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THE VERY IDEA OF A SCIENTIFIC ETHOS. THE MERTONIAN BEGINNINGS

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Abstract: My aim in this paper is to provide a detailed historical reconstruction regarding the genesis of the concept of scientific ethos in the works of Robert K. Merton from Science, Technology and Society in Seventeenth-Century England (1938) to Science and Technology in a Democratic Order (1942). He described science as a social institution that needed its own social legitimacy in order to gain its autonomy. But science remained in close relation with society and it functions socially as a community of inquiry and as an institution. Therefore, in addition to characterizing science on the basis of methodological rules of empirical validation and criteria of logical consistency, we must also consider its normative structure, its own ethos as a system of values, attitudes, and feelings. Merton made this theoretical discovery in less than a decade, and the reconstruction of this theoretical journey is itself illuminating for clarifying the concept of the scientific ethos.

Keywords: Robert K. Merton, science, social order, ethos of science, autonomy of science.

“Pure science” and Science in a Social Context

In Science, Technology and Society in Seventeenth-Century England Robert K. Merton does not use the phrase “ethos of science” nor “scientific ethos” but speaks only of the “Puritan ethos” and he mentions that it is correlated with the same “value system in science”. The paragraph “Social Context” contains the first exposition of the idea of a normative structure of science as a social process and an enumeration of the values that guide this activity. Merton argues that it has become increasingly fashionable to observe that science is, ultimately, a social activity based on a social interaction of scientist involved into a more or less formally organized division of labor. He claims that science as a social activity presupposes the disinterestedness, integrity, and honesty of scientists and is thus oriented towards these moral norms (Merton 1938, 564). Finally, Merton concludes that the verification of scientific conceptions is itself a fundamentally social process. The fragment is remarkable and, although it went almost unnoticed in its time, we can say that it anticipates interdisciplinary research on the two dimensions of the normativity of science, the moral, logical, and methodological aspects.

Merton does not yet conceptualize the ethos of science as a coherent, consistent, and sufficient system of norms and values. It could be said, as Storer observes (Storer “Prefatory Note”, in Merton 1973, 224), that his initial interest was to identify the set of cultural conditions that led to the development of science, that is, the values that lie behind a particular approach to the world, and less so the rules that guide the relations between members of the community and that govern the actual realization of the scientific approach to the world. We must understand in this sense Merton’s concern with the rationalism and empiricism that are common to Puritanism and science, as well as with the ideas of the good of hu-

manity and the glorification of the perfection of God's creation, both considered as the main elements of the motivational basis for the practice of science.[1]

However, it did not take Merton long to take the next step. In the same year, 1938, Merton published the study "Science and the Social Order" in which he first referred to the idea of norms of "pure science" that we find practised at the level of the scientific community. The institutional norms of science have the functional role of protecting science by providing ideological defence, but we should not overestimate them, given the economic and social consequences of scientific inventions which create external pressure on them. Therefore, science is caught in tension between the tendency of institutional conservation based on the internal ethos and external shaping forces of an economic and socio-political nature. "Science and the Social Order" is written in conditions in which the social order and institutional structure of German society were subject to the pressure of the Nazi political regime, which led to a diversion of science from its traditional purpose of seeking truth. Nevertheless, even if in Science, Technology and Society Merton does not explicitly discuss the ethos of science, a good understanding of the normative structure of science requires taking this research into account and achieving a historical contextualization, especially since the description of the ethos of science in "Science and the Social Order" is indebted to the historical context.[2]

Merton was faced with two significant but divergent historical cases. If in Science, Technology and Society, he found that the cultural climate in 17th-century England had been fertile for the development of science, in "Science and the Social Order" he found that in 1930s Germany the cultural climate was threatening for the autonomy of science as a social institution. Merton identifies two sources, one logical and the other non-logical, of hostility towards science (see Merton 1973, 254-255). The first would be the conclusion logically deduced from various factual situations that the results of applying the scientific method do not satisfy certain important values. The second source is emotional and relates to the emergence of a feeling of incompatibility between the ethos of science and the normative value structures specific to other institutions. Therefore, if the results of science do not satisfy the values in which we believe and if scientists share values different from our own, then we would have every reason to be hostile to science. Symmetrically, those who believe that scientific results correspond to their value system and that the values of the scientific community are similar or convergent with their values will have a friendly attitude towards science. They will attempt an institutional dialogue with it and will promote it as an activity that brings certain benefits.

The eloquent case of an interaction of the two conditions of hostility towards science is Nazi Germany. Based on racial criteria, German science was divided into two, s "Aryan science" and "non-Aryan science", and those who did not correspond to the Nazi criteria of "purity" were eliminated from universities and research institutes.[3] These criteria prevailed both over symbolic evaluations within the scientific community and over the instrumental rationality of the utilitarian type from the perspective of which the results of science were traditionally evaluated. The best-known example is the case of Werner Heisenberg, classified as a "white Jew" only because he favourably appreciated Einstein's theory of relativity.

In his research on the relationship between science and social order, Merton starts from a thesis claimed by Max Weber (1922) according to which the belief in the value of scientific truth is not derived from nature, it is not a natural fact, but is the product of certain cultures and civilizations. He develops it within his own conceptual framework, stating that "the persistent development of science occurs only in societies with a certain order, subject to a peculiar complex of tacit presuppositions and institutional constraints" (Merton 1973, 254).

Merton believes that all those internal constraints of science as a social institution together form a social code that is associated with a set of feelings, an ensemble that Merton will describe by the following equivalent expressions: the normative structure of science; the institutional norms of science;

[1] I already have developed this interpretation in Stoenescu, 2011.

[2] See Enebakk, 2007, for the development of such a comparative and integrative view.

[3] Edward Y. Hartshorne (1937) opportunely wrote about this "purge" in his work *The German Universities and National Socialism.*

or the ethos of science. Normally, the ethos of science induces the institutional requirement to evaluate theories in terms of logical consistency and consonance with facts, but the socio-political environment can generate internal dysfunctions of science that lead to error, as would be the case, if we take into account the situation in Nazi Germany that Merton had in mind, certain racial criteria, or related to the political opinions of the researcher. As a result, we end up in a situation where the norms of the ethos of science are repudiated precisely because they oppose the introduction of criteria such as political loyalty in the evaluation of scientific results. This leads to a conflict between the totalitarian state and science as an institution that does not internalize political criteria. The effect is the annihilation of the autonomy of science, and this is the fundamental difference between science policies in a totalitarian or authoritarian state and ones based on a liberal order, transparency, and openness.

In a footnote, Merton comments on the nature of the ethos of science and correlates it with the distinction between culture and civilization that he had previously theorized in his study "Civilization and Culture" (Merton 1936a). According to Merton, the ethos of science refers to "an emotionally toned complex of rules, prescriptions, mores, beliefs, values, and presuppositions which are held to be binding upon the scientist" (Merton 1973, note 15, 258). Merton makes the important remark that some of the elements of this complex have the character of methodological desiderata, such as rules, but he warns that even compliance with rules is not dictated exclusively by methodological criteria. This is because the ethos is not reducible to an abstract social code, but is correlated with the emotions, sentiments, and experiences of those who internalize it. In other words, the violation of the code is accompanied by the emotional activation of prohibitive and disapproving feelings. Therefore, once the code has been activated and through internalization acquires the character of an ethos, its violation automatically leads to resentment and attitudes of contempt and antipathy which, if experienced deeply, can lead to the restoration of the initial balance and the blocking of the intention to violate it.

For example, if we consider Nazi Germany, we can note the resistance to political pressures. However, these interferences did not target methodological rules but constitutive values of the ethos, hence the motivation not to give in to such external interferences. Returning to the distinction between culture and civilization, as discussed by Merton, the ethos of science can be said to be a cultural component of science, while a civilization makes a difference in the uses of the technological applications of scientific research. In this sense, the ethos of science corresponds to a certain image of science as "pure science", as described by the so-called standard model of scientific theory.

Methodological Rules and Social Choices

From the perspective of a model of science, we will consider that the tandem between the ethos of science and methodological rules ensures its rationality. Thus, the ethos of science requires the evaluation of scientific theories in terms of their logical consistency and consonance with the facts. However, the totalitarian state introduces political criteria, which leads to an inevitable conflict with science as an autonomous social institution. The greatest risk is that decisions regarding the contents of science are made by politicians who have no scientific competence and judge science exclusively on the basis of criteria external to science. This is a social conflict and, ultimately, aims at recognizing or not the fact that science has its own institutional norms with a universal character, different from political particularisms. This is also the reason why in the authoritarian or totalitarian state the strategy to subdue autonomous science is to throw accusations that science is "liberal", "cosmopolitan" or "bourgeois", all terms being used pejoratively by the militants of nationalist-authoritarian statehood.

In the fine articulation of his argument in "Science and the Social Order," Merton also provides a first complete description of the structure of the ethos of science, listing intellectual honesty, integrity, organized skepticism, disinterestedness of research, and impersonality in the course of research as the main values. It is precisely these values that are rejected by the totalitarian state, and the natural reaction of the scientist, even if their traditional image is that of a person devoid of passions and one who has an impersonal attitude, must also be deeply emotional. In conclusion, the preservation of institutional integrity and resistance to external interference requires a very cohesive scientific community: "The social

stability of science can be ensured only if adequate defences are set up against changes imposed from outside the scientific fraternity itself" (Merton 1973, 259).

The training of a scientist involves not only theoretical learning and logical-mathematical skills but also the assimilation of values and feelings related to the autonomy of science in relation to theology, economics, or the state. Therefore, we could speak about "the exaltation of pure science" (Merton 1973, 260) which is associated with the institutional autonomy of science. Naturally, when we consider the social value of science from the perspective of external criteria, we will conclude that it may be consonant with certain religious doctrines, economic interests, or political visions, but if we go further and put science under the direct control of these external institutions then the autonomy of science will be dissipated and the place of science in society will become more diffuse.

But does this mean that technological applications of science diminish its autonomy, that they place it in certain dependencies? Alternatively, as somewhat of a paradox, could applied science itself be an argument for the autonomy of pure science, in the sense that applied results are the consequence of freedom from any constraints of fundamental research? These specifically Mertonian interrogations are the expression of the dominant image of science in the period in which Merton elaborated his works: understanding theories as hypothetico–deductive systems of statements that can be tested through experience. Even technological applications of scientific theories were understood as deductive extensions through the testing mechanisms.

But unlike the followers of the linguistic model of scientific theory proposed by the Vienna Circle and the falsificationist methodology developed by Popper, Merton, primarily due to his sociological training, has other theoretical intuitions and proposes conceptual systematizations that make him anticipate the subsequent alternative developments in the philosophy of science that will be made by the New Philosophy of Science, primarily by Thomas S. Kuhn and Paul K. Feyerabend. Thus, I think we may speak of an internal tension of Merton's theory of science in the sense that although he proposes a vision on the ethos of science that is consistent with the standard model of scientific theory, he actually opens up to overcoming this model.

Consequentially, to understand this ambiguity of Merton's sociological theory, it is necessary to return to an article written before the one we are now discussing, "Science and the Social Order". In 1936, Merton published a fundamental study for modern sociology, "The Unanticipated Consequences of Purposive Social Action" (Merton 1936b) where he argued, as the title of the article clearly states, that social action directed towards a certain goal can have consequences other than those initially anticipated. This is also the case of "pure science", in the sense that the battle to preserve the purity of science can have the opposite effect of threatening the very position of science in society. This is yet another of Merton's exceptional ideas that was ignored by the research community of that time precisely because they were not prepared to accept and react to such a change in perspective that overturned professional habits.

Even the most innovative sociologists of the time believed that the purpose of science could be none other than the objective description of facts and the revelation of the laws of nature, that is, nothing other than knowledge for the sake of knowledge. For example, Vilfredo Pareto (1935) emphasizes the separation of factual analysis from personal feelings and ideological prejudices based on a rigorous methodology, which makes him seem like a promoter of science as an end in itself, although, at the same time, he did not hesitate to see theoretical research as a means to improve social life. The paradox is that a methodologically perfect theory can generate social discomfort for science as a social institution if the applications of science, towards which the scientist declares himself neutral, are a cause for controversy in society. Thus, the unintended effects of pure science influence both the image of science and attitudes towards science: "The antipathy towards technological products is projected towards science itself." (Merton 1973, 261)

Thus, concern for the purity of science can unintentionally lead to a negative image of scientific results and to a change in attitude towards science as a social institution and towards the scientific community. This can lead to a social revolt of the public against science as various applications of science lead to negative effects. Such would be the case with the development of effective weapons of mass destruction,

from lethal war gases to the atomic bomb. Although the scientist cannot control these applications, social antipathy towards certain applications of science is transferred to science itself.

This phenomenon of re-evaluation of science is described by Merton as the "imperious immediacy of interest", an expression he had previously used in his study "The Unanticipated Consequences of Purposive Social Action". The immediate and primary interest of the scientist, which is the increase of knowledge through knowledge for its own sake, is doubled by the neglect of the externalist consequences of the research results, but these social consequences exist, are inevitable, and they are reflected, even if the scientist ignores them, even on the initially assumed goal — the increase of knowledge. Scientific research does not take place in a social vacuum, so that the proclamation of the disinterested character of "pure science" is not justified. Of course, the scientist may have a personal motivation centered entirely on knowledge and truth, without pursuing any other interests, but science is functionally caught in the social network and inevitably produces certain effects that are evaluated from the perspective of the social utility of science. In this sense, we must distinguish between truth and social utility in the evaluation of science and take into account the fact that the evaluation standards differ in the two cases, even going as far as the opposition between the rationality of logical criteria with other criteria that lead us into a twilight zone of non-logical science, where interests dominate and motivate choices and decisions.

In brief, truth and social utility, even if they sometimes seem coextensive, are different, and any confusion between them generates effects that distort the relationship between science and society. Values have a symbolic function in society and, in this sense, their status cannot be questioned epistemologically like a problem of truth. Values are a problem of choice and belief (conviction), not one of truth and epistemic foundation of beliefs.

Esoteric Science and Vulgarized Science

Merton (1973, 263–264) also notices an aspect that was barely discussed at the time regarding the relationship between science and society regarding the public image of science, the reception of science and the relationship to science by the general public, not just by citizens with expertise in one field of science or another. The progress of knowledge has made science become increasingly complex, with scientific training becoming necessary to understand scientific theories. This has led to a "gap" between scientists and the laymen uninitiated in the field.

As a result, most of the time, laymen can only take the results of science for granted, without having the opportunity to subject them to critical examination. New theories in science, such as the theory of relativity and quantum physics, seem bizarre to ordinary people, because they are far from common sense. Moreover, the language of science, its specialized vocabulary, and the mathematical apparatus embedded in the theories, makes science seem an esoteric field, inaccessible to the general public.

Hence, in order to avoid a rupture between the scientific community and society as a whole, there is a need to communicate science in such a way that its results can be understood by the lay public. This leads to the popularization of science, to debates about science and its results, even to philosophical approaches and dialogue, sometimes maintained by scientists themselves. Merton anticipates specific public participation mechanisms for what we today call "citizen science". This dialogue is necessary because otherwise, as a result of the aforementioned ruptures, there would be a feeling of hostility towards science perceived as an esoteric activity.

Apparently, popularizing science is a complicated act of translating scientific language into an ordinary one and presenting sophisticated theories by reducing them to common sense. That could pose a danger of vulgarizing science, of sharing research results at the cost of excessive simplifications that introduce the risk of some misunderstandings. But an even greater risk is the mystification of science through the illegitimate takeover of scientific authority by other institutions, as would be the case of the totalitarian state, in which case "the borrowed authority of science becomes a powerful prestige symbol for unscientific doctrines" (Merton 1973, 264). This phenomenon was already happening when Merton wrote this study and it would gain momentum in the Soviet Union during the period of Stalinist dogmatism when new so-called Soviet sciences, from Michurin's selectionism to Lysenko's genetics, were to be presented propagandistically as alternatives to "bourgeois science". Mystification is ideological and

propagandistic, using the vocabulary and authority of science to eliminate and replace robust theories with doctrinairely convenient or pseudo-scientific ones.

Therefore, in the absence of adequate communication between science and society, there is a risk that science, increasingly complex and far removed from common sense, may seem like an esoteric activity, accessible only to initiates. In these conditions, society may react hostilely, vulnerable to alternative theories of a pseudo-scientific or conspiracy type. On the other hand, in a closed totalitarian society, the state may seize the authority of science and mystify it or substitute it with its preferred ideology, somehow in the form of an occultation of scientific truth, the goal being the political domination of the masses.

Organised Scepticism and Its Enemies

The most surprising debate that Merton initiates in "Science and the Social Order" consists in the preliminary analysis of one of the scientific ethos values. This is the organised scepticism and its equating with a possibly iconoclastic attitude towards common sense. Science becomes provocative for other social institutions because it aims to subject them to impartial and objective critical examination. As a result, organised scepticism "involves a latent questioning of certain bases of established routine, authority, vested procedures, and the realm of the 'sacred' generally" (Merton 1973, 264). Of course, logically speaking, the establishment of the empirical genesis of some beliefs or values does not imply denying their validity, but the psychological effect on a naive mind may be this.

Therefore, we distinguish between the logical grounds of a belief, pertaining to the correct logical derivation of that propositional belief from others—that is, of a valid reasoning in which the premises are true or in other words, a context of justidication—and the social, psychological, or other causes of the belief-forming process. In the latter case, it is also a matter of the genesis of true or false beliefs—that is, the context of genesis. If the epistemic analysis of a theory aimed to identify aspects related to the fulfillment of criteria of logical validity and empirical testing, the field of research that Merton developed involves the context of the genesis of ideas in science. In this sense, Merton anticipates, as we have already noted, the alternative that the New Philosophy of Science, starting with Thomas S. Kuhn (1970), will propose to the standard model of scientific theory developed by logical empiricism. Moreover, a comparative perspective of the project proposed by Merton with the "Strong Program" in the sociology of science developed by David Bloor, Barry Barnes and others becomes necessary and fertile.

The sociology of science involves an investigation of facts in the context of the genesis and formation of a scientific belief. Organised scepticism, understood as an epistemic virtue, can lead to questioning other approaches and, as a result, comes into psychological conflict with values that are considered sacred in other institutional spheres, such as political convictions or religious faith. In turn, science itself involves emotional attachment to its own values, but at the same time, as Durkheim had already observed in The Elementary Forms of Religious Life (1912) science aims to overcome uncritical and ritualistic conformity. This is, ultimately, a dual condition of science between objective analysis and axiological commitments.

The hostile reaction to science from other institutional spheres is generated by this objectivist mixing of science with other spheres of public opinion, such as the question of the interpretation of the Bible or certain economic policies. Some beliefs or interests may be opposed to science. The conflict is psychological and is all the stronger the more authoritarian the institutions that are hostile to science are. A siege of science or an assault on it (Nowtny et al, 2005) as a social institution can be reached, but differently in a totalitarian and a liberal society, the main problem being that of the control of science, how it is exercised, and to what extent it is imposed (Merton 1973, 265).

Hostility towards science can manifest itself latently or actively. The prestige of science has increased in modern society, and respect for it has been associated with the requirement, expressed at least verbally in public discourse, not to endanger its integrity. In Merton's terms, a movement against science derives from the conflict between the ethos of science and the ethos of other social institutions. In this sense, all revolts against science are similar from a formal point of view, but the concrete sources of hostility towards science are different from one historical stage to another. In Merton's enumeration,

conflicts arise "when the social effects of applying scientific knowledge are deemed undesirable, when the scientist's scepticism is directed towards the basic values of other institutions, when the expansion of political or religious or economic authority limits the autonomy of the scientist, when anti-intellectualism questions the value or integrity of science, and when non-scientific criteria of eligibility for scientific research are introduced" (Merton 1973, 266). Hostility towards science threatens its autonomous development and if scientists are not loyal to their own community, then their position of power in society begins to be questioned. If the source of social power is other than science, then other institutions intensify their attack on science. The internal effect of hostility at the level of the scientific community and of specific attacks against science was the recognition by scientists of their dependence on certain types of social structures, which brought to the forefront of philosophical and sociological reflection the problem of the relations between science and society. A crisis situation generates reflexive challenges because "an institution under attack must reexamine its foundations, restate its objectives, seek out rationale" (Merton 1973, 267).

In his 1942 study on the relationship between science, technology, and the democratic social order, Merton discusses the challenges that scientists must be aware of as a result of the potential applications of science. In a footnote (Merton 1973, 268), he adds a relevant comment on the changing public image of science and the urgency of awareness caused by new events, such as the atomic bombing of Hiroshima. Merton suggests that after a relatively stable period in which science climbed the ladder of cultural values, the "ivory tower" is now under prolonged siege and scientists have the obligation to defend science and justify the need for scientific research in the new social and political context. If in the 17th century, when science as a social institution was gaining legitimacy, natural philosophers made economic utility and there was glorification of divinity means of the social valorization of science, later, the instruments of legitimation became ends, so that science began to be viewed as a provider of technologies that have various utilities, including military. Science declared its independence in the sense that, although it recognizes its presence as a phenomenon in the context of society, it claims to no longer belong to society but to have its own life. This explains the assault on the autonomy of science in order to remove it from isolationism and integrate it in a participatory and realistic manner in the mediation of radical conflicts between different cultures.

The attack on science has come from various directions, from the ideological assault of political regimes such as those in Nazi Germany and the Soviet Union, to that of assuming civic responsibilities regarding the use of science. Despite these differences, the novelty is that autonomous science is put under assault in order to be put under control. This is why a discussion about the ethos of science becomes a priority and must be done in order to get out of ambiguity and avoid potentially dangerous slippages. Merton's theory about the ethos of science is all the more current and, even if most of his contemporaries did not initially perceive it at its right importance, a discussion about the intrinsic values of research could bring decisive clarifications for contemporary society.

The "Hard Core" of the Normative Structure of Science

Starting with the study "Science and Technology in a Democratic Order" (1942), Merton begins to be concerned with the ethos of science as a system of moral norms that influence the social practice of science. It is interesting how Merton himself perceived the theoretical importance of his study and tried, when he republished it, to highlight this aspect by reformulating the title. Thus, in the first republishing he retitled it "Science and Democratic Social Structure" (Merton 1968), and in the second—"The Normative Structure of Science" (Merton 1973).

In this study, Merton proposes the definitive version of the ethos of science. Universalism, "communism", the disinterested character of inquiry, and organised scepticism are the moral norms that were added by Merton to the methodological (or technical) norms regarding the trustworthiness of empirical evidence and the need for logical consistency. These norms are the social envelope that ensures the implementation of technical methods without which the institutional goal of increasing or expanding authentic knowledge could not be achieved. Therefore, in a relatively short time, from his first studies in 1935 to the rechristened "The Normative Structure of Science" (1942), Merton makes the transition from

researching the external social conditions that influence the development of science, a thesis already in circulation and brought to its final form with Science, Technology and Society in Seventeenth-Century England, to the analysis of the internal normative structure of science, that is the ethos of science as a set of internalized values that order research at the level of the scientific community.

Before introducing the concept of the ethos of science into discourse, Merton mentions (Merton 1973, 268) three primary, mutually exclusive and jointly exhaustive uses of the term "science" and considers that any other use is a combination of any of these three. The three types of use are as follows:

(1) a set of methods that ensure the production and validation of knowledge;

(2) the stock of knowledge accumulated as a result of the application of these methods;

(3) a set of cultural values and morals that govern the activities specific to science.

The field of research assumed by Merton under the name of the "ethos of science" is a narrow one in relation to these possible uses. A limited aspect of science as a social institution is taken into account, namely, the cultural structure of science, that is, not the methods of science, but the morals that accompany them. It is true that methodological rules are primarily technical in nature, but the research proposed by Merton primarily considers their moral significance.

The concept of ethos in the sense used by Merton had already been anticipated by William Graham Sumner in his work Folkway: A Study of Mores, Manners, Customs and Morals (1906), in which he defined the set of behaviors and practices inherited through tradition and guiding social relations in a group or a society in the broad sense. Sumner formulates the hypothesis of an evolution over time of these norms at a subconscious level and considers that they shape the interactions between people and social institutions. Although these norms are constituted on the basis of individual impulses, they come to have social authority over individuals and guide individual behaviors.

Another source mentioned by Merton in a footnote (Merton 1973, note 2, 259) is a study by Hans Speier on the social determination of ideas. He discusses the idea of a social ethos understood as a cultural phenomenon relative to a certain social reality whose configuration is determined through an inclusion of certain material factors that have a social significance (Speier 1938, 197). Merton is also familiar with Albert Bayet's work, La morale de la science (1931), in which the author argues that science plays a role not only in producing knowledge but also in the moral progress of humanity through the social model it implicitly offers, based on reason and critical inquiry. Merton quotes a passage in which Bayet remarks that the morality of science is implicit in the practices of scientists, that it ensures the very existence of science, but that these aspects have not yet been theoretically analyzed (Merton 1973, note 2, 269). We could say that Merton thus assumes the task of becoming the theorist of these previously neglected aspects. Finally, the last contemporary of Merton who had approached the theoretical problem of the ethos of science was Max Scheler (1933). It is well known that Scheler had developed a theory of values in which he discussed spiritual values in an epistemological context that occasioned the distinction between knowledge and ignorance. All of these could be considered contributions that have identified the problem of the ethos of science and sketches of a possible project of deepening it.

Merton takes on this theoretical task and begins by proposing a definition of the ethos of science that we can consider as the standard to which all subsequent development has been referred. I reproduce in extenso Merton's explanatory definition:

The ethos of science is that complex of affectively toned complex of values and norms which is held to be binding on the man of science. The norms are expressed in the form of prescriptions, proscriptions, preferences, and permissions. They are legitimized in terms of institutional values. These imperatives, transmitted by precepts and example and reinforced by sanctions, are in varying degrees internalized by the scientist, thus fashioning his scientific conscience or, if one prefers the latter-day phrase, his super-ego. Although the ethos of science has not been codified, 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. (Merton 1973, 268–269)

Compared with the comment made by Merton in footnote No. 15 to the study "Science and the Social Order" (Merton 1973, note 15, 258), this definition goes further and takes into account what we would call the non-logical aspects of science, while previously it was more concerned with drawing the

distinction between methodological rules as such and the various elements of the ethos of science and to emphasize the interdependence between them in the sense that methodological rules are also influenced by these non-logical aspects. The ethos of science, understood as a social code, is accompanied by the feelings of those who apply it both towards the cases in which the ethos is respected and in those where its violations occur.

Launching the Research Programme

In Merton's view, the research on the ethos of science is only part of a broader research that concerns the comparative study of the institutional structure of science and other institutional components of society. However, a historical perspective shows that although science has developed episodically in various contexts and social structures, the most favorable environment for the growth of knowledge was represented by modern society, and the process of democratization of society coincided with the best period of development of science. In Merton's terms, it can be hypothesized that science has the best opportunities for development in a democratic social order and that such a society is integrative in relation to the ethos of science. Of course, this does not mean that we have to establish a causal connection between democratic society and the development of science, but at the same time, it is obvious that this is not just a coincidence.[4] On the other hand, Merton also mentions (Merton 1973, note 4, 279) the somewhat sceptical comments of Alexis de Tocqueville that science developed in aristocratic societies, and he wondered whether the same would happen in a democratic society. These have inspired Merton to search for a relation between the development of science and the social order (de Tocqueville 1840).

Defined by its institutional purpose that gives its identity in society, science has as its mission the growth of authentic knowledge. To this end, we use technical methods to define knowledge as a system of propositions that state regularities, make predictions, and are both empirically confirmed and logically consistent. This is the point from which Merton articulates his theory on the ethos of science. The institutional imperatives of science derive from the purpose and methods, which means that the final objective of science can only be achieved on the basis of considering technical and moral norms together. Undoubtedly, if we agree that we need to reintroduce Merton in contemporary debates (Crothers 2021) and to reconsider his work critically (Calhoun [ed.] 2010), then the topics of scientific ethos and the autonomy of science are now even more relevant.

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[4] Another contemporary of Merton noted this relationship between the development of science and democratic society and suggested the need for an explanation. See Sigerist 1938, 291)

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