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CHAPTER 9

Natural Sciences and the Radical *Intelligentsia* in the Late Nineteenth and Early Twentieth Centuries

Daniela Steila

In Russia, the natural sciences have alternately been cheered or denounced as a means of modernizing the country, and had a checkered career, depending on whether the government of the Empire adopted a reformist vision, open to Europe, or was inclined toward an anti-Western, exceptionalist view. In the first half of the nineteenth century, during the reign of Nicholas I, they were mostly considered a "necessary evil" for the development of the country, but they were subjected to strict ideological control to avoid challenging the primacy of revealed religion. One example, among many, shows that they were "governed," as was every other intellectual field, according to the particular political concerns of the moment. The 1828 education statute, promoted by Minister of Education Count S.S. Uvarov, centered the gymnasium curriculum on classical languages and mathematics. While it tolerated a rudimentary teaching of physics, it completely banned any study of biology, physiology, chemistry, or geology. However, when the echoes of 1848 reached Russia, the republican spirit of classical studies seemed even more dangerous than scientific notions, which, moreover, might have aided Russian economic development. Therefore, in 1852, following a proposal by the new minister, Prince P.A. Shirinskii-Shikhmatov, the teaching of Greek in the gymnasia was replaced by a general introductory class in "natural science," and by specified classes in zoology,

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botany, mineralogy, anatomy, and human physiology (Vucinich 1963, 247–258).

When the government of the "reformer" tsar Alexander II promoted scientific studies with the aim of modernizing the country and reopened contact with European scientists, these new orientations were welcomed with great enthusiasm. In Germany, an entire generation of scholars and researchers had abandoned the metaphysical speculations of idealist *Naturphilosophie* in favor of materialism. Although the Russian government quickly took a stand in favor of the traditional dualist doctrine that envisioned a separation of "spirit" and "matter" by giving chairs of psychology at the universities to theologians, the names of Karl Vogt, Ludwig Büchner, and Jakob Moleschott became very popular (Vucinich 1970, 122; Lossky 1955, 174). In *The Demons*, Dostoevsky pointed out the "most impossible oddities" performed by a young radical sublieutenant with the following words: "For example, he had thrown two icons belonging to his landlord out of his apartment, and chopped one of them up with an axe; and in his room he had placed the works of Vogt, Moleschott, and Büchner on stands like three lecterns, and before each lectern he kept wax church candles burning" (Dostoevsky 2006, 346). When, in 1858, the professor of physiology at the University of Kazan, Wilhelm Bervi, dared to criticize the new materialist trend, an attack by Nikolai Dobrolyubov appeared in the radical journal *The Contemporary* in support of a letter signed by seventy-one students, who categorically refused to continue to attend the professor's lectures, and enjoined him to leave his chair, which was actually given shortly after to another professor (Pustarnakov 2003, 307; Koshtoiants 1946, 156–157).

The success of the natural sciences in pre-revolutionary Russia, even as an epistemological model for knowledge in its entirety, has been investigated by Alexander Vucinich in his monumental works, which remain an essential reference today.[1] Here, I will pause over the ethical and political implications that derived from that model for the large part of the *intelligentsia* that made "science" the center of its comprehensive worldview. In particular, I will consider the confrontation between the Marxists and the Narodniki during the 1890s and the reaction to the so-called bankruptcy of science by the end of the century. The common general background to both of these cases is the relevance of the experimental method of the natural sciences for the "nihilist" generation of the 1860s, as part of their revolt against traditional knowledge. The new generation opposed to the melancholic and tormented "superfluous man" the figure of the doctor and scientist, who only trusted the results of the empirical method. Indeed, the paradigmatic character Bazarov in *Fathers and Children* by Ivan Turgenev recommended reading *Force and Matter* [*Kraft und Stoff*] by Büchner instead of reading Pushkin. Like Bazarov, the "new people" of Chernyshevsky's *What Is to Be Done?* trusted animal physiology as a means of studying human beings and investigated the nervous system by dissecting frogs (Turgenev 1991, 19–24; Chernyshevsky 1986, 60). In fact, the dominant belief was that human beings were essentially physical and corporeal beings like animals and that historical, moral, and political events had to be analyzed with

the same methods as in the natural sciences. For Chernyshevsky, the "anthropological principle" of Feuerbach, whom he viewed as his inspiration, considered human beings to be "simple beings having only one nature, so as not to divide human life into two halves, each belonging to a different nature, so as to consider every aspect of human activity as an activity of the whole organism, from head to foot, everything included" (Chernyshevsky 1987, 226). As a consequence, the "natural sciences are both the basis of that part of philosophy that considers the problems of human beings, and the basis of that part of philosophy that studies the problems of external nature" (Chernyshevsky 1987, 166). Physiology was introduced as the key to a "scientific" reading of the human world, and lectures on physiology were actually drawing crowds during the 1860s (Florovsky 1972, 79; Vucinich 1970, 102–103).

In Russia, interest in Feuerbach's "anthropological principle" and the fortunes of German physiological materialism intertwined with Darwin's theory of evolution. Darwin was greeted in the 1860s as the Newton of biology (Rogers 1960; Vucinich 1988). As a witness recalled a few decades later, "Darwin's theory was received in Russia with profound sympathy. While in Western Europe it met firmly established old traditions which it had first to overcome, in Russia its appearance coincided with the awakening of our society after the Crimean War and here it immediately received the status of full citizenship and ever since has enjoyed widespread popularity" (Vucinich 1972, 229–230; Todes 1989, 23).

Dmitrii Pisarev's writings from the 1860s very clearly show the intertwining of different components in the radical ideology of the time. With Moleschott's *Physiological Sketches* [*Physiologisches Skizzenbuch*] he explained human behavior by studying the nervous system; he endorsed the maxim, according to which "man is what he eats," and admired Darwin as "a new type of critical thinker, one who studies facts as they really are, unburdened by metaphysical or religious prejudices" (Graham 1993, 58). In the natural sciences, as in history, the dominant approaches had to be materialism and rationalism, the critique of sources and respect for facts, and, on that basis, this new science would lead humanity to overcome the shame of poverty and hunger through scientific progress (Peace 2010, 131). In the ethical field too, the most coherent and extremely rational egoism had to be established: since honesty is rationally more convenient than dishonesty, according to Pisarev, "Bazarov would not steal a handkerchief for the very same reason that he would not eat a piece of rotting meat" (Pisarev 1894, 376; Peace 2010, 128). It is a utilitarian calculation that leads the heroes of Chernyshevsky's *What Is to Be Done?*, the "gospel" of Russian radicals in the 1860s, to behave as the strictest of ascetics, as this behavior was advantageous to the collective (Paperno 1988, 26–38, 195–198). Superior moral values or the hope for ultra-mundane rewards were not necessary, the narrating voice of the novel declared: "No sacrifices are required; no deprivations are asked; they are not necessary. Desire to be happy! that is all; only this desire is wanted" (Chernyshevsky 1986, 316). For Chernyshevsky, the maximum happiness for the greatest number of people was the

fundamental and indisputable criterium of the only possible "scientific" morality, because only a mathematical calculation would provide "an 'all-encompassing' formula that would explain and govern everything," an "instrument capable of an all-inclusive solution to the basic problems of human existence," which, according to Irina Paperno, Chernyshevsky searched for his whole life (Paperno 1988, 168–169).

However, the very idea of a strictly "scientific" ethics implies a deterministic option that ultimately renounces human free will. Only if behavior obeys deterministic laws on the basis of the physiological constitution of the human body and of its consequent rational egoism, is it possible to elaborate a "human science" as sound as the natural sciences. "What's important is that twice two is four and all the rest's nonsense," proclaimed Bazarov in *Fathers and Children* (Turgenev 1991, 44), but, in this way, he reduced the idea of human free will to a trifle. It is these same philosophical implications of utilitarianism and of rational calculation that encountered a major critique from Fyodor Dostoevsky, who observed that a world entirely dominated by deterministic laws would reduce human beings to nothing more than the key of a piano or the pipe of an organ played by someone else's hands (Dostoevsky 1974, 26–27). According to Dostoevsky, the mathematical calculation of usefulness carried out by the positivists did not take into consideration that which human beings hold dear above all else: "One's own free, untrammeled desires, one's own whim, no matter how extravagant, one's own fancy, be it wrought up at times to the point of madness—all of this is precisely that most advantageous of advantages which is omitted, which fits into no classification, and which is constantly knocking all systems and theories to hell" (Dostoevsky 1974, 28). Human beings renounce every rational calculation to do something foolish, irrational, and crazy, by which they even renounce their own well-being to jam the perfect mechanism of the necessary laws of science with just a bit of unpredictable irrationality in the assertion of one's own self (Thompson 2002).

With no space left to choose freely, human beings should also renounce the responsibility of their actions, because everything would be determined chemically and physiologically by the stimuli of the external environment. In *The Brothers Karamazov*, Dostoevsky reports the confused speech that Mitya gives to his brother Alyosha after the former seminarist and radical Rakitin came to visit him in prison in order to write an article about him; in it, the lack of responsibility of the alleged patricidal murderer is evident: "'It was impossible for him not to kill, he was a victim of his environment,' and so on." Our perceptions, desires, and actions—Mitya explains—ultimately depend on physiology:

> Imagine: it's all there in the nerves, in the head, there are these nerves in the brain (devil take them!) […] there are little sorts of tails, these nerves have little tails, well, and when they start trembling there […] that is, you see, I look at something with my eyes, like this, and they start trembling, these little tails […] and when they tremble, an image appears, not at once, but in a moment, it takes a

> second, and then a certain moment appears, as it were that is, not a moment—devil take the moment—but an image, that is, an object or an event, well, devil take it—and that's why I contemplate, and then think […] because of the little tails, and not at all because I have a soul or am some sort of image and likeness, that's all foolishness. […] It's magnificent, Alyosha, this science! The new man will come, I quite understand that […] And yet, I'm sorry for God! (Dostoevsky 2002, 589)

In Mitya's view, with no faith in God or in a future life, the "new people" would become "scoundrels," "Bernards," since Mitya transforms the famous French scientist into the symbol of an entire breed of people with no moral scruples whatsoever (Dostoevsky 2002, 588).

The brutality of the mechanistic application of determinism to the entire human world was a problematic element within the radical milieu, the Narodniki and the anarchists, too, among whom some new positions were developing that contrasted sharply with the social implications of the struggle for existence. When, in 1864, Varfolomei Zaitsev drew explicitly sexist and racist conclusions from a Darwinian premise, a lively controversy developed in the newspapers and journals; among many others, it involved the young Nikolai Nozhin, a biologist by education and a follower of Proudhon. He reproached Darwin for not understanding the specificity of human evolution: "he does not see that the struggle for existence is not helpful for evolution, that by itself it is only the source of pathological phenomena, phenomena diametrically opposed to the laws of physical evolution" (Rogers 1972, 521). According to Nozhin, who had certainly been influenced by the Proudhonian notion of *mutualité*,[2] organisms of the same species did not fight against each other, unless a "sick" society compelled them to by means of the division of labor.

The ideal of a reciprocity where every individual can fully develop significantly influenced Nozhin's friend and roommate in St. Petersburg Nikolai Mikhailovsky, the "ruler of ideas" of the younger generation of Narodniki (Rogers 1972, 517–523). Human beings are indeed natural beings, which can be investigated physiologically and biologically, but they are also a unique product of evolution, capable of distancing themselves from a purely determinist course of events, which they can judge according to values and preferences, and of actively intervening in the flow of history. In open contrast with the objective method glorified by the positivists, the most eminent theoreticians of Populism (along with Mikhailovsky, also Pyotr Lavrov) supported the "subjective method," which has been summarized by Andrzej Walicki in the following words:

> First, it was a defense of ethical standards, and implied that men had the right to judge everything from their own point of view and to protest even against the "objective laws of history"—that indeed they were obliged to protest against human suffering even where the situation seemed hopeless. Second, it was an epistemological and methodological standpoint that disputed the possibility of "objective" knowledge in social sciences; "subjectivism" in this sense implied that

> historical and sociological knowledge could never be really objective because they were colored by the scholar's social position, his unconscious emotions, or consciously chosen ideals. Third, it was a philosophy of history that claimed that the "subjective factor"—human will and consciousness (expressed in the activity of a revolutionary party or in deliberate state intervention)—could effectively oppose the spontaneous development trend and influence the course of history. (Walicki 2015, 375)

These new ideas shattered the firm belief of the generation of the 1860s that the natural and social sciences should follow the same method and the belief that the space of human freedom was reducible to the deterministic laws of the universe. The role of Lavrov's "critically thinking" individual and of Mikhailovsky's "subject" was leading history toward its actual telos, which was supposedly not the fragmented division of capitalist labor, but the harmonic cooperation of fully developed individuals. According to Mikhailovsky's famous "formula of progress:" "Progress is the gradual approach to the integral individual, to the fullest possible and most diversified division of labor among the human being's organs and the least possible division of labor among human beings" (Mikhailovsky 1911, 150). By reinterpreting Comte's theory of the "three stages," Mikhailovsky proposed to divide history into three epochs: the first period would be defined as "objectively anthropocentric," because human beings were spontaneously at the center of nature, and anthropomorphically interpreted each of its phenomena. Simple cooperation, which constituted the economic foundation of primitive society, guaranteed survival within homogenous social groups, composed by "differentiated, equal, free, and independent" individuals. The complex cooperation of the second stage, the so-called eccentric period, overturned this situation, thus creating differentiated and heterogeneous societies, whose members were "unequal, not free, unilaterally specialized, and hierarchically subjugated to each other" (Mikhailovsky 1911, 41). This fragmentation of human personality broke every solidarity; by opposing isolated groups of interest to each other, it led to unilateral specialization in singular fields of knowledge; and it idealized an abstract, "objective," and completely dehumanized model of science. The new epoch would restore the central value of the individual: in this "subjectively anthropocentric period" human beings would again be at the center of the universe, however this time they would be aware that this was not an actual fact, but a legitimate point of view by which they would claim the right to evaluate the entire world. For the Narodniki, every single individual always had the possibility to orient their action toward progress, to take the responsibility of moving history in the desired direction. In the case of Russia, this came down to upholding the communal tradition of the peasants to circumvent the painful experience of capitalism.

Nevertheless, the results of the political activity of the Narodniki were rather disappointing, both in the form of the "going to the people" movement of the 1870s—when young and enthusiastic intellectuals tried to pay their debt of

gratitude toward the most disadvantaged section of humanity, which, as Lavrov put it, "has paid dearly so that a few thinkers at their desks could discuss its progress" (Lavrov 1967, 135)—and in the form of individual terroristic attacks. Around the mid-1880s, some authoritative Narodniki steered, with growing conviction, toward Marxism, whose philosophy of history, a heritage from Hegel, seemed to guarantee the success of socialism with the same sound firmness as natural "laws." The Narodniki emphasized the free actions of the individual within history; Marxists deemed that there were strictly deterministic and objective historical laws, to which human activities should adapt in order to be successful. To many of its followers, Marxism seemed to be a more satisfactory ideology, thanks to its historical determinism. This meant that the certainty of the 1860s, according to which human society could be studied with the same methods and the same unfaltering soundness as the natural sciences deployed, was returning. Georgii Plekhanov, the most prominent figure among the early Russian Marxists, went as far as to write that Marxism was just "Darwinism in its application to social science": "[Darwin] regarded the origin of man as the origin of *a zoological species*. The supporters of the materialistic view want to explain the *historical* fate of such a species" (Plekhanov 1956–1958, 1: 692; 5: 293).

Numerous witnesses confirm that the success of Marxism as a "materialistic conception of history," as it was named in legal publications to avoid censorship, was due exactly to the supposed indestructibility of its "scientific" determinism. Many years later, Semyon Frank reported: "Marxism attracted me because of its scientific form, specifically as 'scientific' socialism. I was attracted by the idea that the life of human society, if studied in the way natural science studies nature, can be known through natural laws" (Frank 1986, 110–111). As late as 1922, the poet Vladimir Mayakovsky observed: "All my life I have been amazed by how Socialists can disentangle facts and systematize the world" (Mayakovsky 1942, 15). If it is true, as Nikolai Lossky observed while remembering his own youth, that "the young Russia" at the end of the nineteenth century "does nothing but talk about the eternal questions" (Dostoevsky 2002, 234), and looks for "a distinctively formulated worldview" (Lossky 1968, 75), Marxism seemed to provide a very solid one. For a radical *intelligentsia* that had grown up in awe of the natural sciences, the conviction of founding one's historical predictions on a solid scientific base, comparable to that of physics and chemistry, held an indisputable appeal. Even the most controversial point in the debate between the Narodniki and the Marxists, the maintained or denied possibility for Russia to realize socialism without going through the capitalistic phase, was ultimately reduced to a question of historical laws. For both contenders, the Russian economy had taken the road of capitalism, but, while for the Marxists this defined the trajectory of subsequent history, for the Narodniki the subjective will of the individuals was still able to change its course. Plekhanov argued in *On the Development of the Monistic View of History* [*K voprosu o razvitii monisticheskogo vzgliada na istoriiu*] (1894):

> Starting from the abolition of serfs, Russia has clearly taken the road of capitalism. The subjectivist gentlemen notice this ceaselessly; for one thing, they all assure us that the relationships of production are developing with astonishing and constant rapidity here. But this does not mean anything, they say: we are leading Russia to the boat of our ideal, and it will sail until the end of the world. (Plekhanov 1956–1958, 1: 713)

Instead of indulging in the subjectivist dreams of the Narodniki, Marxism as a systematic and scientific worldview would guide political practice toward success, because "reason can win over blind necessity only after having learned its internal laws, after having defeated it with its own weapons" (Plekhanov 1956–1958, 1: 692). The only possibility of successful action in history was based on the acknowledgment and the acceptance of necessity, according to the lesson that Plekhanov traced back not only to Hegel, but to Spinoza. He wrote:

> My freedom would not be a vain word anymore, only on the condition that the *consciousness* of it can be accompanied by the *understanding of the causes* that produce the *free* actions of my neighbors, which is to say only if I can consider them from the point of view of their *necessity*, and if my neighbors can say the same thing about *my own* actions. What does all this mean? That the *possibility of a free (and conscious) historical activity for every individual is equal to zero if, at the base of free human actions, there is no necessity understandable by the acting subject.* (Plekhanov 1956–1958, 1: 593)

In fact, Marxism promised to capture the intrinsic necessity of history with the same solidity as the natural sciences found for natural laws, thus allowing successful human realization in both fields. Only by obeying the laws of nature can technology create its prodigious instruments; only by discovering "the laws, under which the historical development of humanity takes place" can one "guarantee the chance of a conscious action within the course of such a development, and, from being a powerless toy of 'chance,' one becomes its master" (Plekhanov 1956–1958, 4: 425).

Marxist determinism raised some serious objections, especially on the level of its ethical and political consequences. In *Economy and Law* [*Wirtschaft und Recht*], which was translated into Russian in 1898 and was so successful that it sold three editions in two years (Stammler 1898, 1899), Rudolf Stammler accused Marxism of a fundamental incoherence: by reducing history to the deterministic dynamics of economic laws, Marx was accounting for an ultimately inevitable process, which was independent of human will. But then, Stammler wondered, why push human beings to struggle? The most coherent attitude would be to sit and wait. No one, Stammler observed, would ever think of founding a political party or a revolutionary movement to realize a lunar eclipse, well knowing that this exclusively depends on astronomical laws, which are completely indifferent to human action. For Stammler, the very fact that Marxists incited the people to act was a sign of the fact that they

themselves, more or less consciously, considered human effort toward a goal a condition for the realization of the goal itself (Stammler 1896, 432–433). Pavel Novgorodtsev, a liberal philosopher with Neo-Kantian sympathies, who had then just returned to Russia from Germany, commented that

> it is difficult to overstate that combination of fatalism and pragmatism that is peculiar to the doctrine of Marx. The fatalistic certainty in the inevitable affirmation of the perfect condition actually relegates the human action to the level of a simple reflex in the objective course of events. What is the meaning of calls to act and to struggle if everything is decided by the immanent and ineluctable laws of history? (Kolerov 2002, 87)

Plekhanov intervened in these discussions with the essay *K voprosu o roli lichnosti v istorii* [*The Role of the Individual in History*], which was directed mainly against the Narodniki, but also against Stammler. Plekhanov admitted that "only in a madhouse could a party be constituted to bring about a lunar eclipse," because "human action does not and cannot be a part of those conditions whose coincidence is necessary for a lunar eclipse." However, Plekhanov continued:

> For the example of the lunar eclipse not to be absurd […] it would be necessary to imagine that the moon were given a conscience, and that its position in the universe, the cause of its eclipses, would seem to it to be the product of its own free will, and not only caused it an immense pleasure, but were also absolutely necessary for its moral tranquility, as a consequence of the fact that it would always passionately aspire to maintain that position. While imagining all of this, it would be necessary to wonder what the moon would feel, if it ultimately understood that, in reality, neither its will nor its "ideals" determine its movement in the sky, but, on the contrary, its movement determines its will and its "ideals." (Plekhanov 1956–1958, 2: 303)

If Stammler were right, the moon would be paralyzed. According to Plekhanov, on the contrary, the most energetic practical action can derive from the awareness of the necessity of a certain process. It was a matter of the identity of freedom and necessity, which had already been established by Spinoza: "in my conscience, necessity is identified with freedom, and freedom with necessity, and then I am not free only in the sense that *I cannot violate this identity of freedom and necessity*, *I cannot oppose one to the other, I cannot feel limited by necessity. But*, at the same time, *a similar lack of freedom is its most complete manifestation*" (Plekhanov 1956–1958, 2: 307). According to Plekhanov, from the point of view of the human subject in history, "the consciousness of the absolute necessity of a given phenomenon cannot but increase the energy of the human being who sympathizes with it, and considers themselves to be one of the forces that provoke said phenomenon" (Plekhanov 1956–1958, 2: 308). According to Plekhanov, the persistent, combative

determinism that derived from it restated the scientific foundations of Marxism against the voluntarism of the Narodniki.

Plekhanov fundamentally kept the same model for the natural sciences that had taken root in the 1860s. This is confirmed by his own interest in the epistemology of the French materialists of the eighteenth century, in Feuerbach and Chernyshevsky, in human physiology, and in Darwin (Steila 1991). But the traditional positivist model was already in crisis. In 1876, the authoritative physicist Gustav Kirchhoff had stated that the task of mechanics was "to describe completely and as simply as possible motions occurring in nature," instead of providing an actual understanding of them, as had been the ambition of mechanistic physics up to that point (Frank 1989, 37). Heinrich Hertz, the discoverer of the electromagnetic wave, argued that scientific concepts and laws did not have to claim to be immanent in reality at all, because it was sufficient that they helped to calculate and predict the occurrence of phenomena. Wilhelm Oswald put forth an interpretation of nature based on the concept of energy instead of matter. The "bankruptcy of science," which was being debated in other European countries, especially in regard to the confrontation with metaphysics and religion (MacLeod 1982), caused a profound consternation among those who had founded their whole worldview on the solidity of scientific knowledge in Russia. Now, those same scientists confessed that they did not possess any definitive answers, and the concepts that had guided their research for decades showed an irreducible conventionality. Alexander Bogdanov, one of the leading figures in the philosophical debate within Russian Marxism at the beginning of the century, would define that period as "the epoch of a great and unprecedented revolution in the world of scientific knowledge, when the scientific laws that seemed the most stable and universal staggered and fell and left their place to be filled by new and incredible forms, thus opening unexpected and incommensurable perspectives" (Bogdanov 2012, 25).

In Russian laboratories and universities, the "revolution" praised by Bogdanov was welcomed with less enthusiasm. The most famous and important figures mostly aligned themselves in defense of mechanics. Aleksander Stoletov, a physicist at the University of Moscow, for example, stood against those who abandoned mechanics "under the impression of the fecundity of the principle of energy, from which, as from the horn of plenty, the most varied and unexpected fruits have spread; under the influence of the second law of thermodynamics, which has developed outside mechanics and is not subject to a simple mechanical interpretation; under the awareness of the immense gaps of our information about the molecular and electrical processes." He suggested interpreting energy itself as a "mechanical" concept, whose ultimate function was to reduce phenomena to movement (Stoletov 1950, 567–569). In the journal *Scientific Word* [*Nauchnoe slovo*], Dmitrii Gol'dgammer, a student of Stoletov, stated: "scientific truth is made of the answers to our questions: what is it, why is it so; and, if we have closely connected the scientific truth in physics—and in the natural sciences in general—to the question of the mechanical scheme, the reason is clear: only the mechanical scheme promises to give an

answer to the questions" (Gol'dgammer 1904, 15). Similarly the outstanding scientist Kliment Timiriazev, in *Russian Thought* [*Russkaia mysl'*], stated that "truth is what is," and the only way to come close to the unreachable ideal of exhaustive knowledge was a scientific inquiry that followed the proven methods of the classical tradition (Timiriazev 1904, 197). From his point of view, the speculations of Mach, Ostwald, Helm, Duhem, and Poincaré all had to be rejected because they admitted the success of contemporary science, but denied the methods with which it had been reached.

However, in the Russian scientific world as well, there were some who approved of the new epistemology. The physicist Nikolai Umov, who was also active as a popularizer within the Psychological Society of Moscow and in the journal *Problems of Philosophy and Psychology*, suggested that physics should abandon the Newtonian empirical tradition to go back to the Cartesian one, to find its center around the importance of the theoretical phase of the elaboration of models for interpreting reality (Umov 1896). In fact, sensations could only provide a frame with gaps that had to be filled by the correct use of hypotheses that could change in time. For example, the discovery and study of energy suggested that the ultimate unities of reality had to be "energetic individualities" and not material atoms, which found their connections in the electromagnetic field and not in a mechanical relationship between forces. In Petersburg as well, Orest Khvol'son supported the relevance of the hypotheses in contemporary physics (Khvol'son 1887, 713) and insisted throughout his whole life on this idea, which he would state in a particularly clear way in his later years: "real science does not consist in a list of phenomena and laws, but in the construction of a theory of phenomena, which is to say in the union of the greatest quantity of facts and laws in a well-constructed whole, which deserves to be called a scientific building; its foundation is a defined hypothesis" (Khvol'son 1916, 13).

Russian scientists were generally aware that the introduction of alternative hypotheses to materialism and mechanics would have ample repercussions outside the mere academic and scientific domain. For Alexei Bachinskii (a student of Umov, an experimenter in molecular physics, and a disseminator of Poincaré in Russia) the rejection of matter as an "ephemeral and illusory idol" would have finally brought scientific thinking back to neutrality in the political and social fields. As a matter of fact, he detected a close link between the materialism that had dominated mechanistic physics and the economical materialism of "scientific socialism." Freeing science from the former would have saved it from the latter as well (Bachinskii 1906, 201–202; Vucinich 1970, 373–374). This was exactly what worried one of the most prominent scientists at the time, the chemist Dmitrii Mendeleev. While placing all his authority in favor of Newtonian physics and mechanics, he described the loss that the "bankruptcy" of science was causing in much of Russia's *intelligentsia*, who had been accustomed, for decades, to trusting scientific results as objective and indisputable. Mendeleev wrote:

> The old gods have been overturned, new ones are being looked for, but we are coming to nothing accessible and complete; and skepticism becomes law by being content with aphorisms and denying the possibility of a complete general system. This is quite sadly reflected in philosophy, which follows Schopenhauer and Nietzsche; in natural science, which tries to "embrace the ungraspable" […]; in the whole of the *intelligentsia*, which is used to adhering to the "latest word of science," but is incapable of understanding anything of what is done now in science; and more sadly than ever the dominant skepticism is reflected on youth, which is losing its way. (Mendeleev 1954, 455–456)

In face of the confusion that came from the uncertainty of the solid scientific model, which many had found to be the basis of their comprehensive worldview, reactions were different. Orthodox Marxists maintained Plekhanov's unshakeable faith in the "objective legality" of nature and of history, borrowed from Hegel and Spinoza, Marx and Engels. According to orthodox Marxists, the contemporary epistemology in Europe, and the critique of the concepts of "matter," "substance," and "object," could dangerously affect the Russian progressive *intelligentsia*, since they ultimately represented a regression to bourgeois thinking. Plekhanov came to recognize that some recent scientific discoveries, such as the second law of thermodynamics, could cause a crisis for the old mechanics, but they still had no consequences against dialectical materialism, which would ultimately be reinforced by them. In fact, "none of these discoveries will undermine the definition of matter as that which (existing 'in itself') acts either mediately or immediately, or under certain conditions can act on our external senses. That is enough for me" (Plekhanov 1956–1958, 3: 469). According to Plekhanov, admitting the objective existence of an external world, independent from the experiencing subject, was the indefeasible presupposition of both the natural and human sciences, which, as such, aimed to analyze, describe, explain objective reality, and to define the objective laws that allow the understanding and prediction of the dynamics of reality.

At the turn of the century, others, who were nonetheless proclaiming themselves "Marxists," tried a "moral" re-foundation of their political ideal by rejecting the determinism of orthodox Marxists. In some cases, Kantianism provided a way to avoid the opposition between idealism, compromised by the reaction, and materialism, discredited by the natural sciences themselves. Among the first to do so, Nikolai Berdyaev declared that "the singsong of positivism, naturalism, and hedonism had been sung to its exhaustion" (Berdyaev 1901, 2), and that, if the claims of positivism continued to have some foundation in natural sciences, they had to be decisively rejected by the philosophy of history and ethics. By tracing the road that had rapidly gone "from Marxism to idealism," Sergei Bulgakov noted that, while he was still trying to defend Marxism against Stammler's critique, he "had to admit beyond any possible disagreement that the ideal of Marxism is not given by science, but by 'life,' and is therefore *extra*-scientific or *a*-scientific. This conclusion is really rather fatal for 'scientific' socialism, which is precisely proud of the scientific nature of

its ideal" (Bulgakov 1903, 7). According to Bulgakov, the justification of "progress" in the history of humanity could not derive from positivist science, but only from the ideal identification of values. Therefore, political choices had now to be founded "ethically" rather than "scientifically"—which would also strengthen them, instead of weakening them: "The contemporary social struggle will seem to us to be not only the clash of adversary interests, but also the realization and the development of a moral idea. And our participation in it will not be motivated by selfish class interest, but will become a religious duty, an absolute imperative of moral law, a commandment from God" (Bulgakov et al. 1902, 46).

The impact of contemporary Western epistemology was massive and profound, especially on the radical *intelligentsia*, who had been nurtured by the "scientism" of the Russian revolutionary tradition and were elaborating their beliefs during the decade preceding the revolution. In the words of Victor Serge, "the new theory of energy of Mach and Avenarius, revising the notion of matter, was of cardinal importance for us" (Serge 2012, 30). And it was exactly the empiriocriticism, which had been elaborated independently by the Austrian physicist Ernst Mach and the Zurich philosopher Richard Avenarius, that fascinated the Russian radicals who were looking for a new paradigm that could account for the most recent scientific thinking without corroding the traditional deference to the natural sciences in the process. Unlike Neo-Kantianism, which attempted to find the foundations of the scientific nature of science in the transcendental structures of pure consciousness, empiriocriticism aimed to draw the model of knowledge from the concrete process of existing sciences. Ernst Mach, while he underscored the relativity of scientific discoveries and the conventionality of its principles and concepts, advocated for the fundamental role of scientific knowledge in human life. Richard Avenarius developed his theoretical thinking on the ground of psycho-physiology, which was long familiar to the Russian radicals. What is more, empiriocriticism, in both its versions, echoed the themes of Darwinian evolution: knowledge appeared as an instrument for adapting to the environment; the very development of ideas was subject to the "struggle for survival," which meant that the most effective conception became more and more preponderant in history. The extraordinary Russian career of empiriocriticism can be explained by the particularly favorable combination of the theoretical proposal of Mach and Avenarius with the "horizon of expectations" of those who received it.[3] In Russia, those who turned to empiriocriticism found a confirmation of the traditional "scientific" worldview, which was capable of surviving the crisis of classical positivism, the "dematerialization" of the world put forth by science, and the fall of Newtonian mechanics. It is not a coincidence that the often-repeated accusation of the so-called Russian "Machists" against orthodox materialism was precisely based on the backwardness of the latter's scientific references. In Bogdanov's words, Plekhanov and his followers continued to apply, in an

> uncritical and unsystematic way, concepts like "matter," "things," "property," "nature," "force," etc., both in a metaphysical sense and in a vaguely physical one. But these very concepts had been profoundly transformed by the science of the nineteenth and beginning of the twentieth centuries. Philosophy can progress only if an indissoluble and lively link with the development of *science as a whole* is maintained, and not by lagging tiredly behind among familiar, but undetermined, concepts. (Bogdanov 2012, 259)

Bogdanov, who was certainly the most authoritative and original of the "Machists," openly asserted the opportunity of "harmonically introducing" into Marxism "everything that is vital in the ideas" of empiriocriticism (Bogdanov 1904, 174). For the "Machists," this did not imply a concession to bourgeois thinking, which would "contaminate" the Marxist orthodoxy, as was claimed by Plekhanov and his followers, but, on the contrary, it was going to re-establish ideas that were already "familiar" to Marxism (Lunacharsky 1906, VI): the "biological" and "pragmatic" conception of knowledge as a way of adaptation to the environment, a strict empiricism stretched until the distinction between subject and object was overcome, and the critique of every metaphysical idea in the face of the essential factuality of experience, which had to be approached without prejudice (Lunacharsky 1905, 368).

The internal dispute within Marxism that these subjects ignited, and that even caused some witnesses to talk about a real "fight around Mach" (a "Machomachy") (Izgoev 1910), is well-known, at least because it occasioned Lenin's "philosophical" work, *Materialism and Empiriocriticism* (Steila 2013). Here, without entering into the specific terms of this conflict, I would like to limit my observations to the fact that both the orthodox Marxists and the "Machists" shared the same faith in the "scientific" value of historical materialism and Marxist political theory. The division came from the idea of "science" that they supported, and the epistemology they embraced. According to Plekhanov's followers, the claim of a reformation of Marxism on the basis of empiriocriticism would destroy any possible materialist conception of history. Liubov' Aksel'rod, who was so faithful to Plekhanov's line that she chose the pseudonym "Orthodox," observed "that *the acknowledgement of the objective laws of history cannot coexist with the denial of the reality of nature and its objective laws in general*" (Aksel'rod 1906, VIII). On the side of the "Machists," the then young historian Mikhail Pokrovsky maintained that:

> science is the means of finding one's way in the chaos of experience, and thus of economizing the energy of consciousness which would otherwise be infinitely dispersed […] From this point of view, that which is best and will most surely lead to the fundamental goal of science will be the most scientific. The hypothesis that can explain in the most direct way the greatest quantity of phenomena possesses the *record* for scientific nature in a given moment. Naturally, this *record* is relative: in the following moment, an even more scientific hypothesis can appear, but this will be such only in the case in which it comes even closer to the scientific ideal. (Pokrovsky 1904, 125)

The "law" does not reproduce an objective reality at all, nor does it represent the "plan" that reality follows in its development. It is just a formula, reached by way of generalizations, which enfolds all known phenomena that possess a certain characteristic. In this sense, history was no exception, if only for the degree of proximity to the model of scientific knowledge:

> the concepts of natural science are elaborated according to a strictly defined method, which is to say by respecting certain logical conditions. Most historical concepts come from life, where they have been formed with no method at all […] But this difference is in the degree of perfection, not in substance. The concepts that serve as a basis for the historian refer to the same logical category of the concepts of natural science, but the former are less adapted than the latter to the scientific requirements: this is all the difference there is. (Pokrovsky 1904, 118)

With this, Pokrovsky used empiriocriticism to reject Neo-Kantian and historicist positions in the name of a concept of history as science with the same rights and meaning as natural science.

However, according to the orthodox Marxists, "Machists" rejected the objective criterion of truth, the ultimately "real" foundation of any possible knowledge and judgment, and therefore their political actions were to take the risk of arbitrariness and errors. The great advantage that early Marxism had been able to hold against the Narodniki, which was its reference to an objective "science" of society that interpreted reality and predicted its development with certainty, seemed to have been utterly smashed. If, in 1913, Lenin stated with conviction that "the Marxist doctrine is omnipotent because it is true" (Lenin 1977, 25), it was exactly the strength of that "truth" that the "Machists" seemed to undermine. Plekhanov could put forth against the "Machists" the same arguments that, a decade earlier, he had held against the "subjectivist" Narodniki:

> The criterion of truth does not reside in me, but in existing relationships outside of me. The *true* ideas are those that give an exact representation of these relationships; the *false* ones those that deform them. In the sciences of nature, the theory that faithfully embraces the relationships between natural phenomena is *true*; in history, the description that faithfully accounts for the existing social relationships in the described period is *true*. (Plekhanov 1956–1958, 1: 671)

The possibility of linking Mikhailovsky's "subjective sociology" and empiriocriticism was supported by many, and not simply because one of the latter's most coherent advocates in its applications to the study of history and society was Viktor Chernov, one of the proclaimed heirs of the tradition of the Narodniki (Chernov 1907). The interpretation of Marxism as a "philosophy of action," the revision of the traditional categories of reality and causality, and the foundation of a new historical monism based on the critique of experience were common themes in the thought of the "critical" Marxists and late-Narodniki. This was particularly clear in a polemical piece signed by Anton

Morev, who protested against the presumed originality of the "self-critique" of Russian Marxists, and against their lack of gratitude for their authentic "forerunners," who were to be found among the Narodniki (Morev 1909, 8–9). In 1909, while the well-known philosophical discussion within the Bolshevik faction was raging, an anonymous reviewer in the journal *The Russian Wealth* [*Russkoe bogatstvo*] commented that, a few years earlier, "the invitation to align with the flag of Mach's and Avenarius' empiriocriticism, the critique of the 'truths' of metaphysical materialism, the references to the early works of Marx in spite of the 'dogmatic' Marxism of the various Misters Plekhanov etc., were branded as 'petty bourgeois ideology,' typical of the followers of Lavrov and Mikhailovsky. But *tempora mutantur*" (Retsenziia 1909, 111–112). Now, among the Marxists, "Machists" seemed to repeat the very same ideas of the Narodniki.[4]

In this perspective, it is interesting to observe that the first reception of empiriocriticism in Russia had occurred a few decades before in the Populist milieu. Vladimir Lesevich, a student of Lavrov, the founder of a school for peasants, a scholar of folklore, a friend of Mikhailovsky, and even a contributor, under the pseudonym of "Ukrainian," to the clandestine *Bulletin of the People's Will* [*Vestnik Narodnoi Voli*], was the first, at the end of the 1870s, to adhere to the program of "scientific philosophy" of Avenarius, and to enthusiastically start its dissemination in Russia. Vladimir Bonch-Bruevich assigned him a direct responsibility for the success of empiriocriticism among the Marxists by recalling that Lesevich had held a lecture on Avenarius in Petersburg in 1898 and some of the attending Marxists had then begun "to bring the philosophy of Avenarius closer to dialectical materialism and to Marx's philosophical opinions" (Bonch-Bruevich 1929, 32–33). According to Bonch-Bruevich, Mikhailovsky was also present at the lecture, and asked Lesevich a direct question about the relationship between the philosophy of Avenarius and the subjectivist method. Lesevich allegedly answered that the new philosophy "was opening doors and windows to subjectivism" (Bonch-Bruevich 1929, 33). Actually, it was not difficult to connect the empiriocriticist attacks on metaphysics, and the claim that the conscience plays a "constitutive" role in the elaboration of experience, with the assertion of the driving function of individuality in history. For Lesevich, scientific knowledge, free from prejudices, was going, prospectively, to allow humanity to transform the world. To this end, "it is necessary to look at nature directly, to desist from its personification, to stop attributing to it goals and tendencies, to resist the seduction of vain expectations. Intentionality and teleology are only present in human activity" (Lesevich 1915, 598). Lesevich's epistemological ideal, the disillusioned knowledge of reality, was thus embracing action as consciously oriented toward the aim of political activity. Lesevich presented the seemingly abstruse and abstract philosophical system of Avenarius to the Russian readers of *Russian Thought* [*Russkaia mysl'*] as the foundation of a project that had to be realized in history. He wrote:

> Richard Avenarius […] made clear that traditional knowledge only contains casual and unconnected elements of experience, and it is overloaded with a great quantity of fictions; he made it clear that the preservation of life and the strengthening of its stability demand that these fictions be eliminated from experience, that "pure experience" be established, and he irrefutably demonstrated that the stability of social groups […] is based on the development of social solidarity, which triumphs and distances the threats against itself only on the basis of the complete and systematic elaboration of "pure experience." (Lesevich 1903, 83–84)

An equally committed reading of empiriocriticism, this time with an anti-Narodniki purpose, was put forth a few years later by the journal *Scientific Survey* [*Nauchnoe obozrenie*], which, although it was not openly Marxist, was considered by contemporaries to be "an authentic platform for materialistic thought and for the struggle against Populism" (Strumilin 1969, 3). Filippov, the founder and soul of the journal, a scientist by education, reproached the Narodniki for propounding the subjectivist method "not as the regulator of every scientific research, but as an autonomous method independent from research, which was applicable to the phenomena of the individual and social life of human beings" (Filippov 1895, XVII). To his eyes, on the contrary, the "subjectivist point of view" was not eliminable from any research, and, for this reason, had to be consciously taken into consideration. At the heart of the polemics between the Marxists and the Narodniki about historical determinism, Filippov invoked the principles of "scientific philosophy" that could bring the natural and human sciences closer; he observed that "an unconditional necessity, even in the physical world, is a metaphysical myth, just like chance or unconditional freedom" (Filippov 1897, 114). The natural and historical world is understood as an interconnected web of functional relationships, where "every necessity is conditional, and those who *can* do something to overcome evil, *must* do it. The only question is the *accurate evaluation of our strength*, otherwise, like a bad general, we risk wasting it all where it is not actually needed" (Filippov 1897, 130). From Filippov's point of view, the unavoidability of a strictly "scientific" worldview was again stated as necessary in order to have effective political action.

Russian reception of the European conception of science between the late nineteenth and early twentieth centuries was largely bound to political and social thought, as had been the case for Darwin's theories. In general, this confirms the traditional conception of historiography, according to which, in Russia, "philosophy was not expected to answer the theoretical questions of reason, but rather to provide some indication about a possible way of resolving the questions of life" (Zenkovsky 1991, 120). Even reflections about the epistemological foundations of the natural sciences were loaded with ethical and political implications. More specifically, this whole history shows the relevance of the problem of the "scientific" foundation of different worldviews and of different political and social projects within the Russian revolutionary movements.

Translated by Lucia Pasini

Notes

1. See Vucinich (1963, 1970, 1988). For a more recent survey, Ellis (2010).
2. The idea of mutuality would be taken up again at the beginning of the century, among the anarchists, by Pyotr Kropotkin (1908).
3. About the concept of "horizon of expectations," see Jauss (1987).
4. Here, the reviewer was referencing Bazarov (1908) in particular.

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