duties, and strengthening their professional competence in technical areas and disciplines. This process is going on, and seems likely to continue.

A third approach, which will be discussed in the concluding section of the chapter, is to devise ways of increasing the amount of time available for each issue by identifying it sooner. The hypothesis is this: If an issue can be certified for congressional study at an early point, and surveillance maintained over it by skilled people, the process of maturation can occur without consuming congressional time and attention, until the need for action is manifest. Issues might then be dealt with by the Congress on an orderly time schedule, with less reliance on crash decisionmaking and a reduced frequency of sudden sensational alarms.

*Organization of a system to achieve and maintain technical perspective*

This concluding section of the study suggests a number of congressional needs for scientific and technological information services. No

opinion is volunteered on the particular organizational form to provide these services. The observations as to congressional needs for technical information are drawn from the study of a series of case histories of congressional decisionmaking in actual operation since 1945. The general conclusion is that the Congress might benefit from some form of help in compressing the time between (a) the point at which knowledgeable specialists perceive a need for an important technical policy decision, and (b) the point at which the Congress judges itself sufficiently well informed to make the required decision.

Put another way, a useful congressional service might be rendered by (a) an early warning system of the need for technical decisionmaking, and (b) a perfected means for supplying technical information and information sources to the Congress. These two related services, it is suggested, would enable Members of Congress to perform more expeditiously and more confidently the task of becoming specialists to the extent necessary for the decision process on important, urgent, complex technical issues.

Functions identified in this section could take many organizational forms. Among the possibilities are: additions to staffs of individual Members or committees; creation of a new and appropriately staffed joint committee of the Congress; enlargement of the Legislative Reference Service in the Library of Congress; creation of a separate congressional agency, patterned administratively after the General Accounting Office; and perhaps others. For the purpose of conciseness, the collective arrangement to supply the suggested congressional functions is referred to hereafter as "the Service," but without any implication that a particular form of organization is intended.

The primary two functions of the Service might be to provide the Congress with early warning of the possible need for decisionmaking on technical issues, and to develop information resources in anticipation of congressional needs to support such decisionmaking. The kinds of actions to carry out these two functions are so closely related that they can be considered together, and actually are difficult to separate.

The Service might maintain a close awareness of changing U.S. social and economic conditions and goals and changing technical capabilities, in order to translate these into technical goals and issues. The social and economic goals would include those expressed or implied in the published literature, but the relative importance accorded to the development of further information about them could be determined on the basis of expressed congressional interest or by analysis of the Service as to anticipated future congressional needs for information.

On the basis of continuing study, the Service might recommend criteria to determine the relative importance and urgency of technical issues, and could assist the Congress by assembling and providing information indicative of the relative importance and urgency of national technical goals. The Service might identify, from the literature and from contacts with technical institutions and informed persons, the potential dangers and hazards to U.S. welfare resulting from technical artifacts in a changing technical culture: the Service could keep itself ready to advise the Congress about the technical goals necessary to reduce such dangers and hazards.

On the other hand, the Service could point out at an early point the opportunities offered by potentially important and beneficial new technology. While it is true that the development of a technology cannot be hurried except at great cost, it is also true that opportunities for important social gains from technological innovation can be lost or unduly delayed for want of prompt recognition and selective sponsorship.

The Service might make its own estimates of the kinds and scope of factual information likely to be needed by the Congress in the political evaluation of technical goals and programs needed to preserve U.S. welfare and safety in a technological environment. It could develop and maintain bibliographies, data files, and other information resources including computer data bases, to provide this information. The information might include periodic tabulations of U.S. goals for basic sciences, applied sciences, and engineering technology, in physical, biological, medical, and social science fields.

For those technical issues that the Service judged were likely to become politically important and urgent, the Service could develop and maintain plans that could be offered for congressional investigations of such issues. The plans might include analyses of the issue and its implications, lists of salient questions to elicit needed information, abstracts of pertinent literature, rosters and biographical data about professionally qualified witnesses, and appropriate methodologies for gathering and analyzing the technical information about the issue.

The Service could request to congressional Member and committee requests for consultation and advice on the factual aspects and consequences of alternative actions relative to technical issues, and to identify persons professionally qualified to serve as witnesses or professional consultants to develop further information about each such alternative.

The Service might be instructed to publish from time to time concise anticipatory reports and forecasts judged helpful to inform the Congress of the possible or probable emergence of a technical issue of outstanding importance in terms of potential social advantage or potentially serious consequences.

In connection with its function of maintaining contacts with the professional and technical disciplines, in universities, professional societies, foundations, not-for-profit corporations, and private industry, the Service might be expected to contribute professional studies and papers to the established professional media and at symposia and seminars in the United States and occasionally elsewhere. Arrangements might be developed for the substantial interchange of personnel between the Service and academic research activities on a temporary or loan basis. If such personnel on loan to the Service were available as full-time consultants to congressional committees investigating problems in areas in which the loan personnel possessed special qualifications, the congressional resources of information would be strengthened in breadth of scope, depth of expertise, and degree of flexibility.

Finally, the Service might periodically assess its own operation, functions, organization, and resources of personnel and information, in order to report on ways of strengthening the Service to be responsive to the growing and changing needs of the Congress.









