# SCIENTISTS AND THE ABM

by

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ABSTRACT

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Between September 1968 when a United States decision to deploy an anti-ballistic missile (ABM) was announced by Secretary of Defense Robert S. McNamara, and August of the following year when 50 United States senators almost succeeded in blocking this decision, hundreds of scientists entered the political arena to support or oppose deployment of such a defensive system.

The ABM issue established new precedents and relationships in the interactions between decision-makers and scientists. For the first time a major weapon system was challenged in the Congress and long standing reservations among government science advisory groups were carried to the public.

The study consists of an empirical investigation of the ABM issue based on detailed interviews and mailed questionnaires with 152 scientists who were active participants in the ABM issue, in order to understand the reasons why the ABM became an issue, who the activist scientists were and what motivated them to become active. The data indicate pervasive differences in attitudes, perceptions and behaviours between pro- and anti-ABM scientists on a broad variety of issues relating to science and politics.

The scientists' effectiveness varied widely. Within the executive branch, where scientists have long been influential, the anti-ABM scientists were often ignored and the pro-ABM scientists appeared often to have been used to legitimatize political decisions. In the Senate new precedents and new relationships between scientists and legislators were established. Scientists seemed most effective in the political arena when they were able to enlist the support of the public and work together with diverse and widespread coalitions.

The study concludes by suggesting ways in which these new links between scientists, legislators and "the public", which were forged by the ABM issue, can be strengthened and enhanced in the future.

Thesis Supervisor: George W. Rathjens
Title: Professor of Political Science

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Acknowledgements

All studies benefit from the advice, support and encouragement of many persons but rarely does one feel a need to pay tribute to 152 people. This, however, is so in this instance for I am deeply indebted to each person who consented to become the data for this study. Almost without exception each man interviewed was most gracious, cooperative and generous with his time.

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To my children, Martin, Andrew and Lorie, my thanks for enduring without complaint these years of having a graduate student mother. There is one scientist whose name does not appear anywhere in the ABM story, but there is not one page which has not benefitted from his inspiration, his insights and his help. It is to this scientist, John W. Cahn, that this thesis is lovingly dedicated.

Anne Hessing Cahn
Cambridge, Massachusetts
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# CHAPTER I

## PROLOGUE

On September 18, 1967 Secretary of Defense Robert S. McNamara announced that the United States would deploy an anti-ballistic missile system. (ABM) Almost two years later, on August 7, 1969 fifty United States Senators voted against an ABM deployment.

In the 22 months between these two events the American scientific community became galvanized, energized and polarized in attempts to reverse or expand the former decision and to affect the latter one. Hundreds of members of what has been termed "an apolitical elite" testified before Congressional committees, briefed Senators and Congressmen and lobbied with them as well; signed petitions; ran ads in newspapers; wrote articles and reports; edited and contributed to books; marched to the White House; set up information booths at shopping centers; travelled across the country from Boston to Los Angeles, from Seattle to Washington D.C., from Chicago to North Dakota speaking to audiences ranging from 30 to several thousand persons; debated with generals and colonels, senators and fellow scientists; addressed state and local officials; worked with women's groups, peace groups, labor, religious and civic organizations; presented resolutions to village, town, city, county and state legislative bodies; printed and distributed buttons and bumper stickers; appeared on local radio talk shows and on national television programs.

As the youngest child asks at the Jewish Passover dinner "Why is this night different from all others?" so might one well ask why this arousal, this concern and this animation about this particular weapon system? Dozens of weapons systems, large and small, offensive and

defensive have been invented and improved upon and their deployment encouraged by scientists since the end of the second world war with only faint whispers of doubt or hesitation about the desirability or necessity of such expenditures, such developments and such deployments. Proponents and opponents of ABM alike have proclaimed that ABM became a SYMBOL. One leading advocate of deployment, Albert Wohlstetter, ironically referred to it as "Good Guys, Bad Buys, and the ABM."[1] Accepting that, indeed, for many scientists the ABM was a symbolic issue through which they could voice their despair or indignation with the war in Viet Nam, with the "military-industrial complex," with the specter (or reality) of their own impending unemployment or obsolescence, with the prospects for arms control--it remains a fact that the ABM debate mobilized and "turned on" a sizeable segment of the scientific community. As Alice Kimball Smith, in her chronicle of an earlier effort of scientists to influence public policy, wrote, "A certain epic quality attaches to any experience by which men are so stirred as to be wrenched from their accustomed patterns of behavior."[2]

Since the advent of the atomic era, the "peril and the hope" of Alice Smith's book, the interface between scientists and the political world in which they live has become a matter of increasing concern to academicians and the public alike. A voluminous literature has emerged describing such phenomena as "The Two Cultures"[3], "The New Priesthood"[4], "The Scientific Estate"[5], "The Scientific Adviser"[6], and "The New Brahmins"[7].

However insightful these pioneering studies were in examining the virgin terrain of the relationship between scientists and their political environs, the great bulk of them painted the landscape with broad descriptive strokes. As the field of science and public policy advances from its infancy it would seem propitious to proceed increasingly from

the general to the more specific. Before one can understand why the ABM became such a major controversy in the late 1960's, it would seem useful to examine the participants in the issue in greater detail.

This study addresses itself to the following questions: Who were the scientists who participated in the ABM issue? What were their motivations, their expectations of success, their perceptions of the debate itself and its effect upon them individually and upon the scientific community? What seems to differentiate the pro- from the anti-ABM scientist? Are these activated scientists likely to remain as vocal players at the tumultuous game of politics or will they return to the reputed tranquility and quietude of their research? Lastly, what was the effect of all this activity upon the ABM issue itself? How efficacious do the participants view themselves and how effective do the decision makers, both within the Executive departments and in the Senate, believe the scientists were?

A detailed examination of the political perceptions, attitudes and behaviour of these participant scientists will also aid in gaining insight into the ethos of the scientific community. Many axioms, often propounded by the scientists themselves, concerning this community have become widely accepted by the scientists and by the larger public. These deal with the collegiality of the community and the ubiquity of the scientific method itself, presumed to exist within the scientific community.

From the observations and descriptions of the scientist-politic interface in the microcosm of the ABM issue, we move to see what generalizations, what inferences to the macro-level are possible. What

lessons are to be learned from the ABM story and how can they be applied towards more effective interactions between scientists and politicians?

If scientists wish to exert influence in the political arena, what approaches or avenues seem most promising? In the past, scientists have placed most of their hopes and efforts on the executive branch of government. In this particular issue, not only were both the executive and legislative branches important, but for the first time, scientists found themselves involved in local community coalitions as well. If the relationships brought on by the ABM between the scientists and both Congress and the public are a harbinger of the future, then what mechanisms can we suggest to improve these relationships?

The remainder of chapter one sets the stage for the ensuing narrative. The participants in the ABM issue are defined and the methodology employed in the study is described. The criteria for designating scientists and pro- and anti-ABM are explicated.

Chapter two deals with the "begatting of an issue": What turned the ABM into a national issue? What motivated so many scientists to enter the political lists to slay or defend an inanimate object? The self-perceived motivations of Inner or establishment scientists as opposed to those of Outer scientists and of pro- and anti-ABM scientists are shown to differ markedly.

The myriad activities scientists engaged in, in their quest for victory on the ABM battlefield are described in chapter three. These included serving on advisory panels, addressing local and out-of-town groups, lobbying with city, county, state and national representatives, testifying before congressional committees, writing reports, articles

and books on the ABM, establishing and working with citizens' coalitions. The relationships between age, place of employment and stance on ABM and which of these activities scientists participated in are also explored.

Chapter four looks at the scientist-participants in the ABM issue and asks what differentiates pro- from anti-ABM scientists. While the ABM activisists are shown to resemble each other closely on a number of background characteristics such as education and eminence, the differences between the two groups' views of the ABM debate and its effect upon the scientific community, on the feasibility of deployment and the reasons for deployment decisions, their attitudes about science and scientific objectivity,the politicization of professional societies and the role of scientists in the political arena are so disparate that the stereotype of a homogeneous "scientific community" must be severely questioned. A scientist's stand on ABM deployment is shown to be a much better indication of his views on the United States Congress, the military establishment in this country, China, the Soviet Union and the SALT talks than is the occupational factor that he is a scientist.

The penultimate chapter addresses itself to the question of what effect did the scientists' efforts actually have upon the various decisions made in the ABM issue. How effective or influential were the scientists in the political arena, both in their own eyes and as seen by the decision-makers?

The last chapter attempts to relate the findings of the study regarding the "scientific community" and the interrelationships between scientists and politicians from the micro- to the macro level. Recommendations for improving both communications between scientists (Inners and Outers, younger and established scientists) as well as between scientists and decision-makers conclude the study.

The time frame of the study is essentially from the announcement by Secretary of Defense Robert S. McNamara of the decision to deploy a "light" or "thin" antiballistic missile system on September 18, 1967 to the vote on that deployment decision by the United States Senate on August 6, 1969. To set the study in its historical perspective a brief chronology is given in Appendix I.

## THE SETTING

To begin we must first define our terms: who is a scientist and how do we specify participation? Several social scientists [8,9] have

referred to the elusiveness of a precise definition of the term "scientists". Using the Bureau of Census's criterion of "trained as" is just as imprecise and filled with obvious counterexamples as using the Labor Department's standard of "employed as". For a study dealing with the political arena, the term must be defined in the broadest sense possible, i.e., anyone who considers himself and/or is considered by others to be a scientist. This conforms to the criterion used to compile the National Register of Scientific and Technical Personnel which is based on information supplied by scientific societies.

Thus broadly construed, the definitional net includes engineers such as Jerome Wiesner and administrators like James Killian, both of whom served as Presidential Science advisors.

In the course of the research it became apparent to the investigator that one man's "strategist" may be another man's "social scientist", with the former term often denoting approbation and the latter disparagement. Regardless of their connotations, both "strategists" and "social scientists" are encompassed under the rubric of "scientist" in this study. For this study then, scientists are those who consider themselves or are considered by others to be scientists.

Our definition of participation is based upon Lester W. Milbrath's work. He has ranked political acts in an hierarchy of political involvement from "spectator" activities such as voting or reading campaign literature, through "transitional" activities like making a financial contribution to a party or candidate, or attending a political meeting, to "gladiatorial" activities which include contributing time in a political campaign, becoming an active member in a political party, soliciting political funds and running for or holding public or party office.[10]

Translating this terminology for the present case, "gladiators" in the ABM arena were those scientists who testified, lobbied, wrote and debated or lectured. However, these overt and public actions represent only one facet of the scientists' involvement in the ABM issue. By turning the kaleidoscope of scientists and the ABM just a few degrees, there quickly tumble into view the activities of "transitional" scientists who served on task forces and advisory panels. The boundaries between the "gladiators" and the "transitionals" are not always sharp and distinct and indeed, sometimes overlap. That is, most scientists who testified had served on ABM advisory panels but this correlation is asymmetric. Many scientists who were consultants and advisers on the ABM over a period of many years gave no speeches, testified before no committees and had no visible or public connection with the issue at all. But participation and influence are no less real for being unseen and therefore these transitional scientists are included in the study.

Scientists who acted only as "spectators" and did nothing beyond signing their name to a petition, buying an ABM bumper sticker or button, joining in a physicists' march or voting in the American Physical Society poll were excluded.

A concerted effort was made to compile as comprehensive a list as possible of scientist-participants. This was initially obtained by a thorough search of the relevant congressional hearings and national, regional and local newspapers. The "snowball" method of asking each person interviewed to name all other participants he knew was also utilized. The total number of names collected by these methods was 229. Of these, six came to my attention too late to be contacted. Of the remaining 223, twenty-two turned out not to have participated in the

ABM issue along the criteria defined above and were dropped from the list.

This resulted in a population of 201, of whom 152 (76%) constituted the sample. Outright refusals to cooperate in the study were received from only ten scientists who consisted entirely of contractor and government employees and official government advisers. Sixteen of the 49 scientists not included in the sample had indicated a willingness to participate but were not included due to illness, missed plane connections or their unavailability. Based on the comparisons that could be made readily, the non-respondents did not differ in any significant way from the respondents. (See Appendix 2).

The bulk of the data was gathered by means of personal interviews conducted by the author (N = 122) with the remainder obtained from questionnaires. The interviews lasted from just under one hour to three hours or more with a modal length of one and one half hours. No tape recorder was used (at least by the investigator!) but extensive notes were taken during and immediately after each meeting.

The interviews consisted of open-ended questions focused on the scientist's role in the ABM issue, his perceptions of the debate and his general political attitudes and opinions. The proclivity of each scientist to dwell at length on a given question or to discuss it summarily was given rather free rein with minimal guidance by the investigator. The hoped-for benefit of this "client centered" interview was to maximize communication between the interviewer and the respondent. The cost of this procedure was primarily that not every question was answered by each scientist. This accounts for what will appear to be fluctuating

numbers of respondents in the tables and figures that follow.* The interview form can be found in Appendix 3.

Over 35,000 miles were travelled between November 1969 and April 1971 to collect the data. The interviews occurred in a variety of places and circumstances ranging from a bedside interview in a hospital with the hapless scientist strapped in traction to leisurely sessions over lunch or dinner in elegant restaurants.

The reliability of any data obtained by interviews and questionnaires rests ultimately with the veracity and cooperation of the subjects themselves. Almost without exception the scientists who comprise the data of this study not only expressed great interest in the subject, but demonstrated their helpfulness both in the generosity with the time they allotted to the project and in the thoughtfulness with which they responded. Thus from a scientist at a government lab:

> Three hours of government time went into this. Hope you can read it. _____ says it's O.K. to save the world on government time.

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* For sources dealing with interviewing techniques, see: Lewis Anthony Dexter, Elite and Specialized Interviewing,(Northwestern Univ. Press, 1970);Herbert H. Hyman, "Interviewing as a Scientific Procedure" in Daniel Lerner and Harold D. Lasswell (eds.), The Policy Sciences (Palo Alto: Stanford Univ. Press, 1951) pp. 203-216; Robert L. Kahn and Charles F. Cannell, The Dynamics of Interviewing (N.Y.: Wiley, 1957) Chaps. 1-3 and 7-9; Peter K. Manning, "Problems in Interpreting Interview Data", Sociology and Social Research, Vol. 51 (April 1967), No. 3, pp. 302-316; NORC, Interviewing for NORC (Denver: National Opinion Research Center, 1945) Field Manual; David Riesman, essays on "The Sociology of the Interview, "Orbits of Tolerance, Interviewers and Elites" and "Interviewers, Elites and Academic Freedom", in Abundance for What? and Other Essays (Garden City, N.Y.: Doubleday, 1964) pp. 515-583; Myron Weiner "Political Interviewing" in Robert E. Ward et. al., Studying Politics Abroad (Boston: Little, Brown, 1964) pp.103-133.

The author is deeply indebted to these scientists and can only hope that most of them shared the feelings of a physicist from Princeton who wrote:

> For me the talk was as good as two hours on the psychiatrist's couch, without the psychiatrist's fees.

Let us turn now to the questions raised earlier.

## THE CAST

The 152 scientists who were active participants in the ABM issue can by no means be considered as representative of the scientific community in general, as a quick comparison to the 1968 National Register of Scientific and Technical Personnel[11] will demonstrate. The Register reports three-fifths of its registrants in the physical and mathematical sciences, one-fifth in the life sciences and the remainder in the behavioral and social sciences. Our sample consists of 91% (N = 138) scientists in the physical, mathematical and life sciences and 9%(N = 14) in the social sciences. Of the 297,942 scientists in the Register, 9% were women: there are no women in the ABM sample.

A comparison of scientific fields is shown in Figure 1.

As in other recent occasions in the U.S. when scientists became politically active, such as the movement to establish civilian control of the Atomic Energy Commission and to establish the National Science Foundation, a greater proportion of physicists is found among the activists than scientists from any other field.

Figure 2 compares the highest degree received for the two populations.

Industry employed 32% of the scientists in the National Register and 16% of scientists in the ABM sample. The proportion of scientists

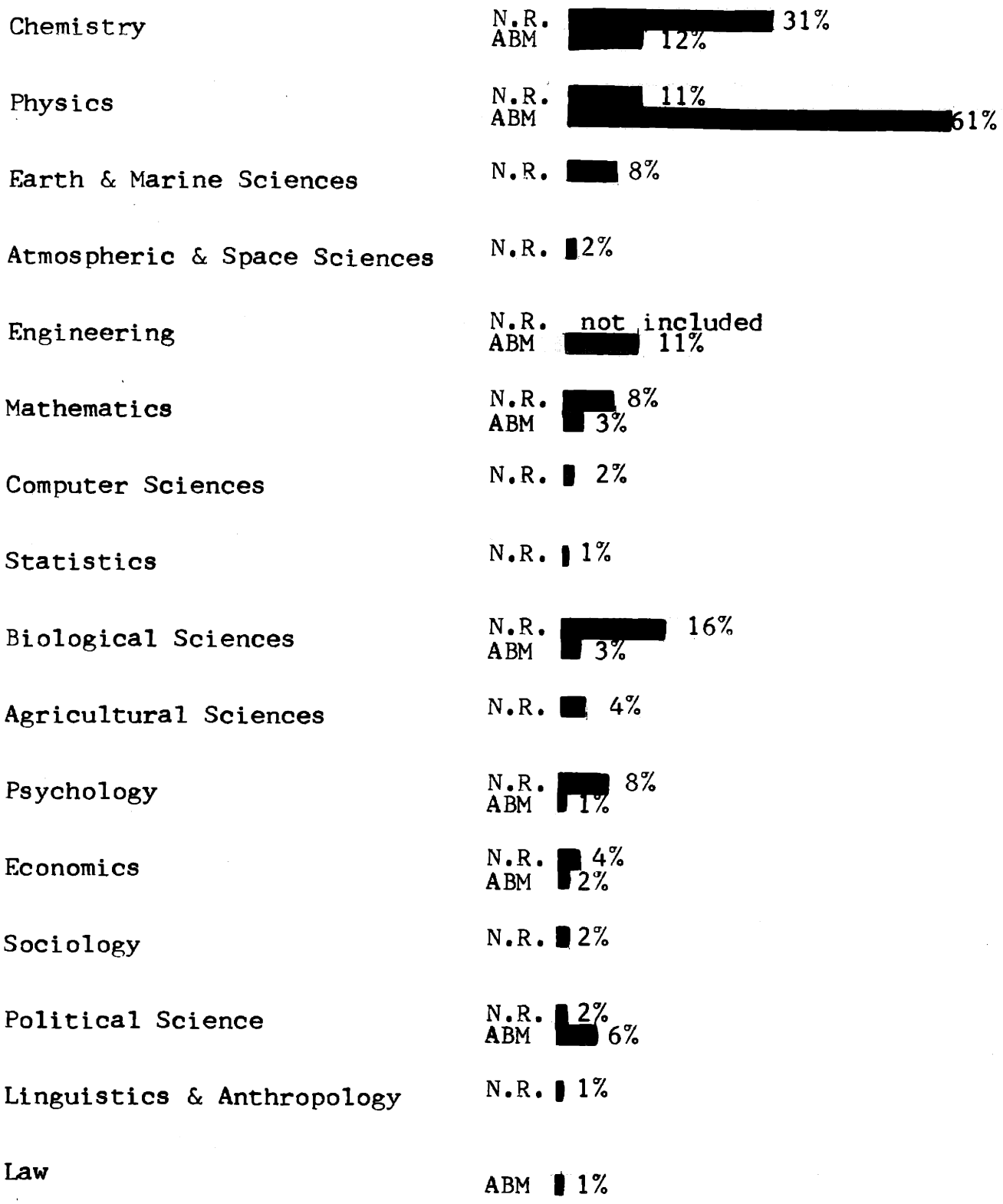


FIGURE 1: Comparison of Scientific Fields - National Register and ABM Scientists

N.R.= National Register

HIGHEST DEGREE RECEIVED

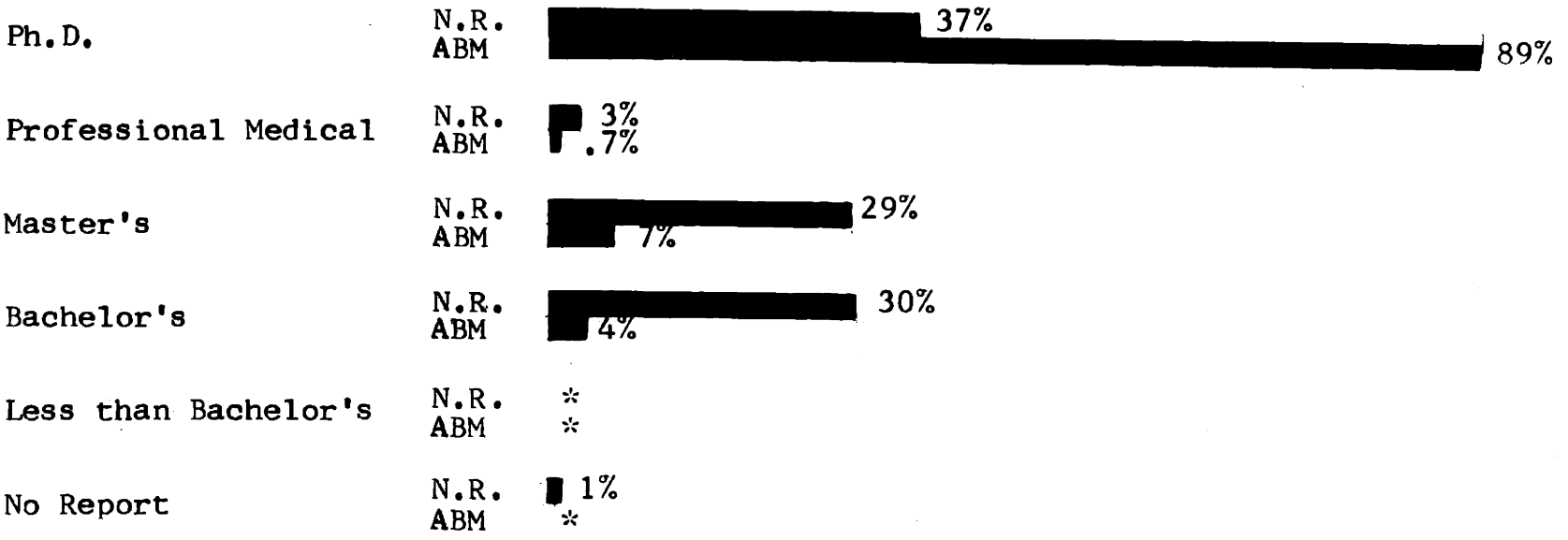


FIGURE 2: Comparison of Highest Degree Received - National Register and ABM Scientists

*Less than 0.5%

employed in educational institutions is 40% for the National Register and 60% for the ABM group; and those in the Federal Government is 13% for the Register and 18% for the ABM sample. Those employed by nonprofit organizations is 4% and 6% respectively. This comparison is illustrated in Figure 3.

The median age of registrants in the National Register was 38 years; the median age of the ABM sample was 46.9 years. The respective age distributions are shown in Figure 4.

The ABM activists were a prestigious group of scientists by any criteria. At the apex of the scientific hierarchy reside the Nobel Laureates. At the present time there are 70 Nobelists amongst the almost 298,000 scientists of the Register, or about .02%. There were six Nobel Laureates (4.0%) in the ABM sample.

Next comes the National Academy of Sciences, described by D.S. Greenberg as "the Established Church, the House of Lords and the Supreme Court and the headquarters of the politics of science".[12] As of 1970 the Academy had 842 members, or about .3% of the entire scientific community. The ABM population contained 27 members of the Academy, or 17.8%.

Yet another measure of eminence might be the recognition accorded in the form of citations by other scientists. For this purpose, the number of citations for each ABM scientist was obtained from the Science Citation Index for a fifteen month period, January 1 - December 31, 1965 and January 1 - March 31, 1970.* The mean number of citations for the

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* To avoid biasing the count either against younger scientists whose work may only be beginning to permeate the literature and against older men whose research may no longer be in vogue, the count was a composite of the two periods.

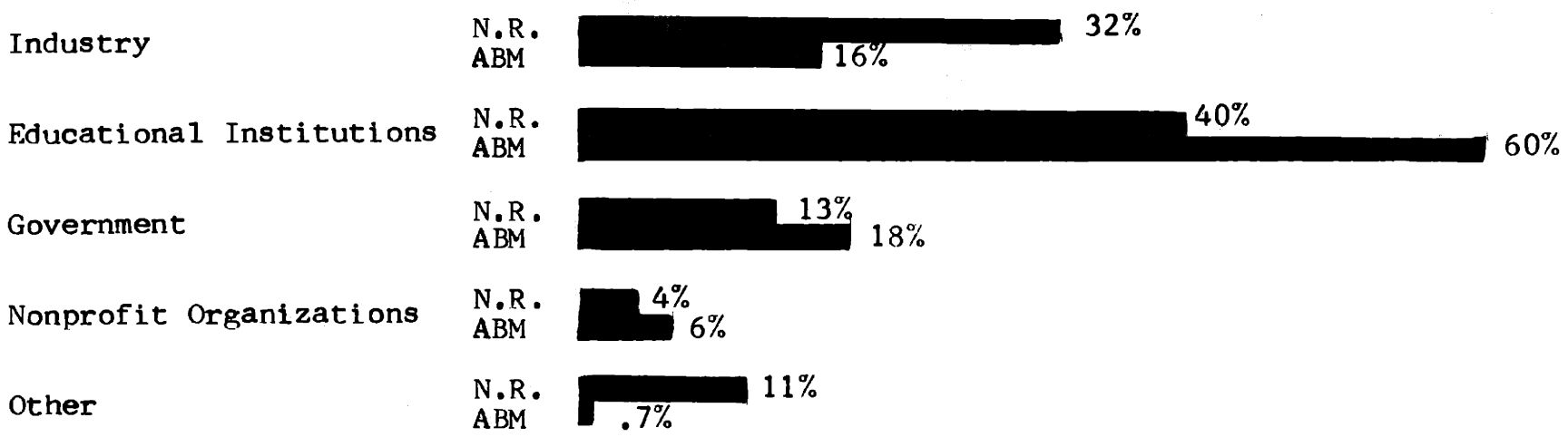


FIGURE 3: Comparison of Type of Employer - National Register and ABM Scientists

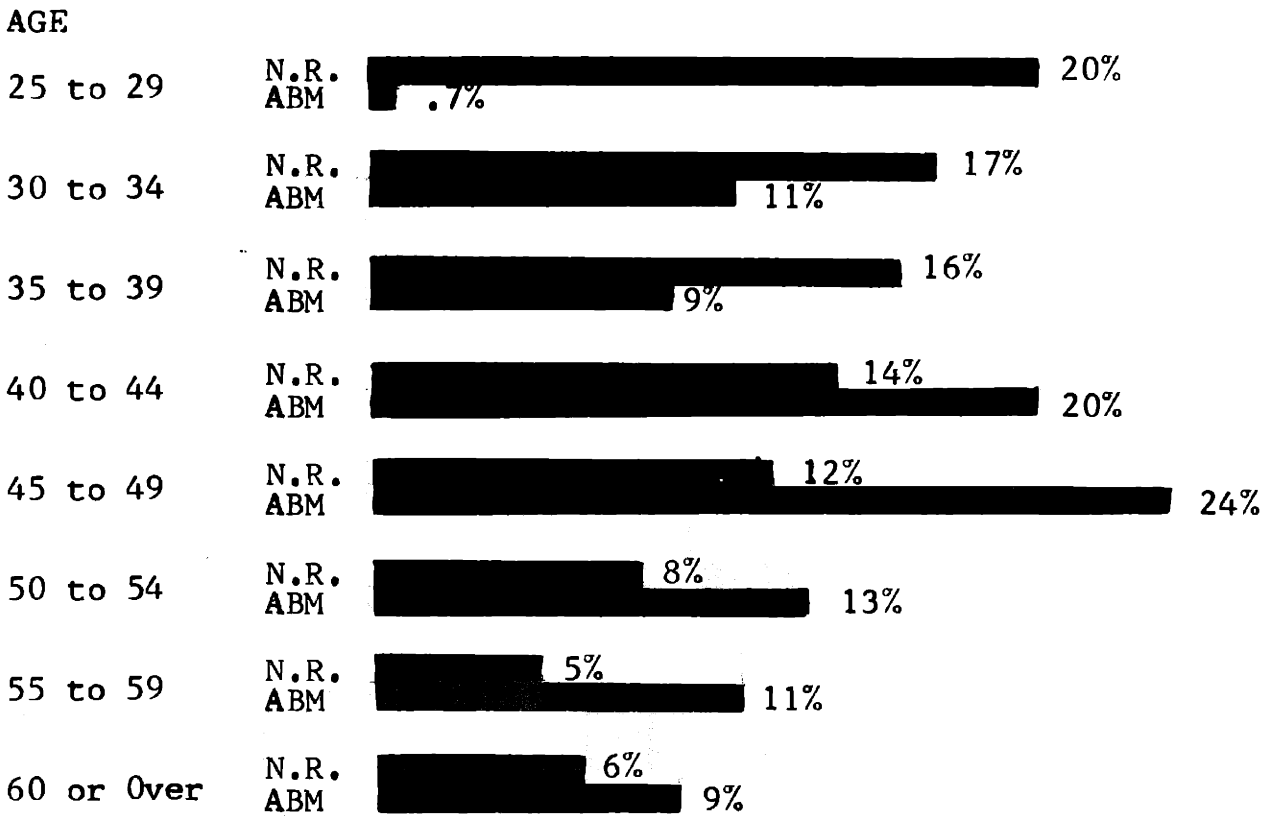


FIGURE 4: Comparison of Age Distribution - National Register and ABM Scientists

ABM scientists was 49. If we eliminate the 23 ABM scientists who had no citations at all during the fifteen month period, we obtain an average of 60 citations per respondent. In 1965, the average number of citations per cited author in the Science Citation Index was 6.[13] Even after correcting for the fact that our citation count was based on 15 months and the Index's on 12 months, the average number of citations for the ABM scientists was more than eight times the overall scientific average.

A recent study[14] of members of the National Academy of Sciences found the mean number of citations for Academy members to be 98. Here again, the ABM Academy members rank higher with a mean of 122 citations per member, computed on a comparable twelve month basis.

To summarize, in comparison to the larger scientific community, the ABM activists were older, more prestigious, held more doctorates and were preponderantly to be found in university physics departments.

The background variables examined thus far were independent of those criteria on which the sample was selected. That is, age, type of employer or membership in the National Academy of Sciences, were not standards considered in delineating the participants. Another background variable, however, membership on advisory committees on the ABM, was one of the criteria for selection for the study. Thus, it should not be surprising that 16% of the ABM sample have been members of the President's Science Advisory Committee (PSAC) or the PSAC Military Strategic Panel. Likewise, 16% have been members of the Defense Science Board (DSB) or Department of Defense (DOD) Task Forces on ABM with considerable overlap in membership on these advisory committees. One would not expect to find similar percentages of scientists at large serving on these committees.

In addition to comparing the ABM scientists to the greater scientific community we need to place them in the larger perspective of political participation in general. A wide variety of research findings point to a patterning or clustering characteristic of political activity.[15] According to Milbrath, "The variables that correlate with a specific political act tend to correlate with other political acts as well...for example, higher socio-economic status (SES) is positively associated with increased likelihood of participation in many different political acts; higher SES persons are more likely to vote, attend meetings, join a party, campaign, and so forth."[16] Seymour Lipset cites nine studies in five countries supporting the proposition that those persons who are active in non-political community and social affairs are much more likely also to participate actively in politics.[17]

A second characteristic of participation, according to Milbrath, is that participation can be conceptualized as being cumulative.[18] Persons who engage in the gladiatorial behaviors are very likely to perform the transitional and spectator activities as well.

According to these hypotheses, we should expect the ABM scientists, who were in this instance politically active almost by definition, to have also engaged in a variety of other political and nonpolitical activities. The data would seem to support this proposition. 72% of the respondents (N = 101) reply that they have spent equal or greater amounts of time on other issues not directly related to their professional work in addition to the ABM. Another 4% had spent half as much time on outside activities as they had on the ABM.

What sort of community, social or political activity had these three quarters of the ABM scientists engaged in? The largest fraction (36%)

had been active in the Test Ban issue, 14% had been gladiators in partisan politics, either working in campaigns or being a candidate, 15% had worked in the peace movement.

Other activities ranged from "working with youth groups", "protesting cutting down of trees to make room for a football stadium", "running a summer science school for ghetto children", "conducting traffic studies in the village of Hinsdale" to working on pollution, conservation, improvements in mental health care and civil rights.

To complete this initial examination of the ABM gladiators, we need to separate the antagonists, to place the combatants in their respective sides of the arena. An anti-ballistic missile defense might properly be viewed as existing on a continuum, starting with no defenses at all. Then one could proceed perhaps to an upgraded or modernized air defense system. Next might come a very limited deployment, either to protect a few Minutemen bases or perhaps to protect the national capital and/or command and control headquarters.* Then we might consider a light area defense designed to provide countrywide protection against a light attack or an accidental launch. At the upper end of the spectrum one could speak of a heavy urban defense, intended to provide protection of the entire country.

One would then expect to find scientists arraying themselves along this continuum. However, as Table 1 indicates, the middle ground was not heavily populated with the majority of scientists taking an extreme position.

* Such defenses, particularly when the points to be defended are relatively invulnerable underground facilities, are commonly referred to as "hard-site" or "hard-point" defenses, terms further defined in the glossary.

TABLE 1: SCIENTISTS' ATTITUDES TOWARDS ABM SYSTEMS*

| | ABM in General | Hard Point Defense | Light Area Defense | Urban Defense |
|---|---|---|---|---|
| Oppose completely | 62% | 53% | 66% | 78% |
| Oppose with qualification | 8 | 12 | 6 | 1 |
| Neutral | 2 | 3 | 1 | 2 |
| Favor with qualification | 4 | 8 | 3 | 3 |
| Favor completely | 22 | 21 | 21 | 9 |
| Don't know | -- | -- | -- | 1 |
| Not answered or not asked | 2 | 3 | 3 | 7 |

N = 152

* On this and all following tables percentages may not add to 100 because of rounding.

Table 1 raises the question of whether knowing the lineup of scientists supporting or opposing deployment of an ABM in general, one could make a prediction about their stand on a light area defense (Sentinel), hard point defense (Safeguard) or on a heavy urban defense. Table 2 shows the scientists' stand on a general ABM deployment as the independent variable:

TABLE 2: SCIENTISTS' ATTITUDES TOWARD ABM IN GENERAL VS. ATTITUDES TOWARD HARD POINT ABM

| Attitude Toward ABM in General | Attitude Toward Hard Point ABM | | | | |
|---|---|---|---|---|---|
| | Oppose Completely | Oppose With Qualification | Neutral | Favor With Qualification | Favor |
| Oppose Completely | 54% | 8% | -- | -- | -- |
| Oppose With Qualification | -- | 3 | 1% | 3% | -- |
| Neutral | -- | -- | 2 | -- | -- |
| Favor With Qualification | -- | -- | -- | 3 | 1% |
| Favor Completely | -- | 1 | -- | 2 | 20 |

N = 148

The measure of association, gamma, has a value of 0.99. In this and all following tables where it appears, the statistic is interpreted as a measure of the proportional reduction in error of estimation (P-R-E) made possible by the relationship.[19] Thus by knowing a scientist's stand on ABM in general, our error in predicting his stand on hard point defense is reduced by 0.99. Gamma values of 0.99 and 0.97 were likewise obtained by comparing attitudes toward ABM in general against attitudes toward light area and heavy urban defenses.

Because these variables are so closely correlated, the single measure, attitude towards ABM in general, will be the one used throughout the study, unless otherwise noted, to designate pro-and anti-ABM scientists. Scientists who oppose ABM completely or with some qualification we shall refer to as anti-ABM scientists (N = 106). Scientists who support ABM completely or with some qualification we shall designate as pro-ABM scientists (N = 40). (The missing six are those scientists who either

professed to be completely neutral or would not give their stand.)

The close relationship among attitudes to all kinds of ABM would seem to give credence to the foregoing analogy of combatants and the lining up on one or the other side. Among the participant scientists there were few neutrals. The ABM was a symbolic issue to be fought out between "the Good Guys and the Bad Guys".

FOOTNOTES TO CHAPTER I

1. Authorization for Military Procurement, Research and Development, Fiscal Year 1971, and Reserve Strength, Committee on Armed Services, U.S. Senate, 91st Congress, 2nd Session, May 19, 1970, p.2225.

2. Alice Kimball Smith, A Peril and A Hope (Chicago: University of Chicago Press, 1965) p. vi.

3. C. P. Snow, The Two Cultures; And A Second Look (New York: The New American Library, 1959).

4. Ralph Lapp, The New Priesthood (New York: Harper & Row, 1965).

5. Don K. Price, The Scientific Estate (Cambridge: Harvard University Press, 1965).

6. Harvey Brooks, "The Scientific Adviser" in Robert Gilpin and Christopher Wright (eds.) Scientists and National Policy Making (New York: Columbia University Press, 1964).

7. Spencer Klaw, The New Brahmins (New York: William Morros, 1968).

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# CHAPTER II

## THE CALL TO ACTION

What causes an inanimate object, consisting of radars, computers and missiles to become a symbolic issue for scientists, a cause célèbre? Foremost among the multiplicity of interactive components intertwined in the making of this issue was the phenomenon of the scientists' entrance into the political arena in behalf of or in opposition to the system. There emerges an obvious circularity: the ABM became an ISSUE because the scientists helped to turn it into one by their public participation and the scientists latched on to the ABM in part because it was a question with which they could turn public attention to the greater issues as they perceived them: arms control for some, Russian parity or supremacy in strategic armaments for others, strengthening or legitimizing the efforts of the Senate to reassert its role in military and foreign policy for yet others.

### SELF PERCEIVED MOTIVATIONS

As we turn now to look at the motivations for their involvement as perceived by the scientists themselves, it will be useful to keep in mind the distinction between the "Inners" and the "Outers". By "Inners" we mean those scientists who have held high level government positions or have been members of prestigous advisory groups such as PSAC, DSB, or their panels. Inners are the "members of the establishment" in the vernacular. The "Outers" are all other scientists since the terms used here are mutually exclusive and exhaustive. The division of the ABM scientists is as follows: Inners, N = 59; Outers, N = 93.

One of the opening questions of each interview was "What motivated you to become active and involved in the ABM issue?" As is to be expected, a wide variety of answers were elicited by such an open-ended query, with many scientists indicating several reasons. Table 3 gives the number of scientists listing each category as his primary or secondary motivation for participation in the ABM issue:

TABLE 3: FREQUENCY OF REASONS FOR SCIENTISTS' PARTICIPATION*

| | |
|---|---|
| Answers having to do with personal involvement in the ABM, as consultants, doing analyses, working on the system. | 68 |
| Answers having to do with arms race issues or international aspects of an ABM system. | 49 |
| Answers having to do with being asked or recruited by others. | 39 |
| Answers having to do with priorities, misuse of money. | 20 |
| Answers having to do with the quality of the debate. "It was too emotional" or "It was not educational or technical enough." | 18 |
| Answers having to do with siting of missiles near large cities. | 15 |
| Answers having to do with technical shortcomings of the system. | 11 |
| Answers having to do with the other side. " They were too vociferous." | 10 |
| Answers having to do with the social responsibility of scientists "to speak out", "to use their knowledge in a useful way." | 9 |
| Answers having to do with peace and/or the war in Vietnam. | 6 |
| Answers having to do with the public. "The public was being misled." | 5 |
| Answers having to do with the military-industrial complex. | 4 |

* Tabulation is based on the first and second reasons mentioned by 147 scientists for their participation.

The Inners. The single most frequently given reason was "personal involvement with the ABM issue for many years." According to the previous definition, we would expect this answer to come predominantly from the Inners, and indeed this is the case.

TABLE 4: PRIMARY MOTIVATION FOR INVOLVEMENT OF ABM SCIENTISTS: INNERS AND OUTERS

| Reason | Inners | Outers |
|---|---|---|
| Personal Involvement | 79% | 17% |
| Arms Race Issues | 4 | 34 |
| Recruited by Others | 7 | 11 |
| Priorities | -- | 10 |
| Quality of the Debate | 2 | 4 |
| Siting in Cities | -- | 10 |
| Technical Shortcomings | -- | 2 |
| The Other Side | 7 | 1 |
| Social Responsibility of Scientists | -- | 3 |
| Peace, Vietnam War | -- | 3 |
| The Public Misled | 2 | 2 |
| The Military-Industrial Complex | -- | 4 |

N = 147

The underlying question, however, was what motivated these establishment scientists to shed their customary cloaks of quiet persuasion within the Executive departments to don the more visible and strident coats of arousing the public. Several of these scientists expressed a deep feeling of betrayal.

In January, 1967 each of the former and present Presidential Science Advisors and Directors of Defense Research and Engineering (Drs. Brown, Foster, Hornig, Killian, Kistiakowsky, Wiesner and York) was invited by Secretary of Defense McNamara to present his views on a proposed ABM deployment to the President. One of these men recounted the story in the following manner:

> Late in 1966 I was called to Mr. McNamara's office and was given a memorandum by Secretary McNamara which advocated limited deployment of the Nike X ABM. I was asked to prepare my views on the subject and present them at a White House meeting in January. I took the memorandum back with me and studied it. The document mostly refuted the use of anti-ballistic missiles but in the end recommended deployment.
>
> Shortly before the meeting took place in the Cabinet Room of the White House, we met in Dr. Hornig's office and discovered that each one of us had formulated views strongly opposing deployment. We decided quickly that each of us would present personal, uncoordinated views in our five minute presentations to the President.
>
> The meeting began with the chairman of the Joint Chiefs of Staff, General Earle Wheeler, recommending deployment of the Nike X system.

Killian, Kistiakowsky, Wiesner and York then each presented their arguments opposing deployment. . . Wiesner recalls that he voiced his own opinion that the Army would only back a proposed light deployment (Sentinel) if it were a precursor to a larger thick deployment. President Johnson asked "Is that right, Buzz?" to which General Wheeler replied "Yes Sir".

The scientists left the White House thinking they had voiced their independent opposition to deployment of an ABM as clearly and firmly as they were able.

In his September speech Secretary McNamara, in the view of one of the participants, misinterpreted the conclusions of the science advisors when he stated that

> The four prominent scientists--men who have served with distinction as the Science Advisors to Presidents Eisenhower, Kennedy, and Johnson, and the three outstanding men who have served as Directors of Research and Engineering to three Secretaries of Defense--have unanimously recommended against the deployment of an ABM system designed to protect our population against a Soviet attack. (Emphasis added)[1]

Killian recalls that "Mr. McNamara called each of us in advance of his San Francisco speech to assure us he was not seeking to give an indication that we were supporting his changed position."

Despite these reassurances, however, at least some of these distinguished scientists felt betrayed and were puzzled that Secretary McNamara "stated a different position in his speech than that we had understood him to hold." Said one of them: "We were opposed to all kinds of ABM, not just a heavy anti-Soviet deployment."

Kistiakowsky aired his views on this explicitly when he wired Senator John Cooper "Secretary McNamara's speech of September 18, 1967 might have given unintentionally the impression that I endorse immediate start of deployment of Sentinel thin ABM system. I do not...".[2]

If a feeling of betrayal was the dominant motivation for some of the anti-ABM Inners, what prompted some of the other leaders of science to become vocal opponents of a system they had been content to oppose quietly hitherto? Several expressed dismay not about advice misrepresented or unheeded, but about advice not sought or asked for at all. When queried about his reaction to the McNamara speech Hans Bethe, member of the PSAC Military Strategic Panel, replied he was "profoundly shocked". It was, he said, "one time PSAC was not asked for advice."

Similarly with regard to President Nixon's March 1969 Safeguard decision, W.K.H. Panofsky, another member of the same committee, stated "the Safeguard ABM system has not been discussed by any of the science advisory bodies which you mention (i.e. PSAC or its panels) before the decision was

communicated to the public."

To some extent one could say that these Inner scientists took it almost as a personal affront that despite the hundreds of hours they had spent detailing the arguments against deployment of the Sentinel-Safeguard ABM it kept reappearing in one guise or another. It should be noted that these particular experts (Bethe, Garwin, Panofsky) did not oppose anti-missile defenses per se, but they felt strongly that the particular components of Nike X-Sentinel-Safeguard with the very large, soft and expensive missile site radars were unsuited and ill designed for the purposes proposed.

For other scientists, the change of administration in Washington brought about their departure from the government and with it, freedom to assume a public advocacy position. "It had every conceivable thing wrong with it," said one, a chemist. "If you really wanted to change the way of doing things in the Pentagon this was an ideal issue. It was lousy technically and you could get lots of public attention."

If the primary motivations for the anti-ABM Inners can be explained partially by ire over advice unheeded or unsolicited and partially by their exodus from the government, what prompted the pro-ABM establishment scientists, who also customarily stayed behind the scenes, to enter the public arena?

Table 5 shows the first or primary reason given by all Inner scientists for becoming ABM participants:

TABLE 5: PRIMARY MOTIVATION FOR INVOLVEMENT OF INNER SCIENTISTS

| | Pro-ABM (N = 27) | Anti-ABM (N = 26) |
|---|---|---|
| Personal Involvement | 74% | 81% |
| Arms Race Issues | -- | 8 |
| Recruited by Others | 4 | 12 |
| Priorities | -- | -- |
| Quality of the Debate | 4 | -- |
| Siting in Cities | -- | -- |
| Technical Shortcomings | -- | -- |
| The Other Side | 15 | -- |
| Social Responsibility of Scientists | -- | -- |
| Peace, Vietnam War | -- | -- |
| The Public Misled | 4 | -- |
| The Military-Industrial Complex | -- | -- |

From Table 5 we conclude that the preponderant majority of the Inner scientists became ABM participants precisely because they were Inners: they had been deeply involved with the ABM question for many years. This would indicate that the events of 1968-1969 did not activate many additional Inners. Figure 5 illustrates the activation of scientists over time. Forty-eight of the 59 Inners were already immersed in the ABM by the time the decision to deploy was announced in 1967.

If we look at the following three closely related answers as a prime reason for becoming activist: I felt the public was being misled

The quality of the debate was so low

The other side was too vociferous,

we find 23% of the Inner pro-ABM scientists felt that these motivations

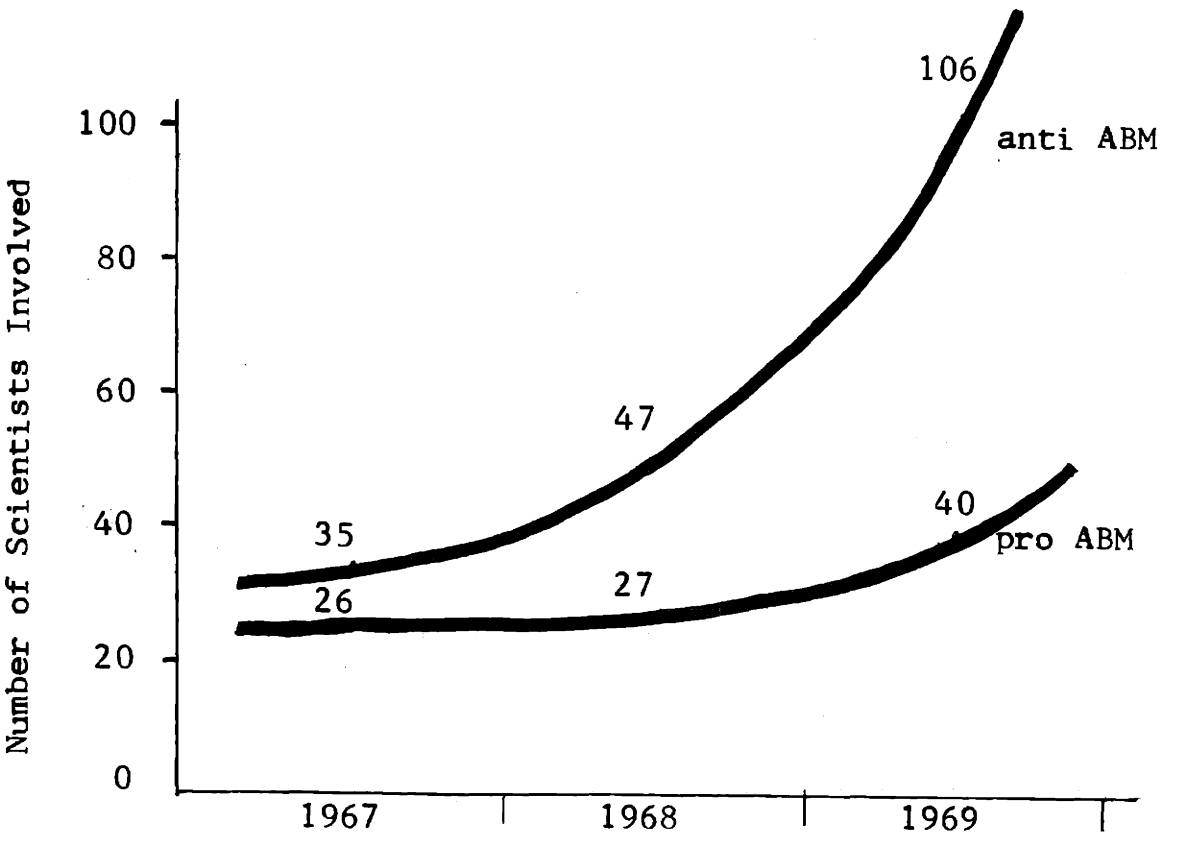


FIGURE 5A: Activation of pro and anti ABM Scientists

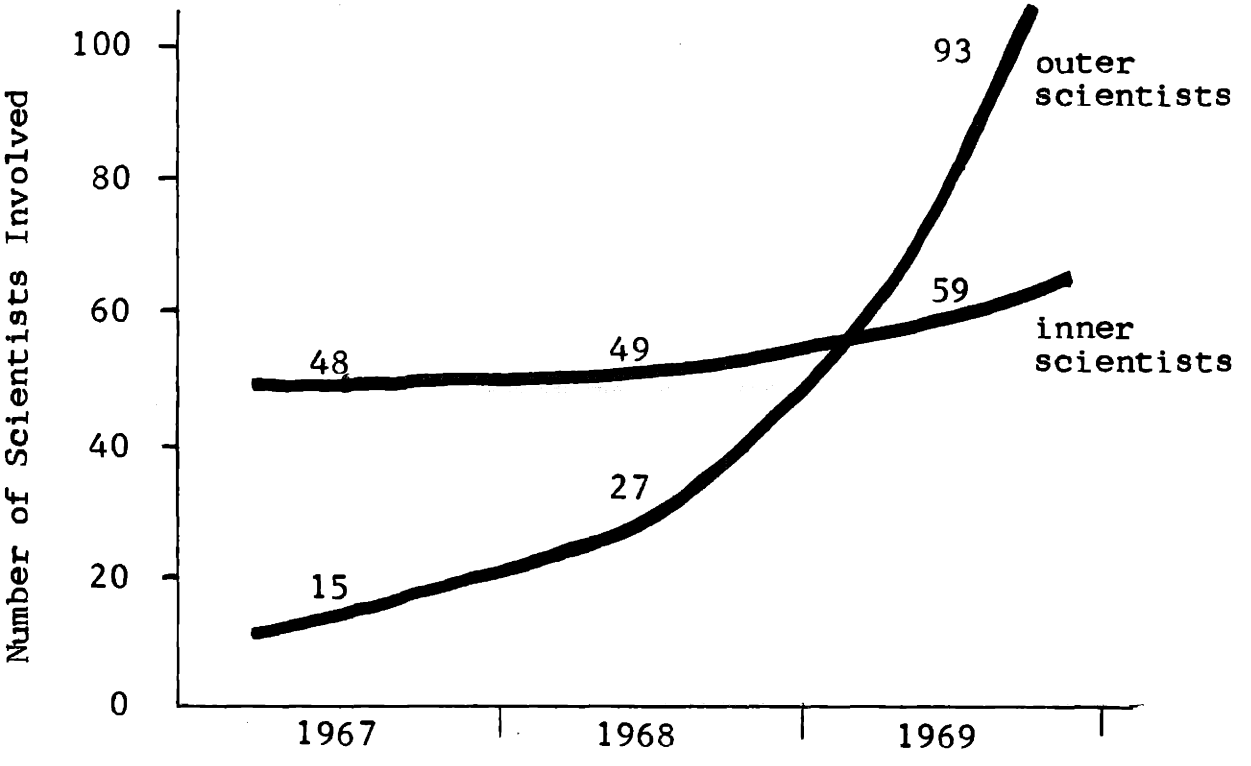


FIGURE 5B: Activation of Inner and Outer ABM Scientists

FIGURE 5: Activation of Scientists Over Time

were central to their shedding their anonymity, while none of the anti-ABM Inners mentioned any of these reasons as their prime motivations. Typical comments of the pro-ABMers were:

> "I decided to go (public) because my colleagues were behaving so abominably."
>
> "I was annoyed at the debate in the sense that it was uneven and unfair."
>
> "I didn't think the vocal opponents were intellectually honest."
>
> "I am in politics in self defense against so many Bethes, Wiesners and Yorks."

However, as far back as 1963 one of these scientists was opposing the Test Ban Treaty because it "would impede the development of missile defenses in the United States."[3]

In the summer of 1966 he wrote, "The cost of the needed missile defense will run into billions of dollars. But we should be glad to pay this cost for the country's safety."[4] In Seattle on December 5, 1967, this scientist stated that the selection of the Fort Lawton site in Seattle for anti-missile defenses means that "Seattle will be safer" and continued that "all the cities which do not have such an anti-missile system should protest."[5] All this occurred before the Outer ABM opponents had become organized and vocal.

In summary, for those Inners who became participants after the deployment decision, the anti-ABM Inners became activists either because they were recruited into the fray by their colleagues or because of their concern with the arms race. Pro-ABM Inners became participants after the deployment decision both in reaction to the ongoing debate as they perceived it and to promote policies they favored.

Now we turn to the motivations of the Outers.

The Outers.

TABLE 6: PRIMARY MOTIVATION FOR INVOLVEMENT OF OUTER SCIENTISTS

| | Pro-ABM (N = 13) | Anti-ABM (N = 77) |
|---|---|---|
| Personal Involvement | 31% | 13% |
| Arms Race Issues | 15 | 38 |
| Recruited by Others | 15 | 10 |
| Priorities | -- | 12 |
| Quality of the Debate | 15 | 3 |
| Siting in Cities | -- | 10 |
| Technical Shortcomings | -- | 3 |
| The Other Side | 8 | -- |
| Social Responsibility of Scientists | -- | 5 |
| Peace, Vietnam War | -- | 4 |
| The Public Misled | 15 | -- |
| The Military-Industrial Complex | -- | 3 |

We recognize that the numbers we are dealing with are quite small. Nevertheless, from Table 6 we can see that for the Outer scientists, a strong stimulus for the pro-ABM side was also the emphatic feeling that the vocal anti-ABM scientists were "the Bad Guys". Said a California physicist: "I recognized it as a cause blown out of control by leftists." From an Argonne Laboratory scientist: "...the conviction that the most vociferous of the physicists in opposition were using their reputation in physics to influence opinions in matters where they had little understanding and less competence."

Quite another motivation was expressed, however, by Freeman Dyson of the Institute for Advanced Studies at Princeton. Dyson was in the British Royal Air Force during World War II, involved in the strategic bombing of Germany. For Dyson this was a traumatic experience[6] and because of it, Dyson says he has become "emotionally committed to defense." While he thought that MIRV was a more serious problem, he was "dragged into the ABM debate because everyone was paying attention to it."

From Table 6 we see that 31% of the pro-ABM Outers, as compared to only 13% of the anti-ABM Outers cited personal involvement as their primary motivation. By looking at Figure 5, one explanation for this contrast arises. Of the 40 pro-ABM scientists, only 14 became active after the deployment decision; 65% of the pro-ABMers were already involved prior to that time. Of the anti-ABM scientists, however, 74 became activated after September 1967, compared to 35 who were involved before.

According to Table 6, a greater variety of motivations was expressed by Outer scientists opposed to ABM. A partial explanation for the diversity of responses is that the activation of these scientists was not simultaneous, but occurred over a period of several years.

Among the earliest non-establishment science opponents was a small group of graduate students and professors at the University of Washington. A young graduate student, Newell Mack, appears to have been the "catalytic agent" for initial concern with the ABM. According to Mack, he became interested in problems associated with nuclear war in the early 1960's and by 1965 was worrying about the possibility of an anti-Chinese ABM deployment in the United States. In the Fall of 1965 Mack spoke to Senator George McGovern about the possibility of raising the ABM as an issue in the

Senate and also discussed the problem with David Inglis, another early opponent of the system.[7]

By July, 1967 Mack had prepared an outline "Missile Defense: A First Glance" which he distributed to scientists attending a talk given at the University of Washington by Hans Bethe. In this prescient four page paper, Mack raised many of the questions which would be debated at great length two years later such as the hardness of Minuteman silos, the number, payload and reliability of Soviet missiles, arms race implications of deployment and eventual costs of a deployed anti-ballistic missile system. Moreover, Mack correctly predicted who the main protagonists and antagonists would be in the forthcoming debate and in which magazines and journals the written debates would occur.[8]

While Bethe was at the University, the group discussed with him the possibility of producing an anthology of ABM writings. Bethe agreed "such an anthology would be very timely and would help to form public opinion on this important issue."[9] However, with the announcement of the decision to deploy in September of that year, plans for the anthology were abandoned.

On November 15, 1967 the Army announced the first ten geographical areas to be surveyed as possible locations for the area defense system. These were listed as: Albany, Georgia; Chicago, Illinois; Dallas, Texas; Grand Forks Air Force Base, North Dakota; New York, New York; Oahu, Hawaii; Salt Lake City, Utah; Seattle, Washington; Boston, Massachusetts; and Detroit, Michigan.[10]

When he realized that the proposed missile site for Seattle was to be at Fort Lawton, <u>within</u> the city limits, Mack began to wonder where the

other missile sites for the proposed area defense would be located. On December 19, 1967 Mack wrote to Bethe: "I don't know whether Sprints are to be placed so close to other cities tentatively chosen as possible locations for Sentinel bases...If Sprint missiles are to be placed in or near these cities, then the 'thin' defense begins to look like a destabilizing 'thick' defense."[11]

In real detective fashion he began to ferret out the information. Mack wrote to the Senators of each state where a site was announced, requesting the precise location of the radar sites. Senator John Tower replied, "This is information that I do not feel at liberty to divulge. I would suggest that you communicate with the Army Air Defense Command."[12] Other Senators, apparently not knowing the precise locations themselves, forwarded Mack's letter to the Department of the Army.

Col. Raymond T. Reid, of the Office of Legislative Liaison wrote to Senator Herman Talmadge of Georgia on April 22, 1968 that "a precise location for the radar has not been established at this time." He went on to add, "It may be of interest to you that a similar request from Mr. Mack has been made upon individual Senators of most states announced as a potential Sentinel location."[13] Senator Talmadge forwarded this on to Mack.

The Secretary of the ABM Committee of the Seattle Association of Scientists, as they were now called, wrote to newspapers in each locality named as a site, requesting additional information. By the early summer of 1968 Mack pinpointed the precise locations for seven of the proposed sites and came to the conclusion that "the sites being considered for battery locations are so close to major cities as to defend the cities."[14]

At Argonne National Laboratory too, the chance discovery that the Army was surveying proposed sites for Spartan missiles in their vicinity was the needed trigger for activation. A group of Argonne scientists, members of the local Federation of American Scientists (FAS), had been holding weekly lunch table discussions about the arms race and arms control. As one physicist explained, "Due to (David) Inglis' momentum, the FAS group became opposed to increases in nuclear armament." When the local Sentinel sites were discovered in October, 1968, the latent concern with arms control sprang to the foreground. One of the scientists expressed it in this way:

> It seemed this was an issue where something could be accomplished at a local level and bring the question of the arms race home to people in a much more immediate way than is the case usually. Forcing people to think about these issues in such an immediate local context was useful. I felt that here I might do some good by participating other than just easing my own conscience which tends to be my attitude toward such activities in general.

More Outer anti-ABMers (38%) mentioned arms race implications of ABM as the primary reason for their concern and activity in the ABM issue. The related topic of national priorities and the need to cut military spending was given by 12% of the anti-Outers and was not mentioned by the pro-ABM scientists.

The issue of the social responsibility of scientists was mentioned by 5% of the anti-ABMers. The February, 1969 American Physics Society Meeting in New York and the concurrent but independent formation of Scientists and Engineers for Social and Political Action (SESPA) drew more physicists into the activists' ranks. A University of Wisconsin physicist saw in the ABM "a chance to actually set a precedent for turning down a new

weapons system" and "an issue around which to form a new organization of socially concerned scientists."

Founders of SESPA worried that the ABM concern would be "a short term thing -- a catharsis." One explained he "wanted to demystify scientists, to use the ABM as an issue to begin discussion with people on larger issues. The ABM as such was never a prime motivation for us."

Typical responses of the scientists who mentioned technical shortcomings of the system as their primary reason for involvement ranged from "ABM is an example of expensive misapplied exotic technology. It won't work"--a Bell Telephone Laboratory physicist, to "I was and still am opposed to the ABM on general, almost thermodynamical grounds as another form of pollution of our country"--physicist at the University of New Mexico, and "It was a conspiracy to foist off upon the public a system which was a glorified military WPA project. I became convinced the state of the art was still not adequate"--applied mathematician, University of Washington.

If any pattern can be discerned from such a varigated and disparate set of self-perceived motivations, it would seem to be as follows:

1. Some of the most eminent advisors despaired of being able to continue exerting quiet influence from within the Executive Branch. "I decided to try to participate mildly through the Congress instead" explained a former Special Assistant to the President for Science and Technology.
2. As the prominent scientists began to voice their opposition, eminent proponents became disturbed and "tried to furnish evidence that not all scientists were against it," according to a chemistry Nobelist.

3. Perhaps encouraged by this example and certainly influenced by the opportunity of having an issue (missiles in the back yard) with which they could arouse public attention, scores of scientists, unknown publicly and professionally, entered the political arena to do battle with the ABM.

4. This evoked a predictable reaction from scientists supporting deployment. While characterizing their opponents as "a vocal minority of scientists whose training, judgment and experience did not fit them for the making of this practical decision", they proceeded to reach just such "practical decisions" (to support publicly an anti-missile defense) as well.

WHY ABM OF ALL THINGS?

In addition to questioning the scientists why they personally became involved in the ABM, the broader area of why the antiballistic missile rather than Multiple Independently Targetable Re-entry Vehicles (MIRVs) or the B-1) bomber became the issue upon which so many of them chose to take a stand was also probed.

When the question was phrased this way: "Why do you think scientists picked the ABM?" rather than "Why did you become involved in the ABM issue?", the most frequently given response was that the ABM was a ready made political issue. That is, the siting of missiles in metropolitan areas gave the scientists a cause in which wide spread coalitions rapidly became possible. As Dean Harvey Brooks of Harvard put it, "There was positive feedback from the political system."

While both pro- and anti-ABM scientists agreed that the public outcry against "missiles in the back yard" was the critical ingredient in snow-balling ABM into an ISSUE, the role of scientists as the instigators or as followers was perceived differently by the two sides. The pro-ABM

scientists saw their scientific colleagues as "stirring up the public", "creating the phony issue of accidents". Their general feeling was that if only these scientists hadn't aroused the citizenry, all would have been well. The anti-ABMers saw their role as one of "educating and informing the public" and, moreover, latching on to the ABM after it became an issue, rather than creating the issue.

The evidence on this point is inconclusive. In Seattle, for example, the Mayor was battling the Army to keep Fort Lawton for use as a city park for almost a full year before the scientists became involved. In Lynnfield, Massachusetts, citizens held meetings in May and June, 1968 protesting the selection of Camp Curtis Guild for a missile site, and scientists in the area played no discernable role whatsoever. It was only in January, 1969 that the Boston area scientists became activated on the local issue.

But a different picture emerges in Chicago (see page 71) where it is clear that the Argonne scientists were the nucleating agents for protests against ABM. In Pittsburgh too, scientists established a Pittsburgh ABM Study Group in February 1968, well before ABM emerged as a headline issue. The Study Group made plans to publish papers and generate publicity on the technical and political implications of ABM.[15]

In contrast to ABM, MIRVs and B-1 bombers would not have consumed any surburban property. Elizabeth Drew, writing about the ABM debate in The Atlantic, concluded that "in part the intensity of the anti-ABM sentiment was a fluke, provoked by good old American feelings about real estate."[16]

Only anti-ABM scientists pointed out that to some extent the creation or definition of ABM as the issue was made in the Senate of the United States, not by the scientists. According to Abram Chayes: "You can't pick where you fight." One scientist phrased it thus: "It was inconceivable

that you could get Stuart Symington to oppose a strategic weapon like MIRV. But you could get him to oppose ABM and that was critical."

The answer that ABM had serious technical uncertainties or difficulties was the second most frequent answer of the scientists. Many felt that MIRV was "technically sweet" in J. Robert Oppenheimer's phrase. "One can't say that MIRV won't work," explained a former PSAC chemist. "Therefore it could only be opposed on purely political grounds. But I have both technical and political reservations about ABM," he added. Even pro-ABM scientists agreed that "there are real technical uncertainties with ABM; that is not the case with MIRV."

Another contributory factor of why ABM and not MIRV or the B-1 bomber became the issue, cited by the respondents, was the qualitative "go" or "no-go" nature of ABM compared to the incremental approach possible with MIRV. As Jerome Wiesner, former President's Science Advisor, stated: "MIRV grows along, it is not a 'yes' or 'no' commitment. You can put a MIRV on one missile and have a MIRV deployment." With MIRVs, initial deployment costs are discussed in terms of <u>millions</u> of dollars; initial ABM deployment costs are discussed only in <u>billions</u> of dollars. Even though MIRVs on Poseidon and Minuteman III will eventually cost billions of dollars, "the vastly greater sums of money involved in ABM" were mentioned frequently by the scientists.

One aspect on which there was wide agreement by the opposing sides was that there was little discussion of or opposition to MIRV deployment within and outside of the government compared to the ABM.

Both pro- and anti-ABM participants agreed that 1) the ABM had been debated within government for ten years and 2) arguments in public tend

to reflect arguments in private, within the Administration. That still leaves unanswered why the ABM was so hotly debated and why MIRV was not.

Albert Wohlstetter feels that this is due to a commitment to "minimum deterrence" held by many of the anti-ABM establishment or Inner scientists. According to Wohlstetter, since 1958 these scientists "have been down on ABM and ignoring MIRV." In Wohlstetter's view, these scientists have opposed active defenses since 1958 because they feel that they threaten to deprive the other side of their deterrent and increase the probability of nuclear war. According to Wohlstetter, the deterrent equation for these scientists becomes: Defense of Population = Bad; Offense (ICBMs) = Good. The Sentinel decision was to deploy an urban defense, therefore it was bad.

According to many pro-ABMers, Safeguard is not an urban defense, but a defense of the Minuteman missiles. Therefore this reasoning might not explain the scientists' opposition to Safeguard. However, the anti-ABMers argue that Safeguard "is really Sentinel, thinly disguised." In any case, this writer agrees that a commitment to minimum deterrence theory did play a role in forming the basis of opposition to ABM on the part of many scientists.

Still another explanation offered as to why the scientists did not oppose the B-1 bomber was that "Physicists like something new. One bomber is just another bomber, but ABM was something entirely different. It was a new ball game."

In summary, then, the scientists had a variety of explanations as to why ABM became such an important issue. Among these were the political opportunities which arose from the placement of missile sites in urban areas, the technical uncertainties and the alleged far greater costs of ABM compared to MIRV, commitment to deterrence theories, the greater interest aroused by a qualitatively different weapons system and by the existence of long standing disagreements within the government.

FOOTNOTES TO CHAPTER II

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6. Freeman Dyson, "The Sellout," The New Yorker, Vol. 46, February 21, 1970, pp. 44-59.

7. Interview with Newell Mack, April 10, 1971.

8. Newell Mack, "Missile Defense: A First Glance," unpublished paper, July 28, 1967.

9. Letter, Hans Bethe to Newell Mack, dated August 21, 1967.

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11. Letter, Newell Mack to Hans Bethe, dated December 9, 1967.

12. Letter, Senator John Tower to Newell Mack, dated March 28, 1968.

13. Letter, Col. Raymond T. Reid to Senator Herman Talmadge, dated April 22, 1968.

14. "The Sentinel ABM System," United States Congress, Congressional Record, Vol. 114, July 11, 1968, p. 20699.

15. Notes of the organizing meeting of the ABM Study Group, January 31, 1968, furnished to the author by Professor John R. Townsend.

16. Elizabeth Drew, "Reports: Washington," The Atlantic, Vol. 224, December 1969, pp. 4-18.

# CHAPTER III

## SCIENTISTS DO "THEIR THING"

> It is not book learning young men need, nor instruction about this and that, but a stiffening of the vertebrae, which will cause them to be loyal to a trust, to act promptly, concentrate their energies, do a thing...
>
> --Elbert Hubbard

Stephen Dedijer, of Lund University in Sweden, has suggested a Brinnel classification scheme for the physical and social sciences according to the firmness or hardness of their data.[1] The motivations we discussed in the previous chapter are subjective, open to differing interpretations, and would be, according to Dedijer, "whip cream soft." The actions of the ABM scientists are, however, firmer data and move us up a little on Dedijer's continuum. We shall now examine what activities the scientists engaged in, in their efforts to effectuate or prevent deployment of an antiballistic missile system.

### ADVISORY PANELS

The scientists' earliest involvement with the ABM consisted of serving as members of advisory panels. As early as May 1946, an army study group, the Stillwell Board, recommended the development of an anti-missile defense.[2] A still classified Lincoln Laboratory Summer Study of 1952 which, according to some scientists on it, was primarily looking at anti-aircraft defenses, also concluded that anti-ballistic missile defenses were possible. After a hiatus of several years, the ABM reemerged as Nike Zeus, in a feasibility study conducted for the Army by the Bell Telephone Laboratories and completed in September, 1956.[3]

Almost as soon as the Army recommended deployment of the Zeus system in 1958, the ABM became a controversial issue and scientists began to line up on one side or the other.[4] With President Eisenhower moving his Science Advisory Committee (PSAC) into the White House and creating the Office of Special Assistant for Science and Technology in 1957, the establishment of the Advanced Research Projects Agency (ARPA) in 1958 and the Directorate of Defense Research and Engineering (DDR&E) also in 1958, many of the scientists who were to become major players in the 1969-1970 ABM drama began their involvement with the ABM issue.

Fifty-seven (36%) of the ABM scientists eventually served on advisory panels or task forces concerned with missile defenses. The most important of these have been PSAC and its Military Strategic Panel, and the Defense Science Board (DSB) and task forces established by the Defense Department (DOD), on which 42 ABM scientists served. (Nine scientists served on both PSAC and DOD panels.) While there usually was at least one proponent of deployment on the PSAC panels and occasionally opponents of deployment on a DOD panel, in general, the members of PSAC and its panels opposed deployment while the members of DSB or its panels were in favor of deployment. This is shown in Table 7:

TABLE 7: STAND ON ABM OF MEMBERS OF PSAC AND PSAC/ABM PANELS AND MEMBERS OF DSB AND DOD ADVISORY PANELS AT TIME OF ABM DEBATE

| | PSAC and/or PSAC Panels | DSB and/or DOD Panels |
|---|---|---|
| Anti-ABM | 76% | 23% |
| Pro-ABM | 24 | 77 |
| | (N = 25) | (N = 26) |

There are at least three plausible hypotheses to account for such a polarization. One would be that the scientists' judgments on the feasibility or desirability of an ABM were arrived at independently and were known to the policy maker who then selected them for their views as well as for their expertise.

It is useful to consider in this respect both the PSAC and DOD Panels. Many of the scientists who were on the PSAC Military Strategic Panels were, in the late 1950s and early 1960s, advocates of stressing defensive over offensive strategies and were therefore favorably inclined toward development of an ABM. By about 1962-1963 some of them began to worry about the arms race implications of a deployed system. Others, impressed with the great advances made in offensive missiles began to feel that the offense could always "beat" the defense, whether by sheer numbers or by decoys, chaff and/or other penetration aids. Because some of these scientists, then, did not hold the same views regarding ballistic missile defenses in the mid-1960s as they had in the early 1960s and yet were reappointed to the PSAC Panel, the hypothesis would seem to be unconfirmed.

However, it should be pointed out that the reappointments were not necessarily made by the same man who made the original nomination. The chairmen of PSAC panels are named by the chairman of PSAC, who by tradition has been the President's Science Advisor. From 1957 to the present there have been six chairmen of PSAC.

It is also possible that the incumbent PSAC chairman changed his views on antimissile defenses in step with those of the panel chairman he reappointed.

John Foster, Director of Defense Research and Engineering, who appointed many of the DOD Panel members said quite frankly "that a certain

amount of partiality is built into any advisory body in the selection of its members." But Foster felt that if one only chose panel members who were known to agree with the agency's views, they would not be performing their primary function of examining the agency's proposals with a critical and evaluative eye.

A related but somewhat separate hypothesis would be that the policy maker chooses panel members who have other connections with the agency and who may therefore not really be free to dissent from the department's primary objectives.

Questions dealing with the source of funding of the scientists' research were included in the interviews. For the entire sample of ABM scientists, 35% reported that some or all of their research was funded by the Defense Department. (However it should be noted that information regarding funding sources was obtained from only 98 respondents (65%).)

Table 8 looks at the subpopulation of those ABM scientists who were members of PSAC or DOD Advisory Panels:

TABLE 8: ABM SCIENTISTS ON ADVISORY PANELS WHOSE RESEARCH IS FUNDED BY THE DEPARTMENT OF DEFENSE

| | % funded by DOD |
|---|---|
| Member of DSB/DOD ABM Advisory Panel | 86% (N = 21) |
| Member of PSAC/PSAC ABM Advisory Panel | 47% (N = 15) |

It should be noted that six members of these panels are university administrators who do not engage in research themselves. Although in each case it is quite likely that their institutions receive Defense Department funds for research, these six men were not included in Table 8.

The present and immediate past employment for the total ABM sample is shown in Table 9.

TABLE 9: PRESENT AND IMMEDIATE PAST EMPLOYMENT FOR ABM SCIENTISTS

| Institution | Present Time | Last Job Prior To Present One |
|---|---|---|
| Academic | 60% | 40% |
| Industry | 16 | 13 |
| Non-Profit | 7 | 5 |
| Government Laboratory | 13 | 11 |
| International Laboratory | -- | 3 |
| DOD or DDR&E | 2 | 13 |
| Other Government Agencies | 3 | 16 |
| | (N = 152) | (N = 141) |

Table 10 looks at the present and immediate past employment for the subpopulation of scientists on PSAC or DOD panels:

TABLE 10: PRESENT AND IMMEDIATE PAST EMPLOYMENT FOR PSAC AND DOD PANEL MEMBERS

| Institution | Present Time | Last Job Prior To Present One |
|---|---|---|
| Academic | PSAC 76%<br>DOD 19 | PSAC 46%<br>DOD 32 |
| Industry | PSAC 12<br>DOD 46 | PSAC 4<br>DOD -- |
| Non-Profit | PSAC 4<br>DOD 15 | PSAC 4<br>DOD 8 |
| Government Laboratory | PSAC --<br>DOD 4 | PSAC 4<br>DOD 16 |
| DOD or DDR&E | PSAC --<br>DOD 8 | PSAC 8<br>DOD 32 |
| Other Government Agencies | PSAC 8<br>DOD 8 | PSAC 33<br>DOD 12 |
| | PSAC, N=25; DOD, N=26 | PSAC,N=24; DOD,N=25 |

With 86% of DOD Panel members funded by the Defense Department and 66% of DOD Panel members working for the government or industry at the present time, compared to 47% and 20% respectively for PSAC Panel members, the data would seem to confirm the hypothesis that DOD Panel members tend to be scientists who have funding or employment ties to the Defense Department.

It is interesting to note that Deputy Secretary of Defense David Packard has stated that "I do not consider that when you are involved with scientific matters it is important whether you have people outside the Defense Department or not. Scientists, to me, are objective about such matters."[5]

One could also hypothesize that the homogeneity of the respective views of PSAC and DOD panel members is due to the effect such a group exerts on its members. Solomon Asch in his experiments on the effect of group pressure found that a substantial minority (37%) of his subjects would yield to majority opinion, modifying their judgments in accordance with the majority even when the group's judgments are perceived to be contrary to fact.[6]

Accordingly, one could expect pro-ABM scientists on PSAC gradually to shift to a more negative viewpoint, submitting indirectly, perhaps, to the group norm and anti-ABM scientists on DOD panels to adopt more and more a position favoring deployment. In keeping with this hypothesis, the clearly dominant anti-ABM feelings of the majority of the PSAC panelists did seem to serve to inhibit the expression, if not the maintainence of an opposing viewpoint of at least one panel member interviewed. On the other hand, Richard Latter, of the Rand Corporation, a member of the PSAC Military Strategic Panel, seems to have always

withstood whatever pressures that group may have exerted and has expressed his pro-ABM views clearly and vigorously, according to other panel members.

In summarizing the three hypotheses, the data seem to the author to be suggestive rather than conclusive evidence for confirming the latter two hypotheses.

Since none of the hypotheses are flattering to the scientists' own view of their independence, it would seem that the anomalous members deserve a closer look. By anomalous members, we refer to those scientists who were opposed to ABM deployment and were members of DOD panels and those who favored deployment and were members of PSAC panels. If scientists served on both PSAC and DOD panels, then they must have been anomalous members on one panel or the other. With three exceptions, all of the anomalous panel members are those and only those scientists whose memberships overlap, that is, they were members of both PSAC and DOD panels. This is illustrated in Figure 6 .

If we now ask how these overlapping or anomalous scientists are selected for membership on the advisory committees, the following hypotheses can be considered:

HYPOTHESIS 1: The scientists are so prominent and eminent that they cannot be excluded, that is, the credibility or legitimacy of a panel which did not include them would be questioned. Looking at our three indicators of eminence; being a Nobelist, membership in the National Academy of Sciences, and scientific citation rate, we find no statistically significant differences between scientists who did and did not overlap. We also found no differences between these two groups of

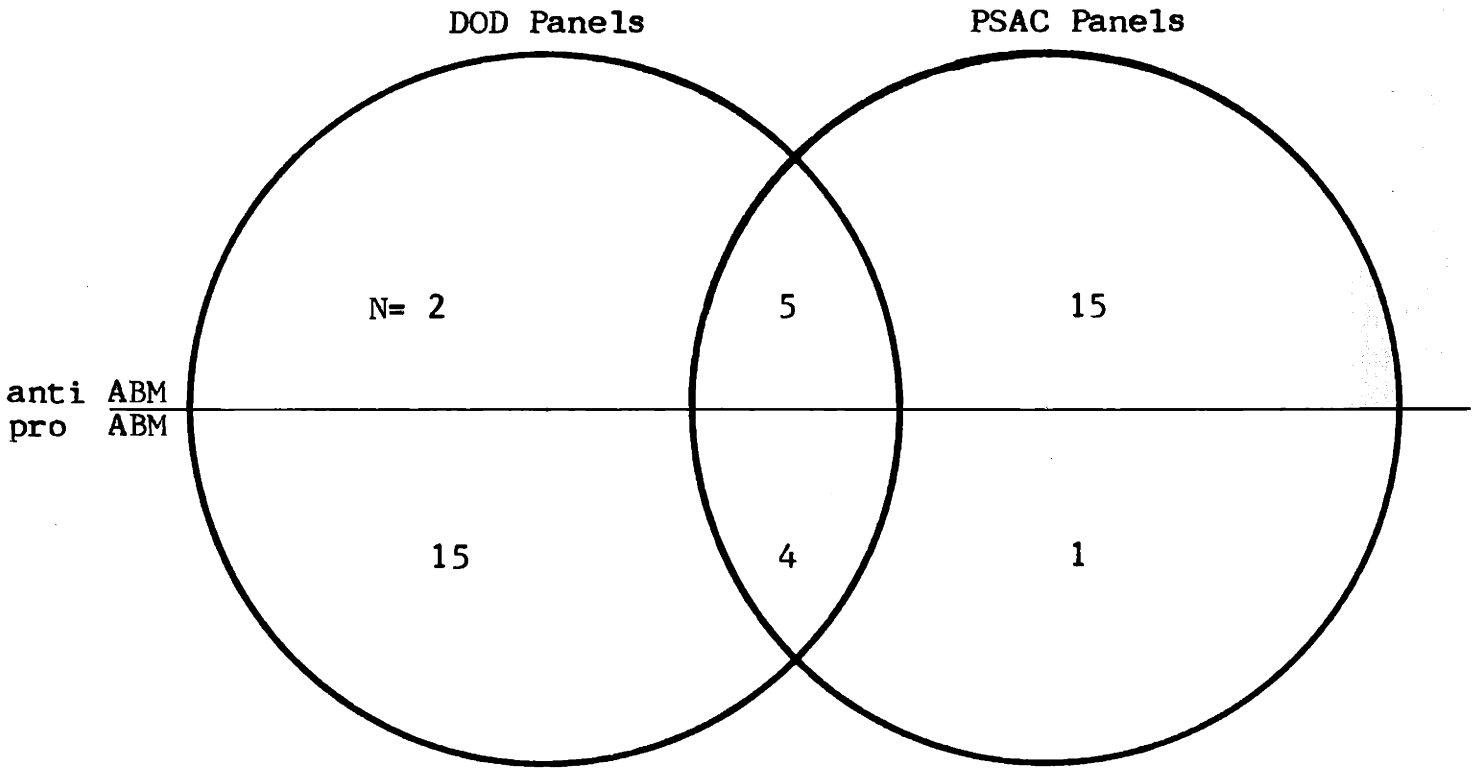


FIGURE 6: Stand on ABM by Members of DOD and PSAC Panels

scientists in terms of the length of time they had been involved with the ABM issue.

HYPOTHESIS 2: The scientists are first appointed to the committee where they are in the minority or anomalous position. Then later they become a member of a panel where they are in agreement with the majority views. This also does not seem to be borne out by the data. In each case with which we are familiar, the anomalous scientists had a prior identification, connection or affiliation with the panel in whose reports they concurred, then came their appointment to an advisory group "on the other side."

HYPOTHESIS 3: The stands of the scientists are known to the decision maker and the anomalous appointment is made to "balance" or "legitimatize" the advisory group. This seems well supported by the available data. This hypothesis is further strengthened when we refer back to the strong polarization shown in Table 7. In going over panels that have examined the ABM issue since 1967, in only one instance could one speak of such a phenomenon as a "nearly evenly divided" panel. In all other cases, the anomalous scientist was clearly in an isolated position where he was sure to be outvoted and overruled. But that is not to say he was without effect and influence. A pro-ABM PSAC panel member, for example, felt that his threat of issuing a minority appendix had altered more than one PSAC panel report.

The mantle of executive privilege makes it extremely difficult to obtain reliable information about the performance, scope and recommendations of these advisory groups. The following information, which has been obtained by a variety of techniques including interviews, deduction, and cajolery, gives a glimpse into the proceedings within these inner sanctorums.*

To begin, it may be useful to contrast the Defense Science Board and Defense Department Task Forces with PSAC and PSAC Panels. DOD panelists appeared to take a narrower view of their responsibilities and tended to view their position as less independent. As one DOD Panel member said, "We really work for DDR&E and John Foster. We respond to his concerns." This same member stressed that Foster utilized the Defense Science Board much more than his predecessor, Harold Brown, did. However, the process may be circular; a panel member may suggest something to DDR&E which then requests a study.

PSAC Panels are more likely to initiate avenues of inquiry and originate studies for themselves. DOD Panels have a specific charge spelled out to them. PSAC Panels are almost always chaired by a PSAC member and the Panels report back to PSAC and to the President's Science Advisor. The DOD Task Forces are often chaired by a non-member of the Defense Science Board and report back to the appointing agency, mostly DDR&E, not to the Defense Science Board. The DOD Panels are more ad hoc, while PSAC Panels, particularly in the case of the Military Strategic Panel, continued for many years. In both DOD and PSAC Panels, there is considerable continuity of membership and often overlap between committees as well.

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* A selected bibliography on advisory bodies is to be found in Thomas E. Cronin and Sanford D. Greenberg (eds.), The Presidential Advisory System (New York: Harper Row, 1969) pp. 339-357.

For example, Richard Latter in the years 1967-1971 was a member of the PSAC Military Strategic Panel, was chairman of a 1967 DOD Task Force on Ballistic Missile Defense, was a member of the Defense Science Board, was chairman of a 1970 DOD Task Force on Missile Defense, and chaired the 1971 DOD Task Force on Hardsite Defense.

The longevity of membership tends to generate a chummy, club-like atmosphere. Thus we learn that the October 1968 meeting of the PSAC Military Strategic Panel was converted into a working session of Scientists and Engineers for Humphrey-Muskie, to the chagrin of at least one panel member who was a Nixon supporter. He viewed with distaste the sight of his colleagues "arranging calling and canvas activities at the expense of the legitimate responsibilities of PSAC." Other panel members, when questioned about this, either stated they had not attended the meeting or could not remember such an activity occurring, but no outright denials were issued.

Briefing sessions are de rigueur for most panels and an officer of a major ABM contractor recalled how "we were called on the carpet about twice a year by PSAC" up until about 1965. "Each briefing" he claimed, "was followed by a scathingly denunciatory report by PSAC on the suitability of ABM."

The chairman of a 1967 DOD Panel to assess the Chinese ICBM threat stated that panel members worked eighteen hours per day for six weeks in Washington preparing that report. In contrast, the DOD Ad Hoc Group on Safeguard for FY 1971 (the O'Neill Panel) met for a total of three days before submitting their report.* Since the report was publicly

* Almost the entire O'Neill Report was declassified and inserted in the Congressional Record, August 6, 1970.

available, panel members felt freer to discuss it. We shall conclude this preliminary description of the scientists' activities on advisory panels by a closer examination of that panel.

The members of the group were Lewis Branscomb, Director, National Bureau of Standards; Sidney Drell, Professor of Physics and Deputy Director, Stanford Linear Accelerator Center; Marvin Goldberger, Professor of Physics, Princeton University; William McMillan, Professor of Chemistry, University of California at Los Angeles; W.S. Melahn, President, Systems Development Corporation; Lawrence O'Neill, President, Riverside Research Institute, (chairman); Allen Peterson, Professor of Electrical Engineering, Stanford University.

John Foster stated that he "personally picked the list and called them." Some of the panel members were apparently notified by mail with the charge to the committee spelled out. However, two panelists asserted they were notified by telephone on Friday, with the committee scheduled to meet the following Tuesday. Both these scientists were told over the phone that they were being asked to evaluate DOD proposals for Safeguard Phase II and were told that any objections they raised regarding the system would be passed on to the Administration along with recommendations. However when the Panel convened on Tuesday, the charge laid out by Gardiner Tucker, Assistant Secretary of Defense for Systems Analysis, was to "offer advice on scientific and technical grounds regarding the deployment of additional elements of Safeguard to be funded FY 1971."[7]

One of the two "telephoned" scientists said that he "felt betrayed" when the meeting got underway and the other man stated that "he appreciates

now that if one joins a panel, one must have in writing what the charge to the panel is." Nevertheless, both scientists did "review and approve" the report when it was issued.

Richard Latter, though not a panel member, attended all panel meetings and deliberations. One panelist said he had insisted on Latter being on the panel because "it would increase our credibility with Johnny Foster," but according to another panel member, "Latter was a noisy observer whose views were not reflected in the report." Said this scientist, "I presume Latter was there to give Foster an account of who said what; he was a functionary of J. Foster's."

The first day was devoted to "briefings by the Safeguard Systems Command, the Advanced Ballistic Missile Defense Agency (ABMDA) and representatives of DDR&E. The material covered in these briefings included: a threat assessment at the top secret level; a Safeguard status report; Safeguard schedules and budgets for various possible deployment programs; ABMDA advance study and development programs; a joint Safeguard/ ABMDA study of active defense of Minuteman; and a description of possible alternatives to active defense for improving the survivability of Minuteman."[8]

The second day was given to discussion, the definition of points of agreement and identification of differences in technical judgments.[9] The preparation of working notes for the group's report and the presentation of its advice to officials in DOD occupied the final day.[10]

In its conclusion ("pablum-like" according to one panel member), the report offered the following comments: "Safeguard Full Phase II is a system embodying compromises intended to enable the system to achieve to some extent, the three objectives stated by the President. It provides

thin area coverage and some defense of Minuteman. It retains the possibility of including Safeguard technology in a dedicated system for Minuteman defense."[11] In addition the report included observations on budgetary matters, the relationship between various deployments and the realization of the several objectives of Safeguard, (i.e. defense of Minuteman, light defense against Communist China and coverage against sea launched ballistic missile attacks).

There the report might have remained, buried under stacks of similar advisory panel reports, forgotten or unheeded. There are times, however, when officials seemingly want to buttress their projects with an aura of legitimacy and expertise. Such appeared to be the case when, as he faced hostile questioning by members of the subcommittee on Arms Control, International Law and Organization of the United States Senate Committee on Foreign Relations, on June 4, 1970, John Foster resurrected the O'Neill Panel report.

In answer to Senator Fulbright's question whether "the (Defense) Department is capable of an objective view of these matters"[12] Foster pointed out "that he had asked a group of scientists to come together as an ad hoc committee...and to review the program." He continued that "the report sent to the Secretary of Defense said this equipment will do the job that the Department of Defense wants to do."[13]

That must have caused the telephone lines to sizzle, for the very next day Sidney Drell, one of the panel members, wrote to Senator Gore, chairman of the Subcommittee, "It seems to me that Dr. Foster's remarks indicate that we made recommendations which in fact we did not make."[14]

Another panelist, Marvin Goldberger, indicated "<u>The report took no such position</u>."[15] On June 29 both scientists appeared before the

subcommittee and vigorously denied that the O'Neill Panel had reached the conclusions attributed to it by Foster.

To assuage the suggestion that Foster had misrepresented the views of the panel members, O'Neill wrote to Senator Stennis, chairman of the Senate Armed Services Committee that

> Several times I have heard of references to the so-called "O'Neill" report in hearings before committees and in other discussions in the Senate. I have been particularly disturbed by suggestions that seem to have been made at various times that Dr. John S. Foster misrepresented the views of the members of the panel that prepared the report when he stated that the panel felt that SAFEGUARD components would "do the job" the Department of Defense wants to do in ABM.
>
> Dr. Foster was aware, as all panel members were, that our membership included men of considerable distinction who believed SAFEGUARD deployment was a poor idea from a political and strategic point of view and that some members felt that approaches to ABM other than SAFEGUARD might be preferable from a technical point of view.
>
> Nevertheless, it should be realized that Dr. Foster's inference is a reasonable one in view of the way the panel presented its advice. In addition to the submission of its written report, the panel twice participated in spoken presentations of its work to senior officers of the Defense Department and the Department of the Army. Dr. Foster was present on both occasions. Both discussions were of an "open forum" type at which any panel member had full opportunity and encouragement to speak out. Although it was clear that some panel members would have preferred to pursue technical approaches different from SAFEGUARD, no panel member offered the opinion that pursuit of SAFEGUARD was so unpromising as to be clearly inadvisable. In the circumstances of these conversations, as in the written report, Dr. Foster would, in my judgment have been fully justified in concluding that we thought SAFEGUARD was a reasonable approach although not, in the opinion of some, the best possible approach. In a complicated technical situation it is usual, indeed inevitable, for such a range of opinions to exist.
>
> Dr. Foster's comment suffered from normal difficulties resulting from the brevity that is usual in the answer to a question during testimony. It cannot, in my opinion, be fairly viewed as a misrepresentation or as substantially different from the reply that most (in my opinion) members of the panel would have offered in Dr. Foster's place.

> In short, in my opinion, given the constraints of funding and schedule that had been specified to the panel, most members believed that SAFEGUARD was a reasonable approach to ABM and conveyed that impression to Dr. Foster and others.
>
> I hope this will be of some assistance in clarifying a matter which might have some bearing on the difficult judgments that Senators will soon be called upon to make. [16]

The membership, scope, performance and effectiveness of advisory panels vary from one panel to the other. In summarizing our conclusions about the O'Neill Panel, we would not feel justified in generalizing to advisory panels at large.

From the timing of the meeting of the O'Neill Panel, it would appear that the panel contributed at most a very marginal or minor input into the decision-making machinery. The panel met on January 6-8, 1970. President Nixon announced the FY 1971 plans for Safeguard at a press conference on January 30, 1970.[17] It would seem that the decision-makers who convened the panel had substantially decided what course to recommend and it appears to this observer doubtful that there would have been any substantial difference in the President's recommendation had the panel never met. One can speculate that if the panel report had pointed out a gross technical blunder or had used less ambivalent and watered down terminology, the result might have been different, but this

must remain speculation.

Moving now to the role of scientific advisors in the ABM issue overall, scientists have been active as advisors in the ABM issue since the idea of "hitting a missile with a missile" was just that, a concept, a dream or a nightmare. The advisory panels established within the Executive Department, both by the President's Science Advisory Committee and by the Department of Defense, have been highly polarized groups with the PSAC panels consistently opposing deployment and the DOD panels favoring deployment. The composition of the panels has been fairly homogeneous with PSAC panel members coming primarily from the academic world and DOD panel members being mostly industrial and government scientists. The evidence would seem to indicate that the DOD panelists are not entirely free from dependence upon ar allegiance to the Defense establishment. That is not to argue, however, that there are no pressures working on PSAC panelists. There assuredly are, but being perhaps of a more subtle nature, are more difficult to recognize. The fragmentary and anectodal nature of the available information about the achievements of such advisory groups preclude forming any firm conclusions.

FRIENDS AND NEIGHBORS

Among the other activities the scientists engaged in, speaking, lecturing, and debating about the ABM in their own communities were the actions in which the largest number of them participated. In Seattle, Berkeley, Honolulu, Minneapolis, Detroit, Chicago, New York, and Boston, more than half (51%) of the ABM scientists "took to the hustings" to extoll the virtues or vices of ABM systems to women's clubs, Chambers of Commerce, students, bird watchers, or clergymen, to almost any warm body willing to listen, it appeared at times.

While the scientists who served on advisory committees were by our definition Inners, the scientists who spoke out in their own communities were predominantly Outers. Of the 76 scientists who lectured or debated the ABM issues before their neighbors and friends, 78% were Outers and 22% were Inners. What activated these Outer scientists to become activists was in many instances the discovery that a proposed missile site was to be located in their vicinity.

Many elements of the activation of Outer scientists into the ABM issue are illustrated by the Argonne Laboratory story. Foremost among these is the serendipitous nature of the discovery that 55 feet high rockets carrying megaton sized thermonuclear warheads were to be emplanted literally in one's backyard.

In the flat, square, neat suburban communities of Chicago's western suburbs, a biweekly community newspaper, Suburban Life, on October 26, 1968 contained a small story about "The Chicago base of the Sentinel Missle(sic) Air Defense system will be located either on a portion of the Healy farm land...or west of Westchester...Both Spartan and Sprint missiles would be kept at the Chicago site, Col. H.G. Fuller, executive officer of the North Central Division, Army Corps of Engineers, Chicago, said...Fuller added that residents surrounding the site would have no problem with excessive noise...'These are not the type of missiles with engines that can be warmed up,' he said..."[18]

Since both locations were within eight miles of his own home and Argonne National Laboratory where he was employed as a physicist, John Erskine stopped off at the farm to inquire "what was going on." The drilling rig operator laconically mentioned "something about missiles,

you know, the big ones." Erskine called the Army Corps of Engineers in Chicago who verified that the diggings were indeed for the Sentinel ABM system.

As a member of the FAS group at Argonne, Erskine had read and discussed with David Inglis, then also at Argonne, his articles[19] opposing a United States deployment of an anti-ballistic missile in answer to the Soviet Union's deployment of one ; he knew of former Science Advisor Jerome Wiesner's opposition to ABM[20] and he had read the Richard Garwin-Hans Bethe article detailing technical shortcomings of an ABM.[21] But until that moment, the ABM was simply one of many issues-- urban blight, pollution, prejudice, Vietnam--about which Erskine and thousands of other scientists had vague feelings of uneasiness.

Suddenly and dramatically ABM exploded on the collective consciousness of the Inglis-FAS group at Argonne into an issue of immediacy and paramount importance. The scientists were propelled into action.

They scrutinized the record of the hearings of the subcommittee on Military Applications of the Joint Committee on Atomic Energy of the previous year and abstracted them for handy reference. They prepared charts and graphs from The Effects of Nuclear Weapons, an AEC and DOD publication, and they telephoned numerous queries directly to the Huntsville, Alabama Sentinel System Headquarters.

Before three weeks elapsed, two of the Argonne scientists contacted friends in the television and newspaper media, and on November 15 Chicagoans awoke to find two inch headlines querying "A-Missile Sites in Western Suburbs?"[22] Television, radio and newspaper reporters interviewed the Argonne scientists, and three days later, the scientists

now calling themselves "The West Suburban Concerned Scientists" had prepared a position paper discussing the issues of cost, effectiveness and arms race escalation of ABM. Local government officials in areas adjacent to proposed missile installations were contacted with an offer to send speakers and information packets.[23]

Almost immediately the public meetings commenced. The Army organized a briefing session for local congressmen, governmental officials and the public which the Argonne scientists attended. The questions of safety raised by them prompted one citizen at the meeting to ask "how far from Chicago the missile site could be placed without reducing its effectiveness?"[24] Col. William Wray, chief of site operations for the Sentinel System command, said "he could not answer the question for security reasons."[25] AFter the army briefing the scientists in attendance were again interviewed by the news media and pointed out that many answers to the questions raised were obtainable in the open literature.

Area residents began circulating petitions to block the development of the defense facility at either of the two proposed sites. "We'd rather have the dump" is the way Mrs. Joseph Sanek, a suburban housewife of Westchester who became active, explained her stand against the proposed missile site near the village.[26] Thus "the Argonne scientists found themselves allied with residents who were concerned that a military takeover of the dump would mean increased garbage-hauling charges," wrote Calvin Trillin in the New Yorker in February, 1969.[27] Trillin came to Chicago for a week in January and accompanied the scientists on their lecture circuit.

Over 350 citizens of Westchester attended what was to be the first of many village board hearings that winter. The panel discussion featured

Frederick Wedinger, village president, Congressman Harold Collier and John Erskine and John Schiffer of Argonne.[28] In contrast to the scientists' eagerness to speak at all possible meetings, the Army continued its policy of stating that "It would not be possible for an Army representative to appear at a meeting to discuss the proposed Winchester site inasmuch as much of the material is classified."[29] At the end of the meeting, after a show of hands indicated that, with one or two exceptions, all 350 people opposed the proposed sites, the village board passed a resolution opposing the missile sites.[30]

Three days after this initial victory Erskine, accompanied by another Argonne physicist, Roy Ringo, addressed 75 members of the York Woods Community Association.[31] Now the speaking engagements spread out with George Morrison addressing the Holy Name Society of La Grange Park,[32] Stanley Ruby talking to the Lombard Democratic Club[33] and together with Congressman Sidney Yates and Village President Paul Thomas, speaking at a public meeting sponsored by the Glenview League of Women Voters.[34] All this flurry of activity centered in the Western suburbs. Suddenly, on December 12, Libertyville, a northern suburb, was selected as the site for the installation and the action shifted to the northern suburbs.

The Forward Luncheon meeting of the Waukegan-North Chicago Chamber of Commerce heard George Stanford, yet another of the Argonne Dauntless Dozen, speak on "The ABM -- What Does It Mean?"[35]

By now, with one village and county board after another having passed resolutions objecting to missile sites within their jurisdiction, the Army changed its policy and dispatched a team "ordinarily consisting of two full colonels, a lieutenant-colonel working the slide projector

and a civilian public relations man with a pipe, a Sentinel tie clasp and an elaborate tape recorder"[36] to counter the Argonne scientists' offensive.

As the opposition continued to mount, the Army strategists decided to shift to their top team and sent John Foster and Lt. General Alfred Starbird to an open briefing in Waukegan, attended, of course, by the indefatigable Argonne scientists as well. Foster said that the Sentinel system was designed to be used against a relatively primitive Chinese attack (conjuring up in Trillin's imagination "visions of thousands of Chinese peasants laboriously carting the mud of the Yangtze to crude molds, creating out of the baked earth something that roughly resembles an intercontinental ballistic missile, straining together to pull it back on some enormous catapult and launching it 7000 miles over the Pole in an attempt to obliterate Chicago"[37]). "But," Foster continued, "the matter of thick and thin is one of degree" and "he did not know whether or not the present system might be expanded."[38] This remark did not allay or mitigate the scientists' fears and their speaking engagements continued unabated throughout January 1969 with "the soldiers and the scientists travelling around Lake County like old prize-fighters staging exhibitions"[39] until on February 6 the new Secretary of Defense, Melvin Laird, ordered a halt to further ABM site investigations pending a project review.

For the Argonne scientists, Laird's announcement resulted in a diminution but not the cessation of their public speaking on the ABM. At the University of Minnesota, in contrast, the announcement of the Safeguard decision in March marked the beginning of the anti-ABM effort. Here the focus was on small neighborhood gatherings of "affluent and

conservative suburbanites" according to a professor of chemical engineering. He estimated he spoke to at least one such "coffee klatsch" weekly throughout the summer of 1969.

Pro-ABM scientists too were speaking out in their home towns, pointing out that many cities already had nuclear weapons stored nearby and that there had been no accidents caused by these. Of the 76 scientists who lectured or debated in their communities, 12 were pro-ABM and 64 were anti-ABMers. Although a few scientists charged fees for these speaking engagements, mostly the scientists did not seek any payment for their lecturing forays.

A novel approach was adopted by a physicist at the State University of New York at Stony Brook who tired of addressing only a few dozen people at each meeting. He informed the next bearer of an invitation to appear that he would charge a speaking fee of $500 and return one dollar to her for each seat filled in the auditorium. The gimmick worked. The scientist addressed a packed hall and went home no richer, but greatly pleased.

Each area had its own particular set of circumstances which determined to some extent the format of the scientists' speaking activities. In Seattle where the mayor had been attempting to obtain Fort Lawton, the first proposed missile site, for a city park, the scientists addressed many conservation groups. In Pittsburgh the focus was on amalgamating a large coalition of citizens' groups which emphasized the issue of national priorities. In Detroit, Alvin Saperstein, a physicist at Wayne State University had difficulty in enlisting the support of his colleagues and single handedly did almost all of the public speaking

in that area. "I never saw the inside of so many churches and synagogues before in my life," Saperstein said. In Boston, by contrast, Nobel Laureates and former Presidential Science Advisors joined relatively unknown scientists in the local public speaking efforts. In general, however, as we stated, speaking in their own communities was predominantly an activity of the Outers.

PEREGRINATIONS

When we turn our attention now to the scientists who travelled to other localities and communities, this changes. At least 44 scientists travelled away from their home towns, sometimes criss-crossing the country to spread the gospel according to Saint Donald or Saint Jerome. We find that 59% of these scientists were Outers and 41% were Inners. These two groups, the Inners and the Outers, reported widely differing receptions, audiences and experiences.

For example, Nobelist George Wald addressed over 2300 Chicagoans who paid up to $7.50 each to attend a rally sponsored by Chicagoans Against the ABM.[40] In the same month an Outer physicist travelled to North Dakota to speak before "about 50 people, only a few of whom were youngsters, at a public forum...at the Municipal Auditorium. The event... raised $53 in donations. Most of that will be applied toward ____'s plane fare. He received no speaking fee."[41]

Many of the scientists' speaking arrangements were coordinated by the dozens of ad hoc citizens groups formed by both sides. A feast of acronyms seemed to spring up across the country from SCRAM (Sentinel Cities Reject Anti-Missiles) in Seattle; WOMAN (Women Opposed to Missiles

and Nuclear Warheads) in Detroit to NO ABMS (Northfielders Opposed to ABM Systems) In Minnesota.

One such organization was The Committee To Maintain A Prudent Defense Policy co-founded in May 1969 by former Secretary of State Dean Acheson, former Deputy Secretary of Defense, Paul Nitze, and Professor Albert Wohlstetter of the University of Chicago. This committee was formed, according to Acheson's invitational letter, "because of their strong concern that the argument has been largely one-sided." They wanted to "contribute to a balanced debate."[42]

An office was established on Connecticut Avenue in Washington D.C. and was staffed by a secretary and two young men, one a graduate student of Wohlstetter's and the other, a family friend of the Wohlstetters. The staff arranged for appearances by Committee members on the Today and the David Frost television programs and set up debates between ABM supporters and opponents.

But the primary function of this committee was issuing nine reports or position papers which were distributed to all Senators before the vote was taken in August 1969. The first of these, by Wohlstetter, argued that limiting Safeguard to research and development and testing in the Pacific, as was implicit in the Cooper-Hart amendment, would "bear a high cost of symbolism" and be "an assured waste."

Other papers produced by the Committee were devoted to countering specific arguments raised by opponents of deployment concerning the vulnerability of the radars, arms race implications, SS 9 deployment, surprise attack and launch-on-warning.

In summary,
/whether the particular group's primary purpose was arranging the speaking engagements of the scientists or providing a forum for their

ABM papers, the newly forged alliances between peace, farm, labor, business, religious and political groups and a sizable segment of the scientific community seemed to exude an aura of fellowship and well-being seldom expressed before between "town and gown".

CONGRESSIONAL APPEARANCES

Among the scientists' many ABM activities perhaps the most important and far reaching innovation was the appearance of non-administration scientists testifying before Congress on a weapons system.

The scientists' first contemporary foray in the halls of Congress was the epic struggle for civilian control of the Atomic Energy Commission in 1945-46. This battle had many similar characteristics to the ABM fight. Among these was the initial opposition within the Congress of the United States to hearing scientific testimony in opposition to the Administration's proposal. After holding five hours of hearings, Chairman Andrew J. May of the House Military Affairs Committee said that "his committee had heard everyone who asked to testify and closed its hearings because there were no more witnesses."[43] The four witnesses heard were Secretary of War Robert P. Patterson, General Leslie Groves, commanding officer of the Manhattan Project, Vannevar Bush, Director of the Office of Scientific Research and Development and James B. Conant, Chairman of the National Defense Research Council.[44]

According to Alice Smith, "Within ten days of its introduction, a significant portion of the American scientific community was in full cry against the May-Johnson Bill."[45] Within a week the hearings were reopened and a procession of scientists marched to the Capitol to oppose the May-Johnson Bill. But it must be stressed that the May-Johnson

Bill dealt with the establishment of the Atomic Energy Commission. It did not deal with a weapons system.

When the storm erupted about developing the hydrogen bomb in 1949-1950, it occurred behind tightly closed doors. Most scientists and certainly the public only became aware of the existence of that raging battle when the transcript of the Oppenheimer hearings was published in 1954. Non-government scientists had testified both for and against the Partial Test Ban Treaty in 1963, but the Partial Test Ban was a treaty, a recognized political instrument, not a weapons procurement, a recognized military perogative.

To understand the extent of the break with tradition, it is necessary to glance backwards in time a little. Since the Second World War, the United States Congress had not challenged the Defense Department seriously on any appropriations.

Lewis A. Dexter reported in 1965[46] that Congressmen themselves indicated they did not tend "to raise or consider questions of military policy in terms of its meaning for some national or international political objective or goal." Dexter could find few examples during 1946-1957 of Congressional committees "seriously evaluating decisions about weapons, appropriations, personnel, missions, organization or administration..."[47]

As recently as 1966, the Military Appropriations Bill sailed through the United States Senate without so much as a roll call vote.[48] It was not only in the halls of Congress that one witnessed virtual unanimity on every national security proposal. Throughout the land, only a few voices called out for public debate on such issues as the proposed deployment of an anti-ballistic missile system.

We know now, with hindsight, that throughout 1967 this proposal was being fiercely debated within the Executive Department[49], but during the spring and summer of 1967 there was a notable absence of public discussion of the issue. Ralph Lapp, in addressing the Midwestern Conference of Political Scientists at Purdue University in April 1967, cried out in solitary protest:

> The President has a science advisor, but he has given no public counsel on Nike X. The White House has a President's Science Advisory Committee, but it issues no public statement--no White Paper on Ballistic Missile Defense. The National Academy of Sciences has a Defense Science Board, but it gives no public counsel on Nike X. But the science hawks sweep down and urge more arms. [50]

Senator Joseph Clark took up this concern as he inserted Lapp's speech into the Congressional Record and emphasized "What is needed...is informed national debate on the issue of anti-ballistic missile deployment. Congress, the Executive and all sectors of American national life must participate in such a debate."[51]

Senator Jacob Javits commented on what he considered to be "the inadequacy of the national debate which preceded the ABM decision" in a speech he delivered at New York University on November 6, 1967, seven weeks after McNamara's announcement of deployment.[52]

"It is essential," Javits stated, "that public men, both in and out of government join the continuing debate over the need and justification for ABM defense. Now is the time we need the views and judgments of the nation's best minds. Later, when we might be irrevocably tied to the ABM roller coaster, their post mortem dissent will be of little value."[53]

But when the Congressional committees held authorization and appropriation hearings on the Sentinel system in 1968 the sacrosanct modus vivendi continued unaltered, as was brought out in the following

exchange between Senators Fulbright and Russell:

Fulbright: "Did I understand the Senator to say that no witnesses were brought into the hearings on this matter except administration witnesses?"

Russell: "We heard all the witnesses who wanted to be heard."[54]

Hans Bethe, George Kistiakowsky, Jerome Wiesner and Herbert York had telegraphed Senator Cooper on July 23: "We believe that it would be wise to delay this deployment for a year or more."[55] When this telegram and a similar one sent to Senator Hart signed by Bethe, Carl Kaysen, George Kistiakowsky, Arthur Larson, Burke Marshall, Roswell Gilpatric, Wiesner and others were referred to, Senator Russell replied: "We have been conducting research on this missile for 12 years. These scientists, every time a bill comes before the Senate, send a telegram saying this will not add to our defense. But at no time has any of them ever asked to appear before the committee. Not a single Senator has ever asked for one of them to appear. But year after year they send in this telegram when the bill is before the Senate."[56]

The entire proceedings of the rare executive session in which the foregoing colloquy occurred, censored by the Department of Defense at the Senate's request, were quietly slipped into the Congressional Record on November 1, 1968 by Senate Democratic leader, Mike Mansfield, and were apparently overlooked during the heat of the closing days of the presidential campaign.[57]

Why didn't the telegram senders ask to testify publicly in the spring and summer of 1968? Why didn't Senators Cooper, Hart, Javits, or Fulbright seek to have them appear as witnesses? Partially the explanation lies in the strong Senate respect for tradition.

Donald R. Matthews has pointed out that the United States Senate, as any group or organization whose members interact frequently, has its "unwritten rules of the game, its norms of conduct, its approved manner of behavior. Some things are just not done..."[58] Matthews continues: "The Senators believe, either rightly or wrongly, that without the respect and confidence of their colleagues they can have little influence in the Senate... The safest way to obtain this respect is to conform to the folkways."[59]

Because this reverence for tradition, in this instance, of having only administration scientists testify on a weapons issue,is so firmly embedded in the folkways of the Senate, knowledgable outsiders, such as lobbyists, incorporate or internalize the Senate's mores into their own plans and calculations for action. The Senate's respect for tradition is accepted as a given by lobbying organizations.

The Council for a Livable World (CLW), a scientists' lobbying and fund-raising organization, and the Federation of American Scientists (FAS) both were firmly opposed to ABM deployment in 1968. Each organization had issued position papers and arranged for briefings of selected Senators and their staffs by prominent scientists opposed to deployment before the Senate votes in the summer of 1968. But according to Tom Halsted, CLW national director, "We never thought we'd get the chance to have outside scientists appear before Russell's committees." The folkways of the Senate in effect imposed conceptual blinders on the ABM scientists' efforts in those early days.

Secondly, in the spring and summer of 1968, the voices protesting missile sites remained isolated and largely unheard and unheeded in the country as a whole. There were, it is true, pockets of scientists' and

other citizens' anxiety about ABM expressed, but the voices in Seattle, Washington and Lynnfield, Massachusetts remained localized and did not attract nationwide attention. The necessary spark for a conflagration was just not present.

Thirdly, 1968 was such a tumultuous year that ABM as an issue simply could not penetrate the public's consciousness. The New Hampshire primary, President Johnson's decision not to seek reelection, the assassinations of Martin Luther King and Robert Kennedy, the debacle at the Chicago convention and the campaign in the fall--these were the events which preempted the public's attention.

Fourthly, we must consider the political affiliations of the scientists. Most of the ABM activists belong to the Democratic Party and indeed, many of them had held government positions under Democratic administrations. Undoubtedly it was easier for these men to go public after the election.

Then, late in 1968 and early in 1969 the confluence of many factors brought about the sudden and dramatic birth of ABM as an issue. Suddenly, in the hiatus between the election and the inauguration, the once isolated and muted voices of protest against ABM began to reinforce each other and grow louder. Whatever "critical size" of public clamor is necessary to transform a concern into an issue was reached as the mass media picked up the stories of citizens' protests across the land. That in turn provided the necessary impetus for a break with Congressional tradition.

Two factors meshed to bring this about. One was that Senator Russell's earlier denunciation of the scientists for their failure to testify was taken as sufficient reason by some for the scientists

to be heard in the future. On December 12, 1968 Cameron B. Satterwaite, chairman of the FAS, wrote to Senator Russell: "I have just read in Science ...that you stated that no scientists outside the government have requested to testify...If this is true, let me correct it at once and request that the FAS...be given the opportunity to provide witnesses to testify at any further hearings under the auspices of your committee which deal with the ABM."[60]

Another contributory factor was the relinquishing of the chairmanship of the Senate Armed Services Committee by Senator Russell to Senator John Stennis. Stennis had earned a reputation among his Senate colleagues for fairness and justness.[61] Soon after he assumed the chairmanship, he agreed to a request from Senator John Cooper to allow outside witnesses to testify before his committee.[62]

The combination of rising public opposition to siting ABM missiles near large cities, often led by the scientists, the end of the 16 year era of Senator Russell's presiding over the Senate Armed Services Committee, a growing concern with military spending and national priorities and the scientists' reactions to Russell's rebuke all united in the beginning of 1969 to make the break with tradition possible.

The eminence of the men chosen to testify was stressed from the outset. It was heralded that the witnesses "would include all former Science Advisors to U.S. Presidents, Nobel Prize winners in physics and men from some of the major scientific institutions in the nation."[63] "Credentials count," is how one of these scientists, Herbert York, phrased it. "It puts moxie into our remarks!"

The first outside scientists to testify on the ABM appeared on March 6, 1969 before the Subcommittee on International Organization and Disarmament Affairs of the Senate Committee on Foreign Relations (hereafter

referred to as the Gore subcommittee.) A steady procession of scientists, opponents and supporters of antiballistic missile deployments, marched before the Gore subcommittee and the House Foreign Affairs Committee in March, the Senate and House Armed Services Committees in April and the Gore subcommittee again in May and July 1969. Between March 1969 and the present time of writing (May 1971), 33 physical and social scientists of our ABM population have testified before Congressional committees on the ABM.

In most instances the witnesses were selected well in advance of their appearance and many scientists spent considerable amounts of time preparing their testimony, replete with charts and graphs. But probably the most publicized and, according to the scientists themselves, the most influential was the first appearance of W.K.H. Panofsky before the Gore subcommittee. As with the chance discovery of the proposed missile sites near Argonne, Panofsky's initial appearance seemed due to Lady Luck or Lady Fate, depending on one's point of view.

According to Panofsky, he was in Washington testifying before the Joint Committee on Atomic Energy on the subject of collaboration with the Russians in high energy physics. Before the session at which he was to testify, Panofsky lunched with a staff member who had been present at a meeting of the Gore subcommittee that very morning. He told Panofsky that his name had come up in the following manner:

Deputy Secretary of Defense David Packard was asked by Senator Fulbright: "Did you go outside and employ any independent people to analyze the feasibility and advisability, the wisdom of this program?"[64] Packard replied: "The review utilized the full staff of the Defense Department and those people that the Department had utilized for scientific evaluation. In addition to that, I have talked to some

scientific people on my own about the matter, some people who have no connection with the--- One of the men that I talked to, I have a very high regard for, is Professor Panofsky."[65]

When Panofsky was informed of this exchange, he disputed the facts as stated and was asked by Senator Gore if he could testify before his subcommittee on the following Friday. Since he could not leave Washington until Wednesday evening after his testimony to the Joint Committee on Atomic Energy, an aide said to him with a grin, "You got gored by Mr. Gore." He flew to San Francisco Wednesday night and "studied all day Thursday for his testimony" and flew back to Washington on Friday morning to testify "that I did not participate in any advisory capacity to any branch of the Government in reviewing the decision to deploy the current modified Sentinel or Safeguard system. I appreciate having had the opportunity of an informal discussion with Mr. David Packard, Deputy Secretary of Defense, several weeks ago prior to the modified Sentinel decision."[66] Senator Gore inquired, "Was there an extended conversation over a period of time?" Panofsky: "About half an hour...We happened to accidentally meet at the airport."[67]

Although generally the ABM scientists felt very effective about all of their ABM activities (see Chapter V), of those scientists who testified before Congressional committees, only 27% thought their testimony had had some effect upon the actual voting outcome, 41% felt their testimony had made no difference at all and 9% suggested they had merely reinforced the Senator's or Congressman's preexisting dispositions.

This may be attributed to a certain humility or modesty scientists are sometimes professed to have. They may not have wished to appear as

unduly boastful. All of them seemed flattered at having been asked to testify. Several had volunteered as witnesses and then expressed surprise at being invited to appear.

71% of the testifiers said that if they were to testify again, they wouldn't change their testimony in any way. 13% claimed they would change the style of their presentation and 17% said they would change the emphasis of any future testimony. These changes typically would have included more visual aids such as graphs and figures in the former case and greater emphasis on the strategic implications of deployment in the latter case.

To summarize this discussion of the scientists' Congressional testifying activities, it must be stressed again that invitations for non-Administration scientists to appear before the Senate and House Armed Services and Appropriations committees in opposition to a weapons system were a marked break with tradition. Moreover, a new precedent has now been established and the principle of hearing outside scientific witnesses seems firmly embedded within the Congressional mores. One could predict that just as it once was utterly unthinkable for such appearances, it may well now be utterly unthinkable not to have scientists heard in opposition as well as in support of defense and arms control issues.

## THE MIGHTY PEN

The scientists' efforts we have been discussing thus far, advising, debating and testifying, were all predominantly verbal activities. In their battles in behalf of or against the ABM the scientists, not unexpectedly, used the pen as well as their tongues. Sixty of the ABMers

produced a spate of newspaper and journal articles, reports and books. Amongst the earliest scientists to write about ABM was Jerome Wiesner. In discussing comprehensive arms limitation systems in 1960, he wrote, "It is important to note that a missile deterrent system would be unbalanced by the development of a highly effective anti-missile defense system and if it appears possible to develop one, the agreements should explicitly prohibit the development and deployment of such systems."[68]

Some of these early ruminations on the ABM were remarkably prescient. Freeman Dyson, who in 1964 opposed deployment of an anti-missile system, commented on the intense political pressures existing in both the United States and the Soviet Union to duplicate what the other side does in the strategic weapons areas. Dyson prophesized "It will require unprecedented self-restraint for the American people to accept a Soviet ABM deployment and not embark on a much bigger deployment in response."[69] Already in 1966 Jeremy Stone pointed out, "We are engaged in one of those debates that takes so long that it changes its form in the course of the dialogue."[70]

These early public ABM exchanges between scientists, conducted mostly within the pages of the Bulletin of Atomic Scientists, are noticably milder and less passionate in tone than those which were to appear during the zenith of the battle in 1969. Richard McMahon in critiquing Dyson's article merely stated "These negative feelings toward U.S. ABM deployment, which Professor Dyson reports, are undoubtedly held by many influential persons. These feelings are not necessarily wrong but the arguments adduced by Professor Dyson are inconclusive in proving them right."[71]

This seems quite restrained compared to Herman Kahn's explanation of the fact "that about ninety per cent of the scientists who normally speak

in public, or who consult part-time for the government on defense issues... opposed ABM." "I would argue," writes Kahn, "that the very magnitude of the phenomena indicates we are dealing with an issue in which fashion, bias and/or selection is playing a crucial role."[72]

The single most cited (whether praised or condemned) treatise on the ABM has been the Garwin-Bethe article which appeared in Scientific American in March, 1968. The gestation period for this influential piece was just the proverbial nine months. In June 1967 Hans Bethe was invited to deliver the Mack Memorial Lecture at the University of Wisconsin in Madison. This annual lecture is devoted to the subject of the impact of science on society. Bethe's talk, which dealt with the ABM, was off the record for the press. However, the presentation was taped and later became the basis for Bethe's discussion of the ABM at the American Association for the Advancement of Science (AAAS) symposium on "Is Defense Against Ballistic Missiles Possible?" held December 26 and 27, 1967.

Gerard Piel, publisher of Scientific American, attended the symposium and suggested that Bethe's talk should become the basis for an article to be published by his journal. Bethe and Richard Garwin, another symposium participant, decided to write the article jointly. According to the two authors, the Scientific American article was essentially a "polishing up" of their presentations at the AAAS meeting. The entire article was inserted in the Congressional Record on February 26, 1969 by Congressman Brock Adams.

Much confusion exists as to whether the Garwin-Bethe article was submitted to the Department of Defense for security clearance before it appeared in print. According to Bethe, he submitted his AAAS symposium talk to the Defense Department two months before the talk was to be given.

Bethe claims he spent the last ten days before the scheduled talk on the phone, urging Defense officials to clear it. Garwin transmitted his contribution to John Foster "for comment, not clearance, and received guidance on questions of classification regarding thermonuclear weapons."

According to Bethe, John Foster gave up a Saturday golf date on December 23 to clear the article personally. Although Foster confirmed that he had issued the clearance, a high ranking Army scientist felt that Bethe "had put China years ahead by highlighting specific deficiencies of the U.S. defensive system." A former AEC Commissioner stated that "the Bethe-Garwin article was a shockeroo to me because it divulged so much."

That much attention was paid to the Garwin-Bethe article is attested to by the numerous times it was spontaneously mentioned by the interviewed scientists. Typical comments were:

> When Garwin says something I really have to convince myself he's wrong if I want to oppose what he's saying.
>
> -- a New Jersey physicist

> I became convinced that no fundamental overriding issue was being neglected by the opponents when Bethe-Garwin, with access to all the information, opposed it.
>
> -- a Harvard professor

The proponents of deployment as well took notice of its appearance. A memorandum written by Secretary of the Army, Stanley Resor, to then Secretary of Defense, Clark Clifford, said that "several highly placed and reputable U.S. scientists have spoken out in print against the Sentinel missile system. Among these are Bethe, Kistiakowsky and Wiesner." To counteract them, Resor proposed, "Although it is difficult because of security aspects to answer the technical arguments used by these men against Sentinel, it is essential that all possible questions raised by these opponents be answered, preferably by non-government scientists. We will be in contact shortly with scientists who are familiar with the

Sentinel program and who may see fit to write articles for publications supporting the technical feasibility and operational effectiveness of the Sentinel system. We shall extend to these scientists all practical assistance."[73]

The Resor memorandum was written in September 1968[74] and the proportion of pro-ABM articles written by scientists increased slightly thereafter. How much of this can be attributed to Defense Department efforts and how much to the general intensification of the debate remains conjecture.

Some of the deluge of material written by scientists is accounted for by the fact that often the Congressional testimony of the scientists formed the basis for articles reprinted in journals and in books. For example, the testimony of William McMillan and Albert Wohlstetter before the Senate Armed Services Committee, and Eugene Wigner and Jerome Wiesner before the Senate Foreign Relations Committee appeared in Safeguard: Why the ABM Makes Sense, edited by William R. Kintner. Marshall Shulman's and Allen Whiting's words before the Gore subcommittee were reprinted in the Chayes-Wiesner edited book, ABM: An Evaluation of the Decision to Deploy an Antiballistic Missile System. Excerpts from testimony by Herbert York and Hans Bethe appeared in the Bulletin of Atomic Scientists in the spring of 1969.

Of the 60 scientists who published articles on the ABM, 39 were Outers and 21 were Inners; 45 were anti-ABM and 15 were pro-ABM. In proportion to their numbers in our total sample, pros and antis were equally prolific with their pens. What is interesting is the almost universal and correct feeling expressed by the pro-ABM writers that they belonged to a small minority. We mentioned earlier (p. 78 ) that the Acheson-Nitze

Committee to Maintain a Prudent Defense Policy was expressly established because of a feeling that the debate was entirely too one-sided. Donald Brennan writing in Foreign Affairs in April, 1969 suggested that "the doubts increasingly expressed in the Congress in early 1969 may well result from the highly one-sided literature on the subject."[75]

As will be discussed in Chapter V, both sides generally perceived themselves as "underdogs." Among the writers, however, the feeling was confined exclusively to the pro-ABM scientists. The anti-ABMers wrote merrily away and their papers, articles, reports and books tumbled forth undiminished until the Senate vote in August, 1969.

## LOBBYING

"Lobbying," writes Lester Milbrath, "is an inevitable concomitant of government."[76] By lobbying we mean communication directed to a decision maker with the hope of influencing his decision. Fully 40% of the ABM scientists lobbied with elected officials in Washington and 29% lobbied with state and local representatives. There was considerable overlap: 12% of the sample did both.

However, this lobbying was predominantly engaged in by the anti-ABMers, as is illustrated in Table 11.

TABLE 11: PERCENTAGE OF SCIENTISTS WHO LOBBIED WITH ELECTED OFFICIALS

| | Lobbied in Washington | Lobbied Locally |
|---|---|---|
| Anti-ABM | 86% | 98% |
| Pro-ABM | 14% | 2% |
| | (N = 59) | (N = 41) |

In examining Table 11, it is well to keep in mind that the table is based entirely on self-admitted or self-designated lobbying efforts. No attempt was made to ascertain whether a scientist who answered he had not engaged in any lobbying had in fact spent time trying to convince a legislator of his point of view on deployment or not.

Scientists can be expected to have differing conceptions regarding the propriety of lobbying. Many of the pro-ABM scientists appeared to view lobbying by their scientific colleagues with distaste and expressed mild shock at being asked whether they had lobbied themselves. However, it is entirely possible that the very same scientists who seemed to be taken aback by a suggestion of lobbying, had in fact had contacts with legislators about the ABM which they viewed as merely informational, educational or social.

It is interesting to note that this seems to be a reciprocal phenomenon. Donald Matthews reports that "Senators do not perceive much of the lobbyists' action as lobbying. When asked how much 'pressure' he actually felt, one well known Senator replied, 'You know that's an amazing thing. I hardly ever see a lobbyist. I don't know, maybe they think I'm a poor target, but I seldom see them.'"[77] Bauer, Pool and Dexter, too, stress that "communications from constituents are seldom perceived as pressure in the legislator's eye."[78]

Some of the anti-ABM physicists who attended the American Physical Society meeting in Washington D.C. in April 1969 engaged in an intensive lobbying effort. The Federation of American Scientists, Council for a Livable World and the newly formed Scientists and Engineers for Social and Political Action jointly sponsored a "how to lobby" briefing session

for the physicists. Between 300 and 350 scientists were instructed in the art of lobbying by Tom Halsted and Jeremy Stone.

Under the leadership of Barry Casper, a physicist at Carleton College in Minnesota, 53 Senators or their aides were seen by the physicists during the three day meeting. For some physicists, this was their baptism into Congressional waters. Reaction to their plunge was mixed, with some scientists expressing surprise at "how responsive the system is to just a little effort." Others became convinced "one needs a powerful political base, not just words of sweet reason."

Not all of the lobbying was done personally in Washington. Professor Jay Orear at Cornell persuaded dozens of his scientific colleagues to write letters to 30 key Senators. Orear claims that each of those 30 Senators received at least 50 letters and began to remark with surprise that all of their anti-ABM mail seemed to be coming from Ithaca, New York!

Another intensive lobbying effort was carried out in Honolulu. Physicists at the University of Hawaii prepared an ABM fact sheet and a statement on the ABM which was taken to all state legislative offices in February 1969. The State Legislature held hearings on the location of a Sentinel site in the state of Hawaii. Soon thereafter both houses of the legislature passed resolutions opposing the location of an anti-ballistic missile system in the state of Hawaii. On March 11 the Council of the City and County of Honolulu resolved "Whereas...a preponderance of the nation's leading scientists question the defensive or deterrent value of such anti-ballistic missile systems...BE IT RESOLVED...that this Council supports the position taken by Senator Daniel K. Inouye, Congresswoman Patsy Mink and Congressman Spark Matsunaga in opposition

to the Sentinel anti-ballistic system...". The physicists' statement was inserted in the Congressional Record by Congresswoman Patsy Mink on March 13, 1969.[79]

These endeavors to exert constituency influence on elected officials were predominantly actions of the anti-ABMers and of Outer scientists. Of the scientists who lobbied in Washington, 68% were Outers and Outers accounted for 90% of the scientists who lobbied with their local representatives. It is of interest to look at some of the deviant cases. Who were the Inners who did lobby in Washington and locally?

In this respect, as in the case of having non-administration scientists testify, firmly embedded tradition was shattered during the ABM debate. Historically, members of the President's Science Advisory Committee have considered their advice to the President to be of a privileged nature which must remain confidential. This issue of the privileged nature of advice to the President needs some elaboration. There would seem to be varying degrees of privilege starting with

1) The content and nature of the President's remarks, requests or charges to the PSAC;
2) The content and nature of the PSAC deliberations;
3) The content and nature of the PSAC's advice to the President;
4) Individual views of the members of PSAC.

There seems to be general agreement amongst past and present members of PSAC about the strict confidentiality of the first three of these items.

In the past the pervasiveness of executive privilege in effect decreed that PSAC members who disagreed with official policy would not give voice to their opposition. In the ABM case, however, this custom was honored in the breach as well as in the observance. This break with tradition revolved around the fourth item.

Richard Garwin, a member of both PSAC and the Defense Science Board, wrote a personal letter to each Senator on July 10, 1969 urging the defeat of the proposed Safeguard deployment. Garwin declared that "Although I personally do not see the need to defend Minuteman at this time, I would support a reorientation of Phase I of Safeguard toward a large number of small radars specifically designed for the task of defending many robust low value targets."[80]

In the spring of 1970 Garwin mailed to Senators a Safeguard discussion paper in which he found Safeguard "seriously deficient in the protection which it can give Minuteman if the Soviet threat materializes," and noted that "money in defense of Minuteman would be far better spent on providing a real defense from a dedicated system."

Garwin feels that "to support whatever the Administration does, right or wrong, violates the code of conduct for government employees." He suggests that he has an obligation to the government, not only to the Executive department. Therefore, he feels no reluctance in informing Senators and Congressmen of his own views both on ABM and on the SST, without disclosing the nature of his advice to the Administration.

Garwin's break with tradition has been quick to garner both praise and censure. James Robert Shea in his Harvard Senior Honors thesis on "The SST and Technology Assessment" wrote, "The actions demonstrated by Richard Garwin and other Government science advisors, in protesting the misuse of their advice on the SST, are of course, encouraging."[81] However, according to Garwin, he has "never protested the misuse of his advice."

One member of PSAC, However, felt that Garwin's action "considerably decreased the likely effectiveness of PSAC." Several non-PSAC scientists also expressed the view that Garwin's "indiscretions" had lessened PSAC's standing in the eyes of the Nixon Administration.

In summarizing the scientists' lobbying activities, we note that no scientists thought these contacts were instrumental in actually "changing any votes." But many felt a) it was of educational value to them, gaining them insight into "how the system operates," and b) it was important that elected officials became aware of the intensity and the extent of the misgivings a sizable segment of the scientific community held about the deployment of Sentinel and/or Safeguard.

SUMMING UP

In addition to the activities we have been describing, scientists also spoke on radio and television, organized a march to the White House where they presented anti-ABM petitions to Science Advisor Lee DuBridge, held press conferences, leafletted at shopping centers, placed advertisements in national newspapers, arranged "work stoppages" and "work ins", held rallies, forums, designed and sold buttons, posters and bumper stickers. Admidst this welter of activity it is necessary to keep in mind the relatively small number of scientists who were thus engaged. The large majority of the scientific community did not participate publicly in any way.

Therefore one is not surprised to find that those scientists who did become ABM activists contributed considerable amounts of time and energy to the cause. The total time per scientist spent on ABM activities ranged from less than ten hours to involvement over many years. The modal time was several weeks full time. Figure 7 presents a profile of the relationship between the total amount of time a scientist spent on the ABM and the kinds of activities he participated in. For the scientists who had been involved with ABM for many years, the main activities were serving on advisory panels, testifying, speaking in other communities, writing and lobbying in Washington. The major efforts of those scientists whose involvement with the ABM could be measured in weeks rather than years were in speaking in their own communities and lobbying with their state and local officials.

One would have hypothesized that such an energetic group of scientists would be composed primarily of young men, but this was not the

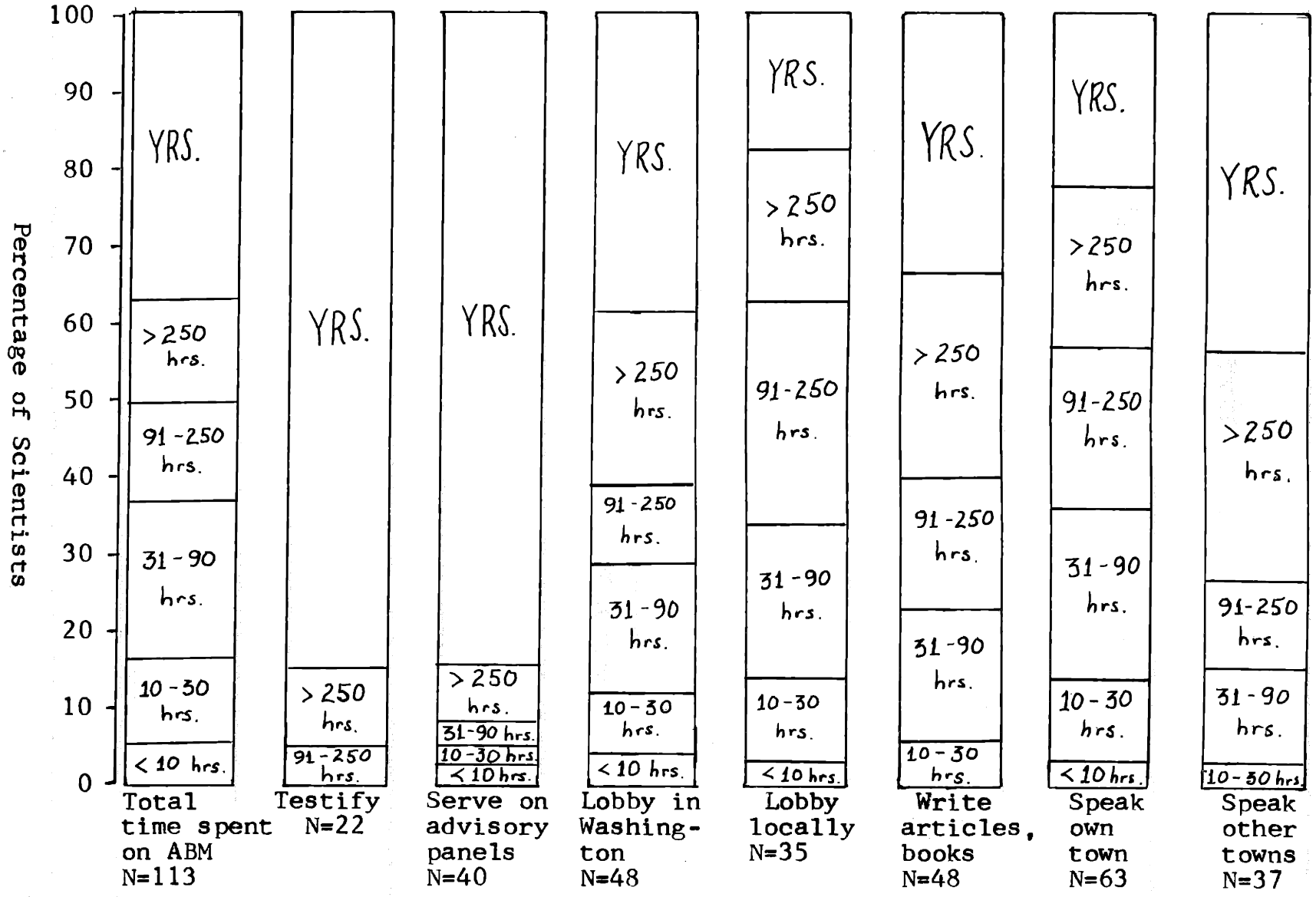


Figure 7: Relationship between Time Spent and ABM Activities Engaged in

case. The mean age for the entire ABM sample was a venerable 46.9 years. The activity in which the "now" generation was most engaged was speaking in their own communities. The mean age for these "youngsters" was 44.1 years; for those who lobbied with their local officials, the mean age was 44.6. Next came those who lobbied in Washington, with a mean age of 45.5. Those activists who took to the pen were just under the overall mean at 46.7. The "oldtimers" were those who spoke in other communities (mean age 47.1) and the grand old men were those who testified, having an average age of 53.0 years.

The relationships between where a scientist is employed and which ABM activities he participated in are shown in Table 12:

TABLE 12: PRESENT EMPLOYMENT OF ABM ACTIVISTS

| | % In Total Sample | % Who Testified | % Who Spoke Locally | % Who Wrote | % Who Lobbied In Washington | % Who Spoke In Other Communities | % Who Lobbied Locally |
|---|---|---|---|---|---|---|---|
| Academic | 60% | 70% | 71% | 64% | 67% | 58% | 71% |
| Industry | 16 | 9 | 4 | 12 | 10 | 9 | -- |
| Non-Profit | 7 | 9 | 5 | 9 | 9 | 12 | -- |
| Government Laboratory | 13 | 3 | 17 | 14 | 9 | 14 | 27 |
| Other Government Agencies | 3 | 3 | 1 | 2 | 2 | 2 | -- |
| DOD, DDR&E | 2 | 6 | 1 | -- | 3 | 5 | 2 |
| | N=152 | N=33 | N=76 | N=60 | N=59 | N=44 | N=41 |

From Table 12 it appears that industrial employment is less likely to lead to participation in an issue like ABM than does employment in the other sectors. The greater freedom allegedly afforded to university professors to participate in the political arena is borne out by the data.

The often stated view of scientists employed in government laboratories that they work in an academic-like atmosphere also seems substantiated by Table 12.

The fervor with which some of the activists participated in the ABM can not be captured by statistical relationships or numerical tables. At least two scientists, one at a government laboratory and one at a college, took a month's vacation, unpaid, in order to be able to devote full time to the ABM fight. Phone bills in the hundreds of dollars charged to personal accounts were incurred in many instances. One Argonne scientist who felt he was unable to articulate clearly enough in public forums took public speaking lessons. Wives and children, neighbors and friends were enlisted to aid in the battle. To these activists the ABM became an integral part of their personal lives. They approached it not in the abstract, not with detachment, but with commitment, and passion.

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## CHAPTER IV

## THE GOOD GUYS AND THE BAD GUYS

The commitment and passion which scientists brought to the ABM debate were instrumental in transforming an issue into drama. The participants themselves, if not the general public, saw in Wohlstetter's vivid words, in his article from which we borrow the title of this chapter, "the forces of virtue arrayed against the forces of evil." Such self-appellations of the good guys and the bad guys, the white-hatted heroes triumphing over the black-suited villains, seems comprehensible if the opponents genuinely differ from each other along a whole spectrum of perceptions, attitudes and behaviors.

We are, after all, dealing with a fairly uniform and selected group of highly educated, upper class, professional men who are usually considered to have a great deal in common with each other. The growing corpus of literature on the sociology of science all implicitly assumes the essential homogeneity of the scientific community and the universality of the mores governing it. Norman W. Storer lists seven different approaches by which the community of science has been studied:[1]

1) Science as a social institution: "Science is viewed as a system of social behavior, complete with norms, values, demographic characteristics and organizational forms...".
2) Scientists as members of concrete groups: This deals with "problems of morale, group influences...recruitment and the management of research."
3) Scientists as members of a profession: This views science "as a corps of experts in interaction with other parts of society."

4) Scientists as creative individuals: "These studies...concentrat(e) on the origins and general personality characteristics of people who become scientists, and...analyz(e) the nature of scientific creativity itself."

5) Scientists as members of specific disciplines: These "concentrate on members of specific disciplines...".

6) Science as an influential participant in national decision-making: "The relations between science and government (are) a major focus of interest."

7) Science as a communication system: "This focuses directly upon the dynamics of the bloodstream of science."

The ingredient common to all these avenues is consensus on the "oneness", the homogeneity and the uniqueness of the scientific community.

It will be the thesis of this chapter that such a view of the community of scientists is an oversimplification. A more appropriate model will be shown to be one which views scientists as members of the body politic. Their motivations, attitudes, perceptions and behaviors on a great variety of issues are more accurately to be viewed as reflections of their political, not their scientific orientation, consequently exhibiting a range of diversity not corresponding to those attributable to a homogeneous community.

In this chapter we shall first examine the background characteristics of the ABM scientists to see how similar our two sub-groups, the pro's and the anti's, are in terms of their ages, scientific specialities, education, eminence, place of employment, sources of funding and connection with defense related research and previous political activity.

Then we shall compare the two groups' views and actions on the ABM itself and their perceptions of the debate and its effect upon the scientific community. We will then move to larger realms and compare the pro- and anti-ABM scientists on their attitudes about science and scientific objectivity, the politicization of professional organizations and the role of scientists in the political arena.

We will conclude by examining how each side views the outside world. What are their perceptions of Congress and its ability to understand and deal with highly technical issues such as the ABM? How do they perceive Russia? China? the SALT talks? the military establishment? In short, did the protagonists differ only on the uni-dimensional question of the deployment of an antiballistic missile, or were the differences of opinion on the ABM symptomatic of deep rifts, fissures and divisions within the scientific community?

## BACKGROUND CHARACTERISTICS

### AGE/LENGTH OF INVOLVEMENT WITH ABM

The opposing sides tended to view each other through caricatured and stereotyped lenses. To some of the proponents of deployment the anti-ABM scientists were young "whippersnappers", inexperienced in strategic arms consideration who "had difficulty in separating the signals from the noise." Many opponents of deployment viewed the pro-ABM scientists as "the old guard, defenders of the status quo." How close to reality were these mutual mental images?

We shall seperate these stereotypes into their components. First, the hypothesis that age is a determinant factor of one's stand on ABM: As we have pointed out before the mean age of the entire sample

of ABM participants was 46.9 years. The mean age for the anti-ABM scientists was 45.5 years and for the pro ABMers was 50.2 years. This difference in ages between the pro- and anti-ABM groups is significant beyond 01. In this instance then, the stereotype conformed to reality if one can call a 45 year old scientist "a young whippersnapper."

In so far as age is commonly a critical variable in differentiating political opinion our finding is in agreement with a large body of relevant research. In a recent and comprehensive national survey of students, faculty and administrators initiated by the Carnegie Commission of Higher Education in 1969, Ladd and Lipset found "No other variables discriminate as powerfully among the political opinions of political scientists as those revolving around age."[2]

With the first part of the reciprocal images the scientists carried of each other confirmed, we turn now to the second half. Were the anti-ABM scientists Johnny-come-lately to strategic arms deliberations? Had the pro-ABM strategists devoted significantly more years to the questions of defense and deterrence? Here again the data confirm the perceptions. Figure 8 plots the total time pro- and anti-ABM scientists spent on the ABM. 63% of the pro-ABM scientists indicated that the time they had been involved with the ABM issue should be measured in years, not hours or weeks, compared to 23% for the antis.

The longer immersion of the pro-ABM group is substantiated by referring back to Figure 5A. Here we saw that 65% of the pro-ABM scientists were already involved with the ABM at the time of the deployment decision compared to 33% of the Antis.

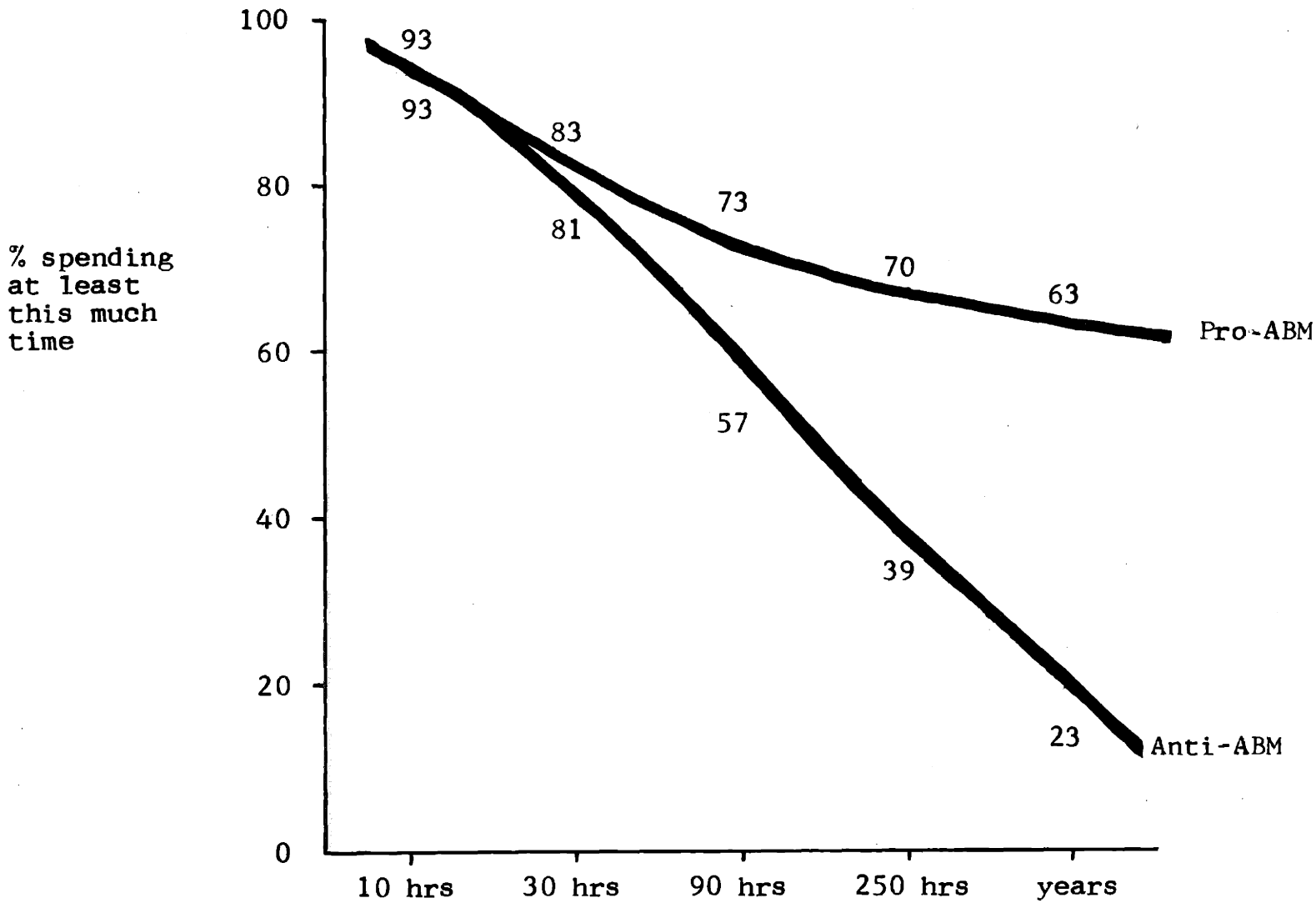


FIGURE 8: Cumulative Time Spent on ABM - Pro and Anti-ABM Scientists

In summary, we have found significant differences between the pro- and anti-ABM scientists in the first background characteristic we examined, namely age and length of involvement with ABM. Pro-ABM scientists are older and have had a longer involvement with the ABM issue.

SCIENTIFIC SPECIALITY

Several social scientists in recent years have proposed that political party affiliation and political attitudes of professional disciplines tend to be significantly influenced by the profession itself and by association with colleagues. That is to say that professional socialization plays an important role in determining party affiliation and political ideology.

In his doctoral dissertation David Nichols arrayed scientists (N=37) along a conservative-moderate-radical continuum and found "most of the moderate scientists were physicists...The radical group of scientists consisted mostly of mathematicians and biologists."[3]

Everett Carll Ladd, in a study of professors and political petitions examined 18,500 signers of Vietnam War Protest petitions which appeared in the New York Times from October 1964 to June 1968. He found that "natural scientists were not nearly as heavily represented as social scientists." Chemists were decidedly underrepresented among natural scientists and physicists were most numerous among the signers. "Biologists were poorly represented."[4]

Turner and Spaulding[5] examined party affiliations and political attitudes of college professors (N=2,389). Based on a 14 item index designed to measure the liberal - conservative dimension they found a

strong correlation between "liberal" answers and Democratic party affiliation and "conservative" replies and Republican party affiliation.

For the disciplines relevant to this study their findings were:

Political science: 74% Democratic, 16% Republican, 10% Independent;

Psychology: 70% Democratic, 21% Republican, 9% Independent;

Mathematics: 29% Democratic, 56% Republican, 15% Independent;

Engineering: 27% Democratic, 62% Republican, 11% Independent;

Also showing essentially the same distribution for additional fields in our sample was a study by Eitzen and Maranell (N= 979). For the relevant disciplines their data showed:[6]

Psychology: 70% Democratic; 30% Republican

Chemistry and Physics: 50% Democratic; 50% Republican

The data amassed in these four studies are summarized in Table 13.

TABLE 13 SUMMARY OF FINDINGS REGARDING POLITICAL VIEWS OF PROFESSIONAL GROUPS:

| Study | Liberal, Democratic | Moderate | Conservative, Republican |
|---|---|---|---|
| Nichols (1968) N = 37 | Mathematicians<br>Biologists | Physicists | |
| Ladd (1969) N = 18,500 | Political Scientists<br>Physicists | Biologists | Chemists |
| Turner & Spaulding (1969) N = 2,389 | Political Scientists<br>Psychologists | | Mathematicians<br>Engineers |
| Eitzen & Maranell (1968) N = 979 | Psychologists | Chemists, Physicists | |

If we discount the work of Nichols as being based on too small a sample we find considerable agreement among the three remaining studies that social scientists tend to be more liberal than physical and biological scientists with engineers and mathematicians the most conservative. To take a single variable, such as stand on ABM, based on a selected sample and use it as an indicator for placement on a liberal-moderate-conservative spectrum is obviously an oversimplification. It is used here only to compare our data with the foregoing studies.

If we combine the fields represented in our study into the categories social science, physical science and engineering, and array them by the percentage of scientists within that discipline opposing deployment of ABM we get the results shown in Table 14.

TABLE 14 PERCENTAGE OF EACH DISCIPLINE IN SAMPLE OPPOSED TO ABM

| | | |
|---|---|---|
| Physical Science | (N = 119) | 77% |
| Engineering | (N = 15) | 53% |
| Social Science | (N = 12) | 50% |

Our data are not in agreement with the general finding that social scientists tend to be "more liberal" than physical and biological scientists. However it must be emphasized that because 67% of the ABM activists were physicists the numbers in the other disciplines are exceedingly small.

The differences in Table 14 are marginally significant ($P < .05$).

EDUCATION

We find no significant differences between pro- and anti-ABM scientists in terms of the highest degree received. The figures are as follows: 2% of the anti-ABM and 8% of the pro-ABM scientists report a Bachelor's as their highest degree received; those whose highest degree is a Master's are 5% of the anti- and 8% of the pro-ABM scientists. All others hold Ph. D.'s, LLB's or M.D.'s.

EMINENCE

According to our three criteria of eminence we find no significant differences in terms of receiving a Nobel Prize, membership in the National Academy of Sciences or in number of citations listed in the Science Citation Index. The data are presented in Table 15:

TABLE 15. SCIENTIFIC EMINENCE OF ANTI- AND PRO-ABM SCIENTISTS

| | Anti-ABM Scientists | Pro-ABM Scientists |
|---|---|---|
| Nobelist Laureates | N = 4 | N = 2 |
| Members of National Academy of Sciences | N = 20 | N = 6 |
| Mean Number Scientific Citations | 50 | 49 |

EMPLOYMENT

In contrast to the previously mentioned background characteristics of discipline, education and eminence where we found no noteworthy correlation with a scientist's stand on the ABM, when we look at emp-

loyment patterns and patterns relating to the funding of research the picture changes drastically. Table 16 illustrates the relationship between place of employment and stance on ABM:

TABLE 16. PLACE OF EMPLOYMENT AND STAND ON ABM

| Employment | % Anti-ABM | % Pro-ABM | |
|---|---|---|---|
| Academic | 85% | 15% | (N = 89) |
| Industry | 39% | 61% | (N = 23) |
| Nonprofit | 38% | 62% | (N = 8) |
| Government Laboratory | 76% | 24% | (N = 17) |
| Department of Defense | -- | 100% | (N = 3) |
| Other Government Agencies | 80% | 20% | (N = 5) |

$P < .001$

This finding corroborates the view expressed by 93% of the entire sample who answered affirmatively the question "Do you think one's institutional position influences one's political views and attitudes?" Typical answers were:

> "My God, does it. If anyone really believes in ABM they leave this laboratory." -- Industrial vice-president.
>
> "Yes, one's outlook tends to be limited by the type of problems one is requested to concentrate on. Thus, in government, a scientist will be asked the technical feasibility of a given weapons system, not if there may be a non-technical solution that might be better." -- Professor at University of Washington

"If I were at Harvard and coming up for tenure, it would be harder to come out for ABM than if I were working for Herman Kahn." -- Social Scientist.

However, many scientists differentiated between attitudes and behaviors, pointing out that where one worked would affect how one spent one's time or what one did, but not necessarily how one thought or felt about political issues. Others stressed that the correlation between institutional position and political views was not causative but rather a matter of pre-selection. As a scientist at Los Alamos said "There is a definite sort of selection process. Those unwilling to consider anything good about weapons will not be here or in industry. They will congregate on the campuses."

The highly significant correlation we have found between one's place of employment and one's stand on the ABM corresponds to the perceptions of the scientists themselves concerning this relationship.

FUNDING SOURCE

A similar finding emerges when we look at the source of funding of the scientists' research. For the entire sample, sources of funding were ascertained for 98 scientists; 35% received support from the Defense Department. Table 17 shows the relationship between having one's research funded by the Defense Department and one's stand on the ABM.

TABLE 17. DEFENSE DEPARTMENT FUNDING OF RESEARCH AND STAND ON ABM

| | Anti-ABM | Pro-ABM |
|---|---|---|
| Funded by Department of Defense | 18% | 79% |
| Not Funded by Department of Defense | 82% | 21% |
| P $\leq$ .001 | N = 71 | N = 24 |

Again the data confirm the spontaneous remarks of many of the scientists. In response to the question "To what do you attribute the differences between pro- and anti-ABM scientists?" there was almost complete agreement that technical considerations were not paramount. Many of the anti-ABM scientists made statements like:

> "It very much followed funding lines. If you were funded by DOD, you were for it." -- Brooklyn Polytechnical Professor

> "The difference was dependence on military funding for support or not." -- M.I.T. Professor

> "The Hudson Institute were the main people for it and they have support from the Army." -- A former government official

## WEAPONS AND DEFENSE WORK

Several scientists indicated that they thought whether a scientist had worked on weapons development was a determinant of his stance on ABM. Pro-ABM scientists generally attributed a feeling of remorse or guilt to scientists who had worked on nuclear weapons which caused them to "become pacifists" or "opposed to any weapons."

Anti-ABMers used the association with weapons development the other way: "The Los Alamos crowd is wedded to nuclear weapons" and "Atomic Energy Commission people develop a sort of loyalty toward nuclear weapons and ABM depends upon nuclear weapons for defense."

The hypothesis that working on weapons correlates with attitudes towards ABM is confirmed by Table 18:

TABLE 18. WORKING ON WEAPONS vs. STAND ON ABM

| | | Anti-ABM | Pro-ABM |
|---|---|---|---|
| "Have you ever worked on weapons development?" | NO | 72% | 20% |
| | YES | 28% | 80% |
| | | N = 79 | N = 20 |

$p < .001$. The strength of the relationship is indicated by a gamma value of .78.

From Table 18 it appears that when a scientist is associated with weapons development he is considerably more likely to favor the deployment of a weapon system like the antiballistic missile than he is to oppose such deployment or become a "pacifist" as claimed by some pro-ABM scientists.

In addition to working directly on the development of weapons per se, many scientists have been engaged in other defense related research. This was also explored during the interview and the findings are summarized in Table 19.

TABLE 19. WORKING ON DEFENSE RELATED RESEARCH vs. STAND ON ABM

| | | Anti-ABM | Pro-ABM |
|---|---|---|---|
| "Have you ever worked on defense related research" | NO | 31% | 7% |
| | YES | 69% | 93% |
| | | N = 83 | N = 29 |

$p < .01$. Gamma = .72.

Again, the data indicate that working on defense related research is significantly correlated with a scientist's stance on ABM deployment.

PREVIOUS POLITICAL ACTIVITY

The last background characteristic to be explored is prior political activity by the ABM scientists. We have indicated previously that 72% of the ABM participants had been politically active prior to their entry onto the ABM battlefield.

Since the pro-ABM scientists are older and were involved in the ABM issue before the anti-ABM scientists became activist, we could hypothesize that they were also more active politically in other issues than the anti-ABMers. This hypothesis is not borne out by the data which show no significant differences at all between pro- and anti-ABM scientists in the amount of time spent on non-ABM political issues. While differences did appear in the type of issue these men had been engaged in, with no pro-ABM scientist being active in anti-war or peace related activities, the fluctuations could have been caused by chance alone, and were not pursued any further.

In examining the background characteristics of our ABM scientists we have found that age, length of involvement in the ABM issue, employment, funding by the Defense Department, previous work on weapons or other defense related research are associated with pro- and anti-ABM stands of the scientists. Education, discipline, scientific eminence and previous political activity did not correlate with ABM attitudes. We turn now to compare the two groups' views and actions on the ABM itself.

VIEWS ON ABM:

DEPLOYMENT:

Before the majority of scientists became activated to participate in the ABM debate certain events had already occurred. We shall now explore whether perceptions of these events differed between the opponents. If scientists approach issues with a common attitude as the folklore about them would lead us to believe, then one could assume that their interpretations of events in the recent past would resemble each other, allowing perhaps for subtle shadings and nuances to differentiate amongst them. If our model of scientists as political men is operative, then we would expect past events to be viewed through partisan eyes and failing to cluster neatly together.

On October 16, 1964 the Chinese People's Republic detonated its first atomic device marking China's emergence as a nuclear power. From then on, the threat of a Chinese missile capability became intertwined with the domestic ABM debate within the government.

When the deployment decision was announced by Secretary McNamara on September 18, 1967 the official rationale given for the decision was as a "countermeasure to Communist China's nuclear development... (and) to provide an additional indication to Asians that we intend to deter China from nuclear blackmail...and enable us to add -- as a concurrent benefit -- a further defense of our Minuteman sites against Soviet attack."[7]

The scientists in our sample were asked "What is your explanation of the September 1967 decision to deploy an ABM?" The answers are tabulated in Table 20.

TABLE 20. EXPLANATION OF THE SENTINEL DECISION BY ANTI- AND PRO-ABM SCIENTISTS

| Answers | Anti-ABM Scientists | Pro-ABM Scientists |
|---|---|---|
| Political pressure From Republicans, From Congress From the Military | 100% | 27% |
| Growing Chinese Threat | --- | 59% |
| Growing Soviet Threat | --- | 14% |
| | N = 52 | N = 22 |

$p < .0001$;

Not a single ABM scientist who opposed deployment of the ABM and expressed an opinion on the subject indicated he believed the official explanation for the deployment decision, while nearly sixty percent of

those scientists favoring deployment seemed to accept it. We have here in dramatic form, our first inkling of the enormous gulf in the perceptions and attitudes between the ABM protagonists. We turn now to examine whether the second deployment decision was similarly viewed through almost diametrically opposed lenses by the two groups.

On March 14, 1969 President Nixon, in announcing his decision to proceed with the Safeguard ABM stated that "The Soviet Union has engaged in a build-up of its strategic forces larger than was envisaged in 1967..." He continued that "the Chinese threat against our population, as well as the danger of an accidental attack, cannot be ignored."[8]

Again the ABM scientists were asked for their explanation of President Nixon's decision and again the opposing sides interpreted the event in starkly different ways:

TABLE 21. EXPLANATION OF THE SAFEGUARD DECISION BY ANTI- AND PRO-ABM SCIENTISTS

| Answers | Anti-ABM Scientists | Pro-ABM Scientists |
|---|---|---|
| Political pressure: from the cities; Congress or the military | 69% | 21% |
| "It was a compromise" "Expediency" | 29% | 16% |
| "Growing Soviet Threat" | 2% | 53% |
| Needed for SALT Agreement | -- | 10% |
| | N = 48 | N = 19 |

$p < .001$,

Of the scientists agreeing with the Administration's decision, just over half (53%) cited the official rationale as their explanation for the decision. Over one-third (37%) felt the decision was based on the expediency of trying to arrive at a compromise solution or reaction to political pressure from the cities, Congress or the military.

98% of the scientists in our sample who opposed deployment of the Safeguard antiballistic missile defense indicated that the official explanation, the growing Soviet threat, was not, in their opinion, the real reason for the decision.

The numerical base on which the evidence is based is admittedly small, but the strength of the correlations and the unidirectionality of the findings provide a strong empirical base for emphasizing the greater explanatory role of the political rather than the scientific milieu for insight into the community of scientists.

## FEASIBILITY

In addition to the question of whether scientists believed the Administration's reasons for this defensive system, one might assume that considerations of technical feasibility would be of some importance to scientists in determining whether they favored or opposed deployment of such a system. We saw in Chapter II that "technical shortcomings" were only infrequently mentioned as reasons for the scientists' entrance into the political arena. We now are interested in the question of whether the scientists' perceptions of the feasibility of anti-ballistic missile defenses are positively correlated with their attitude towards deployment. The hypothesis is that scientists who favored deployment believed such a defense was technically feasible. Scientists

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who had severe doubts about the technical feasibility of ABM would oppose deployment.

Just as views on the respective roles of defensive and offensive weapons in the strategic equation have changed over the decades from the 1950s and 1960s into the 1970s, so have perceptions of the feasibility of various technical solutions to military problems. In the 1950s most military strategists, both within and outside of the government did not believe that a defense against a hypothesized attack of hundreds of incoming warheads employing decoys and other penetrations aids was technically available. With the development of phased array radars capable of tracking many targets simultaneously and the concurrent development of rapidly accelerating Sprint missiles and the long range Spartan missiles, some scientists became convinced in the mid-1960s that antimissile defense was now obtainable under special conditions. These conditions were envisioned as a "light attack" by a lesser power or "an accidental launch".

By the time of the public debate in 1969 there was no dispute regarding the technical feasibility of intercepting a few attacking missiles with defensive missiles. The dispute revolved around two questions.

One concerned the reliability of highly complicated advanced computer technologies under unprecedented conditions of a sky full of nuclear explosions. Opponents of ABM such as J.C.R. Licklider emphasized "the unhappiness that lies ahead for anyone who deploys a large, complex system that involves computers and software, that faces a changing and complicating threat and that can not be tested continually as a whole".[9]

John Foster tried to counter the "non-testability" argument when he wrote that all individual components (radars, missiles and computers) have been tested separately and "thus, the only real task that the Safeguard system has, is to integrate all these functions in the computer programs and to check thoroughly and test out the programs before the system is made operational." He went on to say that the simulation would involve simulation tapes, "so that the entire system is exercised just as it would be in a real battle."[10]

This argument was rebutted by Computer Professionals against ABM, an ad hoc organization of 800 members of the computing profession. In a fact sheet prepared in 1971 and distributed to the major news media, Daniel D. McCracken, chairman of the group, stated that "simulating the system, just as it would be in a real battle is impossible because there is no way of knowing exactly what the real battle would be like. And in any event, simulation is no guarantee that a system will work properly when it is tried out on the real thing."[11]

The second major disagreement concerning the feasibility of an ABM had to do with the adversary nature of an offense-defense exchange. Anti-ABM scientists argued that:

1. The technical uncertainties of an ABM would fuel the arms race by causing the attacking country to overestimate and the defending nation to underestimate its effectiveness.
2. The system could always be overwhelmed by sheer numbers; if there were 1,000 interceptors, the 1,001st incoming nuclear weapon would "come in free."

3. The long lead time necessary for deployment of an ABM would enable the offense to devise stratagems to confuse, deceive or elude the defensive missiles.

Scientific proponents of ABM argued that:

1. We won't know whether ABM is technically feasible if we do not go beyond the research and development stage and we can not afford not to know.
2. Interceptor exhaustion (attacking with more warheads than the defender has interceptors) is not as simple as it appears because the attacker can not know with certainty the number of interceptors available to the defense.
3. The overwhelming majority of the enormous variety of decoys, chaff and other penetration aids that have been built and tested by the United States have been ineffective.
4. The proposition that ABM has to work 100% or not work at all is not a standard applied to other weapons. ABM is feasible to some extent and to some effectiveness.

Now let us examine the proposition that by knowing a scientist's stand on the ABM we will be able to predict his judgments as to its feasibility. As before, the scientists were asked to differentiate among three possible kinds of antimissile defenses: hard point, light area and an urban defense. The ABM scientists' assessments as to the technical feasibility of each type are shown in Table 22:

TABLE 22. TECHNICAL FEASIBILITY OF HARD POINT, LIGHT AREA AND URBAN DEFENSE JUDGED BY ANTI- AND PRO-ABM SCIENTISTS

| | % Answering "It is feasible" or "probably feasible" | |
|---|---|---|
| Type of defense | Anti-ABM | Pro-ABM |
| Hard point defense | 43% | 97% |
| Light area defense | 21% | 97% |
| Urban defense | 1% | 52% |
| | N = 83 | N = 36 |

For each type of defense the results in Table 22 are significant beyond .001 and yield gamma values of .98, .98 and .95 respectively.

Our data would seem to indicate that those who opposed and those who supported ABM each viewed the ABM issue through different sets of judgmental and perceptual lenses. The pro-ABM gladiators wore rosy tinged spectacles concerning feasibility. Although they saw growing Russian and Chinese threats to our national security, they believed that ABM deployment decisions were taken by two successive administrations to counter those threats and that an antiballistic missile system such as Sentinel or Safeguard was a technically viable and feasible solution to the perceived threats.

The anti-ABM battlers looked through the glass darkly. They perceived the deployment decisions as expedient responses to political pressures, as being politically, not strategically motivated. Further, they simply did not believe in the technical feasibility of the proposed ABM systems.

We now will consider whether wearing these different, almost contraposed spectacles led these erstwhile scientific colleagues along different paths in their attempt to influence the outcome of the ABM debate.

## ACTIVITIES

In Chapter 3 we discussed briefly some differences between pro- and anti-ABM scientists in terms of which activities the opponents engaged in, in their quest for a victory on the political battlefield.

Altogether 57 ABM scientists served on advisory panels of one kind or another dealing with the question of ABM. 52% of these were pro- and 48% were anti-ABM. If we restrict ourselves to the members of PSAC and PSAC/ABM panels and to members of DSB and DOD/ABM panels the division remains the same: 48% anti- and 52% pro-ABM. When we remember that overall our sample opposed ABM 73% to 27% we must conclude that proportionately twice as many pro-ABM scientists served on these committees as would be expected if they were randomly drawn from our sample.

We can interpret this finding in several ways: One line of reasoning would be that scientists who served on advisory panels become the most knowledgable about the subject of anti-ballistic missile defenses, and that having become informed they recognized its virtues. Therefore, if one wanted to make an assessment of how the "knowledgable" scientific community divided on the question of an ABM deployment, one would find a slight majority in favor of deployment. This interpretation, not surprisingly, is held by most pro-ABM scientists. (See page 143)

An alternate explanation is that the scientists on advisory panels were chosen not solely for their technical expertise but also for their presumed or known stance on the desirability of deployment. From the evidence we presented in Chapter 3 concerning the previous employment and research funding patterns of scientists who serve on PSAC and DOD panels, this interpretation of scientists serving as "legitimizers" of the sponsoring agency's basic viewpoint on the deployment of ABM can not be discarded.

This sentiment was expressed by a pro-ABM scientist who has served on several advisory panels in the following way: "...at times I felt that scientific advisory groups had been convened to give a stamp of approval to policies for which a decision had already been made." If we accept this argument then the "lineup" of advisory panel scientists is very close to the expected 50-50 division based on the assumption that PSAC and/or the President's Science Advisor since the mid-1960's opposed deployment and that DOD and/or DDR&E since the mid-1960's favored deployment of an ABM.

One could also conjecture that service on a scientific advisory panel tends to inhibit the expression of anti-administration views. That is to say, scientists become co-opted to the establishment point of view. If one accepts this view it would not be surprising to find a majority of advisory panelists favorable to ABM. However the persistent, nearly unanimous opposition of PSAC and PSAC panels to ABM for more than ten years and spanning three different administrations would seem to invalidate this argument.

Whichever interpretation one gives credence to, the significant difference between pro- and anti-ABM scientists in their advisory roles is the fact that of the 40 pro-ABM scientists in our sample, fully 65% served on DOD or PSAC panels compared to 23% of the 106 anti-ABM scientists.

Quite a different ratio is observed when we turn our attention to lecturing or debating within one's own community. Of the 76 scientists who spoke publicly to their friends and neighbors on the subject of ABM, 12 were pro- and 64 were anti-ABMers. Two background characteristics may serve as partial explanations for this finding.

1. The anti-ABM scientists were, on the average, the younger men. Addressing town fathers and citizens, fraternal organizations and political bodies, night after night, lunch hour after lunch hour requires stamina and endurance (as well as naivete and foolheartiness according to some) one more likely expects to find in younger men.
2. Nearly three-quarters of the anti-ABM scientists were in academia compared to only one-seventh of the pro-ABMers. Traditionally university and college professors have felt free and indeed, often obligated, to participate in public discussions of current and controversial issues. As a M.I.T. physics professor bluntly put it "It's a lot easier and cheaper for academics to stand up and be counted in issues like ABM."

Many industrial and government scientists do not perceive that they possess the same freedom and security to become publicly identified in a controversial issue. Whether in fact, that is illusion or reality is

immaterial. It is the scientists' perceptions of constraints upon their extra-work activities which serve as inhibitors upon their participation in issues like ABM.

When we consider those scientists who travelled to other communities to discuss or debate the virtues or vices of ABM deployment the differences between pro- and anti-ABMers which were significant beyond .001 in the case of local speaking engagements vanish completely. 30% of the anti- and 33% of the pro-ABM scientists lectured or debated in communities other than their own.

A plausible hypothesis for this difference between the two kinds of lecturing or debating activites is as follows: The great majority of the speaking engagements of ABM scientists in their own communities arose because of proposed siting of missile bases in that immediate area. The scientists who addressed local groups were opposed to "missiles in the backyard." The local townspeople who were similarly opposed were happy to have "experts" allied with them. A community attempting to prevent the installation of an ABM missile site is not concerned with trying to present a balanced view or with having both sides heard.

Coupled with this was the initial reluctance of the Pentagon to furnish speakers in support of the system. So in late 1968 and early 1969 the anti-ABM scientists were, with some exceptions, the only ones on the speaker's dais in their home towns.

However after the ABM became a national topic of discussion and concern, citizens in other communities which were not selected as missile sites, invited scientists to discuss the ABM issue and parti-

cipate in public fora and discussions. The sponsoring organizations in these situations now, often wanted to present both sides of the issue and so often requested from the national citizens' committees on the ABM scientists to represent both points of view.

It seems almost self-evident that in planning a rally, forum or public meeting to which outside speakers are invited, one will attempt to secure the most prominent speakers possible. So one would expect that the scientists who were recruited to address gatherings in other cities and states would tend to be the more eminent ones. Table 23 furnishes the data:

TABLE 23. EMINENCE OF SCIENTISTS SPEAKING IN OWN AND OTHER COMMUNITIES

| | Spoke in own communities | Spoke in other communities |
|---|---|---|
| Nobel Laureates | N = 2 | N = 1 |
| Members National Academy of Sciences | N = 9 | N = 6 |
| Mean # Citations | 38 | 41 |

Failure for confirmation of the hypothesis that the scientists who addressed gatherings in localities other than their own were more eminent may be due to several factors. The numberswe are dealing with are too small: There are only six Nobelists and 27 Academicians in our sample. Also the men who were invited or who accepted the most out-of-town speaking engagements were "strategists" rather than "pure" scientists and therefore not only are they ineligible for Nobel prizes or Academy membership but their articles, if cited would not be listed in the Science Citation Index.

To account for the nearly identical percentage of pro- and anti-ABM scientists who journeyed afar on ABM speaking engagements, we need to remember that pro- and anti-ABMers did not differ significantly in their eminence as scientists as was shown in Table 15. In addition, an invitation to appear before a community in another locale, particularly one where no missile site was geographically to be located there and therefore the meeting would not take on the coloration of a "protest" meeting is one which pro-ABM scientists would by inclination be much more likely to accept. We have already mentioned the distaste with which many pro-ABMers viewed lobbying. Addressing local town fathers who were about to vote on the siting of missiles in their vicinity is more likely to be construed as a form of lobbying than is journeying afar to deliver the same speech.

When we examine the testifying activites of our ABM scientists before Congressional committees we also find no significant differentiation between pro- and anti-ABM appearances: of the 32 scientists who testified, 20 were opposed to deployment and 12 were in favor of deployment. Most committees, in fact, made a careful effort to have both sides represented and scheduled the scientists in prudently balanced pairs or groups.

The first scientists to appear before the Gore subcommittee on March 6, 1969 were Daniel Fink, a proponent of deployment and J. P. Ruina and Hans Bethe, opponents. The Senate Armed Services Committee on April 22, 1969 paired Paul Nitze and William G. McMillan against Herbert York and Wolfgang Panofsky. Two days later the protagonists before the House Committee on Armed Services were Marvin Kalkstein, George Rathjens

and Frank Collins in the opponents' corner and John Wheeler, Donald Brennan and Lawrence O'Neill in the proponents' corner.

The Gore subcommittee in 1970 heard only anti-ABM scientists as non-administration witnesses although pro-ABM scientists were invited to testify and declined to do so. Secretary of Defense Melvin Laird and John Foster testified on the Administration's behalf. The one-sideness of these particular hearings were frequently mentioned by pro-ABM scientists, never however, by ABM opponents!

Just as with testifying, so with the actual amount published on the ABM, we find no significant differences between the number of articles published by the pro's and the anti's in proportion to their numbers. However, only 15 pro-ABM scientists had articles appear in the public press compared to 45-anti-ABMers. Explanations for this difference varied according to one's stance on ABM. Pro-ABM scientists claimed that they could not get their articles published due to bias on the part of the media. The anti's were inclined to feel that the amounts published by each side were fairly accurate reflections of the division of sentiment within the scientific community on the ABM issue.

From Table 11 we learned that lobbying in Washington or with state and local officials was primarily and activity reported by anti-ABM scientists. Only 20% of the pro-ABMers lobbied in Washington and only 3% lobbied locally, compared to 49% and 40% respectively for anti-ABM activists.

Again the place of employment must be considered as a critical variable. With cries about the military-industrial complex echoing across the country scientists employed by industry or by the government un-

doubtedly felt constrained about lobbying for or against the ABM. The largest ABM contractor, the Bell Telephone System has for many years had a firm company policy of "avoiding public discussion of the technical facts about ABM systems, even if this information is declassified or has been made public by others, because such discussion might be construed as an attempt to influence national opinion."[12]

We mentioned earlier the differing perceptions about the propriety of scientists lobbying held by pro- and anti-ABM participants. Charles Herzfeld, Technical Director of the Defense Space Group of International Telephone and Telegraph Corporation expressed it thusly:

> "I avoided lobbying on the hill. I don't like to play the game that way. Senator Jackson wrote me, asking me for my views. I did, in writing. Then one can be more thoughtful."

For comparison, George Rathjens, Professor of Political Science at M.I.T. recounted that he had contacts with more than one quarter of the Senate. According to Rathjens, sometimes these were personal meetings, at times just telephone conversations and other times merely an exchange of correspondence.

Again age must be considered as an intervening variable. Lobbying was an activity engaged in by the younger scientists, and the scientists opposed to ABM were younger than the proponents.

In summarizing the activities of the scientists on each side we found that ABM proponents and opponents were equally likely to testify before Congressional committees, author articles or papers on the subject and address out-of-town gatherings. The activity in which pro-ABM scientists were proportionately the most active was serving on advisory panels.

Lecturing or debating in their own communities and lobbying with their elected representatives were the actions most favored by the anti-ABM activists. Background factors which most contribute to these statistically significant differences are age and place of employment.

## VIEWS CONCERNING THE DEBATE

Thus far we have compared the ABM gladiators by their background characteristics, by their judgments of the reasons for deployment decisions, by their assessments of the technical feasibility of anti-ballistic missile defenses and by the political endeavors they engaged in and have found significant variations in all of these except the background characteristics. This has been interpreted to give credence to our view of scientists as members not of a homogeneous scientific community but as members of a heterogeneous political community. Now we shall examine how these participants viewed the ABM debate itself.

Did they think the debate had any effect upon the scientific community? If so, did they perceive it as beneficial or detrimental? How did they see the scientific community divided on the deployment question? How important did each side think access to classified information was? How did the opposing sides view each other? How effective or influential were the scientist-participants seen by each other and which scientists were deemed especially influential by each side?

## EFFECT UPON THE SCIENTIFIC COMMUNITY

First as to the question of whether the long and sometimes raucous ABM debate had any effect upon the scientific community. To begin with,

the large majority of the scientists felt that the debate did indeed have consequences for the community as a whole. Of the 116 scientists with whom this question was discussed, only 17% of the anti's and 12% of the pro's answered that the ABM had little or no effect upon the scientific community. (See Table 24)

Of the 98 scientists who felt the ABM issue did have repercussions, 34 felt these side effects were harmful to the community of scientists. The most frequently given answer of scientists holding this view was that the debate had harmed the prestige of the scientific community. Typical answers were:

> "I believe firmly that many scientists have gone too far in taking political positions and have weakened the presumptive validity of their judgments."
> East Coast Industrial vice-president

> "It destroyed us. It destroyed the faith of the American people in what scientists say."
> West Coast physicist at Nonprofit firm

> "Scientists don't have the prestige they had a few years ago. Those who transfer their particular expertise from one field to another have contributed to that downfall."
> Political scientist at University of Pennsylvania.

Scientists expressing this point of view were rather evenly divided between the two camps: 14 were anti- and 20 were pro-ABM.

The second most often stated harmful consequence of the ABM debate was that it contributed to the lack of funding for science. According to Frederick Seitz, President of Rockefeller University and former President of the National Academy of Sciences, "The extent to which leading Congressmen desert science serving committees is partly due to the extent to which scientists bicker amongst themselves." Seitz felt that

with the departure of Senator Lister Hill, Representative Emilio Daddario and the death of Congressman John E. Fogarty, "science has almost no friends in Congress. This is one of the factors of the lack of funding for science."

Marvin Goldberger, Chairman of the Physics Department at Princeton University was even more emphatic: "A very important factor in the crunch in federal support of basic research is the scientists' strong opposition to the ABM." This linkage between the ABM controversy and funding cutbacks for science was mentioned by nine pro-ABMers and three anti-ABM scientists.

The last detrimental result mentioned was that the ABM debate produced deep rifts and schisms within the scientific commonwealth. According to a Defense Department scientist "People who knew they disagree on issues could work together before. Now it has become harder to work together."

This was echoed by a physicist at Los Alamos: "One has difficulty in getting the most capable people involved. Some of the best brains in the country are refusing to work on defense problems."

A young Columbia University assistant professor recounted that through his ABM involvement he became aware of a "tremendous generation gap between over and under 30 years old physicists. The older the physicist, the more cautious and even hostile he was." Our data confirm the existence of an age gap, except that the line of demarcation, as indicated by our sample of ABM activists, needs to be revised upward by 15 years! The perception of the scientific community split asunder by the ABM issue was held by pro-ABM scientists by a 4-1 margin over anti-ABMers.

Almost 10% of the sample felt that the debate had produced mixed results; these were usually described as harmful in the short run and beneficial in the long run. Chemistry professor Frank Westheimer of Harvard, remarked that even if "the Administration or Congress may vindictively slap down some science funding we are better off with the truth, the whole truth and nothing but the truth, so help you God."

According to Francis Low, M.I.T. physics professor, "to our pocket books perhaps, it was harmful, but to our souls it was beneficial. It made us realize things we should have realized a long time ago."

John Foster also subscribed to the "mixed" view of the debate. Foster stated "the debate was constructive. It took a long time, that meant that the debate kept pressure on the technical design for a longer period than would normally be the case. It is a better system for it... On the other hand we released a lot of information that could be very beneficial to the Soviet Union and China. Of course it is possible they could obtain it by espionage anyway."

The ABM debate was seen as having had positive and beneficial effects upon the fellowship of scientists by 46% of the sample. As can be seen in Table 24 these were overwhelmingly anti-ABM scientists. As J. R. Killian expressed it "In a period where technology is being questioned it helped to give an indication that scientists are sensitive to the problem of making sure technology's effects are not harmful. We need to give more expression to the many strong convictions regarding the social importance of the management of technology for social benefits."

A physics professor at the University of New Mexico echoed with "It showed society that scientists 'cared'".

The division of the ABM participants on the question of what effect the debate had upon the greater scientific community is summarized in Table 24.

TABLE 24. EFFECT OF THE ABM DEBATE UPON THE SCIENTIFIC COMMUNITY AS SEEN BY ANTI- AND PRO-ABM SCIENTISTS

| | Anti-ABM Scientists | Pro-ABM Scientists |
|---|---|---|
| The debate had no effect | 17% | 12% |
| The debate had harmful effects | 13% | 70% |
| The debate had mixed effects | 11% | 6% |
| The debate had favorable effects | 59% | 12% |
| | N = 83 | N = 33 |

$p < .001$

From Table 24 it would appear that the combatants had switched glasses: the pro-ABM scientists now view things darkly, over 2/3 of them felt that the ABM debate had produced detrimental side effects for the scientific community. The anti-ABMers donned the rose colored lenses and over 75% of them perceived the fellowship of scientists either as unaffected by the ABM controversy or as having benefited from the debate.

## DIVISION OF SCIENTIFIC COMMUNITY

Next we examine how each side saw the scientific community divided on the issue of deployment of antiballistic missile defenses. The question was posed in the following manner: "How would you estimate the division of the scientific community on the ABM issue: 90-10 opposed; 75-25 opposed; 50-50; 75-25 favorable; 90-10 favorable?" In Table 25 these categories are combined to form the simplified groupings of "a majority opposed", "even", and "a majority favorable."

The "scientific community" for these purposes was broken into four component parts: academic, industrial and government scientists and scientists knowledgeable as against those unknowledgeable on the ABM issue. Table 25 shows the composite view:

TABLE 25. DIVISION OF THE SCIENTIFIC COMMUNITY ON THE ABM ISSUE AS SEEN BY ANTI- AND PRO-ABM SCIENTISTS

| | | Majority oppose | Even | Majority favorable | |
|---|---|---|---|---|---|
| Academic | Anti-ABM scientists: | 99% | -- | 1% | (N = 108) |
| | Pro- ABM scientists: | 85% | 7% | 7% | |
| Industrial | Anti-ABM scientists: | 67% | 16% | 17% | (N = 93) |
| | Pro- ABM scientists: | 33% | 29% | 38% | |
| Government | Anti-ABM scientists: | 83% | 6% | 11% | (N = 76) |
| | Pro- ABM scientists: | 32% | 23% | 45% | |
| Knowledgeable | Anti-ABM scientists: | 85% | 8% | 7% | (N = 47) |
| | Pro- ABM scientists: | 24% | 24% | 52% | |

Table 25 is to interpreted in the following sense: 99% of the anti-ABM scientists, regardless of where they, themselves were employed, viewed the academic community as opposed to deployment and only 1% thought that a majority of the academic community favored dep-

loyment. Of the pro-ABM scientists, again, regardless of where they themselves were employed, 85% also saw the academic community as opposed to deployment, 7% thought college and university professors were evenly divided on the subject and 7% felt that a majority of the academic community favored deployment.

The academic community was viewed as overwhelmingly opposed to ABM by both sides. Proponents of ABM saw the industrial scientific community as rather evenly divided amongst the three categories while anti-ABMers felt that over 2/3 of the industrial scientists opposed ABM. The sharpest divergences in the perceptions of the division of the scientific community on the ABM arose in the case of government scientists and scientists judged knowledgeable about the ABM issue by their peers. In both these cases the anti-ABM gladiators saw the vast majority of their colleagues as arrayed with them, pro-ABMers perceived only a minority of each category opposing ABM.

The proponents of deployment were in their own eyes, clearly holders of a minority viewpoint within the scientific community. Except for the case of the industrial scientists, the differences in the judgements between the protagonists were significant beyond .01 with gamma values of .85, .76 and .85.

As with the other aspects of the debate we have examined, the scientists' perceptions of the division of the scientific community were correlated with their own stance on the issue.

ACCESS TO CLASSIFIED INFORMATION

Along with most issues which were discussed during the interviews, the scientists varied greatly in their perceptions of the importance that access to classified information played in the debate. A sizeable minority (44%) of the ABM participants stated that they did not think classified information was very important in the ABM issue. Of the 52 scientists who expressed this view, 44 were anti- and 8 were pro-ABM. Two very prominent scientists, one a former proponent of deployment and a member of the General Advisory Committee of the Arms Control and Disarmament Agency and the other, a former PSAC member, voiced almost identical opinions that there was nothing they had learned from their highly classified briefings that they couldn't have obtained from reading the New York Times or Aviation Week and Space Technology. The PSAC scientist recounted that once after attending a highly classified briefing he asked the briefing officer, "What is so secret about all of this? There is nothing that you told us that has not already appeared in print." "Ah", replied the government official, "but now you know it's true!"

The majority of ABM activists, however, did feel that access to classified documents had played an important part in the ABM debate. A famous West Coast physicist, a frequent advocate for less classification and less secrecy, felt that "the great mass of scientists were talking of things they did not understand because of secrecy." He asserted that "the distorted statements by opponents of ABM could not be answered because of existing security regulations." Several ABM proponents felt that "opponents of ABM were much more daring in deciding what was unclassified." "I wouldn't have felt so free," said Charles Herzfeld.

More scientists were of the opinion that the issue of access to classified information and the access itself, had benefited the cause of ABM opponents than it had the proponents' side. "The opponents could speak with confidence about the performance of the system because of their knowledge," explained an anti-ABM social scientist. Lewis Branscomb, director of the National Bureau of Standards, felt that this access to classified information was "the great thing about the involvement of outside scientists. It smoked out the release of most of the information necessary for this important decision." "It was," according to Branscomb, "the first time that a major technically complex issue, heretofore always held to an inner circle was properly and fully debated."

Scientists who took the opposing point of view, namely that the classified information issue aided ABM proponents, declared that "the government made maximum use of disguising certain things by selective declassification." -- a government laboratory scientist and "proponents of deployment in the Senate still vote on the basis that the Pentagon must know what it is doing." -- a physicist at a nonprofit institution.

Table 26 summarizes the views expressed by the ABM scientists on the issue of the importance of access to classified information in the ABM debate.

TABLE 26. ROLE OF ACCESS TO CLASSIFIED INFORMATION IN ABM DEBATE AS SEEN BY ANTI- AND PRO-ABM SCIENTISTS

| | Anti-ABM Scientists | Pro-ABM Scientists |
|---|---|---|
| It was not very important | 52% | 24% |
| It was important and aided mostly ABM opponents | 16% | 12% |
| It was important and aided mostly ABM proponents | 12% | 9% |
| It was important but gave equal advantages | 19% | 55% |
| | N = 84 | N = 33 |

$P < .005$

Once again the ABM participants discerned the same subject, the importance of access to classified information from entirely different perspectives and came up with opposing views. Pro-ABM scientists perceived access to classified information as much more important than did the anti-ABMers. But as to who benefited from access, there was no significant differentiation between them.

## PERCEPTIONS OF OPPONENTS

Since the impressions of the ABM gladiators on so many aspects of the ABM debate seem dependent on their own stance on the ABM issue, we would expect this to carry over into their perceptions of each other. With pro-ABM scientists believing that the ABM debate was injurious to the scientific community, that scientists were sharply divided on the issue, and that the anti-ABMers were young whippersnappers who did not

have the experience in strategic matters that qualified them to make pronouncements on the issue, we would hypothesize that they would view their opponents as:

1. emotional rather than objective
2. unknowledgeable on the subject of ABM
3. ineffective in the political arena.

Anti-ABM scientists professed that the ABM debate was generally beneficial for the scientific community, that the great majority of scientists shared their opposition to ABM deployment and viewed their opponents as members of the "old guard." For them we would hypothesize that their view of their opponents would be as follows:

1. emotional rather than objective
2. knowledgeable on the subject of ABM
3. effective in the political arena.

No norm is considered to be more basic to the scientific ethos than the norm of objectivity. Subsumed under this rubric is "The suspension of judgement until 'all the facts are in' and a detached scrutiny of beliefs in terms of empirical and logical criteria."[13] The ABM participants were asked during the interview whether, in their opinion, scientists in the ABM debate had followed the scientific canons of objectivity. The data are tabulated in Table 27.

TABLE 27. OBJECTIVITY OF SCIENTISTS IN THE ABM ISSUE AS VIEWED BY ANTI- AND PRO-ABM SCIENTISTS (OTHERS)

| | Anti-ABM Scientists | Pro-ABM Scientists |
|---|---|---|
| Yes, they were objective | 24% | --- |
| Some, were, some were not | 19% | 8% |
| The other side was not | 17% | 56% |
| No, they were not | 40% | 36% |
| | N = 95 | N = 39 |

$P < .001$ , gamma = .72

Typical of the responses of the scientists who answered unequivocally in the affirmative was the statement of a government scientist: "I would hate to feel that a scientist's background does not give him some added objectivity. Teller gets excited sometimes but even he realized that if he's going to be listened to as a scientist he must talk as a scientist."

Although obviously said with "tongue in cheek" but yet representative of a large number of respondents who expressed the view that some scientists were and some were not objective was "I can't help but feel that those who agreed with me were 'scientific' and the others were not." -- a physicist at the University of California at Santa Barbara.

The opinion that "the other side side" was not objective was expressed frequently by pro-ABM scientists. Two industrial scientists phrased it in these terms:

> "I think anti-ABM scientists were less objective than proponents. A number of people against the ABM took the feeling that the country is spending too much on defense, that the Viet Nam war is a bad thing, that the military-industrial complex is pushing the country,... ABM was one issue on which they could get the country and Congress to focus...It got to be an emotional issue. They let their technical judgements be colored."
>
> "I'm incensed at the dishonesty in the positions of the opponents. They represent themselves as experts. They clearly are not."

This was echoed by a Nobel Laureate opponent of deployment:

> "I was anti-ABM; most of my colleagues on this side knew much less and were less ready to deal 'objectively' with the problem. I think their reactions were mobilized by some crowd-fever and by a generalized anti-administration and anti-DOD stance...I do not identify many scientists on the pro-ABM side. Perhaps because they were so isolated I have the impression that many of their remarks were more cautious. But after all, ABM is not primarily a scientific issue."

The best known spokesman of those who contended that neither side displayed "scientific objectivity" in the political arena on the ABM issue is Albert Wohlstetter, who has written on this subject since 1963. Wohlstetter feels that "when a scientist represents himself as a scientist, as an expert, as having arrived at his beliefs as a result of careful analysis of the evidence" he has great obligations, which in Wohlstetter's opinion were often not met during the ABM debate. Wohlstetter states that the scientists'

> "reputation for professional competence is not sufficiently affected by statements made out of their field appearing in non-professional journals and never, or very seldom, subjected to professional scrutiny in professional journals. They might behave more responsibly if such scrutiny were normal."[14]

A social scientist stated that "people were using arguments that I would not have tolerated from second year graduate students."

The first of the three hypotheses for each side would seem to be confirmed: A majority of the ABM scientists on both sides viewed the behavior of their colleagues in the political arena as emotional rather than objective. The pro-ABMers were much more inclined to attribute this lack of objectivity to "the other side" than were the ABM opponents.

Next we move to examine how knowledgeable about the subject of the ABM the gladiators considered each other. 31% of the responents to this question thought their scientific opponents were poorly informed or uninformed on the ABM issue. Of these 36 scientists, 15 were ABM opponents and 21 were ABM proponents. 27% of the respondents felt the scientist-participants were well informed; these were divided 27 anti- and 4 pro-ABM. The remainder answered that "some of the participants were informed, some were not", "they were informed on the technical aspects but drew the wrong conclusions" and "they were knowledgeable about narrow parts of the problem only." The data are shown in Table 28.

TABLE 28. KNOWLEDGEABILITY OF ABM ACTIVISTS VIEWED BY ANTI- AND PRO-ABM SCIENTISTS

| | Anti-ABM Scientists | Pro-ABM Scientists |
|---|---|---|
| Poorly, or uninformed | 19% | 62% |
| Moderately informed | 47% | 26% |
| Well informed | 34% | 12% |
| | N = 80 | N = 34 |

P /_ .001

The data confirm the hypothesis that the pro-ABM scientists cast their scientific opponents in a considerably more negative light than did the anti-ABM scientists.

Lastly, we consider the question of how effective and influential each side felt the other had been in the debate. Our prediction was that the anti-ABM scientists would attribute greater influence to the scientific community in the ABM issue than would the ABM proponents. The data as presented in Table 29 support the prediction:

TABLE 29. EFFECTIVENESS OF SCIENTISTS IN THE ABM ISSUE AS VIEWED BY ANTI- AND PRO-ABM SCIENTISTS

| | Anti-ABM Scientists | Pro-ABM Scientists |
|---|---|---|
| Scientists had no influence | 4% | 22% |
| Scientists had a little influence | 5% | 14% |
| Scientists had some influence | 13% | 8% |
| Scientists were influential | 79% | 56% |
| | N = 104 | N = 36 |

$P < .005$

During the interview the question was probed a little further. The respondents were queried, "Which scientists do you feel were particularly effective in the ABM issue?" The three most frequently named scientists were W. K. H. Panofsky, Hans Bethe and Jerome Wiesner.

The scientists in their selections had three available options. They could name only scientists who were on their side in the ABM battle;

they could designate colleagues from both sides as being influential, or they could name only members of the opposition. From the foregoing review, a picture has emerged of pro-ABMers as more disillusioned and disheartened over the role of the scientific community and less willing to attribute objectivity, knowledge or influence to their opponents. From this one could hypothesize that pro-ABM scientists would have been more prone to name scientists siding with them as being influential than would anti-ABMers who seemed to view their opponents with more equanimity. However this was not borne out by the data. Table 30 tells the story:

TABLE 30. TYPE OF SCIENTIST NAMED AS INFLUENTIAL BY ANTI- AND PRO-ABM SCIENTISTS.

| | Anti-ABM Scientists | Pro-ABM Scientist |
|---|---|---|
| Names only scientists on same side | 90% | 10% |
| Names scientists on both sides | 9% | 50% |
| Names scientists only on other side | 1% | 40% |
| | N = 67 | N = 10 |

$P < .001$ gamma = .95

While ABM supporters generally did not feel that scientists had made much difference in the outcome of the issue they were much more likely to name ABM opponents as having been efficacious than they were to name their own team members.

To summarize the perceptions each side had concerning the ABM debate we found that ABM proponents believed the debate to have been detrimental

to the scientific community. They stated that the controversy had harmed the prestige enjoyed by scientists; it had contributed to the funding crises which scientists face, and had brought divisiveness to the collegiality of scientists.

Pro-ABMers saw the scientific community rather evenly divided over the desirability of ABM deployment. From their perspective, access to classified information was an important ingredient in the ABM issue. They saw their opponents as uninformed and lacking in objectivity and attributed less influence overall to the scientific community in the ABM controversy. However, when they listed individual scientists they deemed effective in the political arena, they were more likely to include their scientific opponents.

By contrast, the ABM opponents thought the debate had benefitted the greater scientific community, they saw a vast majority of their colleagues sharing their opposition to deployment. They did not attribute so much importance to having access to classified information; they were more likely to grant that their opponents were objective and knowledgeable and they felt that scientists had played an influential role in the ABM drama. Those scientists whom they felt had been most effective in the debate they placed squarely in their own camp. The model of a monolithic scientific community coolly assessing a given set of data and after due deliberation, arriving at consensus, if not unanimity would seem surpassed by Oliver Wendell Holmes' observation "All I mean by truth is what, I can't help thinking."

## VIEWS ABOUT SCIENCE

Do the ABM scientists who viewed the debate through such disparate lenses also wear different conceptual and perceptual spectacles when they look at the profession of science to which they belong? How do they view not the objectivity of their opponents, but their own objectivity, both in pursuing scientific research and in their political goals regarding deployment of a defensive system? How do they feel about the politicization of professional organizations and what do they see as the proper political role of scientists and of scientist-advisors?

## OBJECTIVITY

Two questions attempted to deal with the scientist's feelings about the norm of objectivity presumed to be intrinsic to the ethos of science. First we asked "Did you perceive any tension or conflict between your role as a scientist and your role in the political arena?" The prolix responses ranged along a spectrum from "no" to "yes" with many qualifiers en route. Starting on the negative end, typical answers were:

> "No, because I am conscious of preparing my own rationale. My emotions tell me in what direction I want to go. I have to see the scientific reasons for getting there."
> --Physicist at the University of Washington

> "No tension, but a continuous responsibility to make clear to listeners which of my judgements were based on professional knowledge and which were my opinions as a citizen." -- Physics professor, University of Oakland Rochester, Michigan

Some scientists felt the only conflict was that of time. The time they spent on the ABM issue was time away from their research and that produced a certain amount of tension for them.

Several described conflict arising from interpersonal relationships. A pro-ABM social scientist said sorrowfully:

> "Some find it odd that being pro-ABM can be consistent with a liberal view of politics and arms control and arms reduction. I am not an arms racer...I felt uncomfortable with my bedfellows, like Senator Thurmond and Representative Rivers. It was unfortunate that the debate polarized views in this way so that to be pro-ABM was to be rightist."

A physicist in Michigan stated:

> "the conflict is not conflict in principle. It comes from the ethics regarding facts between me and people who are professional organizers and spokesmen for political groups. The particular frustration which I felt was that they were less concerned that the ABM be defeated than that the ABM should be used somehow to radicalize the people."

The other question probed whether the scientist felt he personally had been objective when he dealt with the ABM issue. "Did you state your assumptions explicitly and withold your judgement until all the data were in?" Here many respondents adopted a fatherly attitude toward the interviewer and said "You'd be surprised how non-objective physics is" Francis Low. According to Franklin Long "We aren't very bloody objective in our scientific research either" and from Paul Doty "In the case where half a dozen people are working on the same scientific problem there also are compromises made with scientific methodology."

ABM proponents were much less likely to concede that in scientific research objectivity might not be omnipresent. For example a "think tank" scientist said, "I just solve problems -- I try -- I don't always succeed. It is possible to detach oneself from the political issue and make a technical problem out of it. If the President wants an area defense, I ask what is the best technical answer". Lawrence O'Neill

stated "I tried to restrict my comments to things in which I had special knowledge and when I wandered, I tried to label when I was doing it."

Table 31 presents the data concerning the scientists' view of their own objectivity in the political arena on the ABM issue.

TABLE 31. OBJECTIVITY IN THE ABM CONTROVERSY AS VIEWED BY ANTI- AND PRO-ABM SCIENTISTS (OWN)

| "Were you objective" | Anti-ABM Scientists | Pro-ABM Scientists |
|---|---|---|
| NO | 54% | 23% |
| YES | 46% | 77% |
| | N = 87 | N = 30 |

$P < .01$

Because the scientists overall split so evenly on this question with 54% of the respondents professing objectivity and 46% denying it, the issue was pursued further. Was age an intervening variable? One could hypothesize that older scientists would be more firmly socialized by the mores of the scientific ethos and therefore fewer would admit to nonobjectivity. This hypothesis was not confirmed. The mean age of scientists who answered they had been objective in the ABM controversy was 44.6 years compared to 43.8 for those who answered the question negatively.

Another line of investigation concerned eminence. Would eminent scientists be more or less likely to indicate objectivity in the political arena? No significant differences at all were found between Nobelists and non-Nobelists, National Academy members and non-members

and frequently and infrequently cited scientists. Pending further investigation, the varying conceptions held by scientists concerning so basic a norm as objectivity must be taken as further indication of the hetereogenity of the attitudinal and conceptual patterns exhibited by the scientific community.

## POLITICIZATION OF PROFESSIONAL ORGANIZATIONS

The ABM debate occurred during a time of considerable ferment within professional scientific organizations. The debate over the "Schwartz Amendment" to the American Physical Society Constitution in 1968*, the formation of SESPA (Scientists and Engineers for Social and Political Action) and of Computers Professionals Against ABM in 1969 and the political actions by radical scientists at professional meetings of the American Microbiological Society, the Association for Computer Machinery and the American Association for the Advancement of Science throughout 1970 all combined to make the issue of politicization of professional organizations a timely one to discuss with the ABM participants.

* The Schwartz Amendment, introduced by Charles Schwartz, professor of physics at the University of California at Berkeley in 1967, would have amended the Constitution of the American Physical Society to permit the Society to take a stand on political issues such as the Viet Nam War. The amendment was defeated by a nearly 3-1 vote in 1968. However, since then, the American Physical Society has begun formal reconsideration of its political role.[15]

The respondents first were asked wheter they discerned any changes within the professional organizations to which they belonged. Were such organizations in fact becoming politicized? A large majority of both pro- and anti-ABM scientists answered affirmatively, (67% of the anti's and 80% of the pro's). Then the scientists were asked to discuss how they felt about such politicization. Did they view it with approbation or with apprehension? One-third of the scientists voiced strong disapproval of any politicization of professional societies. Typical comments were:

> "Politicization of professional people is a good thing. Politicization of professional organizations is probably bad. It reduces our credibility and justly so, when public statements are made on the technical side of arbitrary issues." -- anti-ABM graduate student

> "The Federation of American Scientists exists and is the proper vehicle for that job. The American Physical Society is tax exempt. It is clear that the people who want to politicize it are a small group now. There is not the slightest chance they would win any kind of vote; they would get even fewer votes now." -- pro-ABM physicist

Just less than half of the respondents (49%) took a moderate or middle of the road stand. They discussed both pros and cons and on balance favored some politicization:

> "I think more exchange of viewpoints on controversial subjects would be enlightening to members and make meetings more worthwhile." -- Yale University physicist

> "It's a tricky business. I would like to see professional organizations involved with social, not political issues. It's not hard to say that the American Physical Society (APS) should be involved with the uses of physicists' works. I would oppose having the APS vote on Viet Nam but would favor it coming out with a statement on disarmament."
> --Princeton physicist

Less then one-fifth (18%) of the sample favored outright politicization.

"I see no particular reason why societies of physicists would be more virginal than the AMA or the NAM. They all have developed political action arms."
-- M.I.T. physicist

"If physics wants to survive, it better get political"
-- physicist at Non-profit institution

"Every organization is formed because some need has arisen demanding organization. Every organization has to change. The APS is a society of physicists and physicists have to relate to things. The society that isn't relevant will fall apart."
-- Government Laboratory scientist.

The data are summarized in Table 32:

TABLE 32. DESIRABILITY OF POLITICIZATION OF PROFESSIONAL ORGANIZATIONS AS VIEWED BY ANTI- AND PRO-ABM SCIENTISTS

| | Anti-ABM Scientists | Pro-ABM Scientists |
|---|---|---|
| "Should professional organizations be politicized? | | |
| NO | 20% | 81% |
| MODERATELY | 57% | 19% |
| YES | 23% | --- |
| | N = 75 | N = 21 |

$P < .001$ gamma - .89

The deep split between pro- and anti-ABM scientists continues to pervade every issue we have examined. Age in this instance also appeares as a critical variable. Figure 9A plots age against the scientists' attitudes towards politicization of professional organizations. But, when we look at either the pro- or anti-ABM camp separately, age no

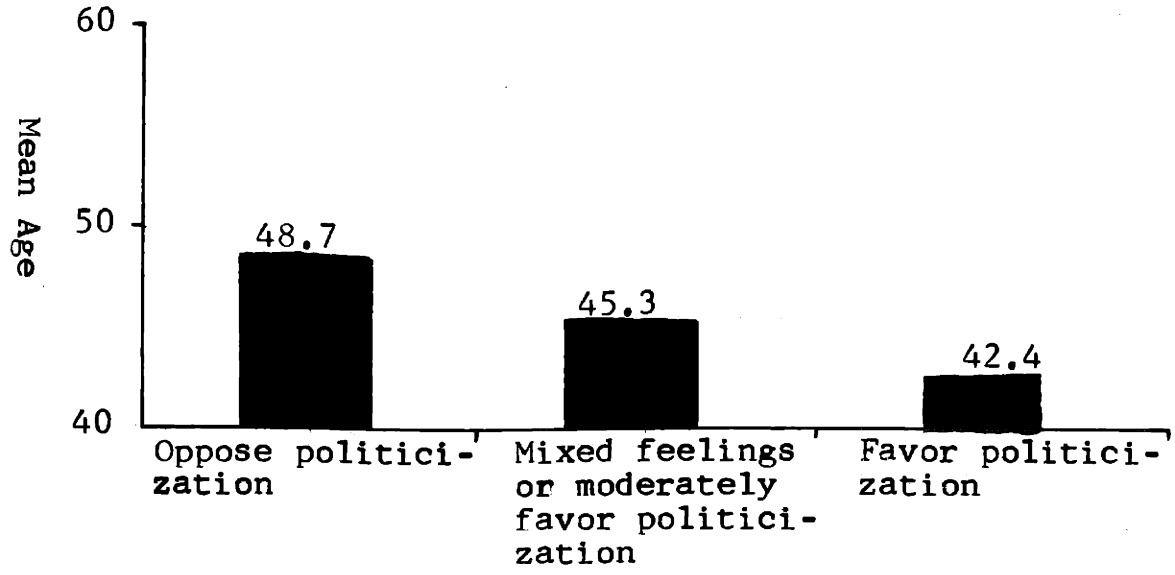


Figure 9A: ABM Scientists Attitudes towards Politicization of professional organizations

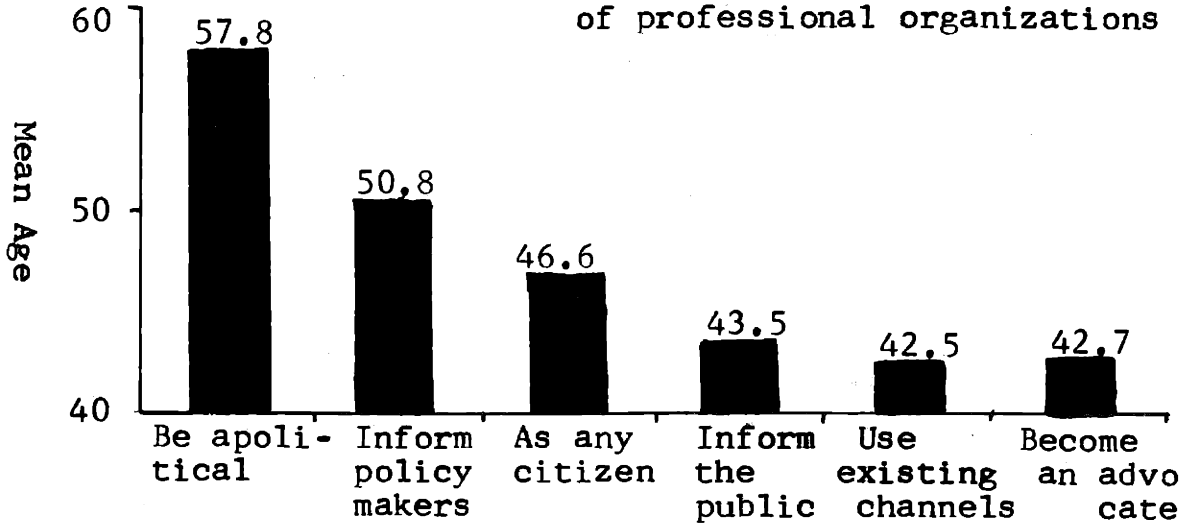


Figure 9B: ABM Scientists' Attitudes concerning Political Role of Scientists

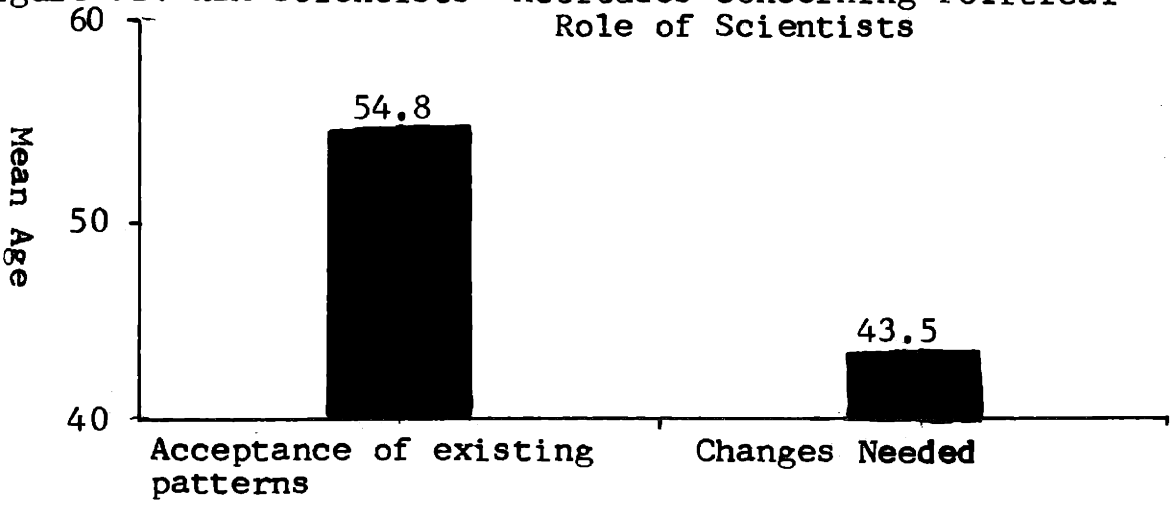


Figure 9C: ABM Scientists' Attitudes concerning Role of Scientist-Advisors

Figure 9: Age vs. ABM Scientists' Attitudes Concerning Politicization of Scientists.

longer intervenes, as is also shown in Figure 9A. Pro- or anti-ABM stand, rather than age is the dominant variable in explaining the scientists' attitude towards politicization of professional organizations.

If the younger scientists who now favor politicization of professional societies maintain these attitudes, as they grow older and assume leadership positions within their organizations and if the slope of the curve is valid for younger scientists not included in our sample, one could predict that in future years, a majority of scientists will favor some politicization of their professional socieities.

## POLITICAL ROLE OF SCIENTISTS

Our respondents were, with few exceptions, scientists who had entered the political arena in order to aid the deployment or cessation of a weapons system. Since they themselves had forsaken their reputed ivory towers and had engaged in the hurly-burly of politics, the question arose as to how these men viewed the proper political role of a scientist? Do they agree with Robert C. Wood's contention that scientists are

> "An apolitical elite, triumphing in the political arena to the extent to which it disavows political objectives and refuses to behave according to conventional political practice?"[16]

Or is Wallace Sayre's dictum that

> "Scientists are now inescapably committed to politics if they hope to exercise influence in the shaping of public policy, including science politics... they are effective in the degree to which they understand the political process, accept its rules and play their part in the process with more candor than piety, accepting gladly the fact that they are in the battle rather than above it."[17]

more congruent with their sentiments?

At one end of the range of opinions expressed were the feelings that scientists best should eschew politics. According to a prominent scientist, "The proper role of scientists is to make science. Our job in science is 1) to do science, 2) to apply science, 3) to explain publicly what has been accomplished. Then a scientist has no more responsibility regarding the political consequences of his work than a general or a legislator." Only seven scientists in our sample agreed that scientists should be essentially apolitical. Of these, six were pro- and one was anti-ABM.

Moving along the spectrum, some scientists stressed the obligation of scientists to make sure that technical considerations are factored into the decision making system. Some of these scientists stressed the importance of the "insiders" role: Said a scientist at Los Alamos "Coming out in the open weakens one's effectiveness in the inside world." and an independent consultant "feels he loses his effectiveness if his name gets in the papers too often, his is an insider role."

Next come those scientists who professed that scientists should have just the same political role as any other members of the citizenry. Eugene Wigner phrased it,

> "Scientists have no more right to decide in which way their contributions to society should be used by society then have the other members of society."

From John Foster: "It bothers me that some scientists feel they should have a voice beyond ordinary people."

Other scientists agreed with the need for scientists to inform but felt strongly this should be done publicly:

"Every professional group has a societal obligation. A doctor who sees child abuse has an obligation to report it, to bring it to the public's attention. The scientist has the same responsibility."
-- a government scientist.

According toa young professor: "The model of the ABM is the appropriate model. Scientists acted just right. They got involved, they educated the public and the decision-makers."

Working through and with existing organizations was deemed most suitable by still other respondents. These were almost evenly divided between those advocating that the scientists' efforts should go to scientific organizations like the FAS and Council for Livable World and those who thought the political parties were more suitable.

The position most diametrically opposed to the apolitical stance advocated some, was taken by others who feel scientists should assume an advocacy position in the political arena. These respondents opined that the scientists referred to by Wood's "apolitical" appellation abstained from politics because they didn't need to lobby. "Physical scientists were the darling of government. They didn't want to kill the goose that laid the plutonium egg" was how a Lawrence Radiation Laboratory physicist phrased it. According to Charles Schwartz, "It is wrong to give away one's birth right as an opinionated person." Respondents who favored this more activist stance for scientists also stated that "politicians should take appropriately skeptical views of what scientists have to say."

Again age was of importance. The mean age of scientists advocating giving technical advise only to decision makers and playing the insider's role was ten years higher than that of respondents who favored the

advocate's role for scientists. See Figure 9B.

But again, if we separate the protagonists from each other, we see in Figure 9B that the effect of age as a variable is much reduced.

The division between pro- and anti-ABM scientists on the question of the proper political role for scientists is shown in Table 33:

TABLE 33. THE PROPER POLITICAL ROLE FOR SCIENTISTS AS VIEWED BY ANTI- AND PRO-ABM SCIENTISTS

| Scientists should | Anti-ABM Scientists | Pro-ABM Scientists |
|---|---|---|
| Be apolitical | 3% | 21% |
| Inform policy makers | 9% | 54% |
| Act as any citizen | 25% | 14% |
| Inform the public | 25% | 7% |
| Work through existing political channels | 23% | 4% |
| Play an advocate's role | 15% | --- |
| | N = 65 | N = 28 |

$p < .001$; gamma = -.81

## POLITICAL ROLE OF SCIENTIST ADVISORS

The preceding question dealt with the generalized role of scientists in the political arena. The more specific issue of the role of a scientist who has been asked to serve in an advisory capacity to government was also explored. Here as elsewhere, the lines were sharply drawn: Donald Hornig, former Science Advisor to President Johnson:

"By remaining within the system the leverage in some respects is much greater, but there are corresponding restraints. My conclusion is that some people should certainly participate within the system as the Strategic Military Panel did and I did. For one thing, pressure could be brought and arguments adduced to abandon the whole ABM idea. That was done and we failed, but I doubt that the same people could have done any better on the outside. In the course of it, not only did the system get trimmed down (I would hate to claim as a result of whose efforts), but quite a lot of much better thinking about ABM in the nuclear strategic context was gradually implanted in other thinking. I think there was a considerable net gain, although the big battle was lost."

versus

Owen Chamberlain, Nobel Laureate:

"I've reached the conclusion those IDA (Institute for Defense Analyses) scientists are being used. They're not listened to. The best way to stop being used is to drop out."

Lewis Branscomb, Director of National Bureau of Standards:

"If Panofsky hadn't served in IDA and PSAC, how could the minority of Senators have had a way to get information?"

versus

Gordon Kane, professor of physics, University of Michigan:

"The members of the executive branch science advisory apparatus clearly took a strong political stand by allowing the government to claim that studies showed that it would "work". They should have spoken up publicly or at the very least dissociated themselves from the executive's claims. The role they played was thus of a "retained lawyer" rather than that of a "scientific advisor."

Stanislaw Ulam, professor of mathematics, University of Colorado:

"It is good for scientists to be involved a little in defense; otherwise charlatans will do it. Although in several respects I do not agree with the views and policies of the present administration, if I were asked for advice, I would give it."

versus

Gregory Dash, professor of physics at University of Washington:

> "Inside advisors are prostitutes."

Charles Herzfeld:

> "When I was in the administration I felt I had publicly to defend the administration viewpoint or at least not to attack it. If it is a major issue and one disagrees, one should resign."

versus

Robert Socolow, professor of physics, Yale University:

> "They (advisers) have their rights too, to be able to advise without constraints being placed upon their behavior."

The viewpoints of scientists who felt changes were needed in the science advisory apparatus, that scientist advisers should take more of an advocate's stand, should not accept constraints and should see their role as advisers to a larger constituency than just to the executive department have been grouped together in Table 34 under the heading "changes needed, more activist." The body of responses indicating general acceptance of the present role of scientist advisors is labelled "acceptance of existing patterns." The division between pro- and anti-ABM scientists is as follows:

TABLE 34. ROLE OF SCIENTIST ADVISORS AS VIEWED BY ANTI- AND PRO-ABM SCIENTISTS

| | Anti-ABM Scientists | Pro-ABM Scientists |
|---|---|---|
| Changes needed, more activist | 76% | 7% |
| Acceptance of existing patterns | 24% | 93% |
| | N = 49 | N = 30 |

p < .001, gamma .95

The mean age of scientists answering "changes needed" is 53.5 years. The mean age of scientists indicating "acceptance of existing patterns is 54.8 years. See Figure 9C.

The picture that has emerged from our examination of the ABM scientists' views on science is one of a multifractionated, hetereogeneous community, whose members exhibit sharply divergent cognitions, attitudes and perceptions.

In broad brushstrokes we can describe pro-ABM scientists as having internalized the norm of objectivity and the norm has become a perceptual screen through which they view the science-politics interface. Since in their view anti-ABMers were not objective and they, themselves were, it became easy to denigate and castigate the opponents for forsaking the "scientific" path in the ABM controversy. Pro-ABM scientists voiced general disapproval of politicizing professional organizations and of having scientists and scientist-advisers assume more public, more Ralph Nader-like political stances. Since such changes would alter the "objective" image of science, these views are self-consistent.

Anti-ABM scientists were more willing to accept the fact that in the political arena they are no more chaste than any other group. Accordingly they more often expressed tension caused by this role conflict. If one believes that pure objectivity is more myth than reality in the actual practice of science, then one is more likely to tolerate, if not to accept, a more activist stance by scientific organizations and by scientists within and outside the scientific organizations and by scientists within and outside the science advisory network. This was the prevailing viewpoint of anti-ABM scientists.

## POLITICAL WELTANSCHAUUNG

We will complete our inquiry into the similarities and differences between the good guys and the bad guys by examining the protagonists' view of the outside political world as it impinged on the ABM issue. From the evidence presented in the preceeding pages regarding the lack of unanimity or agreement within the scientific community on matters closely pertaining to the profession itself, we would expect to find equally large or greater divergencies as we move to subject matters less directly related to science.

## THE CONGRESS

The major effort of scientists on both sides of the ABM issue was attempting to influence the vote on the deployment of antiballistic missiles in the Congress. How did these scientists view the Senators and Congressmen they were attempting to interact with? "Do you feel Senators and Congressmen can understand the technical issues involved in a subject like the ABM?" was one of the questions asked during the interview. A number of scientists expressed the view that the technical issues were so complex that none or only a very few non-technical people could comprehend them. Some typical comments were:

> "They don't know what deterrence is."
>
> "I can't analyze the response time of radar, how could they?"
>
> "Senator Mansfield is not comfortable using a term like 'ballistic trajectory'"
>
> "The visualization of the offensive-defensive game is difficult for them."

The majority of the respondents thought that most or all of the elected representatives in Congress could understand the technical issues involved in antimissile defenses sufficiently well to cast an informed vote. Typically, holders of this opinion felt that the overriding issues weren't technical at all:

> "Most are very able to understand the major ideas. But few would concede that technical issues were paramount in their decision."

> "Most are way above average in intelligence. Most have bright staff people. Once the ABM argument got polarized, the technical facts did not matter. The vote was on military budgets, peace, the military-industrial complex. ABM was a symbolic issue."

The data are presented in Table 35.

TABLE 35. ABILITY OF SENATORS AND CONGRESSMEN TO UNDERSTAND TECHNICAL ISSUES AS VIEWED BY ANTI- AND PRO-ABM SCIENTISTS

| | Anti-ABM Scientists | Pro-ABM Scientists |
|---|---|---|
| None, only a few can understand | 10% | 45% |
| Some can understand | 16% | 29% |
| Most, all can understand | 74% | 26% |
| | N = 93 | N = 31 |

$p < .001$, gamma -0.74

Nearly three-quarters of the anti's compared to just over one-quarter of the pro-ABM scientists expressed confidence in the ability of their elected officials to cast an informed vote in the ABM issue.

Did the scientists feel that Senators and Congressmen were able to secure adequate outside expertise when it came to issues like the ABM or were they too dependent upon administration witnesses and sources? The familiar pattern recurs: 51% of the anti-ABM group and 13% of the pro-ABMers thought that Senators were unable or had difficulty in procuring sufficient independent advise. 35% of the anti's and 68% of the pro's termed the existing arrangements satisfactory or adequate. The remainder in each group stated that some Senators and Congressmen could obtain the necessary expertise and others couldn't, it was more a matter of personal inclination.

How did the scientists view the adversary proceedings in which the ABM was debated in the Congress? A majority of the pro-ABMers thought the debates shed more heat than light. The adversary proceedings were likened to ceremonial dances and Roman circuses said to have "done more to promote controversy than to clarify technical issues." Nearly 90% of the anti-ABMers approved of the adversary format. "It was the best way to bring out the doubts" and "It educated the Congressmen and Senators to the fact that scientific judgments are a matter of opinion, it forced them to think and that was good."

Table 36 presents the data:

TABLE 36. CONGRESSIONAL ADVERSARY PROCEEDINGS AS VIEWED BY ANTI- AND PRO-ABM SCIENTISTS

| | Anti-ABM Scientists | Pro-ABM Scientists |
|---|---|---|
| "Did you believe the adversary proceedings were a desirable way of informing the Congress regarding the ABM issue?" | | |
| NO | 9% | 52% |
| MAYBE | 2% | 4% |
| YES | 89% | 44% |
| | N = 65 | N = 25 |

p < .001, gamma -.82

In their perceptions of legislators and the proceedings in Congress the protagonists continue to view the world differently. To opponents of deployment the issue of ballistic missile defenses can and should be made comprehensible to legislators (and to the public). The adversary proceeding on Capitol Hill in their view were instrumental in accomplishing this goal.

ABM supporters by and large felt the complexities of the technical aspects of ABM made it incomprehensible to all but a very few non-scientists. The adversary proceedings viewed from this perspective served no useful purposes.

THE MILITARY

Before the study was undertaken exploratory hypotheses were set forth concerning the opposing sides' views on the military establishment in this country, the SALT talks, Russia and Communist China. These were as follows:

1. Anti-ABM scientists would view the military establishment in the United States as too large, too powerful and as opposed to arms control; pro-ABM scientists would cast the military in a favorable light as protectors of American interests and survival.
2. Pro-ABMers would view the SALT talks with suspicion and pessimism, while anti-ABM scientists would view the talks with hope and optimism.
3. Pro-ABM scientists would see Russia and China as opponents in a nearly zero sum game; their gains would be our losses in a strategic sense. Anti-ABMers would view the strategic scene as a non-zero sum situation with the best interests of the major powers coinciding.

The data support the first hypothesis very well. What was unexpected however was the ferocity with which many scientists viewed the military. From these staid and usually soft-spoken scientists came comments like:

> "The military is a cancer, each cell of which is just trying to do its best. Basically it is an organ gone malignant." -- Physics graduate student.
>
> "The military is the most serious menace to world peace and democracy in our own country." -- Physicist at University of Wisconsin
>
> "By and large they are war criminals" -- Physicist at M.I.T.
>
> "Irresponsible, short sighted and opportunistic." -- Physicist at UC, Santa Barbara

Milder but still unfavorable views were expressed by others:

> "They are party line people. After the chief of staff has spoken that's it." -- a retired vice-president of an industrial firm.

> "It's the kind of organization that promotes antagonism. The military system is one of the most inert rigid organizations. It's frustrating. They are so dumb they aren't powerful." -- West coast DOD contractor

> "The system is inept. It reminds me of the corporate image of the Penn Central." -- East coast DOD contractor

SALT TALKS

The second hypothesis was not borne out by the data. Although the differences between the two groups are not significant the findings run just counter to the expected ones. Anti-ABM scientists expressed disillusionment, doubt and despair over the SALT talks while the ABM proponents voiced hope and optimism over their outcome. (The interviews were conducted during the winter and spring of 1970-1971 while the talks were in session and before the announcement of "a breakthrough"). The data are summarized in Table 37.

TABLE 37. THE MILITARY ESTABLISHMENT AND THE SALT TALKS AS VIEWED BY ANTI- AND PRO-ABM SCIENTISTS

% expressing positive or optimistic opinions

| | Anti-ABM Scientists | Pro-ABM Scientists |
|---|---|---|
| Military establishment | 12% (N = 57) | 80% (N = 10) |
| SALT talks | 39% (N = 69) | 60% (N = 20) |

SOVIET UNION

The third hypothesis was confirmed by the data. No ABM opponents saw the Soviet Union as a benign ally, "They are not being pussycats" in Marvin Goldberger's phrase, but a cautiously optimistic note was sounded by over half the anti-ABM scientists. Typical comments under this heading were:

> "It is another country very much like the U.S. They have their militarists, their moderates, just as we do. They are moving towards more democracy and a more open society." -- Scientist at Argonne Laboratory

> "It's pretty much like the U.S.A., a little less dangerous to the world at large perhaps, a fair amount worse internally." -- M.I.T. scientist.

Slightly negative comments were in the vein of:

> "It's a nice place to visit but I wouldn't want to live there."

> "You don't have to trust the Russians to think they don't want nuclear war."

At the far end of the spectrum were those scientists who viewed the Soviet Union fearfully and with anxiety:

> "They want to bury us. You can't talk that away."
> -- Physicist at Georgetown University

> "I read what the Russians say and it is frightening. Their desire is to rule the world. I belive them."
> -- Physicist at Princeton University

> "I believe Marxists do want to take over the world."
> -- Industrial scientist

CHINA

A similar range of opinions was expressed regarding China. The data are summarized in Table 38.

TABLE 38. ATTITUDES OF ANTI- AND PRO-ABM SCIENTISTS TOWARD THE SOVIET UNION AND CHINA

| | | % expressing each opinion | |
|---|---|---|---|
| | | Anti-ABM Scientists | Pro-ABM Scientist |
| Cautiously optimistic | Re: Soviet Union | 63% | 19% |
| | Re: China | 63% | 30% |
| Slightly negative | Re: Soviet Union | 30% | 15% |
| | Re: China | 35% | 55% |
| Mainly hostile and/or fearful | Re: Soviet Union | 7% | 66% |
| | Re: China | 2% | 15% |

$p < .001$ in both cases. (N) answering Re: Soviet Union = 97.

(N) answering Re: China = 77.

Pro-ABM scientists viewed China more optimistically or less fearfully than they did the Soviet Union but with significantly less friendly eyes than did the anti-ABMers.

The scientists were asked to assess the probability of the outbreak of hostilities between the United States and the Soviet Union and between the United States and China. No statistically significant differences were found between pro- and anti-ABM scientists in these judgements. Nor were there any meaningful differences in the amount of contact pro- and anti-ABM scientists had had with Russian counterparts or whether they had been to Russia or not.

As with so many other indicators we have examined a scientistst's perceptions of the world in which he lives present so varigated and rich

a pattern that viewing him as a member of a homogeneous scientific community would seem to offer us few explanatory insights. The constellation of cognitions, attitudes, perceptions and behaviors we have examined in this chapter do cluster together but seem to be independent of membership in the scientific community and dependent upon membership in the body politic.

Because our sample of ABM gladiators represents two polarized views, great caution must be taken before generalizing our findings to the larger body of scientists.

For our sample, the knowledge that a man is a scientist did not enable us to predict with any accuracy his views concerning scientific objectivity, the politicization of professional societies, the feasibility of an ABM or his attitudes concerning the Soviet Union, China or the SALT talks. But the added bit of information whether he is pro- or anti-ABM reduced the proportional error in predicting his attitudes not only on those issues but on a multitude of related concerns by 70-99%.

To present a portrait of a modal pro-ABM scientist or a modal anti-ABMer would also be a simplification which would disregard the breadth attitudes, opinions and perceptions present in each group. But the differences between the two subgroups of the scientific community have been shown to be pervasive and sharply cutting and are posited to account for the passions which were aroused by the ABM issue.

FOOTNOTES TO CHAPTER IV

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2. Everett Carll Ladd and Seymour Martin Lipset, "The Politics of American Political Scientists" PS, Vol. IV, Spring 1971, pp. 141.

3. David Nichols, "Political Attitudes of a Scientific Elite" unpublished Ph.D. thesis M.I.T., Cambridge,Massachusetts, 1968

4. Everett Carll Ladd, "Professors and Political Petitions" Science, Vol. 163, March 28, 1969, pp. 1425-1430.

5. Henry A. Turner and Charles Spaulding, "Political Attitudes and Behavior of Selected Academically-affiliated Professional Groups" Polity, Vol. 1, Spring 1969, pp. 309-336.

6. Stanley Eitzen and Gary Maranell, "The Political Party Affiliation of College Professors" Social Forces, Vol. 47, December 1968, pp. 145-153.

7. Robert S. McNamara, "Address before United Press International Editors and Publishers", News Release, Office of Assistant Secretary of Defense, September 18, 1967.

8. "Text of President Nixon's Announcement on Revised Proposals for Sentinel Antiballistic Missile Program", New York Times, March 15, 1969.

9. J.C.R. Licklider, "Underestimates and Overexpectations" in Abram Chayes and Jerome B. Wiesner, (eds) ABM: An Evaluation of the Decision to Deploy an Antiballistic Missile System (New York: New American Library, 1969) p. 129.

10. John Foster, "Safeguard - A Forum of Opinion" Modern Data Vol. 3, January 1970, pp. 58-59)

11. Computer Professionals against ABM "Fact Sheet" Mimeo, page 7.

12. "Information Bulletin", (Internal Employee Information Bulletin) Bell Telephone Laboratory, May 15, 1969.

13. Robert K. Merton, Social Theory and Social Structure, (New York: Free Press, 1957) pp. 160.

14. Albert Wohlstetter, letter to author, May 18, 1971.

15. Daniel Rich , "Scientific Associations and Public Affairs in the United States" unpublished Ph.D. thesis, M.I.T., Cambridge, Massachusetts, 1971.

16. Robert C. Wood, "Scientists and Politics: The Rise of an Apolitical Elite" in Robert Gilpin and Christopher Wright (eds) Scientists and National Policy Making (New York: Columbia University Press, 1964).

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# CHAPTER V

## INFLUENCE IS IN THE EYE OF THE BEHOLDER

Thus far we have followed the journalistic dicta of describing who, what, where, when, why and how: who the ABM scientist-activists were, where and when they entered the political arena, what actions they undertook in their ABM quest, why they were motivated to become involved in this particular issue and what perceptions, attitudes and cognitions concerning both the scientific and political spheres these scientists expressed. In our examination we have found widespread differences on a great variety of issues between the protagonists.

There remains now the fundamental question of what effect this flurry of activity had upon the actual events as they occurred over time. First as to the deployment decision of September 1967: were scientists involved in the making of that decision? Next came the selection of missile sites; what role did scientists play in the initial site selection and in changing the site from Fort Lawton to Bainbridge Island in the Seattle area, from the western suburbs to Libertyville in the Chicago environs?

To what extent are scientists responsible for the change in emphasis from a light area defense to a defense of Minuteman bases and/or the National Command Centers and the consequent removal of the sites from large metropolitan areas?

How much credit or blame should be apportioned to these scientists for the historic 50-50 tie vote in the United States Senate on a weapons

decision? Are there long-term political effects attributable to the scientists' entry into the political lists?

In this chapter we shall deal with a general evaluation of the effectiveness of the scientists' efforts on two different levels: on opinion within the executive branch and on Congressional opinion.

## SELF PERCEPTIONS

We will begin with the scientists' own assessment of their success in the political realm. Based on Freudian ego analysis, it was hypothesized that scientists would tend to assume they had contributed significantly to the outcome of the ABM issue. Persons engaged in ego-involving behavior, such as the ABM participants were, are likely to perceive their efforts as efficacious. One scientist wrote of

> "How exciting it was to go out in the world as an 'expert' in something besides elementary particles. I hope you will keep in mind as you try to understand us that this was really quite a heady 'ego trip' for a lot of us."

The data confirm the hypothesis that the scientists who participated in the ABM controversy felt they were efficacious in the resolution of the issue. 72% of the respondents were of the opinion that scientists had been very influential in the ABM issue; 10% thought scientists had played no influential role and the remainder ascribed "some" or "little" influence to the scientist participants.

Since the anti-ABM scientists failed in their efforts to halt deployment of an antiballistic missile defense system, dissonance theory predicts a reappraisal on their part with a belittling of their own

roles in the debate. That is, having objectively "lost the battle" anti-ABM scientists would tend to downgrade 1) the importance of the ABM issue, 2) the amount of time and psychic energy they expended on it and 3) the effectiveness of scientists on the ABM battlefield.

Our data show that the import and significance of the ABM debate were not questioned or belittled by any ABM participants. Some, it will be recalled, had felt that antiballistic missile defenses per se were not of such momentous concern as MIRVs or the Indo-China war or the rising unemployment of scientific and technical personnel, but the importance of the debate and the issue as it evolved were affirmed practically unanimously.

In assessing the amount of time and energy spent on the ABM, if we consider these only during the period the issue was being actively debated in public, approximately from 1968 to mid 1969 then we find no significant variations between pro- and anti-ABM scientists in their own estimations of the time and energy they expended on the ABM issue.

However, here as elsewhere, we have no independent checks on the responses of the scientists. It could be, for example, that anti-ABM scientists in actuality did spend greater amounts of time on the ABM issue than did the pro-ABMers. But in accordance with dissonance theory, they down-played their efforts in replying to this question. It is also possible that pro-ABM scientists actually spent less time on the ABM than did their opponents, but according to Freudian psychology, their estimates would be inflated. Or just the reverse situation might have occured. In either case, the over- and under-assessments could have cancelled each other out to produce the result we report. Here, as

throughout the study and indeed as with all survey research, the validity of the findings is largely dependent on the veracity and accurate memory of the respondents.

On the third item, namely that anti-ABM scientists would feel less efficacious than pro-ABMers, by referring back to Table 29 it can be seen that this too was not confirmed by the data. The null hypothesis, that pro- and anti-ABM activists felt equally efficacious, is also rejected as the differences between the protagonists are significant beyond the .005 level.

How are we to explain the fact that the anti-ABM scientists perceived themselves to be so much more effective in the political arena than did the apparent winners, the proponents of deployment? It will be argued here that perceptions of influence increase with the ambiguousness of a given situation. The more ambiguous the decision, the more people think that they have influence and therefore more influence is attributed to the whole system.

Power is usually defined as "simply the ability to make things happen, to be a causal agent, to initiate change".[1] Power is assumed to be analogous to a zero-sum game in that if A exerts X amount of power or influence over B, B's power or influence is automatically decreased by X. This "fixed pie" assumption of power has been questioned by Arnold S. Tannenbaum.

Tannenbaum suggests we "envision a graph in which the horizontal base represents the hierarchy in an organization, with the president at one end and the rank-and-file members at the other, and the vertical axis represents the degree of control that persons at the various

hierarchical levels exercise. A curve plotted on such a graph will provide a rough, though meaningful, way of describing the distribution of control in an organization."[2]

Tannenbaum has found that in many different situations,"active and influential members did not necessarily have uninfluencial leaders. On the contrary, the curves for the two most effective unions showed that the members and the leaders exercised a relatively high degree of control."[3] It would appear that the ABM debate was an analagous situation where the size of the "influence pie" was expandable rather than fixed and therefore, almost all of the ABM combatants could feel efficacious.

Scientists, to begin with, could take credit or blame for inventing an antiballistic missile system. According to one of the participants: "If it weren't for science we wouldn't have an ABM."

Furthermore scientists were credited by their peers with devising the concept of a light area defense. Several members of a DSB Task Force on ABM chaired by Richard Latter in 1967 credited that panel with having exerted real influence. One member pointed to that panel as "an example of an effective committee...we estimated a range of systems at $3-6 billion and sold Cy Vance on it and shook (Secretary) McNamara."

Since the Army and the Joint Chiefs of Staff were openly pushing for a heavy or thick urban system in 1966 and 1967[4], when the deployment of a light area defense was announced in 1967 anti-ABM scientists were said to have been instrumental in stopping the more expensive deployment. According to a former President's Science Advisor, "In some ways the PSAC Military Strategic Panel has to be credited with being the

father of the system." According to this scientist, PSAC's message was "if you have to have an ABM, this limited one will serve some objectives." He continued, "We were within a hair's breath of undertaking a bigger program."

The ABM participants themselves assumed that scientists had been consulted on the Sentinel decision. Only 13% of the ABM sample thought that the decision was made without any input by the scientific advisory apparatus. One-third of the respondents believed John Foster was directly consulted and one-quarter believed PSAC was, the rest of the interviewees specified no particular science advisory body and simply referred to "insiders." There was no statistically significant difference between Inners and Outers, pro- and anti-ABMers on this perception of the ABM participants that "surely scientists were consulted on the Sentinel decision." As the ABM "good guys" and "bad guys" viewed the events leading to the Sentinel deployment decision, scientists had played a major role in designing the system to be deployed, in forestalling the deployment of a massive urban defense and through the science advisory mechanisms within the executive branch contributed inputs into the gradually evolving process called decision-making.

A wide chasm lies between being consulted and actually influencing decisions. At this time, we do not intend to construct a detailed analysis of how various ABM decisions came about in order to bridge the gap but a few stepping stones can be offered.

PERCEPTIONS OF OTHERS

In addition to interviewing 152 scientists who were ABM participants, the investigator also talked with 48 non-scientists. These included senators, congressmen and their aides, present and former officials of the State Department, the Arms Control and Disarmament Agency and the Pentagon, ABM contractor personnel, newspaper reporters, registered lobbyists, staffers on citizens' ABM committees both pro- and anti-; grass roots anti-ABM organizers, former members of the National Security Council and present and former members of the Armed Services. Detailed analyses of the data compiled from these interviews (which are still continuing) will appear in a projected case study by the author of the entire ABM issue. Preliminary results, however, show striking contrasts between the perceptions of these decision-makers and the scientists concerning the influence of the scientists in Sentinel decision.

To begin with, none of these non-scientists in a position to know attributed any influence to scientists or to scientific advisory panels in the making of the Sentinel decision. Whereas several scientists had mentioned the 1967 Latter Task Force as being influential, a former DOD official said flatly, "Dick Latter's Task Force was not influential at all. Johnny Foster's staff advisors make a recommendation to him. Foster says 'that's O.K. but I want another point of view' so he puts his friends to work on it. They're useful in picking up obvious bureaucratic entanglements." Likewise a present DOD staff member dismissed advisory committees as "largely window dressing."

While a scientist member of the Montgomery Panel which assessed the threat of the Chinese ICBM program felt that the panel's report "figured

in the decision to deploy", a former State Department official stated, "The Chinese rationale played no part." In fact, according to this former high ranking official, the State Department's judgements were that the Asian rationale was unnecessary and unwise.

According to Morton H. Halperin, former Deputy Assistant Secretary of Defense (ISA), neither the Arms Control and Disarmament Agency, the State Department or the President's Science Advisory Committee "played a major role in these (ABM) decisions."[5] This is corroborated by Herbert Scoville, former Assistant Director of ACDA. In a paper prepared for the annual meeting of the American Political Science Association, September 1970, Scoville wrote: "ACDA was at no time a participant in any of the senior level discussions leading up to it." (The deployment decision.)[6]

After the decision to deploy was announced the next decisions to be made concerned the locations of the missile sites.

The best account of the participants in the initial site selections is provided by Halperin.

He writes:

> "Although McNamara could and did attempt to monitor how the Army would deploy the system, he was unable or unwilling to direct that the system be designed and deployed so as to minimize the possibility of growth. The Army's freedom may have been enhanced by the fact that McNamara's scientific and technical advisers tended themselves to favor keeping open the option for the system to grow into a large ABM system. Deputy Secretary of Defense Paul Nitze, to whom general responsibility for much of the day-to-day administration of the Pentagon fell as McNamara devoted more and more of his time to Vietnam, tended also to favor keeping open

> the option for a large system. ...And in making precise decisions about where to locate radar and missile launching sites the Army in fact opted for sites close to cities, which would permit the deployment to grow into a large anti-Russian system should the decision be made at a later data to do so."[7]

Our own interviews corroborate Halperin's account. The scientific and technical advisers to McNamara referred to by Halperin were John Foster and his deputy, Daniel Fink.

According to Foster:

> "We put the radars and missiles near the most populated areas because as the system fails, it fails in its further reaches first. We were just trying to give cities a little extra defense for the money.

Fink stated:

> "Had I known then what would occur, I never would have let it happen. I would have said within 50 miles of major cities would have been reasonable. I just didn't forsee the outcry of the cities."

In summary, in the period prior to the deployment announcement in September 1967, Inner scientists appear to have been instrumental in delaying that decision by several years and in devising the concept of a light area defense. The year following the deployment decision was one of relative quietude on the ABM scene. The decision to locate the missile sites near large metropolitan areas seems to have been made by a few scientists in the office of DDR & E. Scientists played only a peripheral role in the five day Senate debate in 1968 on the Sentinel deployment. Once the deployment decision had been reached, the sites selected and congressional action taken, Inner scientists receded temporarily from the scene.

EVALUATION

The first stirrings of the Outer scientists now began, quietly at first in Seattle. The Seattle story differs from the Chicago story in that in the former city the mayor of Seattle had been hoping for many years to obtain most of Fort Lawton for a city park, when that Fort was to be declared surplus property on July 1, 1967. When the Army obtained a halt to the surplus action in anticipation of using the Fort for a Sentinel missile site, the Mayor "largely sailed solo"[8] in his efforts to counter this action. This was well before the scientists at the University began their technical analysis of the Sentinel system. In Chicago, it was the scientists at Argonne National Laboratory who first became alarmed about the issue of "missiles in the backyard" and alerted the citizenry as well as public officials.

In Seattle, the efforts of the scientists were only one component, as a far-flung coalition was formed not to oppose the deployment of an antiballistic missile system per se, but the proposed location of such a site at Fort Lawton. The coalition included representatives of the League of Women Voters, the Allied Arts of Seattle, the Citizens Planning Council, the Seattle Chapter of the American Institute of Architects, the Seattle Chapter of the Federation of American Scientists, the Audubon Society, the Sierra Club, the Mountaineers, the Junior League of Seattle, the Alpine Club, the Seattle Junior Chamber of Commerce and the Western Outdoor Clubs.[9] The scientists' main contribution to the coalition was to provide detailed data that "the Sentinel strategically can go at sites other than Fort Lawton."[10]

The coalition met with Senators Magnuson and Jackson as well as with their Congressmen and even arranged for a briefing by Lt. General Alfred Starbird, project manager of the Sentinel Program in Washington D.C. for one of the scientists who had security clearance.

When it became apparent that the "Battle of Fort Lawton" was going to be won, credit was awarded to "a loosely knit group of citizens and local politicians."[11] In this instance, the scientists' influence appeared chiefly as one input into a very successful grass roots effort.

When the location of the missile base was changed from Fort Lawton to Bainbridge Island on December 18, 1968 the scientists' role continued to be one of parity with many other influential residents of that Island who were aroused almost overnight to a fever-pitch of activity. During Christmas Week a petition opposing selection of the Island for the missile site was signed by 2,400 Island residents and 600 Islanders attended a meeting on the Island held by the Army on December 30.[12]

Throughout this time some Boeing scientists were conducting siting studies for the Army while other Boeing scientists, mostly at the Boeing Science Research Laboratory were actively opposing deployment of the same system. Some of these scientists considered the possibilities of organizing scientists within the "military-industrial complex" to form a nationwide anti-ABM group, but this did not materialize.

In our judgement Seattle scientists played a contributory but not dominant role, first in changing the location from Fort Lawton to Bainbridge Island and then in opposing the siting at the Island. In Chicago, on the other hand, all the available evidence point to the

Argonne scientists as the prime cause behind the decision to relocate the proposed missile site from the western to the northern suburbs.

In Boston the opposition to each of five proposed Northern suburban locations for the missile site also aroused citizen protest. In Lynnfield irate citizens formed a Citizens' Committee and conducted an energetic campaign against an installation in their community. This culminated in a vote at a special Town Meeting on June 3, 1968 to set up a committee "to investigate the proposed establishment of a missile base at Camp Curtis Guild and the effect on the town for the purposes of protecting the interests of the town. An amount of $2,500 was voted for appraisal, engineering, legal and other expenses incurred in this study."[13] However, in this initial round, the scientists who were to be so vocal on half year later were not heard from.

At Reading, Massachusetts on January 29, 1969 the Army was scheduled to present its plans for the proposed missile site. During the previous two weeks a loose coalition of anti-war groups, political activists and scientists had generated enough pbulicity about the meeting that nearly 2,000 people and the major news media were in attendance. That meeting marked the turning point in the Boston fight against an ABM as local scientists leapt to the forefront of the battle and remained there until the Senate vote in August.

In all the other locations where opposition to ABM was voiced, such as in Detroit, San Francisco, Tenafly, New Jersey, Pittsburgh, Pennsylvania, Montana and North Dakota, Outer scientists were active in the opposition. Their role appears as a necessary but not sufficient ingredient in turning the ABM into a national issue. That is to say,

Outer scientists often were the catalysts but it was the nucleating effects of massive citizen opposition that carried the political weight.

EXPLANATIONS

How are we to explain then, the almost unanimous expressions of efficaciousness expressed by these scientists?

A possible explanation for the unexpectedly frequent preceptions of influence expressed by the ABMers all over the country were their very low expectations of success. That is to say, anti-ABM scientists did not think that they would be successful in their attempts to move the missile sites away from large cities. Pro-ABM scientists, after the ABM issue became front page news, worried that not only might the missile locations be moved but that the whole defense system might be scrapped.

Illustrative of this point of view was a thoughtful letter written by Patrick J. Friel, former deputy assistant Secretary of the Army for R. & D. to John Foster, the morning after he attended the meeting in Reading, Massachusetts at which the Army discussed the construction plans for the Sentinel site near Boston. Friel wrote:

> "I was very impressed with the fact that the audience was extremely well informed and would not accept weak answers on either the technical or policy aspects of the system. It is fairly clear to me that a substantial fraction of the people present (over 2,000) fully intend to prosecute the issue further with their congressmen and senators... If this is the typical reaction throughout the country, and if the information exchange continues to be as inadequate as last night's presentation in Reading, it seems to me that there is a very good chance that the Congress

would have to act to cancel the system..." [14]

Nearly 2/3 of the ABM scientists thought their chances for achieving their objectives regarding ABM deployment were "low" or "hopeless." Pro-ABMers were more optimistic about their chances of achieving their goal, i.e. a deployment vote in the Senate, but only one of them rated their chances as "high".

Related to the low expectations of success was the perception that each side saw itself clearly as the underdog. This is not unusual in adversary situations.

In their study of tariff policy, Bauer, Pool and Dexter found "In full good faith, each side depicts the other as well-heeled professionals, whereas 'we are amateurs operating on a shoestring'".[15] Dexter amplifies this in his own book and writes "We repeatedly encounted the theme, 'our opponents are powerful but we are handicapped.' Big businesses speak with envy and longing of the influence and cunning they attribute to big labor and big labor speaks with jealousy and longing of the influence and cunning it attributes to big business."[16]

Again and again, the anti-ABMers depicted themselves as David going after the Pentagon Goliath:

> "It was an outgroup versus the establishment and the establishment always wins." -- a government scientist

> "We were the mouse crawling up the elephant's leg with rape in mind." -- Stanley Ruby, Argonne Laboratory

The pro-ABMers felt "there was no debate; only one side was being heard."

"I got the feeling the pro-ABM side was so much the underdog." -- Daniel Fink

"When the Wiesner-Chayes book came out there was a two-page spread in the New York Times. That alone cost $35,000. There was much more money on the anti- side than on the pro-side." -- William Kintner

The uncertainties inherent in an interregnum worked to increase the perceptions of influence held by so many of the ABM scientists. At first the Army refused to hold public hearings prior to the actual selection of a site. The official reasons given often were couched in terms of "security considerations."

At a meeting held in Oakland County, Michigan

> "All outsiders were barred as top Army brass met behind closed doors yesterday with the seven member Oakland County Board of Supervisors Planning, Building and Zoning committee. Four sheriff's deputies patrolled the halls during the meeting... According to Supervisor Niles Olson one of the three Army officers, Col. William Wray of the Huntsville, Alabama missile center said he was 'under orders from his superiors in Washington not to speak to the press...Carl O'Brien, another Oakland supervisor complained after the meeting, "Anytime I asked them something important about the sites, they said it was classified."[17]

But according to a former Pentagon official, the rationale behind the Army's initial reluctance to engage in public debate was based on the view of the Public Affairs people in the Pentagon that "you can't sell this kind of thing."

Whether it was due to the public clamor or to policy directives of the new Nixon Administration, the Army did begin to engage in public debate. According to this same source "They knew it was a loser."

This switch in the Army's strategy, of consenting to appear at public meetings, after previously refusing to do so, was construed as a victory by many anti-ABM scientists and accounts in some part for their high feelings of efficacy.

## THE SAFEGUARD DECISION

We turn now to discuss briefly the making of the Safeguard decision. As with the earlier Sentinel decision, the ABM participants assumed that scientists had been involved in the evolution of that decision. Only 15% of the sample thought that no scientists had been consulted. The percentage of scientists who attributed influence to John Foster rose from 33% in the case of Sentinel to 43% for the Safeguard decision. Those who believed PSAC had been consulted decreased from 24% for the Sentinel decision to 10% for the Safeguard. The remainder of the respondents again referred to "insiders" or "others" as having been influential. Also as with the earlier case, there was no statistically significant difference in the perceptions of who the participants in the Safeguard decision were between Inner and Outer scientists or pro- and anti-ABMers.

In announcing his Safeguard decision President Nixon mentioned three possible options available to him in addition to the Safeguard program. These were an urban defense against an attack by the Soviet Union, a continuation of the Sentinel program and in indefinite postponement of deployment, continuing only with research and development.[18]

However, according to all the evidence available to the investigator, this last option, namely postponing deployment, was never seriously considered. According to John Foster,

> "Looking back on it one might conclude it was a foregone conclusion that the Republican Administration which had just won an election on a security gap plank in its platform was not likely to say 'no' on the first major weapons issue to come up."

Other officials involved in the decision also corroborated this view.

That is not to say that such views were not vigorously advocated. According to a former member of the National Security Council staff, the Arms Control and Disarmament Agency made "a big push for no-ABM". According to this same source the views of the Office of Systems Analysis in the Defense Department "That they could get on quite nicely without an ABM" were also made known to Deputy Defense Secretary David Packard, who headed the committee charged with re-evaluating the strategic position of the United States. The point is that although "no-ABM" views were being expressed within and outside of the Administration, they were not considered as viable options by the men involved in preparing the new administration's antiballistic missile proposal.

In his analysis of the decision-making process leading to the Safeguard announcement, Robert Semple stated that Henry Kissinger, who consulted with groups of scientists, "asked some of his friends in Cambridge, Massachusetts to provide him with several papers on the technical feasibility of the project and to give him a reading of the sentiment among the scientific community at Harvard University and the Massachusetts Institute of Technology."[19]

Apparently late in February, Kissinger was informed that a hard-point defense would win at least a 50-50 acquiesence of the scientific

community. One interpretation of this episode is that Kissinger may have felt he had a signal to go from an area to a Minuteman defense and was stunned and disillusioned when the Cambridge scientists, whose advise he thought he was following, turned on the Administration following the Safeguard announcement. Such was the view of a prominent anti-ABM former congressman.

Another interpretation could be that Kissinger's sounding of the scientific community was a goodwill gesture, not intended to be taken seriously if it ran counter to the decision as it was evolving and useful to have if it concurred with the decision. This view was expressed by several scientists who believed that Kissinger felt threatened by the Cambridge scientists. "They have knowledge that he doesn't" is how one prominent scientist phrased it.

The interpretation favored by the author is that communications broke down. The Cambridge scientists who advocated/defending Minuteman implicitly assumed that different (i.e. smaller and cheaper) radars would be used and did not state explicitly that they would oppose a Minuteman defense which used the same components as the Sentinel, nee Nike X. Or, if reservations about using these radars for a different mission were explicitly voiced, they were selectively screened out by the listener. In political as well as in everyday life, in order to avoid potential stress, "inconsistent" information, incongruent with one's general opinions, beliefs and attitudes is often ignored.

If the views of scientists outside of government were only marginally influential what role was played by the science advisory mechanisms within the government? The PSAC Military Strategic Panel was apparently

specifically asked what they thought of hardpoint defense and were told the query came from the President. They wrote a document on hardpoint defense which was said to be similar to the points raised by Hans Bethe in a letter he wrote to Senator John Cooper on March 21, 1969.

Bethe (and other members of the panel) thought while "ABM defense of Minuteman sites (is) technically feasible and in principle sensible... the deployment of ABM around Minuteman seems to be premature".[20] Bethe and other panel members felt there would be better means of defending Minuteman than using Sentinel parts.

The contents of the Panel report became known to anti-ABM Senators and to the news media. A Chicago reporter wrote, on the day before President Nixon's Safeguard announcement: "Senate sources said the report was negative and held-as other scientists have testified publicly-that the ABM system would be of dubious value in defending against nuclear attack".[21]

PSAC apart from this Panel, was, according to a majority of the members at that time, not directly involved at all. Semple writes "the President saw few Senators and even fewer scientists".[22] According to a former Presidential Science Advisor "Kissinger made it clear he wanted no part of PSAC on studies relating to defense and security matters".

Another PSAC scientist stated "Henry Kissinger came to PSAC on at least a couple of occasions but he was highly suspicious of the committee right from the beginning." Whether PSAC was consulted at all by the Nixon Administration on the ABM decision that was evolving is a matter of some debate.

Lee DuBridge, Presidental Science Advisor to President Nixon at that time, stated that "PSAC discussed ABM and they were briefed by members of the Defense Department and others".

All of the PSAC members interviewed (approximately 75% of the total) agreed that the January 1969 meeting of PSAC was a "hail and farewell" occasion with a big dinner for new and old members. According to the PSACers no serious discussion of ABM occured at that time.

There is some difference of opinion about the February meeting of PSAC. According to one attendee, "there was no consultation or discussion with PSAC on ABM prior to the Safeguard announcement at all." Another said "I don't recall the issue was discussed that much at that particular time." But other PSAC members remember a briefing on ABM by John Foster and one scientist stated that Lee DuBridge, expressed his own view "which seemed to be favorable to deployment." This recollection was disputed by several other PSACers. One said "DuBridge never indicated he disagreed with the Panel's (Military Strategic Panel) conclusion. If he had disagreed with it we would have known about it." This was echoed by a PSAC scientist who quite indignantly remarked "The change of administration brought on the phenomenon that Mr. DuBridge made a public statement without the slightest consultation or discussion with PSAC. He didn't consult with PSAC on ABM at all."

The statement referred to by this scientist was a letter to President Nixon by DuBridge, released on March 17, 1969, three days after the Safeguard announcement and on the day of the monthly PSAC meeting. In this letter DuBridge congratulated the President "on the excellent decision you have made and the clear and thoughtful way in

which you presented it." DuBridge continued "Since coming into my present office, I have studied this problem carefully and have discussed it with members of the PSAC and its panels..."[23]

It was this reference to prior consultation with PSAC which seemed to grate so on many of the PSAC members. According to Dan Greenberg, "DuBridge lost contact with important elements of his own constituency, notably an influential segment of PSAC which felt that he had violated PSAC etiquette by voluntarily speaking out in support of the administration's antiballistic missile system."[24]

But according to DuBridge, after he gave copies of his letter to PSAC members "there was not very vigorous comment on it."

From the available evidence it appears that the advisory structure officially designated to provide the President with scientific advise, PSAC, was given a briefing on the ABM in February 1969 but without any opportunity to raise technical questions. According to DuBridge "There was substantial PSAC input in the Safeguard decision but there was no time for a formal PSAC report." The PSAC Military Strategic Panel was asked for its advice but when that advice was at variance with the proposed deployment it was disregarded. It appears that if scientists were influential in the Safeguard decision they were not the scientists within the official science advisory bodies.

One scientist, however, was credited by many observers as having been very influential in changing the Sentinel to the Safeguard ABM system. This was Harold Agnew who was Weapons Division Leader at Los Alamos Laboratory at the time, and now is the Director of the Laboratory. In a paper dated January 2, 1969 titled "What's Wrong with Sentinel" Agnew

wrote that "the Sentinel system could add significantly to the survivability for our strategic missile forces, the command centers which control their use, and the command structure."[25]

After listing several ways in which "technically hard point terminal defense is a much easier problem than that associated with area defense" Agnew pointed out that "defense installations are primarily located in areas of existing military bases thus minimizing problems presently being posed by citizens worried over safety matters or angered over dislocation problems."[26]

Agnew stated that his paper was prepared "for no one in particular" but it was circulated on Capitol Hill by members of the prestigious Joint Committee on Atomic Energy and their staffs.[27]

What weight is assigned to this paper by members of the Senate remains to be investigated but from our preliminary examination it appears that Agnew, a member of the Defense Science Board and of the Special Subcommittee of the National Strategical Committee of the American Security Council may well have been one of the few scientists who played an influential role in the Safeguard decision.

## THE CONGRESSIONAL PICTURE

In analyzing what effect the scientists' efforts had in the Halls of Congress, we are really asking how much influence can be attributed to the ABM scientist-participants in the 50-50 tie vote in the Senate in August 1969. Although Congress consists of two houses, almost all the scientists' energy was expended upon influencing the decision in the Senate.

Historically, in this century at least, the Senate has been perceived as the more "liberal", the less parochial house of the legislature. Apparently quite independently and often unaware of similar conclusions by other groups, each of the organizations interested in influencing the voting outcome on the ABM in the Congress decided for tactical reasons to concentrate on the Senate. The Federation of American Scientists did hold briefing breakfasts for Congressmen and their staffs, but the major efforts of the Federation, the Council for a Livable World, SESPA, SANE and the many citizens' groups both pro- and anti-ABM emphasized the importance of the vote in the Senate. It would be interesting to speculate what the result might have been had a similar intensive campaign been conducted in the House of Representatives.

In 1968, the first year that Congress voted to authorize and appropriate funds for the deployment of Sentinel, the vote in the Senate on an amendment by Senator John Cooper on April 18, to bar use of funds for deployment of an antiballistic missile system until the Defense Secretary certified that it was "practicable" and that its cost was known "with reasonable accuracy" was defeated 28-31. On June 24, a Cooper-Hart amendment to the Military Construction Authorization Bill delaying the bill's authorization of $447.3 million for the Sentinal ABM system for a year was defeated 34-52.

When the 91st Congress convened in Washington in 1969 events regarding the ABM occured rapidly. Responding to the rising tide of citizens' protest against the missile sites, Congressman Mendel Rivers, chairman of the House Armed Services Committee, notified Secretary of Defense Melvin Laird on February 4, that he would not approve further Sentinel sites

until the new Adminsitration clarified its intentions regarding the program.

Two days later, Secretary Laird ordered a halt to further ABM work pending a project review. On February 20, Senator Edward/ Kennedy announced that he was commissioning a review of the Sentinel program. On March 6, the first of the anti-ABM scientists testified before a congressional committee.

It was only during this brief period, in the spring and summer of 1969, that Inner and Outer scientists worked for or against deployment simultaneously. Inner scientists were collectively spending hundreds of hours on Capitol Hill, both testifying before Congressional committees and explaining the intricacies of phased array radars, blackout effects of nuclear explosions and the blast resistance of Minuteman silo to Senators.

At the same time Outer scientists were busy lobbying on all levels, local, state and federal, and working prodigiously with rapidly broadened coalitions. These two concurrent enterprises succeeded in making ABM front page news throughout the country for nearly six months and culminated in the 50-50 tie vote in the Senate in August.

We have indicated previously that the ABM scientists felt highly efficacious overall in the ABM issue, but with few exceptions did not think that they individually had swayed any Senator's minds or votes either by their lobbying or by their testifying. How did the Senators and their aides, the recipients of these intensive efforts, feel about the effectiveness of the scientists' efforts?

The following comments must be considered as very preliminary and subject to change pending further investigation, as they are based on a very limited sample. Thus far we have interviewed seven Senators and 14 aides for periods ranging from 20 minutes to 1 1/2 hours.

Based on this very small sample, the data point to an interesting symmetry between the perceptions of pro-ABM senators and pro-ABM scientists and anti-ABM scientists and senators. In our analysis of the scientists' attitudes towards Congress and the ability of senators to understand the technical issues involved, the data indicated that pro-ABM scientists felt that the technical issues inherent in the ABM were of such complexity that non-scientists, even senators, were incapable of comprehending them. Anti-ABM scientists were of the opinion that the technical questions were not paramount and could be understood by any intelligent laymen if a conscientious effort was made by both the explainer and the listener.

These feelings seem to be reciprocated by the senators. The pro-ABM senators did not attribute a great deal of influence to the scientists' efforts on the ABM battlefield. They were inclined to agree with Jeremy Stone's observation "where you stand depends on where you sit." That is, they saw the scientists on both sides of the ABM question as "having a line to sell", as advocates, not impartial, objective witnessess. Since for each anti-ABM spokesman they could listen to a pro-ABM scientist, they tended to equate the two sides and shrug off the scientists as "lobbyists no different from any others."

The anti-ABM senators, on the contrary, were emphatic in their assertations that "without the scientists, we never could have made a

close fight of it. They were informative, influential and effective as opinion makers." From another Senator: "The key to the whole thing was the revolt of the scientific community against the system. The spontaneous role of the scientists was central to the issue."

The most frequent comments from anti-ABM staff people were that "scientists enabled the members of the Senate and their staffs to argue on a level of parity with the Pentagon on technical issues." and "The scientists gave the senators the confidence to say this was right or wrong." and "It is hard to overstate the importance of the scientific community. Because of their prestige and access they were able to articulate the difficulties of the system and they were able to get the press interested in it."

In summary, the scientists' influence in the political arena in connection with the ABM issue was not of a constant nature. In the early days, before the deployment decision, it was scientists who were chiefly responsible for the technological advances and improvements which made anti-ballistic missile defenses seem feasible. The decision to deploy, which was a political and not a technical one, was made against the advise of the President's official science advisory apparatus and with the approval and concurrence of the science advisory bodies within the Defense Department. Influence in the location of the missile sites can be attributed to about two or three scientists working within the Defense Department's Directorate of Research and Engineering.

Outer scientists across the country were influential in spearheading citizen opposition to the location of missiles near large metropolitan areas. It was their success in fostering this opposition that

lead, in our opinion, to the Nixon Administration's decision to proceed first with defending Minuteman bases. Had the scientists not been able to enlist public support, it seems doubtful that the technical misgivings of the anti-ABM scientists about the feasibility of ballistic missile defenses would have become known publicly at all, or had any influence. It was the people's voices, not the scientists' that were heard in Washington.

When the scene shifted to Congress, anti-ABM senators found anti-ABM scientists useful in providing what some have referred to as the "fig leaf" function of science advisors. They provided anti-ABM senators with the technical jargon, facts and figures to bolster the senator's own doubts or misgivings about the system. Because the technical and political views of the anti-ABM scientists coincided with the political views of the anti-ABM senators, a situation arose where the appearance of influence was perhaps greater than the actuality.

Pro-ABM scientists provided the same "fig leaf" legitimizing function to pro-ABM policy makers and to pro-ABM senators. It is perhaps over simplified, but not inaccurate to say that in the ABM issue, scientists were influential when their views corresponded to those of the policy makers who were at the critical decision-points in the policy-making process. When the scientists' advise ran counter to these streams, it was largely unheeded except when scientists were able to arouse and sustain wide spread public interest and participation.

Footnotes Chapter V

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# CHAPTER VI

## LESSONS TO BE LEARNED

Now that the tale of scientists and the ABM has been told, let us return to the questions and issues raised in the introduction and see what lessons can be learned from our study.

### THE INFLUENCE OF SCIENTISTS

We asked first, what role did scientists play in the ABM issue. Because of the technological nature of antiballistic missiles, scientists undoubtedly played a critical part. It was scientists who investigated and came to understand the effects of nuclear explosions upon radar waves, scientists who studied the effects of X-rays upon the heat shields of incoming missiles, scientists who investigated electromagnetic pulses, exoatmospheric intercepts, neutron flux and precursor blasts. Without scientists and computer and electronics experts the possibility of anti-missile defenses simply would not have come into existence.

But once the concept of ballistic missile defenses seemed feasible, what role did scientists then play as the ABM moved off the drawing boards and out of the laboratories into the world of politics? How influential were scientists not in providing decision makers with the option of missile defenses but in the decisions when, if and how that opinion should be exercised? Here again we must divide the political arena into its constituent parts. We deal first with decision-makers within the Executive branch.

From our analysis it would appear that scientists were not nearly as influential in this sector as they would like to believe they were. While the Sentinel deployment decision was reviewed by various advisory committees on which scientists served, in our opinion, former Presidential Science Advisor Jerome Wiesner was correct when he testified before the House Committee on Foreign Affairs that "The technical basis for the decision was very, very thoroughly studied, but I don't think it was taken seriously by anybody until they suddenly decided they had to have something as a way of getting started."[1]

The decision to deploy Sentinel appears to have made against the advice of the majority of the President's Science Advisory Committee and more particularly, of its Strategic Military Panel, and against the advice of the "elder statesmen" of the scientific advisory apparatus. While the decision was approved of by the majority of the five non-Defense Department scientists to the DSB Task Force on Ballistic Missile Defense (the Latter Task Force), even this panel, in the eyes of non-scientist government personnel, served to approve or legitimate a decision already reached.

It may be that scientists' real influence in the Sentinel decision lay in convincing Secretary McNamara that a heavy urban ABM deployment would be both technically futile and destabilizing in the arms race context. Through McNamara's strong objection to the thick system favored by the Joint Chiefs of Staff and some influential Senators and Congressmen and some pro-ABM scientists, anti-ABM scientists were thus influential first in delaying the deployment by several years and secondly in limiting the deployment to a light area defense. However, this remains

specualtion. At this point, we lack evidence linking McNamara's resistance to a heavy ABM deployment to the efforts of anti-ABM scientists.

The next decisions in the ABM issue concerned the locations of the missile sites. Our data again indicate a lack of any influence or power attributable to any scientists other than those officially charged with carrying out such policy decisions, (i.e.) John Foster and Daniel Fink in DDR&E. It should be emphasized that scientists who do become decision-makers, like Foster and Fink, can and do exert real power and influence, in contrast to those scientists who act as advisors.

The Safeguard decision appears similarly to have been made with a minimum of influence exerted by the official scientific advisory groups established to provide the Executive branch with advice. Again it seems that if scientists within the official scientific advisory bodies were consulted it was a gesture only. As the preponderant opinion of the officially established science advisory /groups was counter to the views of the prevailing policy makers it was ignored.

Since the August 1969 Senate vote to proceed with a Minuteman ABM defense, Safeguard components and configurations have undergone modifications and improvements. Because these are based on scientific and technical considerations, one could argue that scientists have indeed exerted influence on the Safeguard system. We do not deny this. But advice consisting of improving and thereby, implicitly supporting an established position, will almost always be heeded. It is just such expertise which serves to legitimate, not to challenge the political decision. When policy makers want to buttress their political decisions with the backing of scientific expertise they always seem able to find

some scientists to serve on advisory panels and perform this legitimizing function.

One can raise the normative question here of whether this is not just as it should be. Should the views of scientists carry any more weight than the views of any other members of the body politic? We are not arguing that such should be the case but rather that scientists have deluded themselves into believing that such is the case. Within the Executive branch of government it appears to us that the major role of scientists in recent years has been to support established positions.

Next we can question what should scientists whose advice was repeatedly ignored have done? One option, open to any adviser, of course, is to resign. Many scientists who served in an advisory capacity on the ABM were asked why in fact they had not resigned. Their replies are illuminating.

Some were worried that their resignation would have had no effect. "I was afraid no one would notice it," said one disgruntled PSACer. "Generally resignations with fanfare have a flurry of one day in the press, then they are forgotten" a former government official concurred.

"The question I asked myself was where could I be spending my time more effectively elsewhere?" another PSACer mused.

It is this question we would like to explore next. While, according to our data, scientists in the executive branch were not able to exert real influence, when we move now to the public sector of the political arena a different condition prevails. It was in the public sector that scientists were, in our view, the most effective.

Across the country scientists, mostly Outer, younger, not scientifically prominent men took it upon themselves to alert, inform and educate the public about ballistic missile defenses. Some scientists have argued that the issue of "bombs in the backyard" was a "phony" issue, both because many major metropolitan areas already had many nuclear tipped missiles emplanted in their vicinity for many years and because the probability of an accident was truly minute. We would argue that both objections are valid but they miss the relevant point. The important event, in our opinion, was that scientists took their case to the people.

"Science for the People", the slogan of Scientists and Engineers for Social and Political Action, could, in our view, be reinterpreted to apply to such actions as those of the Chicago, Seattle, Detroit, San Francisco-Bay Area, New York and Pittsburgh scientists who went to the public and tried to enlist their support. Where the scientists were successful in their community efforts, it appears that they became influential through a multiplier effect. From our initial interviews with Senators and their aides it seems that the mutually reinforcing voices of scientists and lay people were clearly heard by their elected representatives in state capitals and in Washington.

The motives of the citizens who protested missile sites in their vicinity presumable ranged from selfish anxiety about a possible loss in property values to altruistic concern with reordering national priorities. All of them appeared pleased at having nuclear physicists and other scientists provide them with an overlay of scientific and technical jargon to bolster their apprehensions. So in this sense too,

one could argue that the prestige and expertise of scientists were used to legitimize considerations that were primarily political. Even if "used" in this sense, if our preliminary findings are substantiated by further evidence, it would appear that one lesson to be learned from the ABM case is that scientists will be most effective in the political arena when they take their case to the people and build bridges to close the gap between "science" and "people".

Turning now to the congressional level, the influence of scientists in this arena appears to be somewhere between the low level of influence they were able to exert in the executive branch and the high level they reached in the public arena. Some Senators may have been genuinely persuaded by the scientists' arguments pro- or anti-ABM. Many appeared pleased to have eminent scientists reinforce their own misgivings or hopes in the system. Quite a number expressed genuine appreciation for the scientists who had taken the time to educate them about blast effects, circular error of probability (CEP), hardening and shoot-look-shoot capabilities. But in discussing the effectiveness of scientists we must remember that a coincidence in view points between scientists and senators does not necessarily mean influence on the part of the scientists. It may be that the senator is using a scientist with a congenial point of view for the same legitimizing pay off we ascribed to bureaucrats in the executive branch and to citizens in the public sector.

Quite a few senators spoke of the continuing willingness of scientists to furnish them with technical information and of the trust and personal friendship that has built up between them. If subsequent research bears

this out, then the long term influence of the scientists may prove to be more powerful than their short term effect upon the Senate vote in 1969.

In summary we find that in the ABM issue scientists seemed to be influential when they were able to garner widespread and fairly long lasting public support for their viewpoints. The influence of scientists in the Congressional arena may be more pronounced in the long run than it appeared in the short run. On the Executive level, where the great majority of the scientists' efforts and hopes have been placed hitherto, we find they were influential mostly in providing a legitimazation for decisions based on political considerations.

## THE SCIENTIFIC COMMUNITY

We turn now to examine the second issue raised by this study. What do we mean when we speak of "the scientific community?" We recognize that our sample represents two highly polarized groups of scientists. By our definitional terms our ABM scientists were not picked to be representative of the community of scientists. Nevertheless, the differences we found between the pro- and anti-ABMers were so pervasive and so stark that it is our view that the concept of a homogeneous scientific community is not a useful frame of reference. Whether the questions dealt with the role of scientists and scientist-advisors in the political arena, or the politicization of professional organization, or the effect of the ABM debate upon the scientific community or the scientists' views on the United States Congress, on the military establish-

ment in this country, on the SALT talks, on China or on Russia, there was no consensus, no common reference point. While age at times seemed to be an intervening variable, when age was held constant, the differences in attitudes and perceptions between pro- and anti-ABMers remained significant beyond .01.

Judging by our data, greater insight can be gained by considering a scientist as a political actor operating in the political milieu than by ascribing any common set of characteristics to him based on the fact that he is a scientist.

Another myth which we would question is that scientists are an "apolitical elite". We challenge this on both counts. Our data indicate that many scientists are very politically active and have been so almost continuously since the end of the second World War. Nearly 3/4 of our sample reported previous time commitments to political activities comparable in scale to their ABM endeavors. The vast majority of them declared that they intend to remain politically active. The image of apolitical scientists has perhaps in the past been carefully cultivated by the scientists themselves but based on our sample one must question that image today.

However again we must stress the unrepresentative nature of our sample. It is quite likely that included in our ABM sample are the most politically active scientists living in the United States today.

The question of being an elite is perhaps more clouded. In the period immediately following the shock of Sputnik, it seems clear that scientists were accorded the budgets, titles and accouterments reserved for elites. But this era appears short-lived and perhaps the question of whether scientists now are an elite or not was best answered by an ABM scientist who responded, "It is hard to think of yourself as an elite when you are unemployed!"

The passions involved in the ABM issue also serve to illustrate the fragility of the colleagueship or the sense of community so often attributed to the scientists. Prominently displayed on the blackboard at a "think tank" was the following definition:

> "Intellectual: (n) a) Liberal variety- one who is prone to applying oversimplified models well outside their range of validity with a degree of confidence proportional to his ignorance."

Hostility between academics and non-academics, liberals and conservatives, social and physical scientists appeared with suprising frequency. Numerous social scientists expressed dismay that physical scientists had preempted the stage in what they felt was a political issue and hence one in which their expertise should be called upon. Some physical scientists reciprocated by sneering at the efforts of social scientists to participate in the ABM issue. Because these attacks were unexpected and unprobed for in the interviews and yet appeared gratuitously so frequently, the name-calling and truculence were startling to this observer.

Disputes and animosity between scientists are, of course, not a recent phenomenon. Indeed, many of the scientists who squared off against each other in the ABM had found themselves on opposite sides in the hydrogen bomb decision, in the Oppenheimer hearings and on the Test Ban Treaty. But rarely before have the rifts run so deep that scientists called for official investigations by professional societies to challenge the professional conduct of its members. However this appears to have occured in the ABM issue.

In his retiring report to the Operations Research Society of America, President Thomas E. Caywood wrote that:

> "One of our standing committees is Ethics and Grievances. This committee has not been very active in the past. This last year we received a request to investigate certain matters of professional conduct of testimony before the U.S. Senate in the ABM debate of last year. A committee composed of John Magee, Hugh Miser, Howard Berger, Robert Thrall and myself are now in the process of preparing a report on this activity."[2]

As of July 1971 the report had not yet appeared in print but its existence has become widely known and is another indication of the gossamer nature of the fellowship of scientists.

However, there were also counter examples, of mutual respect and cooperation between scientists from different disciplines and in different institutional settings. The three books on the ABM published in the spring of 1969 all were cooperative endeavors amongst academic and non-academic, physical and social scientists.

The communications network which purports to bind the scientific community into "invisible colleges" seem to be confined to scientific communications only. Although many scientists opposed or supported the ABM on "scientific" or "technical" grounds the communications network amongst scientists concerning this issue was very weak. The only exceptions to this seemed to be among the small group of Inner scientists. Both pro- and anti-ABM establishment scientists appear to have been in almost daily verbal communications with each other.

But the Outer scientists scattered around the country were woefully out of contact with each other. Two valiant efforts were made to coordinate anti-ABM efforts: Newell Mack in Seattle and John Erskine and Stanley Ruby at Argonne spent hundreds of dollars telephoning their

colleagues across the land, to arouse their interest and concern in the ABM, to share their strategies and tactics and successes and failures. But by and large their efforts were not very fruitful. We found a great duplication of effort, both by the pro- and by the anti-ABMers. Very similar reports were issued at a dozen places across the country, their /authors apparently unaware of similar efforts elsewhere.

Furthermore, the activities of the Outer scientists were unknown to the Inners. There is no evidence to suggest that the alliance between the Inners and the Outers in the spring and summer of 1969 was anything other than fleeting. Since the summer of 1969 meaningful interactions between the Inners and the Outers, whether on ABM, MIRV, or the SALT talks have been almost non-existent. There have been few attempts to recruit the younger Outer scientists to the Inner's ranks. The scientists on advisory panels both in PSAC and in DOD are largely the same Inners as before.

The Inner scientists are not a self-renewing group. The main qualifications for becoming an Inner scientist in the past have been involvement in large projects of the second World War such as the Manhattan Project or radar development.

Because this group was so large and so young at the time, they have dominated the Inner scientists ever since. A few younger men have become Inners, mainly through working at government laboratories or in the defense establishment. Today many younger scientists would not work for the Defense Department. The question of how younger men are to obtain the expertise and familiarity with strategic problems necessary to qualify as Inners needs to be addressed.

Several of the present Inners spoke of this lack of recruitment to their ranks. One scientist commented "I can not think of anyone under 40 who will be in a position in ten years to take on what we're doing." The unwillingness and/or inability of the established scientists to open their ranks to younger scientists has led to a feeling of alienation expressed by many of the younger scientists.

The diversity of attitudes, perceptions and behaviours we have found amongst scientists, the chasms between the older established scientists and the younger men, raise the question of for whom do the spokesmen of science speak? How are they selected?

When Henry Kissinger was apparently informed that a hardpoint defense would win a 50-50 acquiesence of the scientific community, how was that estimate arrived at? Which scientists had been polled? By whom? It would seem to us that the pluralistic nature of the scientific community has not been adequately recognized hitherto. Explicit recognition of the great diversity of opinion which resides therein, in our view, would be conducive to encouraging more scientists to become politically active, which we hold, is fundamental to enchancing their political effectiveness.

## THE ETHOS OF SCIENCE

In our introduction we asked how strongly scientists adhere to their widely heralded scientific method. Our data indicated that the canons of the scientific methods are not nearly as deeply rooted as is commonly assumed. 46% of our sample felt they had not remained objective when they entered the political arena in the ABM issue, while 54% professed

objectivity. What independent indicators other than the scientists' own evaluations do we have to reach a judgment on this question?

Most of the available data indicate to us that non-scientific factors correlated strongly with a scientist's stand on ABM. If scientists had judged the ABM issue objectively one would have hypothesized that such factors as having one's research funded by DOD, having worked on weapons development or on defense related research would not have been influential in a scientist's pro- or anti-ABM stance. But our data showed a very strong correlation between each of these external factors and the scientists' views on ABM.

Such facts do not necessarily imply causality. More likely the correlation is due to a selection process. One interpretation would be that scientists opposed to ABM deployment eschewed both DOD contracts and defense or weapons research. Another aspect of the selection process is that scientists who are more favorably predisposed to weapons development and deployment are more likely to seek employment in industry or government where these predispositions will be reinforced. Because our data on the correlations between funding patterns, and type of research a scientist engages in and his political views were sparse and of an exploratory nature, these relationships need to be studied further.

If scientists had viewed the various ABM configurations objectively one might have expected a range of opinion concerning the various types of ABM but our findings showed that scientists who favored one type of defense also favored the others and those opposed to one type opposed all ballistic missile defenses. Likewise, their judgments regarding the

feasibility of the alternatives were dictated by their stance. Those who favored ABM found all types to be technically feasible, those opposed found none feasible.

During the debate, mathematical calculations abounded and were tossed around at a dizzying rate. To the outside observer it often appeared that numbers were pulled out of a hat by both sides. Why assume an attack of just 420 Soviet SS-9s? Why suppose shoot-look-shoot tactics would not be part of the Safeguard plan?

Seldom were the assumptions underlying these calculations, that is, assumptions regarding blast resistance, yield, accuracy and reload capabilities explicitly stated. It would appear that all of the calculations were influenced by broader considerations than those explicitly treated in the calculations. Was there perhaps something in the way in which the debate was conducted which inhibited the fulfillment of the norm of objectivity?

It seems to us that the procedures of the Congressional hearings could be altered in ways to enhance the goal of achieving objectivity from "expert" witnesses. Although in most of the hearings pro- and anti-ABM scientists appeared at the same sessions there was very seldom an opportunity for the scientists to rebut each other's arguments directly. Often the scientific opponents addressed themselves to different aspects of the problem and in effect talked right past each other. If scientists were given an opportunity to cross examine or challenge each other directly after their testimony, it would contribute to a greater elucidation of the technical issues involved, although it might also lead in some

instances to the scientists' attempting to score debating points on each other.

It has also been suggested that the expert witnesses should meet together before they face the television cameras. This would enable them to ascertain whether there is agreement between them regarding what the technical issues are. Are they basing their calculations on the same set of assumptions? What is the range of their disagreement? After exploring such questions they could then present a summary of their agreements and disagreements to the Congressional committee and the questioning could proceed from that point. Such a procedure might also serve to demonstrate that what the scientists often disagree on are not scientific facts but judgments - judgments concerning Soviet intentions, Soviet reactions and general projections about the future.

We have predicted that the tradition of having opposing expert witnesses appear before Congressional committees will become firmly embedded in the mores of the Congress. Therefore, it seems to us that the format of the hearing process should be considered from an experimental perspective. If the purpose of the hearings is to enable the legislators to obtain the technical information inherent in a given context in the most efficient way (i.e. the most signal with the least noise) then the scientists and legislators together must find the best method for attaining that objective.

SCIENTISTS AND THE POLITICAL PROCESS

In the preceding discussion of the Congressional mode of committee hearings we have already begun the transition we now wish to make, - namely from the micro-level of the ABM to the macro-level of the science-politics interface. What lessons can be deduced from the ABM issue to enhance scientist-politician interactions?

Our first point is that if scientists wish to become politically (more) effective they can no longer consider "politics" a pejorative word. The term apolitical, in our view, is neither empirically nor normatively appropriate when applied to scientists. While our data indicate that many scientists are indeed political activists, a large number of them prefer to think that somehow they are "above" politics. In the ABM issue, it appears to us, scientists delude themselves if they profess they were apolitical. From our own perspective, based on a deep belief in participatory democracy, we conclude that scientists, together with all groups of citizens, have a civic and societal obligation to participate in political affairs on all levels.

Secondly, scientists should (and are) beginning to perceive that their political concerns should not be exclusively based on the executive branch of government. Congress is a part of "the government" just as surely as is the White House or the Defense Department.

Based on the ABM experience it would appear to be in the nation's best interests to broaden the scope of the scientists' political endeavors. Because of the hierarchical structure of power in the Executive branch, the influence of scientists is ultimately dependent upon the

idiosyncratic nature of the President's feelings toward scientists and his own relationship with his Special Assistant for Science and Technology. Where, in the past, presidents have respected the scientific community and trusted their science advisors, the indirect power and influence of scientists seems to have been sizable. In more recent years, according to many scientists, their influence within the executive "corridors of power" has reached a nadir.

Within the legislative branch, where power is more evenly distributed there exist multiple access points. For example, if in 1969, Senator Stennis had not consented to have outside scientists testify on the ABM, Senator Gore's subcommittee was an alternate path to the same objective.

If it is in the national interest to broaden the scientists'political involvement, then it is disturbing to find that so many scientists themselves perceived the ABM activities of their colleagues to have been detrimental to the scientific community. Since the reasons for science funding cutbacks have not been vigorously investigated we can not ascertain what weight to attribute to the scientists' role in the ABM. From our preliminary explorations it appears unlikely that senators and congressmen who live in a world of advocacy and competition between pluralistic groups viewed the scientists' ABM participation as calling for vengeance.

To facilitate enlarging the scientists' perspectives in the political arena, certain changes within the social system of science seem necessary. In the past, scientists have received accolades and been awarded prestige by their colleagues based in part on their service to the Executive branch. Such must now be awarded for efforts expended on the Congressional and local levels as well.

Because many scientists have been disdainful (and indeed many still are today) of Congressmen and Senators and their intellectual prowess, a sort of pecking order has been operative. That is, prominent scientists aspired to serving as advisors to the executive branch, lesser scientists consented to advising legislators. But again, the ABM issue may have marked a turning point.

The new alliances between senators, their staffs and scientists, (albeit predominantly between anti-ABM senators and scientists) forged during the ABM debate appear to be of a lasting nature, at least in a number of instances. Based on their increasing comprehension of the technical issues involved in strategic arms considerations, senators are beginning to gain the confidence they feel they need to reestablish the balance of power between the executive and legislative branches of government. According to most of the senators interviewed thus far, the scientists' most notable contribution to the ABM issue was that they gave senators and their staffs the courage and confidence to express their views on complex technological issues, bolstered by their newly acquired knowledge and expertise.

Many scientists, on their part, have gained valuable insight into the actualities of political life and are beginning to feel more at ease in the legislative milieu. To encourage and facilitate such understanding between scientists and legislators we suggest that each scientific society establish two year post-doctoral fellowship-traineeships to enable young scientists to serve as legislative or staff aides. Such fellowships would fulfill several functions: 1) They would provide

young scientists with opportunities to gain first hand knowledge, understanding and tolerance of the political process. 2) They would begin to provide the legislative branch with its own, independent sources of expertise on the many technological issues facing it. 3) They would provide the peer recognition and rewards for advisory services to the legislative branch which are now awarded only for services rendered to the executive branch.

In discussing this proposition with senators and their aides, there seems to be general agreement with the need for additional and expert staff. Since the salaries of the post-doctoral fellows would be paid by the professional societies and not by the legislators, they would appear to be a welcome addition.

The sheer lack of physical space available to most congressional staff was mentioned repeatedly. It is true that most aides work in cluttered tiny cubbyholes but as room is found each summer for dozens of young college students to work as congressional interns, we do not feel that the scarcity of space presents an insurmountable obstacle.

Many young scientists may not be willing to make a two year commit - ment for full time public service. This is mainly due to an attitude on the part of the scientific community that requires a neophyte scientist to "prove himself" early in his career with excellence in research. The community itself must provide for alternate ways of achieving peer recognition. In addition to the post-doctoral fellowships we would also suggest that Congress establish summer institutes, based on the Jason-IDA model. Such summer studies on conversion from a war to a peace-time

economy, disarmament, anti-submarine warfare, or other issues on which Congress feels it needs detailed technical information could be commissioned by joint, select or standing congressional committees.

A major obstacle to increased comprehension of many issues is the inability of Congress in many instances to obtain the results of studies conducted by scientists for the executive branch. The release of reports favorable to the administration's point of view is much more common than release of studies critical of proposed or existing programs. Summer institutes such as we propose would be a step in alleviating Congress's lack of access to technical analyses.

Additionally, such summer institutes would provide a means for younger Outer scientists to acquire the expertise and experience about some of the nations's urgent problems they now find so difficult to obtain.

From the ABM issue it appears that one of the crucial lessons to be learned is the need to build up alternative sources of research and analysis of the sort that are now available to the Defense Department. Independent, multidisciplinary institutions, similar to the Brookings Institution, and with reports publicly available should be seriously considered. Having several competing research institutions offers a better chance of excellence but does not guarantee it. For research institutions to serve a useful function at least two conditions are necessary: recruitment of first rate minds and a willingness on the part of decision makers to give serious considerations to their findings.

All of the suggestions we have made have the common goal of seeking to enhance the interactions between scientists and decision makers. We feel it is imperative for younger scientists to be given opportunities to bring fresh insights and new ideas to the many urgent problems which beset us. If the ABM issue kindled the sparks necessary for more effective interactions between scientists and politicians, this may be its most lasting contribution.

## FOOTNOTES TO CHAPTER VI

1. "Strategy and Science: Toward a National Security Policy for the 1970's" Committee on Foreign Affairs, House of Representatives, 91st Congress, 1st session, March 11, 1969, pp. 27.

2. "President Thomas E. Caywood's Report (Retiring)" Bulletin of the Operations Research Society of America, Vol. 18, 1970, pp. B. 198.

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APPENDIX I

CHRONOLOGY*

1955. The United States Department of Defense contracted with Bell Telephone Laboratories to undertake feasibility studies of a proposed Nike-Zeus ABM system with research and development focused on defending against intercontinental ballistic missiles (ICBMs).

1957. The Army authorized full system development of the Nike-Zeus ABM system in January. In September the Atomic Energy Commission completed a feasibility study of the Nike-Zeus warhead.

1958. ABM development was pressed as a matter of urgency because of Sputnik and other indications of Soviet ICBM capabilities.

1959. President Eisenhower decided against deployment of Nike-Zeus but authorized continuation of research and development. In August the first Zeus missile was fired at the White Sands, New Mexico, Missile range.

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* Compiled from, ABM An Evaluation of the Decision to Deploy an Antiballistic Missile System, Abram Chayes and Jerome B. Weisner, (eds).
Antiballistic Missile: Yes or No?, A special report from the center for the study of Democratic Institution.
The ABM Debate: Strategic Defense and National Debate, Edward Randolph Jayne, M.I.T., 1969,
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1961. Work began on Ascension Island, Kwajalein Island and Pt. Mugu, California on ABM radar systems. In December a Zeus missile successfully intercepted a Nike- Hercules surface-to-air missile.

1962. In July, a Zeus missile fired from Kwajalein successfully intercepted an Atlas warhead fired from Vanderberg Air Force Base in California.

1963. In January the Defense Department authorized the Army to begin research and development on a reoriented and renamed ABM system, the Nike-X, utilizing new missiles, radars, computers and deployment configurations.

The Senate Armed Services Committee added $196 million for ABM deployment to the Defense Authorization Bill for FY 1964. The move was opposed by the Administration and rejected by the full Senate. The Senate debated the question of United States defense against enemy missiles in the first secret session since World War II.

The Soviet Union announced it had produced a protype of an effective anti-missile missile.

The Nuclear Test Ban Treaty was signed, which, by prohibiting nuclear testing in the atmosphere, limited testing of ABM components.

1964. January: President Johnson ordered a cutback in United States manufacture of fissionable materials and arms and urged the Soviet Union to do likewise as a step toward "eventual abolition of arms".

July: Testing of the new MAR (multiple-array radar) system was begun at the White Sands Missile Range.

October: China detonated a low-yield fissionable device.

1965. May: China detonated its second fissionable device, of low-intermediate yield.

October: The Army completed its Nike X deployment study and presented it to the Secretary of Defense.

November: The first successful flight of the short-range Sprint missile was conducted.

1966. April: The Senate added $167.9 million to the Department of Defense Authorization Bill to be used for Nike-X pre-production funds. These funds were not requested by the Administration and were not obligated by them.

May: China detonated its first thermonuclear device.

October: China launched a prototype ballistic missile armed with an atomic warhead.

November: Secretary McNamara announced that the Soviet Union had begun deployment of the Galosh ABM system around Moscow.

December: China detonated its second thermonuclear device.

1967. January: President Johnson's desire for arms control negotiations was communicated to the Soviet Union. In his presentation of the FY 1968 budget to the Congress, President Johnson included $375 million for potential ABM production initiation but stated there would be "no action now to deploy Nike X" but "in the event the discussions (with the U.S.S.R.) prove unsuccessful, we will reconsider our deployment decision."

A White House meeting was arranged by Secretary McNamara for the seven scientists who were past or present occupants of the posts of Special Assistant to the President for Science and Technology and Director of Defense Research and Engineering.

February: The Republican National Committee criticized current U.S. policy as "lagging" in its efforts at defending the American people. In a London Press Conference Premier Kosygin stated that "a system that serves to ward off an attack (i.e. an ABM) does not heighten the tension but serves to lessen the possibility of an attack that may kill large number of people."

April: The Army halted the disposal of Fort Lawton in Seattle, Washington as surplus property in anticipation of using it for a potential ABM site.

June: China detonated its first hydrogen bomb. Congressional response was to call for an immediate start of Nike-X deployment. President Johnson and Premier Kosygin met at Glassboro, New Jersey. Johnson conveyed the desire of the United States to negotiate the limitation of the development of strategic nuclear weapons, including ABM.

Summer: The 90th Congress approved the military budget for FY 1968 which included $297.6 million for ABM procurement, $421.3 million for ABM research and development and $64 million for ABM construction. Of this amount $366

million was specified for the Sentinel system, an allocation that President Johnson requested in anticipation of a decision to deploy. Seattle scientists prepared first outlines on ABM problem and discussed anthology of ABM writings with Hans Bethe.

September 15: Richard Nixon said the United States should build an ABM system at all costs.

18: Secretary McNamara announced the decision to deploy a light ABM system as a deterrent to an expected Chinese ICBM capability in mid-1970.

19: Senator Henry Jackson hailed the decision as a step towards a massive ABM.

November: The Defense Department identified the first ten areas to be surveyed as possible site locations.

The Military Applications Subcommittee of the Joint Atomic Energy Committee held hearings on the "Scope, Magnitude and Implications of the United States Anti-ballistic Missile Program". Testimony of John Foster, Director of Defense Research and Engineering and Paul Nitze, Deputy Secretary of Defense was that while politically Sentinel was designed to protect against Chinese missiles, physically it will have some degree of effectiveness against even those missiles with Cyrillic lettering.

December: John Foster reported the development of MIRVs, intended to counter the U.S.S.R. development of ABMs. American Association for Advancement of Science (AAAS) held symposium on "Is Defense Against Ballistic Missiles Possible?" with Hans Bethe, Freeman Dyson, Richard Garwin, Marvin Goldberger and Daniel Fink. Gregg Dash, physics department, University of Washington, offered help of Seattle scientists to Mayor of Seattle and Congressman Brock Adams in opposing selection of Fort Lawton as missile site.

1968. January: President Johnson requested $1.2 billion for FY 1969 for manufacturing and deploying Sentinel. An additional $269 million was requested for further research into improved missile defense. Coalition in Seattle formed to oppose use of Fort Lawton for missile site.

February: Formation of Pittsburgh, Pennsylvania ABM study group with plans for publishable papers and publicity on technical and political implications of ABM.

March: Bethe-Garwin article appeared in Scientific American. Defense Department studied series of improvements in Sentinel to thwart refinement in future Chinese ICBMs. The Non-Proliferation Treaty (NPT) draft is submitted to the U.N. Assembly by the United States, the U.S.S.R. and Britain. The Army initiated its public relations campaign on ABM.

April: Seattle scientists began appearing on radio and television shows in opposition to missile site at Fort Lawton.

In Senate, the Cooper amendment to Defense Procurement Bill prohibit deployment until the Defense Secretary certified ABM was practicable defeated by 31-28.

The Senate Preparedness Subcommittee held an inquiry into U.S. strategic posture aimed at determining U.S. response to recent increases in U.S.S.R. ICBM strength.

May: Formation of Lynnfield, Massachusetts citizens' /committee opposed to selection of northern Boston suburbs for missile site.

ABM report issued by Seattle Association of Scientists.

June: Senate rejected by vote of 34-52 amendment to delay ABM construction funds for one year. Approved the $277 million asked by the Administration for beginning the $5.5 billion system.

Soviet Foreign Minister Gromyko announced that the Soviet Union is "ready to enter an exchange of opinions" on the "mutual limitation and later reduction of strategic weapons, both offensive and defensive, including antiballistic missiles."

July: The United States, Soviet Union, Britain and 58 other nations signed NPT. Soviet Union and United States announced they have agreed to open talks aimed at limiting and reducing both offensive and defensive missile systems.

Congressman Robert Sikes, chairman of Real Estate subcommittee of House Committee on Appropriations stated that missile sites "will be some distance from centers of population."

France successfully tested a sea-to-ground and ground-to-ground ICBM.

August: Senate amendment to delete all funds for ABM construction was defeated 27-46.

Marin County, California Board of Supervisors voted to oppose Angel Island site for missiles if "other site can be found to meet necessary military requirements".

Soviet Union invades Czechoslovakia, cooling U.S. interest in Arms talks.

September: Defense Secretary Clifford ordered Sentinel exempted from budget cuts required by Congress.

October: Senate rejected by a 25-45 roll-call vote proposal to delay construction of Sentinel for one year.

Lynnfield, Massachusetts Town Meeting voted $2,500 for use in opposing PAR site in town.

Discovery of local Sentinel sites by nuclear physicists at Argonne National Laboratory in Illinois.

November: Transcript of secret session in Senate inserted into Congressional Record.

Missile protests mounted in Western Chicago suburbs.

Seattle residents "hike-in" at Fort Lawton to oppose missile site.

December: Libertyville selected as Chicago missile site. Protest moved to northern suburbs.

Detroit scientists become activated.

Bainbridge Island announced as site for Seattle. Produced outcry from Islanders.

Cameron Satterwaite, chairman of Federation of American Scientists (FAS) wrote to Senator Richard Russell, chairman of Senate Armed Services Committee, requesting FAS be given opportunity to provide witnesses at further ABM hearings.

1969. January: President Johnson's FY 1970 budget message requested $1.8 billion for deployment of Sentinel.

Northern Illinois Citizens against ABM filed suit in court charging site "threatens constitutional rights and safety of community."

New Secretary of Defense Laird announced he wishes to retain Sentinel system as bargaining counter in any future arms negotiations with the Soviet Union.

Nearly 2,000 attended meeting held in Reading, Massachusetts by Army.

February: Senator Edward Kennedy asked Secretary Laird to freeze ABM deployment. Chairman Mendel Rivers of House Armed Services Committee announced committee will not approve further sites until the new Administration clarifies it intentions regarding the Sentinel program. Secretary Laird ordered ABM halt pending project review.

Hawaii State Senate and House passed resolutions opposing ABM.

Bethe-Garwin article inserted in Congressional Record.

Special Assistant Henry Kissinger informed that a Hard-point defense would win at least a 50-50 acquiesence of the scientific community.

March: Pro- and anti-ABM scientists began testifying before Congressional committees.

Letter opposing ABM deployment sent to President Nixon by 251 members of the National Academy of Sciences.

President Nixon announced Safeguard decision.

Special Assistant to the President for Science and Technology, Lee DuBridge, released a letter praising the Safeguard decision.

April: Gallup Poll showed that 40% of U.S. had not heard of ABM. 60% of those who knew of ABM had no opinion on deployment.

Franklin Long's name withdrawn as chairman of National Science Foundation because of his known anti-ABM views.

American Physical Society symposium "Technical Aspects of ABM System" with Hans Bethe, Donald Brennan, George Rathjens and Eugene Wigner.

Physicists marched from meeting to White House and presented petition with 1,200 signatures to Science Advisor Lee DuBridge.

May: Formation of Committee to Maintain a Prudent Defense. Pro- and anti-ABM books appear in print.

June: Senate Armed Services Committee voted 10-7 to deploy Safeguard.

July: Senate debate opened. Senate held another secret session on ABM.

August: Senator Margaret Chase Smith's amendment to bar further ABM spending except for components such as radars and computers failed by 50-50 tie vote.

Amendment by Senators Cooper and Hart to limit Safeguard program to research and development with no deployment or site acquisition failed by 51-49.

APPENDIX 2

COMPARISON OF RESPONDENTS AND NON RESPONDENTS

(Physical Scientists Only)

| | Respondents | Non Respondents |
|---|---|---|
| Field: | | |
| Physics | 61% | 81% |
| Chemistry | 12 | 11 |
| Mathematics | 3 | 6 |
| Engineering | 11 | 3 |
| Biological Sciences | 3 | -- |
| Employment: | | |
| Academic | 60% | 54% |
| Industry | 16 | 20 |
| Government Laboratory | 13 | 15 |
| Department of Defense | 2 | 3 |
| Other Government Agencies | 3 | 5 |
| Non-Profit | 6 | 3 |
| Highest Degree Received: | | |
| Ph.D. | 89% | 90% |
| Masters | 7 | 7 |
| Bachelors | 4 | 3 |
| Medical | .7 | -- |
| Age: | | |
| Median | 46 years | 50 years |
| Eminence: | | |
| Nobelists | 4% | -- |
| National Academy | 18 | 12% |
| Mean Number of Citations | 49 overall (59 for those cited) | 29 overall (36 for those cited) |
| | Pro-ABM = 25%<br>Anti-ABM = 75%<br>N = 138 | Pro-ABM = 28%<br>Anti-ABM = 72%<br>N = 37 |

## APPENDIX 3

## THE INTERVIEW FORM

Recruitment:

1. How did you become active in the debate?
2. Who recruited you (to write the article, testify, etc.)?
3. What was your motivation for involvement in the ABM controversy?
4. How effective did you think you would be, i.e., what were your expectations of success?
5. Did you recruit any other scientists to enter the fray?

Total Activity:

1. What were all the things you did to oppose or support deployment of ABM?
2. How much time and energy do you estimate you expended?
3. Have you spent similar amounts on other issues?
4. If so, what were they? When?
5. Did you make any effort to engage the community in discussing this issue?
6. If yes, how did you go about it?

Mass Media:

1. Did you appear on TV? Radio?
2. When, how, who arranged it?
3. How effective do you think it was?
4. Did you get any feedback from listeners or readers?

Contacts with Congressmen and Senators:

1. With which Senators and Congressmen did you have any contact concerning ABM?
2. Who initiated it?
3. How many times did you see or write to each one?
4. Which administrative assistants or legislative aides did you see or contact?
5. Who initiated these contacts?
6. Which legislators or their assistants do you think you influenced?

Contacts With the Defense Technical Community:

1. Did you have any contacts with the defense technical community within the Executive branch (ARPA, DOD, ACDA, etc.) concerning ABM?
2. Who initiated the contacts?
3. Whom do you feel you influenced?
4. Who do you feel influenced your thinking?
5. Did you have any contacts with the defense technical community outside the government, industrial and non-profit organizations concerning ABM?
6. Who initiated these contacts?
7. Whom do you feel you influenced?
8. Who do you feel influenced your thinking?

Contacts With Social Scientists:

1. Did you communicate with or make use of any social scientists during your participation?
2. What is your view of the role played by the social scientists in the debate?

Previous Political Activity:

1. Did you engage in any partisan political activity prior to the ABM debate? If so, what? Campaigning for a candidate? Financial contributions? Writing letters on behalf of someone?
2. Were you previously active in such scientific organizations concerned with public issues such as the Federation of American Scientists?

Political Effects of Participation:

1. Has your participation altered your political views in any way?
2. Would you say your experience in the ABM debate has made you more or less likely to participate in future scientific or technological issues with political implications?
3. What are they likely to be?

View of Debate:

1. How would you estimate the division of the scientific community on the ABM question?
2. How would you differentiate among academic, industrial and government scientists in this regard? Between those knowledgable about ABM and those not?
3. To what do you attribute the differences?

4. Do you think that the extent and intensity of the ABM debate had an effect on the scientific community?

5. Was it beneficial or detrimental to the scientific?

6. Do you know of any retribution to scientists, individually or to the community as a whole because of ABM activity?

View of Opponents:

1. How well informed do you think your scientific opponents were?

2. Which one of your opponents do you really feel knew what he was talking about?

3. Do you think access to classified information was important in the debate?

Research and Development:

1. Is there a problem in separating research and development from procurement and deployment?

2. Do scientists fall in love with things they develop?

3. Is there anything in U.S. policy or attitudes that makes likely the use of existing technology, i.e. is there a technological imperative?

4. Do you think ABM is technically feasible?

5. If you did think it would do what it's supposed to do, would you favor its deployment? Why?

6. Why do you think scientists picked the ABM on which to take a stand, rather than, say, MIRV or the B70 bomber?

Technical and Professional Organizations:

1. Do you think professional organizations like the American Physical Society are becoming politicized?

2. What do you think of such politicization?

Role of Scientists As Advisors:

1. In general, do you think scientists are used to legitimate decisions based on political considerations, or do you think they really influenced governmental thinking on the ABM?

2. Could you give me any examples to bear out what you just said?

3. What is your explanation of the September 1967 decision to deploy? Do you think any scientists were consulted on that decision? If so, who?

4. What is your explanation of the March 1969 Safeguard decision? Do you think any scientists were consulted on that decision? If so, who?

5. Can a scientist give impartial advice on a question like ABM?
6. Should he, or should he assume an advocacy position and enlist others to his cause? How will he be more effective?
7. With how many decisions of a government should a man disagree before he decides he must resign from his advisory position in order to maintain his integrity?
8. Can you give an example of where you think it would have been effective in the ABM case if a scientist had resigned?

Congress:

1. What is your view of a Congressman's or Senator's ability to understand the technical issues involved?
2. Do you think Congressmen and Senators are able to secure adequate outside expertise?
3. If not, how would you ameliorate this?
4. Do you think the adversary proceedings that took place in the Congressional hearings on ABM are the best means to bring out the relevant technical facts that Congressmen and Senators need to know for informed decision making?
5. If testified: How effective do you think your testimony was?
6. Would you change your testimony or style of presentation in any way if you had to testify again?

Scientific Ethos:

1. Did you perceive any conflict or tension between your professional role as a scientist and your role as a partisan in a highly politicized issue?
2. Would you say you used the same orientation or approach to the ABM problem as you do in your own research in terms of objectivity, looking at the whole problem, stating your assumptions explicitly, etc.?
3. How about other scientists in the debate? First those on the same side as you.
4. How about those on the other side?

Role of Scientists in Politics:

1. Should scientists organize for political action?
2. If yes, what forms of organization are best? Partisan politics such as Scientists and Engineers for...? Council for Livable World Seminars? Picketing, marching, demonstrating?
3. Have you been involved in any such activities?
4. How effective do you think each of them is?
5. How effective are scientists in the political arena?

6. What skills do they bring into the political arena?
7. How effective do you think scientists were overall in the ABM debate?
8. How would the outcome have been different if there hadn't been a massive effort?
9. Which scientists do you think were most effective in influencing Congress, the public or the decision makers?
10. To what do you attribute their success?

National Security:

1. What means do you see for achieving security?
2. What is your view of the SALT talks?
3. How do you view the military establishment in this country?
4. How do you regard Russia?
5. How would you assess the probability that we and the Soviet Union will engage in a massive engagement within the next five to ten years?
6. How much contact have you had with Russian scientists?
7. Have you been to Russia?
8. How do you regard China?
9. How would you assess the probability that we and the Chinese will engage in a massive engagement within the next five to ten years?
10. Have you participated in any Pugwash Conferences?

Institutional Setting:

1. Do you feel one's institutional position, whether one is in academia, industry or government, colors one's political perceptions?
2. If yes, how?
3. If not, why not?

Personal Questions:

1. Who was your thesis advisor? Where? When?
2. Were you politically active while a student?
3. Did you discuss politics or the science-politics interface with your professor?
4. Are you still in close touch with your professor?
5. Do you feel he had any influence upon your political views or attitudes?

6. Which of your own students are active politically?
7. Do you discuss politics or science politics with them?
8. Do you keep in close touch with your former students?
9. Do you feel you influenced any of their political views or attitudes?
10. Have you ever worked on weapons development?
11. What defense related work have you been connected with?
12. Is any of your research defense sponsored?
13. Is any of your research government sponsored?
14. Has the pattern changed over the last five years?
15. What percentage of your time is spent advising the government?

NAME:

DATE OF INTERVIEW:

PLACE:

LENGTH:

USE OF NAME OR ANONYMITY?

WHAT OTHER PEOPLE DO YOU SUGGEST I INTERVIEW?

MAY I USE YOUR NAME WHEN I CONTACT HIM?

Glossary of Selected Terms

and Abbreviations

AREA DEFENSE -- Defense of an extended generalized area with a radius of several hundred miles around the interceptor launchers. This kind of defense is provided by long range (e.g. Spartan) missiles capable of intercepting enemy missiles hundreds of miles from the ABM launchers.

B-70 BOMBER -- Proposed supersonic intercontinental bomber advocated as a successor to the B-52. Only two protypes were built due to the refusal of President Kennedy and Defense Secretary McNamara to fund an operational force. The Air Force kept the fundamental concept alive and is now proceeding with the B-1 bomber which has some of the B-70's characteristics.

BLACKOUT -- A nuclear explosion above the ground produces a "cloud" consisting of fragments of the nuclear weapon and ionized air. This cloud may absorb, reflect, or deflect radar waves, making it difficult or impossible for the radar to see behind the cloud.

BMD -- Ballistic missile defense. Same as ABM

CHAFF -- a collection of fine ribbons of metal which would provide such a large return for a radar that the real target would be hidden in the return from the chaff.

DECOY -- An object used to draw the fire of a defensive system. Not a real warhead, a decoy may be made to closely resemble a reentry vehicle, or may simply be a balloon covered with metallic paint to show up on radar.

HARDENING -- Protection of military facilities by making them resistant to the blast effects of a nuclear weapon. In the case of missiles, this is generally accomplished by installing them in underground silos with protective covers.

HARD POINT DEFENSE -- The defense would intercept only those objects actually aimed at certain specific very small targets, such as hardened missile sites and command centers. Hard-point defense is provided by the short range Sprint missiles. Technically such defense is easier than a general defense of population and industrial targets because a decision to commit an interceptor missile can be delayed until adversary warheads are well down into the earth's atmosphere, thus facilitating discrimination between decoys and true warheads.

ICBM -- Inter-Continental Ballistic Missile, a multiple stage rocket capable of throwing a warhead mounted on its upper stage on a ballistic trajectory such that it will reenter the atmosphere headed towards its target thousands of miles away.

INTERCEPTOR MISSILE -- A surface-based missile used as part of either an air or an anti-ballistic missile defense system. In the case of ABM systems, interceptor missiles can be divided into 2 classes: those designed for exoatmospheric interception such as the Spartan and those designed for terminal interception such as the Sprint.

KILOTON (kt) -- used to refer to the explosion power of a nuclear weapon, 1000 tons of TNT equivalent; the bombs of Hiroshima and Nagasaki were approximately 20 kt.

MAR -- Multifunction array radar capable of tracking several targets simultaneously.

MEGATON (MT) -- a unit used to measure the explosive force of weapons. 1000 kilotons equals 1 megaton. One megaton is the equivalent of a million tons of TNT. Spartan missiles are expected to carry warheads in the megaton range.

MIRV -- Multiple Independent Reentry Vehicles. Existing launchers are being retrofitted with missiles carrying several warheads each. Each is independently guided; each warhead goes to its own target.

MRV -- Multiple Re-entry Vehicles; this involves using an upper stage of a missile to deliver more than 1 warhead, all of which fall freely when released in a random "buckshot" pattern.

MSR -- Missile Site Radar. Tracks adversary reentry vehicles; with its associated computer discriminates between them and decoys; launches and guides the large ABM interceptor missile, the Spartan, to intercept point high above atmosphere and several hundred miles away. If Spartan fails to destroy enemy warhead, MSR sends up fast accelerating Sprint.

NIKE X -- Proposed ABM system during the early and mid-1960's. Was a follow-on to the Nike-Zeus. It was superceded by the Sentinel system which used substantially the same components with minor modifications when the ABM mission was changed from heavy population defense to a light area defense.

NIKE ZEUS -- Early version of an ABM system. Never deployed because it could not cope with a full scale enemy attack employing decoys and other penetration aids. Development of Nike Zeus went on for seven years.

PAR - Perimeter Acquisition Radar -- Long range - low frequency radar designed to detect attacking missiles while still 1000-2000 miles away. Tracks target and feeds information to a computer and MSR. Beam can be moved from one direction in the sky to another in a few millionths of a second.

PENETRATION AIDS -- Devices facilitating the entry of aircraft or missiles through enemy active defenses. Penetration aids for missiles include decoys which simulate warheads and the use of chaff (pieces of wire that act as dipoles) and electronic jammers to interfere with radar detection and tracking of incoming warheads.

PHASED ARRAY RADARS -- Radars in which the beam is steered electronically and which therefore do not involve moving parts. These radars have an advantage over the older mechanically steered radars in that they can handle many tracks simultaneously and can be steered quickly from one track to another. MSR and PAR are examples.

SS-9 -- A Soviet liquid fueled ICBM (20-25 megatons) first deployed in the mid-1960's. A major consideration in the ABM debate was the speculation that the SS-9 would be used to carry several MIRVs as an alternate to its large (20-25 megaton) single warhead.

SS-11 -- A Soviet liquid fueled ICBM with a warhead just over 1 megaton.

SAFEGUARD -- The ABM system advocated by the Nixon Administration as a replacement for the Sentinel. Initial deployments involved defense of two Minuteman bases. There have been proposals to defend additional Minuteman bases, bomber bases and to provide an area defense against China or an accidental launch. Spartans, Sprints, PAR's and MSR's are used in this system.

SALT TALKS -- Strategic Arms Limitation Talks between the United States and the Soviet Union. Began in Helsinki, Finland, December 1969. Sessions have alternated between Helsinki and Vienna, Austria and are still in progress.

SENTINEL -- The Johnson Administration's ABM system which was designed to provide primarily population defense. The system provided for area defense by Spartan missiles and terminal defense of the radars by Sprint missiles. The missiles were to be guided by PAR's, MSR's, and computers. The system was replaced by the Safeguard ABM in March of 1969.

SPARTAN -- 3 stage solid fueled rocket with range of several hundred miles, carrying megaton-sized thermonuclear warhead. Intercepts incoming missiles in airless, near-space before the missile enters the layer of air, or atmosphere. Can't rely on the shock wave of its thermonuclear explosion to destroy incoming warheads. Releases flood of X-rays to destroy heat shield surrounding enemy warhead.

SPRINT -- Two stage solid fuel rocket with a range of up to 50 miles carrying fractional megaton warhead. Intercepts its target 20 miles or less from its site (i.e. within the atmosphere). Kills enemy warheads by the shock wave of its thermonuclear blast or by neutron melting of material in adversary warhead.

TERMINAL DEFENSES -- Defenses designed to intercept a missile during the final part of its trajectory. Such defenses make use of the differential decelerating effect of the atmosphere to facilitate discrimination between warheads and less dense penetration aids. Because such defenses involve intercepting late in the trajectory of the incoming missile they are relatively inflexible. Thus, missiles deployed to defend one point cannotdefend other points some distance away.

URBAN DEFENSE -- Terminal defense of population centers. Such defense, like hard-site defense, and in contrast to area defense implies a delay in decision to commit interceptor missiles until adversary warheads reenter the earth's atmosphere in order to faciliate discrimination between them and penetration aids. As a consequence this defense is localized in coverage.

Biographical Note

Name: Anne Hessing Cahn

Born: Munchen-Gladbach, Germany
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Education: University of California, Berkeley 1948-1951
Bachelor of Arts, 1951.

Marital Status: Married to John W. Cahn

Children: Martin, Andrew, Lorie

Publications: "The Impact of a Government-Sponsored University Research Laboratory on the Local R & D Economy" with Ashok Parthasarthi. An occasional paper, Science and Public Policy Research Seminar, 1967

"A Student's View of Pugwash", Bulletin of Atomic Scientists, Volume XXVII, April 1971.

Professional Positions:

Seminar Coordinator, World Affairs Council of Northern California, 1951-1952

Research assistant, staff of the minority leader of the State Assembly, Albany, New York, 1964.

Instructor, Modern Language Department, Massachusetts Institute of Technology, 1964-1965.

Instructor, Political Science Department, Massachusetts Institute of Technology, 1969-1970.