Understanding the Merton Thesis

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*By Steven Shapin**

FIFTY YEARS ON, the Merton thesis continues to arouse historians' passions. It is difficult to understand why. There has never been a celebrated historical theory so cautiously framed, so methodologically eclectic, so hedged about with qualifications as to its form, content, and consequences, and so temperately expressed. Robert Merton and his defenders are accustomed to say that his thesis has been "misunderstood." They are being much too kind to certain of the critics. One is tempted to put the case more strongly than that. On the evidence of some of those historians who have endeavored to refute what they represent to be his thesis, Merton's 1938 monograph and related texts can scarcely have been read at all. Merton is quite right to complain at the cavalier treatment he has received at the hands of his critics in the historical community. Modern literary theory rightly suggests that the meaning of a text is not determined by its structure or content, nor indeed by the author's intentions. Nevertheless, it is both a useful convention and a justifiable moral sanction in the academic world that interpretations and understandings be at least occasionally disciplined by reminding readers of *what is written* in the relevant text. How did Merton himself define and characterize his hypothesis? What bearing did these representations have on its subsequent career in the academic world?

First, what was the nature of the thing that Merton was trying to explain? Here, at the very core of his enterprise, historians nervous about the black beast of "externalism" should be reassured. Neither in his 1938 text nor in subsequent writings was Merton ever concerned to adduce social factors to explain the form or content of scientific knowledge or scientific method. Indeed, it is a plausible hypothesis that our present-day language of "internal" and "external" factors, as well as the validation of an overwhelmingly "internalist" historiography of scientific ideas, actually originated with Merton and the circle of scholars with whom he studied and worked in the 1930s. Thus, for example, Merton was exceedingly careful to dissociate himself explicitly from any enterprise (e.g., that of the Marxist Boris Hessen) that sought to account for scientific method or knowledge by reference to social or economic considerations, or, indeed, by reference to nonscientific cultural factors such as religion.[1] Merton's claims were "not to imply that the discoveries of Newton, Boyle or other scientists can be directly attributed to the sanction of science by religion. Specific discoveries and inventions belong to the internal history of science and are largely independent of factors other than the purely scientific." And in an essay published even before

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[1] For Merton's repudiation of "vulgar materialism" see Robert K. Merton, "Science and Economy of Seventeenth Century England," in Merton, *Social Theory and Social Structure,* rev. ed. (New York: Free Press, 1957), pp. 607–627, esp. p. 607 (orig. publ. in *Science and Society,* 1939, *3*:3–27). Merton made liberal use of Boris Hessen's empirical findings in his 1938 text while distancing his own enterprise from Hessen's materialist perspective: see, e.g., Robert K. Merton, *Science, Technology and Society in Seventeenth-Century England* (orig. publ. in *Osiris,* 1938, *4*:360–632) (New York: Howard Fertig/Harper Torchbooks, 1970), pp. 142 n. 24, 206–207, 206 n. 8.

the 1938 text Merton conceded that "the Puritan ethos did not directly influence the method of science and that this was simply a parallel development in the internal history of science." Furthermore, even smaller-scale changes in the foci of scientific interest "are primarily determined by the internal history of science," and Merton delivered the study of these "short-time fluctuations" to "the province of the historian of science rather than that of the sociologist or the student of culture."[2] Far from poaching the traditional game of historians of science, Merton was actually offering them further resources by which they might protect scientific knowledge from sociological scrutiny.

For Merton, the explanandum was emphatically not scientific method or scientific knowledge: it was the dynamics and social standing of a scientific enterprise that was itself conceived of as a black box. There was no reason to open up the box that contained scientific procedures and knowledge; there was nothing sociological to be said about what was in the box. On the one hand, Merton was concerned to offer a causal hypothesis about the social and cultural dynamics of science as a whole in England during the latter part of the seventeenth century; on the other, he attempted to account for shifting patterns of interest in different scientific and technological problem-areas or disciplines. Thus, one part of his enterprise was designed to explain "increased attention to science," "the growth of interest in science and technology," "the increased tempo of scientific activity," "the enhanced cultivation of science," the "elevat[ion] of science to a place of high regard in the social system of values," the fact that science was "positively sanctioned"; while another part aimed to account for relatively large-scale changes in the "foci of scientific interests." "Which forces guided the interests of scientists and inventors into particular channels?"[3] Why, for example, was there an increase in attention to aerostatics and hydrostatics in the setting with which Merton was concerned? Why was so much of seventeenth-century English science (as Merton claimed) geared toward economic and military ends?

Even those historians who have most unfairly misrepresented the status of Merton's thesis seem to have a rough-and-ready appreciation of his explanans, the entity Merton used causally to account for the upsurge of interest in and approval of science and technology: it is, of course, something to do with religion, specifically with Puritan strands of religion. I shall examine the precise nature of Merton's explanans later, but first Merton may be exculpated from unwarranted charges of historiographic hubris, especially from accusations that he advanced a simplistic, or even a simple, monocausal explanation and that the particular explanation he offered possessed general historical applicability. Almost no historian, for instance, seems to have read carefully and digested the qualifications and supplementations of the Puritanism thesis to be found in Chapter XI of Merton's 1938 text. Here he warned that "any attempt to formulate a comprehensive sociological theory of scientific development at this time must be considered premature." Merton then proceeded to point to "further orders of factors," some cultural, some social, that might be thought relevant to explaining the historical materials with which he was concerned. These included

[2] Merton, *Science, Technology,* p. 75; Merton, "Puritanism, Pietism and Science," in Merton, *Social Theory and Social Structure,* pp. 574–606, on p. 579 (orig. publ. in *Sociological Review,* 1936, *28*:1–30); and Merton, *Science, Technology,* pp. 48, 50.

[3] For these and similar expressions see Merton, *Science, Technology,* pp. 27–28, 73, 75, 80, 137, 157, 197; and Merton, "Puritanism, Pietism," p. 574.

interesting speculations about population density, the rates and modes of social interaction characteristic of different societies, and other features of the cultural context not included in religious constructs.[4] And in the essay published before the 1938 text Merton carefully noted that Puritanism only "constitute[d] one important *element* in the enhanced cultivation of science." In other settings "a host of other factors—economic, political, and above all the self-fertilizing movement of science itself"—worked "to swell the rising scientific current." Since science burgeoned in Catholic sixteenth-century Italy, Merton freely acknowledged that "these associated factors" might come to "outweigh the religious component."[5] (Merton thus aroused curiosity about these other social and economic factors, but said nothing that systematically addressed their rôle.) So science can flourish in Catholic environments after all. Ascetic Protestantism, Merton said, is a powerful motive force to science, but not so powerful that its action cannot be masked by other factors; Catholicism is a powerful antagonistic force, but not so powerful that other factors present in a Catholic culture cannot yield a flourishing science.

And even when we focus just upon the causal role of Puritanism and the utilitarian ethos associated with it, we are obliged to acknowledge the explanatory limits Merton placed upon these considerations. How far, for example, are seventeenth-century English scientific developments (even as Merton restrictively defined them) to be accounted for by "extrinsic" factors? Concluding his discussion of the effects of military and economic "needs," Merton cautiously disavowed any unambiguous claim that these needs sufficiently determined even the foci of scientific interest. "The extent of this influence is still problematic. It is by no means certain that much the same distribution of interests would not have occurred, irrespective of this external pressure. Many of these problems likewise flowed directly from the intrinsic developments of science." He argued only that "*some* rôle must be accorded these factors external to science, properly so-called." In 1970 Merton further stressed the circumscribed status of his explanatory claims for Puritanism. He was not saying that "without Puritanism, there could have been no concentrated development of modern science in seventeenth-century England," nor that Puritanism was a "prerequisite to the substantial thrust of English science in that time." Other "ideological movements" (Catholicism?) *could have* performed the functions discharged by Puritanism; *"as it happened,"* it was Puritanism that "provided major (not exclusive) support in that historical time and place. But that does not make it indispensable." In the same preface to the reprinting of *Science, Technology and Society* Merton endorsed "the subdued concluding sentence of this aged but perhaps not yet obsolete essay." The 1938 text, we recall, ended with a sentence of typically gracious academic modesty: "On the basis of the foregoing study, it may not be too much to conclude that the cultural soil of seventeenth century England was peculiarly fertile for the growth and spread of science."[6]

Note the domain of application. The thesis is identified here as a story about

[4] Merton, *Science, Technology,* p. 208.

[5] Merton, "Puritanism, Pietism," pp. 574–575 (emphasis in original); and Merton, *Science, Technology,* p. 136. It is unclear how liberal references here to the role of various "factors" relate to Merton's later denial that he espoused a "doctrine of 'factors' ": Merton, "Preface: 1970," *ibid.,* pp. vii–xxxii, on p. x.

[6] Merton, *Science, Technology,* pp. 198; xviii, xxix ("Preface: 1970"); 238 (emphases in original).

seventeenth-century England, indeed, to be precise, about certain specific developments of scientific dynamics in England in the seventeenth century after the Restoration. It is no simple matter to understand how some historians have conflated such a circumscribed thesis with global claims about the relations between science, society, and religion. Insofar as "extrinsic factors" do play a role in Merton's claims, he formally acknowledged the limits thereby placed upon causal accounting. Merton approvingly quoted his teacher George Sarton's eclectic contention that even mathematical discoveries were "conditioned by outside events of every kind. . . . However, we think that those events were only some of the factors among others, factors the power of which might vary and did vary from time to time." What was true of mathematics was, Merton said, also true of science. Since "these extrinsic conditioning factors" are variable, it follows "that we cannot extend our findings for the seventeenth century without further ado to the history of science in general."[7]

Of course, Merton *did,* both in portions of the 1938 text and in an earlier essay, attempt to give his thesis rather greater scope. He endeavored, that is, to constitute and to instantiate the seventeenth-century English science-and-Puritanism thesis as one of his celebrated "theories of the middle range."[8] For instance, Merton's 1936 essay "Puritanism, Pietism and Science," a version of Chapter VI of *Science, Technology and Society,* did suggest some ways of establishing a thesis that might apply to later periods and in different countries. Here he systematically mobilized evidence from eighteenth- and nineteenth-century Germany to argue that "the impression made by this [Protestant] ethic has lasted long after much of its theological basis has been largely disavowed." Indeed, the 1957 bibliographic postscript to that essay reasserted and refined the claim for persistence, citing 1940s and 1950s studies of U.S. scientists that purported to show a disproportionately large representation of Protestants and a correspondingly small representation of Catholics.[9]

If the precise nature of Merton's explanandum (the dynamics of science taken as a whole in a specific context) has been widely "misunderstood" by historians, the status and mode of action of his explanans has never even been accurately stated by his critics in the historical community. If this is indeed a causal hypothesis relating some religious entity and the dynamics of science, what is that religious entity and how does it exert its effects upon social action? Gary Abraham has rightly identified important sources of confusion among historians on this head.[10] When Merton alluded to the motive force of a religious entity, he did not equate this entity with a church or a specific set of theological doctrines nor,

[7] Merton, *Science, Technology,* pp. 199–200 (quoting George Sarton, *The Study of the History of Mathematics* [Cambridge, Mass.: Harvard Univ. Press, 1936], pp. 15–16); and Merton, "Preface: 1970," p. x, where he warned that his inquiry did not suppose "that the character of the interchanges that occurred in this period is much the same in other cultures and other times."

[8] Merton, *Social Theory and Social Structure* (cit. n. 1), p. 5. See also Merton's cautious backing away from the more "far-reaching questions" about the cultural causes of ascetic Protestantism that characterized his teacher Pitirim Sorokin's work on social and cultural dynamics: Merton, *Science, Technology,* p. 136.

[9] Merton, "Puritanism, Pietism" (cit. n. 2), pp. 583, 602, 605; and Merton, *Science, Technology,* pp. 119–136, where, however, the bases of this "persistence" are not discussed.

[10] Gary A. Abraham, "Misunderstanding the Merton Thesis: A Boundary Dispute between History and Sociology," *Isis,* 1983, *74*:368–387, on pp. 373–374. Abraham's article is an excellent diagnosis of some of the grounds of blocked understanding between Merton and historians. It should be clear to what extent my argument agrees with and diverges from his.

indeed, with formal religious beliefs or the maxims that gave voice to these beliefs.[11] It is not that Merton was "vague" about the nature and extent of something called "Puritanism," "the Protestant ethic," or "ascetic Protestantism." The motive force was in fact exerted by an entity that, so to speak, "lay behind" any cultural expression of "Puritanism" as it is usually understood. Although Merton persistently referred to and named this motive force, I cannot discover that any of his followers or critics have appreciated what it is and how it is said to influence social action.

The entity is most commonly designated as a "sentiment." Throughout the 1938 monograph Merton repeatedly pointed to the role of "sentiments" as ultimate motive forces responsible for social action, in this case for the pursuit and active approval of science.[12] Thus, among very many examples, Merton said he sought to identify "the dominant values and sentiments," "the general climate of sentiment and belief [that] invariably influence[s] the development of science"; he referred to "the motive power of sentiment" and described the Puritan advocacy of experimental science as "the inevitable outcome of an emotionally consistent circle of sentiments and beliefs."[13] Strictly speaking, sentiments are *not* to be equated with any particular form of cultural expression. Instead, sentiments are to be regarded as socially patterned psychic structures that lie behind, give form to, and animate a more or less coherent body of cultural expressions, such as those articulated by the publicists of the "Protestant ethic." It is therefore the sentiments, not the religious or ethical doctrines, to which motive force is properly attributed. In outlining his characteristic "Sociological Approach," Merton said that the sociologist's task is to uncover "the sentiments crystallized in religious values and the cultural orientation which governs their expression." While alluding to "the powerful motivations which derived from Puritanism," Merton clearly did not ascribe motive force to the *expression* of religious values but to the underlying sentiments:

> We must probe under the surface of theological contentions to the sentiments which govern their meaning. The religious component of thought, belief and action becomes effective only when it is reinforced by strong sentiments which lend meaning to certain forms of conduct. These sentiments find expression in word and deed alike. . . . We are concerned with verbal responses, religious exhortations and appeals, in so far as they enable us to arrive at the motivating sentiments which give rise to these ideas and the behaviors associated with them.[14]

Sentiments, therefore, are the theoretically posited mental entities that make Merton's system go, that lie behind the expression of religious values and exert force upon social action. Remarkably, in light of the fundamental importance of sentiments in Merton's scheme, he nowhere said what they are or clearly indicated where they came from in traditions of sociological discourse. In fact, the vocabulary of sentiments and the ascription to them of social force was not at all

[11] Merton, *Science, Technology,* p. 100.

[12] Apparently alternative or equivalent locutions in Merton's work include "value attitudes," "basic values," "dominant ideals," etc.; see, e.g., Merton, "Puritanism, Pietism," pp. 574, 577; and Merton, *Science, Technology,* p. 79. It is perhaps noteworthy that the language of "sentiments" is absent from Merton's 1936 "Puritanism, Pietism" and is pervasive in his 1938 text.

[13] Merton, *Science, Technology,* pp. 80, 111, 115; for other invocations of "sentiments" see, e.g., pp. 58, 60, 75–76, 79.

[14] *Ibid.,* pp. 55–56.

a commonsensical usage in Merton's work. In the United States in the 1930s, the deployment of the language of sentiments in formal sociological theorizing was a specific and technical usage, embedded within a particular and highly charged theoretical and ideological tradition. Most usually, it indicated affiliation to the sociological theories of Vilfredo Pareto (1848–1923).[15] Put unconscionably briefly, Pareto's system was founded upon an analytical triangle (see Figure 1), the apexes of which were two observable entities—human actions (*B*) and statements about those actions (*C*)—and one hypothetical entity—the psychological or neurological states (*A*) that disposed men toward their actions. This last entity

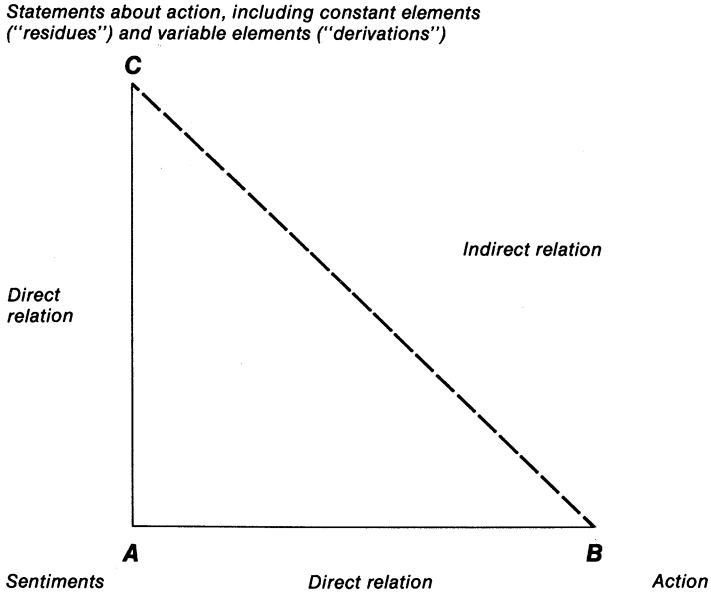

Figure 1. *Pareto's analytic scheme; adapted from Vilfredo Pareto,* A Treatise on General Sociology *(1916; New York: Dover, 1963), Vol. I, p. 88.*

was what Pareto called a sentiment. Sentiments were integral to the Paretan scheme, yet in the strict sense sociologists did not have to analyze the nature of sentiments. They were unobservable mental states, and a leading Harvard Paretan said that "we leave them to the psychologists and affirm that their study is for our purposes inconvenient and unnecessary. . . . All we are interested in are . . . the things we can directly observe." But in loose usage, sentiments were also identified with the Paretan category of "residues" as opposed to "derivations." Residues were conceived as the constant elements, derivations the variable elements, in people's statements about their actions. Thus Paretans contended that residues (verbal behaviors) might, without undue impropriety, be identified with the sentiments (mental states) underlying them.[16]

[15] The masterwork is Vilfredo Pareto, *A Treatise on General Sociology,* 4 vols. bound as 2, trans. Andrew Bongiorno and Arthur Livingston (New York: Dover, 1963) (orig. publ. in Italian in 1916).

[16] George C. Homans and Charles P. Curtis, Jr., *An Introduction to Pareto: His Sociology* (New York: Knopf, 1934), pp. 78–81, 88–89; and Pareto, *Treatise,* Vol. I, pp. 88–94. Sentiments are also technically invoked in the sociology of Emile Durkheim; see, e.g., Durkheim, *Selected Writings,* ed.

Pareto's system of sociology was avidly taken up and propagated by a circle of sociologists at Harvard in the 1930s. The instigator of the Harvard "Pareto circle" was the functionalist biologist and sociologist L. J. Henderson, and the seminar on Pareto over which Henderson presided from 1932 included the young Robert Merton, as well as George Homans, Talcott Parsons, and the industrial sociologist Elton Mayo. Barbara Heyl has argued that Paretan sociology was attractive to Harvard intellectuals because it was a grand historical theory that seemed to "provide an alternative to the Marxist approach."[17] George Homans, perhaps the most vigorous publicist of Pareto's views, said that he "took to Pareto" because, "as a Republican Bostonian who had not rejected his comparatively wealthy family, I felt during the thirties that I was under personal attack, above all from the Marxists. I was ready to believe Pareto because he provided me with a defense." Whether other members of the circle were attracted to Pareto for similar political reasons is unclear and arguably irrelevant, although Homans found these considerations highly relevant, as he did the task of acquitting Pareto from the charge of being the " 'Karl Marx of Fascism.' "[18] What is evident is that Pareto seemed to provide important resources for constructing an all-embracing sociological system that avoided what members of the Harvard circle took to be the *intellectual* failings of Marxist orientations. Among these perceived failings were the Marxist insistence upon the rationality of human behavior, the oversimplified nature of its causal schemes, and the materialist neglect of the role of ideas in social action.

Members of the circle took up Pareto's ideas to varying extents and put them to various uses. For example, Elton Mayo, though never "a full-fledged Paretan," deployed a Paretan vocabulary of sentiments to depict as irrational yet meaningful the behavior of workers in the famous Hawthorne experiments that provided the foundations of the discipline of industrial sociology.[19] And Merton's 1938 text bears eclectic but unmistakable marks of leading Paretan

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and trans. Anthony Giddens (Cambridge: Cambridge Univ. Press, 1972), p. 219. However, while Merton wrote a review of Durkheim's *Division of Labour in Society* in 1934, there is only one oblique mention of Durkheim in *Science, Technology* (p. 60 n. 10). For perceived opposition between Pareto and Durkheim see Homans and Curtis, *Introduction to Pareto,* pp. 90–92.

[17] Barbara S. Heyl, "The Harvard 'Pareto Circle,' " *Journal of the History of the Behavioral Sciences,* 1968, *4*:316–334, on p. 317. For Merton's attendance at the Pareto seminar see Robert K. Merton, "The Sociology of Science: An Episodic Memoir," in *The Sociology of Science in Europe,* ed. Merton and Jerry Gaston (Carbondale: Southern Illinois Univ. Press, 1977), pp. 3–141, on p. 120 n. 32. For Merton's familiarity with European sociological perspectives generally see Lewis A. Coser, "Merton's Uses of the European Sociological Tradition," in *The Idea of Social Structure: Papers in Honor of Robert K. Merton,* ed. Coser (New York: Harcourt Brace Jovanovich, 1975), pp. 85–100. Coser claims that Durkheim was Merton's "consciously chosen role model" (pp. 88–89) and documents Merton's acknowledgment of the influence on his early work of Durkheim, Weber, and Georg Simmel (pp. 96–97). There is no mention of Pareto here.

[18] For Homans see George Caspar Homans, *Sentiments and Activities: Essays in Social Science* (London: Routledge & Kegan Paul, 1962), p. 4; for Pareto and fascism see Homans and Curtis, *Introduction to Pareto* (cit. n. 16), p. 9: "It is true that the *Sociologie Générale* has become for many Fascists a treatise on government. . . . But in point of fact Pareto maintained in deed and word his independence as a scientist. . . . [W]hile approving some of the Fascist measures, he openly condemned others, especially any limitation of academic freedom." The relationship between Merton's own commitment to liberal democracy and his defense of science is well known; see, e.g., David A. Hollinger, "The Defense of Democracy and Robert K. Merton's Formulation of the Scientific Ethos," *Knowledge and Society,* 1983, *4*:1–15.

[19] Timothy Raison, ed., *The Founding Fathers of Social Science* (Harmondsworth, Middlesex: Penguin, 1969), pp. 113, 118; and Homans and Curtis, *Introduction to Pareto,* p. 241.

themes. Thus, a major concern of that text was to display the importance of "nonrational" and "nonlogical" considerations in social action. Sentiments were the nonrational and unconscious wellsprings of the social actions involved in sanctioning and pursuing science in seventeenth-century England.[20] And inasmuch as nonrational dispositions were involved, this would explain why the consequences of much social action were, as Merton famously insisted, "unanticipated"—for example, why the original Protestant reformers, who were not inspired to sanction science, produced an ethic that ultimately did so, or indeed why secularization was the unintended outcome of the religiously motivated science of the seventeenth century.[21]

Moreover, Merton shared the Paretan impulse to build a social science that substituted the circumspect language of "mutual dependence" for the "vulgar Marxist" language of "cause and effect." Hitherto, I have spoken loosely of the "causal" entities in Merton's thesis, yet he used the notion of cause in a much softer sense than is (or was) customary in the social sciences. Critics who fail to recognize the highly qualified and eclectic sense in which Merton used causal language are doing him a disservice. Thus, Merton cautioned that even the apparently "unavoidable implication . . . that religion was the independent variable and science the dependent variable during this period" was "not the least our intention." Both Puritanism and science, he said, "were components of a vastly complicated system of mutually dependent factors." Having pointed to the motivating force of sentiments, Merton was exceedingly careful not to attribute to them the sole causal role. Sentiments, it is true, underlie and find expression in both "word and deed," but sentiments, Merton says, can also be *affected* by these forms of action: "behavior in its turn reacts upon the sentiments, reinforcing, moulding, at times altering them so that the whole process is one of incessant interaction."[22] We are to understand that the causal item that motivates social action is also an effect of that action.

This eclecticism extended to the general form of sociological approach Merton brought to the Puritanism-and-science thesis. Indeed, it is more correct to refer to the general *forms* of sociological approach, since Merton's 1938 text canvassed two relationships between action and ideas that he himself regarded as distinct. On the one hand, Merton offered a general social-structural theory that analyzed the ways by which institutionalized and not-yet-institutionalized activities are legitimated. Given that the dominant sentiments of the historical setting were expressed in religious language, any new form of social action, such as experimental natural philosophy, was obliged to justify itself and to seek legitimacy by a public display of its compatibility with those sentiments and their expression: "New patterns of conducts must be justified if they are to take hold and become the foci of social sentiments." Hence, we can make sense of the constant insistence by "Puritan scientists" on the utility of their practices and on the manner in which science could contribute to religious exercises. If these

[20] Merton, *Science, Technology* (cit. n. 1), pp. 81–82, 101, 107, 136. Pareto is explicitly referred to on pp. 60 n. 10, 91 and n. 30, 106 n. 62, 111 n. 73, 226 and n. 51.

[21] *Ibid.*, pp. 79, 101–110; Merton, "Puritanism, Pietism" (cit. n. 2), p. 597; and Merton, "The Unanticipated Consequences of Purposive Social Action," *American Sociological Review,* 1936, *1*:894–904.

[22] Merton, *Science, Technology,* pp. 104–105 (see also p. 63), 56; see also his view that verbal expressions such as sermons can reinforce "the dominant sentiments of the day" (p. 60).

justifications prove acceptable, the new activity receives social sanction and becomes a value in its own right. Now scientists do not need to offer any "extrinsic" justifications for the activities: "Institutionalized values are conceived as self-evident and require no vindication."[23]

Merton reckoned that this theory of "accommodation" was correct and important, but he insisted that it was by itself insufficient to account for the links between Puritan sentiments and scientific activity. Such a view suggested, Merton said, that expressions of Puritan values by leading scientists were merely rationalizations or "casuistry"—in Paretan language, "derivations" rather than "residues." Moreover, it invited an improper psychological reading of the relationship, one in which scientists consciously cobbled together socially expedient justifications for their activities, which activities were in fact motivated solely by "intrinsic" values. On the contrary, Merton stipulated both that scientists were genuinely and powerfully motivated by religious sentiments and that they need not be conscious of these motivations.[24] Thus, historians who have sought to invalidate Merton's thesis by mobilizing evidence that seventeenth-century scientists were not, in the usual parlance, consciously motivated by religious or utilitarian considerations have missed the point: Merton's views cannot be refuted by such evidence. Nor have they understood how Merton is entitled to diagnose inaccessible motivational states. Again, the procedure is Paretan. Merton claimed Paretan warrant to conclude that constant elements in human speech accounting for action (the residues) reliably "manifest deep-rooted, effective sentiments." "Speaking elliptically," Merton said, "these constant elements may be held to provide motivations for behavior, whereas the variable elements [the derivations] are simply *post facto* justifications." The identification of genuine motivating states might therefore be achieved through a totting-up procedure that assessed which justifications appeared more or less frequently and consistently. Even so, Merton recognized that "in practice, it is at times exceedingly difficult to discriminate between the two [residues and derivations]."[25] If Merton has been widely misunderstood on this score, part of the reason must arise from modern readers' lack of familiarity with Paretan schema, and part from Merton's loose Paretan identification between motivating mental states and the constant speech elements that were treated as expressions of the psychic states that

[23] *Ibid.*, p. 83.

[24] *Ibid.*, pp. 81–82, 91, and n. 30. Cf., however, p. 110, where Merton insisted that the Protestant ethic represented "the consciously felt motivation of many eminent seventeenth century scientists." See also Abraham, "Misunderstanding the Merton Thesis" (cit. n. 10), pp. 371–372, which claims to identify "ambiguity" in Merton's motivational analysis. Merton characterized this psychological account as "independent" of his "justification" hypothesis: *Science, Technology,* p. 81. I must confess to an attempt at constructive simplification in my brief sketch of "The Merton Thesis" in *The Dictionary of the History of Science,* ed. W. F. Bynum, E. J. Browne, and Roy Porter (London: Macmillan, 1981), p. 262. Given limited space, I elected to stress the social-structural aspect of Merton's thesis, neglecting the psychological dimensions. Apart from purely pragmatic excuses, I could argue that the elements I emphasized are precisely those less known among historians.

[25] Merton, *Science, Technology,* p. 91 and n. 30; and Merton, "Puritanism, Pietism" (cit. n. 2), pp. 603–604. Of course, Merton did not approach this aspect of his thesis statistically; constant elements in Puritan expressions were identified impressionistically. In the "Postscript" to the "Puritanism, Pietism" essay Merton offered a further definitive test of whether Puritan values were motives as opposed to rationalizations: such a test is "to be found in the behavior which accords with these reasons, even when there is little or no prospect of self-interested mundane reward" (p. 604). Robert Boyle's behavior was pointed to as such proof; but cf. James R. Jacob, *Robert Boyle and the English Revolution: A Study in Social and Intellectual Change* (New York: Burt Franklin, 1977).

caused them, as a cause of the states, and as the means of discerning the states.

Merton's Paretan language of "mutual dependence" and incessant reciprocal interaction between mental states and verbal and nonverbal behaviors cuts across the more familiar sociological vocabulary associated with coherent "idealist" and "materialist" frameworks. Merton himself insisted in 1938, and again in 1970, that his orientation was neither the one nor the other. In *Science, Technology and Society* Merton obliquely engaged with the materialist view that ideas could not properly be treated as causative agents in social action. His eclectically Paretan solution was to preserve elements of what was usually taken to be materialism and to mix them with elements of what was usually taken to be idealism. Thus, Merton said:

> It is also an acceptable hypothesis that ideologies seldom *give rise* to action and that both the ideology and the action are rather the product of common sentiments and values which motivate conduct. But these ideas cannot be ignored for two reasons. They provide clues for detecting the basic values which motivate conduct. Such sign posts cannot be profitably neglected. Of even greater importance is the rôle of ideas in directing action into *particular* channels. *It is the dominating system of ideas which determines the choice between alternative modes of action which are equally compatible with the underlying sentiments*. Without such guidance and direction, non-logical action would become, within the limits of the value-system, random.[26]

In 1970 Merton applauded his youthful skill in steering his interpretative boat between the Scylla and Charybdis of materialism and idealism, though without explaining the eclectically Paretan foundations of that judiciousness. "As everyone knows," Merton ironically commented, " 'idealistic' and 'materialistic' interpretations are forever alien to one another, condemned to ceaseless contradiction and intellectual warfare. Still, what everyone should know from the history of thought often turns out not to be so at all." Merton condemned "the mock choice between a vulgar Marxism and an equally vulgar purism."[27]

Indeed, there *is* a widely diffused, and a well-supported, view that idealism and materialism are *rightly* set in opposition, and that one cannot mix elements of the one with the other as the occasion or eclectic impulses seem to require. If present-day readers treat Merton's text as belonging to one or the other of these traditions, they are in no different position than some of those closer to Merton and the circumstances out of which his work arose. His own sociology teacher at Harvard, Pitirim Sorokin, continually insisted that Merton "succumbed to M[ax] Weber's theory, overlooking its weak points," and that "he gives a vast body of empirical facts, but applies for their interpretation an uncritically accepted, inadequate theory of Max Weber."[28] Sorokin pointed to what he took to be the causal ambiguity and teleological character of Merton's functional explanations.[29]

[26] Merton, *Science, Technology,* p. 91 (emphases in original); see also Merton, "Puritanism, Pietism," p. 604.

[27] Merton, "Preface: 1970" (cit. n. 5), pp. xix, xiii.

[28] Pitirim A. Sorokin, *Society, Culture, and Personality: Their Structure and Dynamics: A System of General Sociology* (New York: Harper, 1947), p. 657n; and Sorokin, *Sociological Theories of Today* (New York: Harper & Row, 1966), p. 456n. Sorokin rejected both materialist Marxism and idealist Weberianism as untenable theories of cultural change.

[29] Sorokin, *Sociological Theories,* pp. 447, 450: "A particularly conspicuous trait of Merton's theories is their ambivalence" (*ibid.,* p. 447 n. 7). For Merton's part, he accused his former teacher of the sins of "emanationism," relativism, and neglecting the role of "existential" factors: Robert K. Merton

The more closely one reads Merton's 1938 text, the more astonishing it is that this work has elicited such vigorous and at times intemperate opposition. As I have noted above, Merton phrases his argument in extremely cautious and prudent terms. Of course, the language of Pareto's sociology is now little known in the academic world, and Merton's disinclination to explain and to expand upon certain Paretan notions has not made it easy for modern readers to grasp the basic elements of his sociological approach. For all that, failure to appreciate its methodological eclecticism and judiciousness can at best be the result of the very "swift-reading" at which Merton mildly bridled in 1970.[30] However, there is a price to be paid for eclecticism and judiciousness. If one tries too hard to avoid being clearly wrong, one may well be perceived as not clear at all. "Swift-reading" may be culpable in the academic world, but it is all too common, the more so if one's readers have their "straw men" already formed in their minds before they come to the text.

The list of caveats, cautions, and qualifications that have to be taken into account if one wishes to understand the Merton thesis properly is, as I have tried to show, dauntingly large. It is not a materialist thesis, and not an idealist thesis; it is partly psychological, and partly social-structural; it is particular to seventeenth-century England, but not wholly so; it concerns the dynamics of scientific enterprises, but not their intellectual content or methods; it identifies causes of social action that are also the effects of action. An apparently paradoxical conclusion suggests itself. The reason historians are still so animated about the Merton thesis fifty years on is precisely *because* it has been so widely misrepresented.

Less glibly, one might say that the legacy of this thesis has been both triumph and failure. Given the curmudgeonly disposition of the scholarly world, victory is always less visible than defeat. Yet no historian of science now seriously contends that religious forces were wholly, or even mainly, antagonistic to natural science. When Merton wrote his thesis, that was not the case, and we owe a debt to him (as well as to other historians of the 1930s) for establishing the nature of some positive links between science and religion and for setting up an empirical program of research dedicated to exploring them. Similarly, no historian now seriously maintains that the thematics and dynamics of scientific activity (its "foci of interest") are unaffected by social and economic considerations.[31] When Merton wrote his thesis, this was not a common point of view, especially outside Marxist circles. If historians of science have been reluctant to give Merton full credit for these contributions, it is perhaps because the focus of the discipline (intellectualist and contextualist, rationalist and sociological) has continued to be upon the very knowledge and methods that Merton surrounded with a black box.[32]

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and Bernard Barber, "Sorokin's Formulations in the Sociology of Science," in *Pitirim A. Sorokin in Review,* ed. Philip J. Allen (Durham, N.C.: Duke Univ. Press, 1963), pp. 332–368, esp. pp. 334, 343, 357–361. (Sorokin did not have a high opinion of Pareto's work.)

[30] Merton, "Preface: 1970" (cit. n. 5), p. xviii.

[31] For one of the very few historical attempts to apply and develop Merton's approach to "foci of interest" constructively see Steven Shapin, "The Audience for Science in Eighteenth Century Edinburgh," *History of Science,* 1974, *12*:95–121, esp. pp. 104–110.

[32] Almost needless to say, present-day historians would not be as comfortable as Merton was in identifying an entity called "modern science" in the seventeenth century. On the one hand, historians

There is still, however, important historical work to be done in and around the Merton thesis. There is something about it and the general orientation from which it emerged that should not be allowed to disappear from our view. In 1970 Merton identified "a principal assumption underlying the entire book. The substantial and persistent development of science occurs only in societies of a certain kind, which provide both cultural and material conditions for that development."[33] The problematic from which Merton's work emerged in the 1930s was one that accepted the interest, importance, and legitimacy of macrosociological theorizing about the historical development and social setting of culture. How, after all, did we come to inhabit the world of modern science? What, after all, are the relations between large-scale social change and large-scale cultural change? The footnotes of Merton's text are littered with the corpses of big men who ventured big thoughts, scholars of erudition who were not afraid of grappling with such problems, and who belonged to an academic culture in which they were expected to do so: Hessen, Pareto, Sorokin, Weber, Franz Borkenau, R. H. Tawney, Ernst Troeltsh. Where are their like now? Where in the academic history of science are their concerns being addressed? The price of professionalism in the history of science has been a certain timidity, even a certain triviality. If we want to recover our scholarly nerve, we could do much worse than to explore the resources and orientations, the "foci of interest," of the scholarly world that precipitated the Merton thesis.

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discern many *versions* of science in that setting; on the other, they question whether *any* version of seventeenth-century science can simply be equated with modern beliefs and practices.

[33] Merton, "Preface: 1970" (cit. n. 5), p. xix.