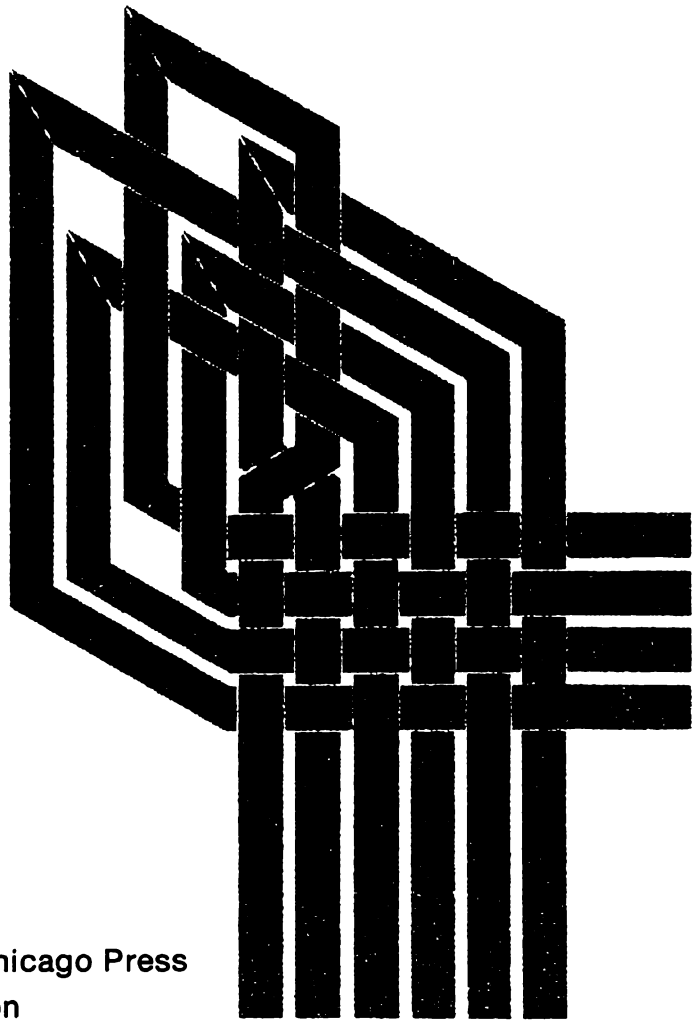
Robert K. Merton

The Sociology of Science

Theoretical and Empirical Investigations

Edited and
with an Introduction by
Norman W. Storer



The University of Chicago Press
Chicago and London

The University of Chicago Press, Chicago 60637
The University of Chicago Press, Ltd., London

© 1973 by Robert K. Merton
All rights reserved. Published 1973. Second Impression 1974
Printed in the United States of America
International Standard Book Number: 0–226–52091–9
Library of Congress Catalog Card Number: 72–97623

13

The Normative Structure of Science

1942

Science, like any other activity involving social collaboration, is subject to shifting fortunes. Difficult as the notion may appear to those reared in a culture that grants science a prominent if not a commanding place in the scheme of things, it is evident that science is not immune from attack, restraint, and repression. Writing a little while ago, Veblen could observe that the faith of western culture in science was unbounded, unquestioned, unrivaled. The revolt from science which then appeared so improbable as to concern only the timid academician who would ponder all contingencies, however remote, has now been forced upon the attention of scientist and layman alike. Local contagions of anti-intellectualism threaten to become epidemic.

Science and Society

Incipient and actual attacks upon the integrity of science have led *scientists to recognize their dependence on particular types of social structure.* Manifestos and pronouncements by associations of scientists are devoted to the relations of science and society. An institution under attack must reexamine its foundations, restate its objectives, seek out its rationale. Crisis invites self-appraisal. Now that they have been confronted with challenges to their way of life, scientists have been jarred into a state of acute self-consciousness: consciousness of self as an integral element of society with corre-

Originally published as "Science and Technology in a Democratic Order," *Journal of Legal and Political Sociology* 1 (1942): 115–26; later published as "Science and Democratic Social Structure," in Robert K. Merton, *Social Theory and Social Structure.* Reprinted with permission.

sponding obligations and interests.[1] A tower of ivory becomes untenable when its walls are under prolonged assault. After a long period of relative security, during which the pursuit and diffusion of knowledge had risen to a leading place if indeed not to the first rank in the scale of cultural values, scientists are compelled to vindicate the ways of science to man. Thus they have come full circle to the point of the reemergence of science in the modern world. Three centuries ago, when the institution of science could claim little independent warrant for social support, natural philosophers were likewise led to justify science as a means to the culturally validated ends of economic utility and the glorification of God. The pursuit of science was then no self-evident value. With the unending flow of achievement, however, the instrumental was transformed into the terminal, the means into the end. Thus fortified, the scientist came to regard himself as independent of society and to consider science as a self-validating enterprise which was in society but not of it. A frontal assault on the autonomy of science was required to convert this sanguine isolationism into realistic participation in the revolutionary conflict of cultures. The joining of the issue has led to a clarification and reaffirmation of the ethos of modern science.

Science is a deceptively inclusive word which refers to a variety of distinct though interrelated items. It is commonly used to denote (1) a set of characteristic methods by means of which knowledge is certified; (2) a stock of accumulated knowledge stemming from the application of these methods; (3) a set of cultural values and mores governing the activities termed scientific; or (4) any combination of the foregoing. We are here concerned in a preliminary fashion with the cultural structure of science, that is, with one limited aspect of science as an institution. Thus, we shall consider, not the methods of science, but the mores with which they are hedged about. To be sure, methodological canons are often both technical expedients and moral compulsives, but it is solely the latter which is our concern here. This is an essay in the sociology of science, not an excursion in methodology. Similarly, we shall not deal with the substantive findings of sciences (hypotheses, uniformities, laws), except as these are pertinent to standardized social sentiments toward science. This is not an adventure in polymathy.

The Ethos of Science

The ethos of science is that affectively toned complex of values and

1. Since this was written in 1942, it is evident that the explosion at Hiroshima has jarred many more scientists into an awareness of the social consequences of their work.

norms which is held to be binding on the man of science.[2] The norms are expressed in the form of prescriptions, proscriptions, preferences, and permissions. They are legitimatized in terms of institutional values. These imperatives, transmitted by precept and example and reenforced by sanctions are in varying degrees internalized by the scientist, thus fashioning his scientific conscience or, if one prefers the latter-day phrase, his superego. Although the ethos of science has not been codified,[3] it can be inferred from the moral consensus of scientists as expressed in use and wont, in countless writings on the scientific spirit and in moral indignation directed toward contraventions of the ethos.

An examination of the ethos of modern science is only a limited introduction to a larger problem: the comparative study of the institutional structure of science. Although detailed monographs assembling the needed comparative materials are few and scattered, they provide some basis for the provisional assumption that "science is afforded opportunity for development in a democratic order which is integrated with the ethos of science." This is not to say that the pursuit of science is confined to democracies.[4] The most diverse social structures have provided some measure of support to science. We have only to remember that the Accademia del Cimento was sponsored by two Medicis; that Charles II claims historical attention for his grant of a charter to the Royal Society of London and his sponsorship of the Greenwich Observatory; that the Académie des Sciences was founded under the auspices of Louis XIV, on the advice of Colbert; that urged into acquiescence by Leibniz, Frederick I endowed the Berlin Academy, and that the St. Petersburg Academy of Sciences was instituted by Peter the Great (to refute the view that Russians are barbarians). But such historical facts do not imply a random association of science and social structure. There is the further question of the ratio of scientific achievement to scientific potentialities. Science develops in various social

2. On the concept of ethos, see William Graham Sumner, *Folkways* (Boston: Ginn, 1906), pp. 36 ff.; Hans Speier, "The Social Determination of Ideas," *Social Research* 5 (1938): 196 ff.; Max Scheler, *Schriften aus dem Nachlass* (Berlin, 1933), 1:225–62. Albert Bayet, in his book on the subject, soon abandons description and analysis for homily; see his *La morale de la science* (Paris, 1931).

3. As Bayet remarks: "Cette morale [de la science] n'a pas eu ses theoriciens, mais elle a eu ses artisans. Elle n'a pas exprimé son idéal, mais elle l'a servi: il est impliqué dans l'existence même de la science" (*La morale de la science*, p. 43).

4. Tocqueville went further: "The future will prove whether these passions [for science], at once so rare and so productive, come into being and into growth as easily in the midst of democratic as in aristocratic communities. For myself, I confess that I am slow to believe it" (*Democracy in America* [New York, 1898], 2: 51). See another reading of the evidence: "It is impossible to establish a simple causal relationship between democracy and science and to state that democratic society alone can furnish the soil suited for the development of science. It cannot be a mere coincidence, however, that science actually has flourished in democratic periods" (Henry E. Sigerist, "Science and Democracy," *Science and Society* 2 [1938]: 291).

structures, to be sure, but which provide an institutional context for the fullest measure of development?

The institutional goal of science is the extension of certified knowledge. The technical methods employed toward this end provide the relevant definition of knowledge: empirically confirmed and logically consistent statements of regularities (which are, in effect, predictions). The institutional imperatives (mores) derive from the goal and the methods. The entire structure of technical and moral norms implements the final objective. The technical norm of empirical evidence, adequate and reliable, is a prerequisite for sustained true prediction; the technical norm of logical consistency, a prerequisite for systematic and valid prediction. The mores of science possess a methodologic rationale but they are binding, not only because they are procedurally efficient, but because they are believed right and good. They are moral as well as technical prescriptions.

Four sets of institutional imperatives—universalism, communism, disinterestedness, organized skepticism—are taken to comprise the ethos of modern science.

Universalism

Universalism[5] finds immediate expression in the canon that truth-claims, whatever their source, are to be subjected to *preestablished impersonal criteria*: consonant with observation and with previously confirmed knowledge. The acceptance or rejection of claims entering the lists of science is not to depend on the personal or social attributes of their protagonist; his race, nationality, religion, class, and personal qualities are as such irrelevant. Objectivity precludes particularism. The circumstance that scientifically verified formulations refer in that specific sense to objective sequences and correlations militates against all efforts to impose particularistic criteria of validity. The Haber process cannot be invalidated by a Nuremberg decree nor can an Anglophobe repeal the law of gravitation. The chauvinist may expunge the names of alien scientists from historical textbooks but their formulations remain indispensable to science and technology. However *echt-deutsch* or hundred-percent American the final increment, some aliens are accessories before the fact of every new scientific advance. The imperative of universalism is rooted deep in the impersonal character of science.

5. For a basic analysis of universalism in social relations, see Talcott Parsons. *The Social System* (New York: Free Press, 1951). For an expression of the belief that "science is wholly independent of national boundaries and races and creeds," see the resolution of the Council of the American Association for the Advancement of Science, *Science* 87 (1938): 10; also, "The Advancement of Science and Society: Proposed World Association," *Nature* 141 (1938): 169.

However, the institution of science is part of a larger social structure with which it is not always integrated. When the larger culture opposes universalism, the ethos of science is subjected to serious strain. Ethnocentrism is not compatible with universalism. Particularly in times of international conflict, when the dominant definition of the situation is such as to emphasize national loyalties, the man of science is subjected to the conflicting imperatives of scientific universalism and of ethnocentric particularism.[6] The structure of the situation in which he finds himself determines the social role that is called into play. The man of science may be converted into a man of war—and act accordingly. Thus, in 1914 the manifesto of ninety-three German scientists and scholars—among them, Baeyer, Brentano, Ehrlich, Haber, Eduard Meyer, Ostwald, Planck, Schmoller, and Wassermann—unloosed a polemic in which German, French, and English men arrayed their political selves in the garb of scientists. Dispassionate scientists impugned "enemy" contributions, charging nationalistic bias, log-rolling, intellectual dishonesty, incompetence, and lack of creative capacity.[7] Yet this very deviation from the norm of universalism actually presupposed the legitimacy of the norm. For nationalistic bias is opprobrious only if judged in terms of the standard of universalism; within another institutional context, it is redefined as a virtue, patriotism. Thus in the process of condemning their violation, the mores are reaffirmed.

6. This stands as written in 1942. By 1948, the political leaders of Soviet Russia strengthened their emphasis on Russian nationalism and began to insist on the "national" character of science. Thus, in an editorial, "Against the Bourgeois Ideology of Cosmopolitanism," *Voprosy filosofii*, no. 2 (1948), as translated in the *Current Digest of the Soviet Press* 1, no. 1 (1 February 1949): 9: "Only a cosmopolitan without a homeland, profoundly insensible to the actual fortunes of science, could deny with contemptuous indifference the existence of the many-hued national forms in which science lives and develops. In place of the actual history of science and the concrete paths of its development, the cosmopolitan substitutes fabricated concepts of a kind of supernational, classless science, deprived, as it were, of all the wealth of national coloration, deprived of the living brilliance and specific character of a people's creative work, and transformed into a sort of disembodied spirit . . . Marxism-Leninism shatters into bits the cosmopolitan fictions concerning supra-class, non-national, 'universal' science, and definitely proves that science, like all culture in modern society, is national in form and class in content." This view confuses two distinct issues: first, the cultural context in any given nation or society may predispose scientists to focus on certain problems, to be sensitive to some and not other problems on the frontiers of science. This has long since been observed. But this is basically different from the second issue: the criteria of validity of claims to scientific knowledge are not matters of national taste and culture. Sooner or later, competing claims to validity are settled by universalistic criteria.

7. For an instructive collection of such documents, see Gabriel Pettit and Maurice Leudet, *Les allemands et la science* (Paris, 1916). Félix de Dantec, for example, discovers that both Ehrlich and Weismann have perpetrated typical German frauds upon the world of science. ("Le bluff de la science allemande.") Pierre Duhem concludes that the "geometric spirit" of German science stifled the "spirit of finesse": *La science allemande* (Paris 1915). Hermann Kellermann, *Der Krieg der Geister* (Weimar, 1915) is a spirited counterpart. The conflict persisted into the postwar period; see Karl Kherkhof, *Der Krieg gegen die Deutsche Wissenschaft* (Halle, 1933).

Even under counter-pressure, scientists of all nationalities adhered to the universalistic standard in more direct terms. The international, impersonal, virtually anonymous character of science was reaffirmed.[8] (Pasteur: "Le savant a une patrie, la science n'en a pas.") Denial of the norm was conceived as a breach of faith.

Universalism finds further expression in the demand that careers be open to talents. The rationale is provided by the institutional goal. To restrict scientific careers on grounds other than lack of competence is to prejudice the furtherance of knowledge. Free access to scientific pursuits is a functional imperative. Expediency and morality coincide. Hence the anomaly of a Charles II invoking the mores of science to reprove the Royal Society for their would-be exclusion of John Graunt, the political arithmetician, and his instructions that "if they found any more such tradesmen, they should be sure to admit them without further ado."

Here again the ethos of science may not be consistent with that of the larger society. Scientists may assimilate caste-standards and close their ranks to those of inferior status, irrespective of capacity or achievement. But this provokes an unstable situation. Elaborate ideologies are called forth to obscure the incompatibility of caste-mores and the institutional goal of science. Caste-inferiors must be shown to be inherently incapable of scientific work, or, at the very least, their contributions must be systematically devaluated. "It can be adduced from the history of science that the founders of research in physics, and the great discoverers from Galileo and Newton to the physical pioneers of our own time, were almost exclusively Aryans, predominantly of the Nordic race." The modifying phrase, "almost exclusively," is recognized as an insufficient basis for denying outcastes all claims to scientific achievement. Hence the ideology is rounded out by a conception of "good" and "bad" science: the realistic, pragmatic science of the Aryan is opposed to the dogmatic, formal science of the non-Aryan.[9] Or, grounds for exclusion are sought in the extrascientific capacity of men of science as enemies of the state or church.[10] Thus, the

8. See the profession of faith by Professor E. Gley (in Pettit and Leudet, *Les allemands et la science*, p. 181): "il ne peut y avoir une vérité allemande, anglaise, italienne ou japonaise pas plus qu'une française. Et parler de science allemande. anglaise ou française, c'est énoncer une proposition contradictoire à l'idée même de science." See also the affirmations of Grasset and Richet, ibid.

9. Johannes Stark, *Nature* 141 (1938): 772; "Philipp Lenard als deutscher Naturforscher," *Nationalsozialistische Monatshefte* 7 (1936): 106–12. This bears comparison with Duhem's contrast between "German" and "French" science.

10. "Wir haben sie ['marxistischen Leugner'] nicht entfernt als Vertreter der Wissenschaft, sondern als Parteigaenger einer politischen Lehre, die den Umsturz aller Ordnungen auf ihre Fahne geschrieben hatte. Und wir mussten hier um so entschlossener zugreifen, als ihnen die herrschende Ideologie einer wertfreien und voraussetzungslosen Wissenschaft ein willkommener Schutz fuer die Fortfuehrung ihrer Plaene zu sein schien. Nicht wir haben uns an der Wuerde der freien Wissenschaft vergangen. . ." Bernhard Rust, *Das nationalsozialistische Deutschland und die Wissenschaft* (Hamburg: Hanseatische Verlagsanstalt, 1936), p. 13.

exponents of a culture which abjures universalistic standards in general feel constrained to pay lip service to this value in the realm of science. Universalism is deviously affirmed in theory and suppressed in practice.

However inadequately it may be put into practice, the ethos of democracy includes universalism as a dominant guiding principle. Democratization is tantamount to the progressive elimination of restraints upon the exercise and development of socially valued capacities. Impersonal criteria of accomplishment and not fixation of status characterize the open democratic society. Insofar as such restraints do persist, they are viewed as obstacles in the path of full democratization. Thus, insofar as laissez-faire democracy permits the accumulation of differential advantages for certain segments of the population, differentials that are not bound up with demonstrated differences in capacity, the democratic process leads to increasing regulation by political authority. Under changing conditions, new technical forms of organization must be introduced to preserve and extend equality of opportunity. The political apparatus may be required to put democratic values into practice and to maintain universalistic standards.

"Communism"

"Communism," in the nontechnical and extended sense of common ownership of goods, is a second integral element of the scientific ethos. The substantive findings of science are a product of social collaboration and are assigned to the community. They constitute a common heritage in which the equity of the individual producer is severely limited. An eponymous law or theory does not enter into the exclusive possession of the discoverer and his heirs, nor do the mores bestow upon them special rights of use and disposition. Property rights in science are whittled down to a bare minimum by the rationale of the scientific ethic. The scientist's claim to "his" intellectual "property" is limited to that of recognition and esteem which, if the institution functions with a modicum of efficiency, is roughly commensurate with the significance of the increments brought to the common fund of knowledge. Eponymy—for example, the Copernican system, Boyle's law—is thus at once a mnemonic and a commemorative device.

Given such institutional emphasis upon recognition and esteem as the sole property right of the scientist in his discoveries, the concern with scientific priority becomes a "normal" response. Those controversies over priority which punctuate the history of modern science are generated by the institutional accent on originality.[11] There issues a competitive coopera-

11. Newton spoke from hard-won experience when he remarked that "[natural] philosophy is such an impertinently litigious Lady, that a man had as good be engaged in lawsuits, as have to do with her." Robert Hooke, a socially mobile individual whose rise in status rested solely on his scientific achievements, was notably "litigious."

tion. The products of competition are communized,[12] and esteem accrues to the producer. Nations take up claims to priority, and fresh entries into the commonwealth of science are tagged with the names of nationals: witness the controversy raging over the rival claims of Newton and Leibniz to the differential calculus. But all this does not challenge the status of scientific knowledge as common property.

The institutional conception of science as part of the public domain is linked with the imperative for communication of findings. Secrecy is the antithesis of this norm; full and open communication its enactment.[13] The pressure for diffusion of results is reenforced by the institutional goal of advancing the boundaries of knowledge and by the incentive of recognition which is, of course, contingent upon publication. A scientist who does not communicate his important discoveries to the scientific fraternity—thus, a Henry Cavendish—becomes the target for ambivalent responses. He is esteemed for his talent and, perhaps, for his modesty. But, institutionally considered, his modesty is seriously misplaced, in view of the moral compulsive for sharing the wealth of science. Layman though he is, Aldous Huxley's comment on Cavendish is illuminating in this connection: "Our admiration of his genius is tempered by a certain disapproval; we feel that such a man is selfish and anti-social." The epithets are particularly instructive for they imply the violation of a definite institutional imperative. Even though it serves no ulterior motive, the suppression of scientific discovery is condemned.

The communal character of science is further reflected in the recognition by scientists of their dependence upon a cultural heritage to which they lay no differential claims. Newton's remark—"If I have seen farther it is

12. Marked by the commercialism of the wider society though it may be, a profession such as medicine accepts scientific knowledge as common property. See R. H. Shryock, "Freedom and Interference in Medicine," *The Annals* 200 (1938): 45. "The medical profession . . . has usually frowned upon patents taken out by medical men. . . . The regular profession has . . . maintained this stand against private monopolies ever since the advent of patent law in the seventeenth century." There arises an ambiguous situation in which the socialization of medical practice is rejected in circles where the socialization of knowledge goes unchallenged.

13. Cf. Bernal, who observes: "The growth of modern science coincided with a definite rejection of the ideal of secrecy." Bernal quotes a remarkable passage from Réaumur (*L'Art de convertir le forgé en acier*) in which the moral compulsion for publishing one's researches is explicitly related to other elements in the ethos of science. For example, "il y eût gens qui trouvèrent étrange que j'eusse publié des secrets, qui ne devoient pas etre revelés . . . est-il bien sur que nos découvertes soient si fort à nous que le Public n'y ait pas droit, qu'elles ne lui appartiennent pas en quelque sorte? . . . resterait il bien des circonstances, où nous soions absolument Maîtres de nos découvertes? . . . Nous nous devons premiérement à notre Patrie, mais nous nous devons aussi au rest du monde; ceux qui travaillent pour perfectionner les Sciences et les Arts, doivent même se regarder commes les citoyens du monde entier" (J. D. Bernal, *The Social Function of Science* [New York: Macmillan, 1939] pp. 150–51).

by standing on the shoulders of giants"—expresses at once a sense of indebtedness to the common heritage and a recognition of the essentially cooperative and selectively cumulative quality of scientific achievement.[14] The humility of scientific genius is not simply culturally appropriate but results from the realization that scientific advance involves the collaboration of past and present generations. It was Carlyle, not Maxwell, who indulged in a mythopoeic conception of history.

The communism of the scientific ethos is incompatible with the definition of technology as "private property" in a capitalistic economy. Current writings on the "frustration of science" reflect this conflict. Patents proclaim exclusive rights of use and, often, nonuse. The suppression of invention denies the rationale of scientific production and diffusion, as may be seen from the court's decision in the case of *U.S.* v. *American Bell Telephone Co.*: "The inventor is one who has discovered something of value. It is his absolute property. He may withhold the knowledge of it from the public."[15] Responses to this conflict-situation have varied. As a defensive measure, some scientists have come to patent their work to ensure its being made available for public use. Einstein, Millikan, Compton, Langmuir have taken out patents.[16] Scientists have been urged to become promoters of new economic enterprises.[17] Others seek to resolve the conflict by advocating socialism.[18] These proposals—both those which demand economic returns for scientific discoveries and those which demand a change in the social system to let science get on with the job—reflect discrepancies in the conception of intellectual property.

Disinterestedness

Science, as is the case with the professions in general, includes disinterestedness as a basic institutional element. Disinterestedness is not to be equated with altruism nor interested action with egoism. Such equivalences

14. It is of some interest that Newton's aphorism is a standardized phrase which had found repeated expression from at least the twelfth century. It would appear that the dependence of discovery and invention on the existing cultural base had been noted some time before the formulations of modern sociologists. See *Isis* 24 (1935): 107–9; 25 (1938): 451–52.

15. 167 U. S. 224 (1897), cited by B. J. Stern, "Restraints upon the Utilization of Inventions," *The Annals* 200 (1938): 21. For an extended discussion, cf. Stern's further studies cited therein, also Walton Hamilton, *Patents and Free Enterprise*, Temporary National Economic Committee Monograph no. 31 (1941).

16. Hamilton, *Patents and Free Enterprise*, p. 154; J. Robin, *L'oeuvre scientifique: sa protection-juridique* (Paris, 1928).

17. Vannevar Bush, "Trends in Engineering Research," *Sigma Xi Quarterly* 22 (1934): 49.

18. Bernal, *The Social Function of Science*, pp. 155 ff.

confuse institutional and motivational levels of analysis.[19] A passion for knowledge, idle curiosity, altruistic concern with the benefit to humanity, and a host of other special motives have been attributed to the scientist. The quest for distinctive motives appears to have been misdirected. It is rather a distinctive pattern of institutional control of a wide range of motives which characterizes the behavior of scientists. For once the institution enjoins disinterested activity, it is to the interest of scientists to conform on pain of sanctions and, insofar as the norm has been internalized, on pain of psychological conflict.

The virtual absence of fraud in the annals of science, which appears exceptional when compared with the record of other spheres of activity, has at times been attributed to the personal qualities of scientists. By implication, scientists are recruited from the ranks of those who exhibit an unusual degree of moral integrity. There is, in fact, no satisfactory evidence that such is the case; a more plausible explanation may be found in certain distinctive characteristics of science itself. Involving as it does the verifiability of results, scientific research is under the exacting scrutiny of fellow experts. Otherwise put—and doubtless the observation can be interpreted as lese majesty—the activities of scientists are subject to rigorous policing, to a degree perhaps unparalleled in any other field of activity. The demand for disinterestedness has a firm basis in the public and testable character of science and this circumstance, it may be supposed, has contributed to the integrity of men of science. There is competition in the realm of science, competition that is intensified by the emphasis on priority as a criterion of achievement, and under competitive conditions there may well be generated incentives for eclipsing rivals by illicit means. But such impulses can find scant opportunity for expression in the field of scientific research. Cultism, informal cliques, prolific but trivial publications—these and other techniques may be used for self-aggrandizement.[20] But, in general, spurious claims appear to be negligible and ineffective. The translation of the norm of disinterestedness into practice is effectively supported by the ultimate accountability of scientists to their compeers. The dictates of socialized sentiment and of expediency largely coincide, a situation conducive to institutional stability.

In this connection, the field of science differs somewhat from that of other professions. The scientist does not stand vis-à-vis a lay clientele in the same fashion as do the physician and lawyer, for example. The possi-

19. Talcott Parsons, "The Professions and Social Structure," *Social Forces* 17 (1939): 458–59; cf. George Sarton, *The History of Science and the New Humanism* (New York, 1931), p. 130 ff. The distinction between institutional compulsives and motives is a key, though largely implicit, conception of Marxist sociology.

20. See the account of Logan Wilson, *The Academic Man* (New York: Oxford University Press, 1941), p. 201 ff.

bility of exploiting the credulity, ignorance, and dependence of the layman is thus considerably reduced. Fraud, chicane, and irresponsible claims (quackery) are even less likely than among the "service" professions. To the extent that the scientist-layman relation does become paramount, there develop incentives for evading the mores of science. The abuse of expert authority and the creation of pseudo-sciences are called into play when the structure of control exercised by qualified compeers is rendered ineffectual.[21]

It is probable that the reputability of science and its lofty ethical status in the estimate of the layman is in no small measure due to technological achievements.[22] Every new technology bears witness to the integrity of the scientist. Science realizes its claims. However, its authority can be and is appropriated for interested purposes, precisely because the laity is often in no position to distinguish spurious from genuine claims to such authority. The presumably scientific pronouncements of totalitarian spokesmen on race or economy or history are for the uninstructed laity of the same order as newspaper reports of an expanding universe or wave mechanics. In both instances, they cannot be checked by the man-in-the-street and in both instances, they may run counter to common sense. If anything, the myths will seem more plausible and are certainly more comprehensible to the general public than accredited scientific theories, since they are closer to common-sense experience and to cultural bias. Partly as a result of scientific achievements, therefore, the population at large becomes susceptible to new mysticisms expressed in apparently scientific terms. The borrowed authority of science bestows prestige on the unscientific doctrine.

Organized Skepticism

As we have seen in the preceding chapter, organized skepticism is variously interrelated with the other elements of the scientific ethos. It is both a methodological and an institutional mandate. The temporary suspension of judgment and the detached scrutiny of beliefs in terms of empirical and logical criteria have periodically involved science in conflict with other institutions. Science which asks questions of fact, including potentialities, concerning every aspect of nature and society may come into conflict with other attitudes toward these same data which have been crystallized and often ritualized by other institutions. The scientific investigator does not preserve the cleavage between the sacred and the profane, between that

21. Cf. R. A. Brady, *The Sprit and Structure of German Fascism* (New York: Viking, 1937), chap. 2; Martin Gardner, *In the Name of Science* (New York: Putnam's, 1953).

22. Francis Bacon set forth one of the early and most succinct statements of this popular pragmatism: "Now these two directions—the one active, the other contemplative—are one and the same thing; and what in operation is most useful, that in knowledge is most true" (*Novum Organum*, book 2, aphorism 4).

which requires uncritical respect and that which can be objectively analyzed.

As we have noted, this appears to be the source of revolts against the so-called intrusion of science into other spheres. Such resistance on the part of organized religion has become less significant as compared with that of economic and political groups. The opposition may exist quite apart from the introduction of specific scientific discoveries which appear to invalidate particular dogmas of church, economy, or state. It is rather a diffuse, frequently vague, apprehension that skepticism threatens the current distribution of power. Conflict becomes accentuated whenever science extends its research to new areas toward which there are institutionalized attitudes or whenever other institutions extend their control over science. In modern totalitarian society, anti-rationalism and the centralization of institutional control both serve to limit the scope provided for scientific activity.