# Utopian and Pragmatic Rationalism: The Political Context of Scientific Advice

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TOWARDS the end of the 1970s, disillusionment with the power of scientific knowledge to transform and rationalise the decisions and actions of governments led to a more sober reassessment of the role of science in public life. This shift was accompanied by awareness of the preponderance of political considerations in the formulation and execution of public policies. The process of democratic politics consists of endless conflicts, negotiations and temporary compromises; legislatures and public bureaucracies which, unlike private firms, are typically insulated from market-like external tests of performance, and are not under compelling pressure to integrate scientific knowledge and technical standards into their activities. Nevertheless, scientific knowledge and techniques do enter into political decisions and governmental programmes, where they have a variety of effects. These effects are, of course, often quite different from the effects expected from the use of knowledge to enhance the rationality and effectiveness of governmental actions. It is our task to understand how scientific knowledge does become woven into the political and bureaucratic formulation and execution of policies. Despite the various constraints, the integration of scientific knowledge remains a factor the weight of which varies in different contexts.

*Two Approaches to the Role of Science in Public Policy*

Problems such as poverty, crime, inflation and automobile accidents are conditions which policies are, at least manifestly, intended to change through measures initiated by governments. There is a distinction between the conditions which constitute the "problems" with which policy is concerned, and the complex of decisions and actions in relation to these conditions which constitute the "policy process". The most common view is that when knowledge relevant to treating problems of policy is available, the process of making policy should, and in principle can, be adjusted to ensure the maximum assimilation of that knowledge into the decisions made and actions taken to carry them out. This view has become so pervasive that it is still hard to imagine an alternative to it. Nevertheless, there is another view of the matter which assumes that the assimilation of relevant scientific and technological knowledge into the process of making and executing policy is limited, first by the fact that the technological elements of problems of policy are rarely clearly separable from the political ones, and second by the fact that the

making and execution of policy regarding problems are not exclusively means of achieving technically rational goals but are also, and often incompatibly, the means of legitimating decisions politically, of furnishing publicly defensible records for the makers of policy, and of attaining other ends which are primarily political.

The first view regards any political aims and considerations in the making of policy to be obstacles to be overcome on the way to the progressive rationalisation of decisions and actions; this is the utopian rationalist view. The point of view of pragmatic rationalism, in contrast, considers the political components of the process of public policy-making as inherent ingredients which neither can nor—in so far as one is committed to a democratic political order—should be eradicated. For pragmatic rationalism the problem is not how to substitute knowledge for politics, but how knowledge can be best incorporated into political decisions, and how the knowledge appropriate to the rational attainment of substantive ends can be combined with the objectives of maintaining and increasing political power.

The pragmatic rationalist accepts, within limits, the inevitability of political ingredients in the making of policies; he sees that political considerations are not confined to the substance of the policies chosen, but are present in the decisions about what problems or conditions are to be dealt with. The identification of problems, like the policies which are devised to deal with them, are seen as part of the pursuit of political objectives which is rarely entirely in harmony with the scientific and technological approach to problems. The very selection and definition of problems, are often means to win support, divert public attention from other problems, and express certain political commitments. Even in situations where moderate expectations could enhance the likelihood of small changes, political considerations may produce grandiose promises which might elicit immediate support while diminishing the probability of success in meeting even the more modest objectives. Especially in fields such as education, welfare and energy, where intervention has produced, at best, only mixed results, politicians prefer to espouse policies which are politically effective even when they are technically irrelevant or inadequate.

> [The] evaluators of social action programmes often complain that the programmes lack any clear and concise statement of aims, a condition which they deplore because it muddies up evaluations. Their response generally has been to bemoan the imprecision and fuzzy-mindedness of the politicians and administrators, who establish the programs and then to choose a summary measure of program accomplishment which satisfies their more precise approach [but which simplifies the objectives of the programme].[1]

[1] Cohen, David, "Politics and Research: Evaluation of Social Action Programs in Education", in Weiss, Carol H. (ed.), *Evaluating Action Programs* (Boston: Allen and Bacon, 1972), pp. 156–157.

Dr. David Cohen is suggesting in this statement that these experts fail " to grasp the diverse and conflicting nature of social action programs ". His objection is typical of the pragmatic rationalist critique of utopian rationalism. Utopian rationalism attributes the imprecision in the definition of objectives to intellectual deficiencies which can be removed by enlightenment or to parochial interests which can be unmasked by objective social-scientific inquiry. For the pragmatic rationalist, ambiguities and contradictions are necessary to the politician who addresses diverse audiences and who seeks to form coalitions of supporters without which no actions can be carried out.[2] Considering the vital role of political considerations and rhetoric in the mobilisation of support, the pragmatic rationalist tries to insert as much scientific analysis as possible into the process. For the utopian rationalist, the equals who possess scientific knowledge are always fighting a war against " politics ", whereas for the pragmatic rationalist, politics is a reality to which he must learn to accommodate himself.[3] The results of sophisticated research in areas such as the production of energy, or military technology or the use of intelligence tests in education, are often integrated into the political arguments for particular policies without regard to their intellectual merit. The " careers " of the Moynihan and the Coleman reports, or the effects of the " I.Q. controversy " on the uses of intelligence tests, are illustrative.[4] They indicate how the political use of the knowledge of experts influences its application in the handling of problems.[5]

### *The Limits of the Two Approaches*

The utopian and pragmatic rationalist approaches are not mutually exclusive. Nevertheless, by comparison with pragmatic rationalism the utopian rationalist approach to the assimilation of scientific knowledge into the making and execution of policy would be instructive only in very rare and limited cases.

The pragmatic rationalist knows that the " scientific knowledge " which is used by politicians and others engaged in contentions over policy might not be what qualified scientists would be willing to acknowledge

[2] See Page, Benjamin I., " The Theory of Political Ambiguity ", *The American Political Science Review*, LXX, 3 (September 1976), pp. 742–752.

[3] For an exceptionally instructive discussion of the conduct of individual scientific advisers, see Jones, R. V., " Temptations and Risks of the Scientific Adviser ", *Minerva*, X, 3 (July 1972), pp. 441–451.

[4] See Rainwater, Lee and Yancey, William L., *The Moynihan Report and the Politics of Controversy* (Cambridge, Mass.: MIT Press, 1967); Cronbach, Lee J., " Five Decades of Public Controversy over Mental Testing ", and Ezrahi, Yaron, " The Jensen Controversy: A Study in the Ethics and Politics of Knowledge and Democracy ", in Frankel, Charles (ed.), *Controversies and Decisions* (New York: Russell Sage Foundation, 1976), pp. 123–170.

[5] The political uses of the authority of scientists are illustrated, for example, in the controversy about the role of nuclear physicists in the foreign and defence policies of the United States after the Second World War. See Stern, Philip M., *The Oppenheimer Case: Security and Trial* (Evanston: Harper and Row, 1969); and also the selection of papers and documents in Grodzins, Morton and Rabinowitch, Eugene (eds.), *The Atomic Age: Scientists in National and World Affairs* (New York: Simon and Schuster, 1965).

as valid. It is, moreover, often the prestige of scientific knowledge rather than scientific knowledge itself that politicians and others draw upon to justify their positions and to discredit their adversaries.

In contrast with the utopian rationalist, according to whom the validity of scientific knowledge should compel its acceptance and application where it is technically relevant, the pragmatic rationalist sees that the structure and complexity of scientific knowledge rarely permits completely unambiguous application and that the progress from intellectual diagnosis to practical action is full of uncertainty and an unavoidable mixture of scientific and non-scientific judgements. The pragmatic rationalist is more likely to appreciate the fact that the uncertainty and the non-scientific judgements which are involved in the uses of knowledge in public policy tend to facilitate the exploitation of the prestige of science to make assertions which lie beyond what is permissible by established professional standards. Such extensions of scientific authority are in fact very common. The conduct of the antagonists in the controversy about intelligence tests in the early 1970s is a case in point.[6]

But even when the validity of the particular bit of scientific knowledge is well established among scientists and the recommendations of experts are widely accepted, politicians are often more interested in the political value of the consensus of the scientists as a shield against external criticism, than in the intellectual and practical value of such a scientific consensus for effective treatment of the problem under consideration. Scientific validity, then, is often respected as a major ingredient of the politically usable authority of science, rather than because it meets scientific standards.

The degree of agreement or disagreement within the respective groups of scientists and policy-makers is important in determining the roles and uses of scientific knowledge in public policy. The exponents of the utopian rationalist outlook limit themselves unwittingly to only one of the possible relationships between politics and scientific knowledge, namely, the situation in which both political objectives and the relevant scientific knowledge are unambiguous and agreed upon. Such situations encourage belief in the feasibility of replacing science for politics. This, however, is only an illusion created by the unusual circumstances where consensus among politicians about what is desirable leaves the field free to scientific analysis of the most effective means of reaching the agreed-on political objective.

*Agreement on Goals with Scientific Consensus*

There are policies the ends of which are relatively clear and agreed upon and policies with ends which are both ambiguous and controversial. And there are problems of policy on the factual aspects of which scientists

[6] Cronbach, L. and Ezrahi, Y., in Frankel, C. (ed.), *op. cit.*, pp. 123–170.

agree and others on which they are not in scientific agreement. Where both goals of policy and scientists' opinions are consensual, the agreement on goals tends to remove the process of making policy from the arena of political contentions, and the task of experts is mainly to give advice on how to execute it most effectively and economically.

Such situations, where the objectives of policy are, at least temporarily, settled and the focus of attention is on execution, tend to generate a demand for expert scientific and technological advice and to be relatively favourable to their application. When scientific advisers agree on the relevant facts and courses of action, the problem can be defined as technological; it is a matter of applying established knowledge to achieve accepted ends. Instances of the role of science in public policy which approximate these conditions, like the Manhattan project or the Apollo programme, are usually cited as the most dramatic illustrations for its success. But they are often illegitimately construed as a guiding standard for the use of scientific knowledge in the formation and execution of policies which usually lack these congenial conditions. Policies such as those pursued in dealing with education, welfare, the economy or crime, do not have available to them the scientific and technological knowledge and the agreement on objectives which were available or attained in the construction of the atomic bomb or during the first years of the space programme. Professor Arthur Jensen's equation of the task of promulgating and carrying out effective educational programmes with engineering tasks like building sound bridges and aircraft is a typical extension of this scientistic approach to areas where agreement on objectives and agreement on the scientific knowledge of the conditions to be dealt with are either lacking or partial.[7] Such a scientistic or engineering approach to social problems is reasonable only in the rare cases where there is consensus about both political objectives and the means of their attainment. The development of military technology has produced several such cases. The field of public health, where political consensus about the desirability of preventing or treating certain, mainly epidemic, diseases often coexists with scientific agreement on the best medical procedure, is another example. In much of social and economic policy, such a combination of political and scientific consensus is by no means common.

*Agreement on Objectives without Scientific Consensus*

Another type of situation is that in which there is consensus about the right objectives of policy but no agreement among scientists as to the facts of the situation or the means to be employed. The proper role of the scientists in this case is to make clear the range of reasonable scientific

[7] Jensen, Arthur R., "How Much Can We Boost I.Q. and Scholastic Achievement?", *Environment, Heredity and Intelligence*, Reprint Series no. 2 (June 1969); also *Harvard Educational Review*, XXXIX, 1 (Winter 1969), p. 3.

judgements. Disagreements among scientists on scientific questions give more freedom to politicians and administrators to interpret scientific opinion and to select measures to be used. At the same time, these scientific uncertainties leave room for potential political opponents to revive political contention over the objectives of policy. If time were not a consideration, further scientific research and further discussion among scientists might produce scientific consensus. In most cases, however, political and administrative schedules do not leave time for further scientific and technological research. One question then is how scientists can assist politicians and administrators to take into account scientific and technological considerations, despite unsettled differences among scientists on important matters.

The controversy in the United States regarding the distribution of the Salk vaccine for immunisation against poliomyelitis illustrates this state of agreement about objectives in combination with scientific dissensus. The threat of poliomyelitis and the need to take preventive measures were increasingly recognised in the United States with the rise in the incidence of the disease in the early 1950s.[8] The question of politically and organisationally acceptable methods for producing and distributing the vaccine was subject to considerable debate, but this was largely resolved by the Poliomyelitis Vaccination Assistance Act of 1955. Although the Act signified consolidation of support for the objective of preventing poliomyelitis epidemics with the necessary organisational measures, qualified scientists were still divided over the purely scientific questions of the efficacy and safety of the Salk vaccine. During the controversy, which ended with the introduction of the Sabine vaccine, the execution of the policy of large-scale immunisation was constrained by the absence of clear scientific consensus on the best methods of treatment.

The "battery additive" controversy and the early phases of the discussions on the relations between smoking and health in the United States represent similar cases of disputes among scientists which have delayed or otherwise affected the execution of policy.[9] In the "battery additive" controversy, the appearance of conflict among scientists in the interpretation of the effectiveness of a certain product was sufficient to complicate the task of governmental agencies which had to decide whether a producer was engaged in deceptive or honest advertising. Similarly, during the late 1950s and early 1960s, in the early phases of the debate

[8] "Congressional Response to the Salk Vaccine for Immunization Against Poliomyelitis", *Technical Information for Congress*, Report to the Subcommittee on Science, Research and Development of the Committee on Science and Astronautics, U.S. House of Representatives, 92nd Congress, prepared by the Science Policy Research Division of the Library of Congress (Washington, D.C.: U.S. Government Printing Office, April 1971), pp. 309–336.

[9] See Lawrence, Samuel, A., "The Battery Additive Controversy", in Bock, E. A. and Campbell, A. K. (eds.), *Case Studies in American Government* (Englewood Cliffs, N.J.: Prentice Hall, 1962), pp. 325–368; and Reiser, Stanley Joel, "Smoking and Health: The Congress and Causality", in Lakoff, Sanford A. (ed.), *Knowledge and Power: Essays on Science and Government* (New York: The Free Press, 1966), pp. 293–311.

concerning the effects of smoking on health, differences among scientists on the precise sense in which smoking could be said to be a " cause " of cancer and other diseases influenced governmental action.

Although the scientists involved could not meet the requirement of certainty, they agreed on assigning sufficiently high probability to the connection between smoking and various diseases—especially cancer—to warrant public action. But to laymen, who typically identify science with certainty of knowledge, even high probability was not persuasive enough. Such doubts made it possible for the opponents of governmental efforts to reduce smoking to claim that the assertion that smoking is dangerous to health lacked a sufficient basis in scientific knowledge.

Scientific consensus cannot be mechanically measured and complete dissensus is not the only alternative to complete consensus. Public misunderstanding of the nature of scientific knowledge can easily lead to situations where even what scientists regard as a fairly high degree of consensus among themselves is construed by laymen as a damaging manifestation of disagreement among experts. These unrealistic expectations of absolutely complete consensus among scientists can easily be exploited by politicians and publicists who wish to discredit their political opponents by pointing out that the scientific evidence upon which they base some of their claims is ambiguous and that the agreement among the scientists is only partial.

If scientists agree that of several alternative courses of action the anticipated effectiveness of any one is not clearly superior to the rest, politicians can interpret the situation as granting them freedom to ignore available scientific knowledge altogether. In doing so, they may fail to recognise which alternatives the scientists have agreed to reject, and they may regard the uncertainty which was restricted to a choice from a range of superior alternatives as a much broader uncertainty, which permits them to choose any course of action which they prefer for political reasons.

*Scientific Consensus and Disagreements about Objectives*

There is a third pattern of the relationship between political objectives and the state of scientific knowledge. Scientists might be in agreement regarding the conditions which can be dealt with by governmental action and about the probable consequences of each of several different courses of action, while the politicians might in the same situations disagree about the objectives which ought to be pursued. In the class of situations in which politicians agree on the objectives of policy and scientists agree on relevant scientific matters, the principal role of scientists is to assess the prospective efficacy of measures. In the class of situations where politicians agree on objectives while scientists disagree about the relevant scientific matters, scientists should, if they confine themselves to what they really know, explain the points of their agreement and disagreement. In the third pattern, where political objectives are controversial and scientific

matters are agreed upon by the scientists, their main task should be to assist the politicians to become aware of the costs and consequences of each of the policies proposed. But in such cases, where the choice of policy is still under contention, even if the scientists are guided by strictly scientific standards, a climate of political partisanship affects attitudes towards even what is put forward as uncontroversial scientific knowledge.

Scientists can assist in the task of choosing policies in various ways. They themselves can be partisans of the competing political groups, making it appear that their scientific knowledge supports their partisan position, or they can try to be neutral experts not siding with any party to the debate but trying to enlighten the entire discussion of alternative policies and trying to make decisions better informed. Even as partisans, scientists might think that they are not being political; they might think that they are acting on behalf of ends given by their scientific knowledge and they might think that the politicians with whom they are in agreement are acting under the guidance of a scientific point of view. They are, in these conditions, espousing the standpoint of utopian rationalism in a situation which is quite inappropriate to it.

In so far as scientists in these situations are themselves on different sides of the issue, the disagreements are political and not scientific. The scientists might agree on the assessment of evidence and on the factual consequences of each of the preferred alternatives of policy, but they would disagree on the policy to be chosen. The disagreements of scientists as citizens might be a function of their different conceptions of the right policy, while being in agreement with other scientists about the facts of the situation and about the consequences of each of the alternative policies. They could in principle be very partisan in the espousal of their political views while not allowing such views to affect their scientific assessment of the factual or scientific aspects of an issue.

The interaction between science and policy during the controversy on fluoridation in the United States is an instance of the pattern discussed here. Concerning the effects of fluoridation on the human body, there was a considerable consensus among scientists that the artificial adjustment of the fluoride content of the public water supply would significantly reduce dental caries and, if done at the proper levels, would constitute both a medically effective and reasonably safe treatment of a major problem.[10] Fluoridation was endorsed in these terms by the National Academy of Sciences, the American Dental Association and the American Medical Association.

Despite this impressive scientific consensus there was considerable political controversy over the issue. In addition to the question of dental

[10] See "Fluoridation: A Modern Paradox in Science and Public Policy", in *Technical Information for Congress*, p. 616. See also Sapolsky, Harvey, "The Fluoridation Controversy: An Alternative Explanation", *The Public Opinion Quarterly*, XXXIII, 2 (Summer 1969), p. 241.

decay, questions were raised concerning the right of an individual to choose what he consumes, and the level at which this decision should be taken. In 952 referenda held on the issue in different communities between 1950 and 1966, fluoridation was rejected in 566 cases.[11]

There are, of course, numerous further examples of cases where scientists agree that the application of a certain technique would constitute the most effective means to produce certain results, but where action is either ruled out or delayed because of disagreement about the desirability of the intended and foreseeable consequences. Although amniocentesis techniques which can be used, among other things , for prenatal identification of sex are generally agreed upon by scientists as being reliable, there is much resistance to a large-scale application of this technique because of the possible uses of such knowledge in parental decisions concerning abortions. The history of birth control pills is also an example of a treatment the technical effectiveness of which was a subject of considerable consensus, while its application was delayed because of disagreements in the moral evaluation of its effects on sexual behaviour. Politicians are sensitive to such attitudes in the electorate and they are not necessarily moved even by the unanimous views of scientists.

In July 1832, the Board of Health of New York City resisted the urging of the Medical Society of New York that it take action against a spreading cholera epidemic. Despite considerable medical agreement concerning the diagnosis and treatment of the problem, action by the Board was delayed by political disagreement which was fed, in part, by the fear that any official acknowledgement of the existence of a cholera epidemic could hurt the commerce of the city, thus having an adverse influence on its welfare. Only when the conditions of the epidemic became more visibly acute was a political consensus generated to approve the policy recommended by the physicians. This was an instance in which the scientific profession agreed about an existing state of affairs and about its remedy, but where action was delayed because a sufficient number of politicians tried to forestall as long as possible acknowledgement of the facts unanimously reported by the scientists.[12]

When the credibility and influence of experts depend not on the scientific validity of their recommendations but upon the seldom realisable condition that the anticipated consequences of acting upon their recommendations will either improve the position of all involved interests, or will not alter the relative distribution of material or political resources among the contending groups, even a perfect adherence to professional standards cannot prevent political contention.

[11] Sapolsky, Harvey, "Science Voters and the Fluoridation Controversy", *Science*, CLXII, 3852 (25 October, 1968), pp. 427–432.

[12] Rosenberg, Charles E., *The Cholera Years* (Chicago: University of Chicago Press, 1962), p. 22.

*Disagreement about Objectives Coupled with Scientific Dissensus*

The expectations of the utopian rationalist are entirely inapplicable to a situation in which the goals of policy are unsettled, ambiguous or contradictory, and the scientists are also in disagreement about the things of which they purport to be able to speak with the authority of science. The absence of both the political and the scientific conditions for a technical solution is not congenial to the tasks of the scientist as a technical adviser on the best means to carry out a particular policy, or as an expert in the assessment of the anticipated consequences of alternative courses of action. Under these conditions, political and scientific disagreements tend to interpenetrate and to aggravate the controversy. Moreover, scientists who, without being supported by a consolidated scientific consensus, argue for politically controversial policies, become particularly vulnerable and tend to lose the credit previously given to them for dispassionate objectivity. Without the support of their peers, they cannot ensure the appearance that their judgements are sufficiently disinterested and that their recommendations are based on modes of analysis which are in themselves neutral with respect to the objectives of contending parties.

The controversies in the United States over the production and deployment of anti-ballistic missiles to defend American land-based nuclear weapons emplacements, and the uses of intelligence tests in the educational system are striking illustrations of the type of situation where simultaneous disagreements over political and scientific or technical issues accentuate each other.

The difficulties inherent in such situations for assuming the strict code of professional standards necessary for guiding and judging professional conduct are most clearly illustrated in the controversy around the decision to develop anti-ballistic missile systems. A leading participant in the controversy, Mr. Albert Wohlstetter, made formal appeal to the Operations Research Society of America to inquire into the professional conduct of some of his adversaries; he thus initiated an explicit consideration of the matter.[13] The Society moved to establish a committee for this purpose in November 1969, and in the report which it released in September 1971 the committee took the position that some of the scientists who testified before a congressional committee had violated professional standards and confused the ethically distinct tasks of analysis and advocacy.[14]

Although the committee did not claim that compliance with specified scientific standards would have resulted necessarily in a scientific agreement, it did insist that:

[13] See "The Obligations of Scientists as Counsellors: Guidelines for the Practice of Operations Research", Report and Documents, *Minerva*, X, 1 (January 1972), pp. 151–152.
[14] *Ibid.*, p. 119.

the calculations are sufficiently simple that in principle it should have been possible to reach agreement among the professionals if not on their results, at least on where their assumptions differ; and then to conduct a debate over the validity of one or the other set of assumptions.[15]

The committee—by insisting that the method and calculations of the critics of the anti-ballistic missile, and especially of Professor George Rathjens, were less reliable than those of supporters of the anti-ballistic missile, like Mr. Wohlstetter—implied that, at least according to the technical standards of operations research, the appearance of scientific disagreement produced by the critics of the anti-ballistic missile was not fully warranted and that their divergent conclusions might reflect the influence of non-scientific considerations. By regarding Professor Rathjens and other critics as unrepresentative of professional opinion, the committee in fact implied that a scientifically tenable consensus was possible in the situation under consideration. The existence of such a consensus among scientific experts—or at least, the presumption of its possibility—is necessary, if a scientific profession wishes to distinguish between acceptable and unacceptable professional practices and if it wishes to censure unprofessional conduct.

Mr. Wohlstetter's adversaries in the debate on the anti-ballistic missile did indeed respond to the attempt to evaluate their performance in the light of standards of operations research by declaring that " there never was any general agreement on the technological facts underlying the debate ".[16] While Mr. Wohlstetter and the committee of the Operations Research Society allegedly questioned the validity of the scientific statements made by the critics of the anti-ballistic missile, the latter justified their conduct by insisting that there was no scientific consensus, that scientific assertions were bound to become mixed with political ones and that no deviation from professional standards could therefore be pointed to.[17] Critics of the anti-ballistic missile, like Professors Rathjens, Weinberg and Wiesner, implied that since the operations research component of the assessment of complex technical systems like the anti-ballistic missile is not the only technically relevant basis of evaluation, even an agreement among professional operations research specialists would not warrant the claim of scientific consensus in the matter.[18]

Professor Paul Doty, a critic of the society's report, took a similar view.[19] His insistence on the " complexity of the issue " [20] and on the wide scope of relevant professional considerations suggests that he would oppose the application to this case of the norms and ethics of scientific

[15] *Ibid.*, p. 121.
[16] *Ibid.*, p. 153.
[17] *Ibid.*, p. 153.
[18] *Ibid.*, pp. 153–154.
[19] Doty, Paul, " Science Advising and the ABM Debate ", in Frankel, C. (ed.), *op. cit.*, pp. 185–203, and " Can Investigations Improve Scientific Advice? The Case of the ABM ", *Minerva*, X, 2 (April 1972), pp. 280–294.
[20] Doty, P., *op. cit.*, 1972, p. 293.

advice which would be appropriate in situations where a professional consensus on a preferred course of action exists. Doubting that the techniques of operations research could be extended to strategic problems with the hope of narrowing " the uncertainties of assumptions and parameters ",[21] Professor Doty defined the relevant technical judgements in the matter much more widely. He required, among other things, a comprehensive evaluation of political consequences which is clearly beyond the competence of operations research.

Moreover, by pointing out that the proponents of the anti-ballistic missile had not considered what he regarded as important types of questions, Professor Doty attempted to demonstrate that his adversaries were guilty of a selective focus of attention. He insisted that it was wrong to start from one definition of expertise and to declare that those who dealt with topics beyond the competence of operations research were unprofessional in their conduct. Instead, he implied that in such complex matters the range of scientific judgements which become relevant to a choice of policy might be much wider than the supporters of the anti-ballistic missile claimed. To balance the common—although inescapable—bias of attention, which leaves out potentially important aspects of a complex issue that do not lend themselves to a particular narrowly defined professional treatment, Professor Doty praised the virtues of a comprehensive approach. But he did not consider the deficiencies of the comprehensive approach when praising it as a remedy for the bias of selective focus. As long as scientists were called upon only to assess those aspects of an issue about which there was a solid body of scientific knowledge and procedures of assessment, at least one necessary condition for scientific consensus was within reach. By extending the range of things about which scientific judgement is required into areas where such knowledge is either lacking or is scanty, although such extensions may be necessary, the probability of scientific consensus and the concomitant opportunity for the influence of scientists on the making of policy are sharply reduced.

The controversy about the anti-ballistic missile and the debate around the report of the committee of the Operations Research Society of America suggest that conflicts between narrow and comprehensive definitions of the roles of scientists as experts are themselves, at least in some respects, a part of the " political game ".[22]

[21] *Ibid.*, p. 293.

[22] For the discussion of the uses of science in politics see Ezrahi, Yaron, " The Authority of Science in Politics ", in Thackray, Arnold and Mendelsohn, E. (eds.), *Science and Values* (New York: Humanities Press, 1974), pp. 215–251, and " The Political Resources of American Science ", *Science Studies*, I, 2 (April 1971), pp. 117–133. See also Nichols, K. Guild, " The De-Institutionalization of Technical Expertise ", in Skoie, H. (ed.), *Scientific Expertise and the Public*, conference proceedings (Oslo: The International Council for Science Policy Studies and The Institute for Studies in Research and Higher Education of the Norwegian Research Council, 1979), pp. 34–48.

The controversy over the validity of intelligence testing, which was renewed at the end of 1969 following claims made at that time by Professor Arthur R. Jensen, is another instance of the confusion engendered when there is a combination of scientific and political disagreements. In the controversy, each side claimed that its opponents had poor scientific grounds for their contentions, and argued that its own position represented a genuine scientific consensus. While the " environmentalists " typically insisted on the hypothesis of " environmental deprivation " as the valid ground for conducting compensatory educational programmes for the disadvantaged such as " Head Start ", the " hereditarians " insisted that research demonstrated that genetic-hereditary barriers to raising the intelligence quotient and the academic achievements of " disadvantaged " children warranted an entirely new approach to the issue. The controversy over intelligence tests shows that, despite the tendency of each side to describe its own position as scientifically sound while ascribing political motives to the other side, strategies of both " narrowing " and " extending " the scientific referents of the issue, even if they are guided by strictly scientific considerations, can arouse sentiments which have to be taken into account by politicians. Professor Jensen, in trying to " narrow " the range of scientifically relevant features of the issue in order to demonstrate the weight of genetic factors in accounting for average group differences in the scores on tests of intelligence, was of the opinion that his adversaries' attempts to give much weight to other factors were unscientific or, more precisely, were politically motivated.[23] But some of Professor Jensen's opponents, using the strategy of " extension ", similarly found unscientific overtones in his selective concentration on genetic factors.[24] Professor Jensen, arguing that there is a scientific consensus, insisted, along with the hereditarian thesis, that " points of disagreement [are] less fundamental and much narrower in scope than the points of agreement ".[25] For him, much of the disagreement should have been regarded as " misunderstanding ".[26] His critics who were mostly but not exclusively " environmentalists ", emphasised those uncertainties and disagreements about the " facts " which weakened his claim to represent an alleged scientific consensus. Some of them claimed that the authoritative scientific opinion was environmentalist, thus asserting that there was a genuine scientific consensus but that it was the opposite of what Professor Jensen said it was. A more moderate claim was made by the editors of the *Harvard Educational Review*. They decided to cease circulation of the original issue containing the article, regardless of the financial loss to the journal. In a letter replying to requests for offprints, they wrote:

[23] Jensen, A. R., *op. cit.*, p. 28.
[24] See Hunt, J. M., " Has Compensatory Education Failed? Has it Been Attempted?", Reprint Series no. 2, from *Harvard Educational Review*, XXXIX, 1 (Winter 1969), p. 149.
[25] *Ibid.*, p. 214.
[26] *Ibid.*

"The Jensen article . . . presents a view of intelligence that we feel must be read in the context of expert discussion from other psychologists and geneticists the Spring issue will contain. It is imperative that our readers be given access to the entire debate." [27] They were, in other words, pointing to a still unresolved scientific dissensus. They also required an enlargement of the range of the scientifically relevant expertise on the matter beyond the professional outlook of genetic psychology which Professor Jensen claimed to represent.

In both the controversy about the anti-ballistic missile and the controversy about intelligence testing, the attempts to delineate the extent of scientific consensus also involved claims that such a consensus of qualified scientists actually existed but was being disregarded by the opposite group. Whereas in internal scientific discourse, such groups may compete with each other in presenting what each regards as the most effective analysis, when the discussion takes place in the context of contention about public policy, their divergent views acquire a political significance which inevitably invites political assessment of competing scientific positions. But the political ramifications of scientific and technical recommendations do not necessarily warrant the attribution of political motives to those scientific advisers who happen to disagree with each other about scientific matters.

### *The Relative Weights of Scientific Knowledge and the Authority of Scientists*

In so far as patterns of the relations between science and the making of policy are analysed as functions of the extent of consensus within the respective groups of scientists on the one side and among politicians and administrators on the other, changes in the extent of consensus should obviously alter the patterns. (The substance of the judgements of the scientists and the makers of policy may change without altering the facts of consensus or dissensus. Our discussion is limited, however, to those cases in which such changes in the extent of consensus occur and therefore transform the interaction between the scientific and political elements in the making of decisions about public policy.)

The history of the use of intelligence tests in the making and execution of educational policy is instructive. The relatively uncontroversial use of the results of Binet tests for the early identification of retarded children in Parisian schools around 1900 developed by the second part of the twentieth century into a heated controversy about the use of such tests for the racially heterogeneous school population of the United States. In the latter situation, the production and use of data on average group differences in the scores on intelligence tests appeared to some persons to

[27] The letter quoted was sent to the author in a private communication. On the position of the editorial board, see also, *ibid.*, pp. 1–2.

undermine arguments for racial integration and equality.[28] There has been a shift from a situation in which both the objectives of policy and the validity and interpretation of intelligence tests were agreed upon, to a situation where the objectives of applying intelligence tests became controversial and finally, to one where the consensus on educational objectives as well as that on the validity and interpretation of the intelligence tests employed have both broken down.

The extension of the use of intelligence tests from Parisian schools of 1900 to the American army in 1916, and later, to American schools and universities and selective immigration agencies, was accompanied by increased disagreement concerning objectives.[29] Later on, especially after Professor Jensen's paper where average group differences in scores on intelligence tests were interpreted at least in part as indicating the hereditary transmission of traits the question of the scientific validity of intelligence tests was raised. The scientific consensus had broken down, partly under pressure of further analysis and partly under pressure of the political partisanship of the scientists themselves. Intense scientific controversy aggravated already existing political disagreement. These shifts corresponded with changes in the social definition of the role of psychologists. They started as scientific experts engaged in applying an obviously valid method to a widely acknowledged problem; then they became preoccupied with defending and reinterpreting the use of intelligence tests in the face of mounting political criticisms, which in the latest stage has split the scientific community and tainted most of the participating experts as partisan advocates.

The decision to change the hand-gun ammunition of the Denver Police Department in 1974 presents yet another example, more limited in scope of the consequences of change in the degree of agreement and consensus.[30] The issue was raised when the police decided to cease using a certain kind of bullet which had proven insufficiently effective in impeding the person shot at from shooting back at policemen or others. The proposed bullet was to have superior "stopping effectiveness", thus improving the security of policemen. The proposed shift from the one type to the other was opposed, however, by partisans of the civil rights movement on the grounds that an increase in "stopping effectiveness" involved here also increase in probable injury to the persons shot at, as well as in higher probability of risk to bystanders. The scientific validity of statements about the properties of the alternative types of bullets and the political views regarding the relative values of "stopping effectiveness", "minimal injury", "reduced threat to bystanders", were each subject to

[28] See Cronbach, L., and Ezrahi, Y., in Frankel, C. (ed.), *op. cit.*, pp. 123–170.

[29] See Cronbach, L., *ibid.*, pp. 139–142. For a more complete documentation of the Lippermann-Terman debate, see Block, N.J. and Dworkin, Gerald (eds.), *The IQ Controversy* (New York: Pantheon Books, 1976), pp. 4–44.

[30] Hammond, Kenneth R. and Adelman, Leonard, "Science, Values and Human Judgment", *Science*, CXCIV, 4,263 (22 October 1976), pp. 389–396.

much disagreement. The clash between the contending parties, each of whom enlisted its own scientific experts, produced an impasse; the problem was resolved by persons who were introduced as " experts on human judgment " and who attempted to analyse the assertions of experts in ballistics and medicine and used certain analytical procedures to replace the deadlocked adversarial procedure in ordering the preferences of the different groups involved in the controversy. The analysts quickly discovered that no analytical methods could uncover in the multiplicity of the politicians' preferences unambiguous criteria for a political decision. They were unable to proceed further before obtaining from the municipal council an agreement to a formula giving equal weight to the three competing criteria involved. Only then, on the basis of this exceptional political decision to suspend political procedures of choice and compromise, were the analysts able to produce a recommendation of a type of bullet which appeared to balance the requisites of " stopping effectiveness ", minimal necessary injury and minimal danger to bystanders.[31] This is therefore not a case where scientific advice resolved a political disagreement. It is rather one where the readiness of politicians to suspend their disagreement by adopting an arbitrary formula furnished a condition for the acceptance of " scientific advice ". Contrary to the impression given by the experts upon whose report of the case we rely here, this is an exceptional example not generalisable to the typical situation where experts have to advise genuinely divided politicians and an equally divided public. Nevertheless, regardless of whether such shifts from political disagreement to political agreement are brought about by experts or not, the case of the hand-gun ammunition of the Denver Police Department does illustrate how the suspension of political conflict changes the terms and role of the expert in relation to policy.

The utilisation by politicians of the general prestige of scientists in situations where the scientists themselves gravitate towards politically partisan positions is clearly illustrated in the controversies over the nuclear test ban treaty and the supersonic transport in the United States. During the congressional hearings on the treaty in the summer of 1963, one of the congressional committees was informed that " in a poll of Nobel prize-winning scientists, there had been no opposed views recorded ".[32] One observer of the controversy noted that:

> the major importance of scientific advice lay not so much in that it provided the basis of decision as that it helped create a political consensus in favor of the decision. In the process of acquiring scientific advice, the prestige and presumed objectivity of scientists were mobilized to ascribe to the treaty a certain aura of technical legitimacy.[33]

[31] *Ibid.*, pp. 393–395.

[32] Uyehara, Cecil H., " Scientific Advice and the Nuclear Test Ban Treaty ", in Lakoff, S. (ed.), *op. cit.*, pp. 152–153.

[33] *Ibid.*, p. 153.

In the controversy over the supersonic transport, as in the controversy over the test-ban treaty, there was disagreement over political objectives as well as scientific disagreement about the technical aspects of the issues; the general prestige of science was exploited for political purposes. Here, too, scientists for the most part either played the role of partisan advocates or allowed their names to be invoked by political partisans. In March 1971, two lists of economists, one favouring and the other opposing supersonic transport, were produced by opposing senators and invoked in the political contention over the policy to be adopted.[34]

Utopian rationalists do not seriously consider the possibility of such misuse of the general prestige of science because they themselves are prone to it, and also because they think that the scientific knowledge presented to politicians and civil servants always consists of statements of demonstrated facts, which only the uninformed or the corrupt can ignore.[35] The pragmatic rationalist outlook sees that political considerations are integral to decisions which concern not only the choice of technical means to attain certain substantive ends but also serve as the means to balance competing interests and legitimate compromises without which no policy is possible in a democracy. Pragmatic rationalism acknowledges the existence of unavoidable constellations of political interests and seeks to enhance the impact of knowledge on decisions; its exponents may therefore try to explore how politicians' responsiveness to scientific authority can be used to enhance the effective role of relevant scientific knowledge.

The fact that scientific knowledge can be drawn upon to serve political ends in contentions about public policy suggests, however, that the increasing prominence and influence of scientists in the making of policy do not necessarily indicate a corresponding increase in the assimilation of scientific knowledge into the handling of problems of policy. It may very well mean, particularly when there is disagreement about the objectives of policy, that science is utilised for its political rather than for its intellectual value. It is often, rather, a political assimilation of the general prestige, not the scientific knowledge, of scientific advisers as the representatives of science.

Correspondingly, efforts to improve the scientific validity of the " scientific component " of public policy, as for example in the case of the Consumer Price Index, are resisted, sometimes precisely because frequent changes and adaptations could weaken the authority which constitutes much of the utility of such technical instruments for politicians and administrators. Thus, the publication of studies on the probable validity and

[34] Clark, Ian D., " Expert Advice in the Controversy About Supersonic Transport in the United States ", *Minerva*, XII, 4 (October, 1974), pp. 416–432.

[35] A typical expression of the desire to restrict the role of scientific knowledge in public policy to the provision of reliable factual statements can be found in " The Science Court Experiment ", interim report of the Task Force of the presidential Advisory Group on Anticipated Advances in Science and Technology, *Science*, CXCIII, 4254 (20 August, 1976), pp. 653–656.

margin of error in the statistics used to compute the index, although it would render the index sounder scientifically, could, at the same time, weaken its credibility as a reliable, stable reference in disputes between trade unions, business men and the government.[36]

*Obscuring the Extent of Dissensus*

There are situations in which scientists who actually disagree on the appropriate method of dealing with a problematic condition may present to politicians the outward signs of a scientific consensus. Even when they agree that the knowledge available in certain areas contains many uncertainties, scientists sometimes wish to minimise the impression that their knowledge is uncertain; they are apprehensive lest the appearance of inadequate knowledge or the disagreements among themselves will lower their status and weaken their influence in the discussion of public problems. Politicians and civil servants for their part might be concerned that a favourable political constellation might be very transient and that conflicts beween scientists on the factual aspects of decisions about policy would be injurious to their cause. It would therefore be to their advantage to do whatever they can do to sustain an outward show of scientific consensus. Sometimes, therefore, the preferences of both scientists and politicians can encourage the concealment or understatement of disagreements among scientists, or of the inadequacy of knowledge, which would be relevant. It is the politically usable prestige of scientific knowledge and the reputation of scientists for objectivity and integrity which are drawn upon in such circumstances, at the price of actually disregarding these very values.

Examples of the attempts to create an impression of scientific consensus by administrative means are numerous. During the controversy over the nuclear test ban treaty, the then Secretary of Defense, Mr. Robert McNamara, summoned the experts to a seminar partly in order:

> to " persuade " the scientists to agree to the use of a common set of figures.... In the technical hearing sponsored by the JCAE [Joint Committee on Atomic Energy], scientists and engineers tended to use slightly different sets of figures for their respective purposes. This made comparison very difficult for policy-making purposes. The administration, therefore, tried to persuade the scientists to agree to a common set of figures which could be used as a base. This set of figures was known as " the bible "...[37]

During the debate concerning the relations between smoking and health, the Surgeon-General of the United States, confronting at an early stage diverse and incongruent scientific opinions, established an advisory com-

[36] See Ezrahi, Yaron, " The Political Context of Science Indicators ", in Elkana, Y., Lederberg, J., Merton, R. K., Thackray, A. and Zuckermann, H. (eds.), *Towards A Metric of Science* (New York: John Wiley, 1978), especially the section on the " Institutionalization of Science Indicators ", pp. 305–310. See also Kruskal, W. H. and Telser, L. G., " Food Prices and the Bureau of Labor Statistics ", *Journal of Business*, XXXIII, 3 (July 1960,) pp. 258 and 279, and " Comment " by Ewan Clague, *ibid.*, p. 280.

[37] Uyehara, C., *op. cit.*, p. 146.

mittee with the intention of precipitating a " majority " scientific opinion, which would declare smoking a serious health hazard. The Surgeon-General was keenly aware of the importance of engendering the outward signs of consensus among important scientists; he hoped that the prestige of science would bring about the support of the laity.[38] In the battery-additive controversy, the director of the United States National Bureau of Standards tried to resolve apparent inconsistencies between the judgements of various scientific experts by a prior agreement on a " public experiment " which would be binding on all parties regardless of the outcome.[39]

Even as a device against political opposition, however, the employment of the appearance of scientific consensus where it is actually absent is a dubious strategy. Experts who were not a party to such processes of adjustment are usually available to politicians who disagree with the proposed policy. Such strategy can, therefore, ultimately diminish the authority and influence of science as a political as well as an intellectual resource.

Another type of problem arises when a political change which eludes the advising scientists makes controversial policies which were formerly fixed by political agreement. When scientific advisers fail to adjust their role to such shifts in the political status of the goals of policy, and where they continue to take for granted goals which are no longer agreed upon, they can unintentionally become advocates. Instead of experts who advise on the execution of accepted policy, they implicitly strengthen one as against other competing goals. This kind of situation does not require that the scientists themselves change. They continue to adhere to strictly scientific standards while the change in the political constellation alters the political significance of their scientific contributions.

Another kind of confusion results from the utopian rationalist belief that more research can help resolve a political conflict which is resolvable only by political means. In such cases scientific advisers may try to persuade policy-makers with the zeal of missionaries instead of paying more careful attention to the complex task of making sure that scientific facts are not ignored in arriving at political compromises.

In many situations, adherence to the scientific norm of objectivity is strained by the presence of genuine disagreement among scientists with regard to the relevant facts and their interpretation. The danger here is that, instead of furnishing an adequate representation of divergent scientific opinions, the experts advocate one alternative which is not scientifically superior to the others.

In other cases where a scientific agreement on an order of alternatives ranked by their efficacy co-exists with political disagreement on the order of objectives, the adequacy of advice depends not—as in the former kind

[38] Reiser, S. J., *op. cit.*, pp. 295–297.
[39] Lawrence, S. A., *op. cit.*, pp. 13–14.

of situation—on accurate representation of diverse scientific opinions, but rather on the accessibility of the same uncontroversial body of knowledge to the partisans of the various political positions and interests.

Another constraint on the integration of scientific advice into policy-making arises from the common clash between the political need for stable and reliable knowledge and the scientific urge for constantly revising knowledge in the light of new scientific advances. Politicians, in so far as they arrive at compromises and acquire support from complex clusters of expectations and desires, are reluctant to allow changes which may disrupt the delicate political conditions necessary for particular policies and programmes, even when these changes are rational from a scientific point of view.

Contrary to the views of utopian rationalists, pragmatic rationalists would not, therefore, attempt to integrate into policies and programmes all new knowledge which is relevant. Instead they would explore the conditions under which the gains of adjusting the programme to new knowledge could be shown to offset the political costs of changing the scientific statements which they put forward.

The prestige of science will differ in accordance with differences in the extent of scientific consensus achieved in the various disciplines. In comparison with the other disciplines, the natural sciences appear more likely, though by no means uniformly, to achieve some measure of scientific consensus. Not only are they better off intellectually, but their premisses and idiom are less likely to become intertwined with the rhetoric of politicians, civil servants, and publicists than those of the social sciences. They are therefore less amenable, though they are by no means invulnerable, to abuse for political purposes. The subject-matters of the social sciences are almost always immediately and obviously the objects of political contention; this is not true of the subject-matters of the natural sciences, although in some areas the relative advantage of the latter has been deteriorating in recent years.

*Conclusion*

Utopian and pragmatic rationalists share a common commitment to the rationalisation of public policy by increasing the incorporation of scientific knowledge in the definition and treatment of problems about which policies are sought. They differ not so much in their aims as in their conceptions of how far these aims can be realised. The utopian rationalist is always at war with politicians and with politics. Viewing political contentions and considerations as irrational and otherwise unjustifiable constraints upon the fullest use of scientific knowledge, he seeks to overcome these constraints. For the utopian rationalist, the complete "scientificisation" of public policy-making is the ultimate good. The pragmatic rationalist is not committed to the sufficiency of scientific knowledge. He

simply would like political actions to draw upon scientific knowledge where it is appropriate and not to fly in the face of established scientific knowledge. He acknowledges the limits set by politics on the uses of scientific knowledge in public affairs. He thinks that a world without competing interests and desires is impossible and he does not think it is possible to establish such a world by subjecting it to the dominion of scientific knowledge.

The attitudes of the utopian rationalist and those of the pragmatic rationalist agree in their high evaluation of the benefits of the application of scientific knowledge. The former, however, believes that the " values " which he thinks are inherent or implicit in scientific knowledge should dominate all others. Now, within the scientific community, it is possible to identify a hierarchy of values in which the pursuit and application of knowledge is conceivably the highest good. But to assume that the value of scientific knowledge and political decisions and actions based on scientific knowledge can be fixed as the highest value of the entire society is incompatible with the wisdom and the ineluctable facts of democratic politics. Such an assumption ignores the diversity of the objectives which are pursued in society, and disregards the task of political activity, which is the creation and preservation of order while pursuing practical objectives which are usually incommensurate, inconsistent and ambiguous.

Hence the very idea that the scientific adviser should act as manipulator of political arrangements to enhance the influence of knowledge is unacceptable, even in the service of the ideal of rationality. Even where the accepted role of the scientist requires that he advance the application of knowledge in politics and administration, it does not extend to all those decisions which have to be taken in political institutions regarding values such as the maintenance of order and the realisation of justice. The justifiable partial autonomy of politics *vis-à-vis* the pretensions of scientific experts rests upon the premise that there is no legitimate alternative to the publicly chosen procedures for the democratic ordering and compromise of diverse values, desires and interests.

The wisdom and prudence of the pragmatic rationalist should deter him, therefore, from being a Machiavellian in the service of truth and rationality. If from the scientific point of view, political reasons are often technically invalid reasons for action, from the political point of view the reasons of scientists and those who invoke the name of science are often equally arbitrary and much too indifferent to the social values, desires and interests to which politicians must attend. The task of scientists and politicians is neither to substitute the one for the other, nor to subordinate one to the other. It is rather to find in each case the way to fuse knowledge and policy within the limits set by the political and moral requirements of legitimacy and feasibility and by the standards of scientific truth and rationality.