

Sensation(al) Science: Ivan Sechenov's *Reflexes of the Brain* and Revolutionary Physiology, Literature, and Politics of the Russian 1860s

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Each thought, each day, each life lies here as if on a laboratory table. And as if it were a metal from which an unknown substance is by every means to be extracted, it must endure experimentation to the point of exhaustion.

Walter Benjamin, *Moscow Diary*

On 4 April 1866, representatives of the Petersburg Censorial Committee confiscated three thousand copies of the scientific treatise, *Reflexes of the Brain*, from the Golovachev publishing house where they were awaiting distribution. On June 9th of the same year, the Committee issued a written indictment to Ivan Mikhailovich Sechenov, physiologist, professor at the Military Medical Academy, and author of the impounded work. The indictment, which accused *Reflexes of the Brain* of intentionally promoting determinism under the guise of scientific research, contains this scathing passage:

This materialistic treatise reduces even the best men to the level of a simple machine devoid of consciousness and free will, and acting automatically; it sweeps away good and evil, moral duties, the merit of good deeds and the responsibility for bad ones; it undermines the moral foundations of society and thereby destroys the religious doctrine of eternal life; it mitigates against the views of Christianity and

the claims of the Penal Code; consequently, it leads to the corruption of morals.¹

These are hefty accusations for a work whose purpose, as Sechenov would later claim in his defense, was “solely to explain the action of external stimuli upon the nervous system.”² Regardless of Sechenov’s original intentions for his work, over the year-long legal battle that followed its confiscation, *Reflexes of the Brain* only narrowly escaped a public trial and its author barely avoided arrest.

While the tsarist state’s dramatic reaction to *Reflexes of the Brain* may strike a modern day reader as odd, in fact, it was emblematic of the centrality of science in literary and political discourses of the Russian 1860s. The publication of Turgenev’s novel *Fathers and Sons* first introduced the character Bazarov, perhaps Russian fiction’s most controversial scientist, to the literary scene in 1862, only a year before Sechenov’s work first appeared. Bazarov’s nihilist philosophy, grounded in a radically materialist view of man, indiscriminately placed both action and emotion in the category of mechanic physiological processes, and set off what historian Isaiah Berlin called “the greatest storm among... Russian readers of any novel, before or... since.”³ In early 1863, the novel *What is to be Done?* written by the jailed literary critic Nikolai Chernyshevsky, featured two similarly minded physician-scientists as main characters. Both of these literary works are fascinated primarily with the function of the nervous system. While Bazarov’s predilection for catching and dissecting frogs strongly hints at his interest in neural pathways, Chernyshevsky is more explicit, writing that the two doctors of his novel “had both chosen to specialize in the nervous system.”⁴

Read in this context, Sechenov’s experiments and conclusions provide a scientific framework for the philosophical-literary model of man that developed in the Russian intelligentsia from the 1860s up to and after the 1917 revolution. Beginning where the censors left off, this paper seeks to evaluate and understand the origins, development, and implications of the man produced in Sechenov’s work and reproduced in the literature of his time. Although Sechenov’s text appears to advocate a

Epigraph from: Walter Benjamin, *Moscow Diary* (Cambridge, Mass.: Harvard University Press, 1986), 28

¹ *Nauchnoe nasledstvo*, Tom III, Ivan Mikhailovich Sechenov. Neopublikovannye raboty, perepiska i dokumenty (Moscow: Izdatel’stvo Akademii Nauk SSSR, 1956), 66. Hereafter abbreviated as NN.

² Quoted in M. N. Shaternikov, “The Life of I. M. Sechenov” in *I.M. Sechenov: Biographical Sketch and Essays* (New York: Arno Press, 1973), xxiv

³ Isaiah Berlin, *Russian Thinkers* (New York: Penguin, 1979), 321

⁴ Nikolai Chernyshevsky *What Is to Be Done?* trans. Michael R. Katz, (Ithaca: Cornell University Press, 1989), 93

cold, mechanical, and hyper-rational vision of man, a more careful reading of *Reflexes of the Brain* destabilizes this interpretation. Sechenov's mechanical man, is in fact an experimental man, likened physiologically to an experimental apparatus, and created and understood through experimental processes. Despite, or perhaps because, of his modern scientific origins, this "experimental man" is not rational or autonomous. He sweeps away distinctions between the individual and his environment and the real and the fictional, and implies a scope for scientific inquiry that is limited only by fatigue of the organic elements of the body. This total and unlimited vision of laboratory science is a modern literary and revolutionary method in itself which advocates mechanical reproduction as the way to produce the extraordinary and the new.

Mechanical Man

In *Reflexes of the Brain*, Sechenov essentially redefines man as a conducting fiber, a machine for turning environmental stimuli into muscular movement. "The brain is the most strange and fantastical machine in the world," Sechenov writes, "a mechanism which, if brought into action by a certain cause, ultimately produces a series of external phenomena which are expressions of psychical activity."⁵ In Sechenov's system, every "psychical phenomenon becomes a part of a chain of machine like processes."⁶ And it is through this seemingly fragmented process of step-by-step conduction that man becomes a coherent thinking and acting whole. "The nervous mechanisms...form, in the aggregate, part of the apparatus that ensures the intactness of the organism as a whole," Sechenov writes.⁷

The "reflexes" of the work's title provide the mechanism by which sensory stimuli is transformed into physical action. "Excitation of the sensory nerves, excitation of the spinal center linking the sensory nerves with the motor nerves, and excitation of the latter, expressed in...muscular movement—such are the acts that comprise reflexes or reflex movements," Sechenov writes.⁸ This process of conduction from sensation to action is mechanical and automatic, a relay with predictable results for any given stimulus. "In definite external and internal conditions...a given sensory stimulus will evoke a perfectly definite second and third element of the whole phenomenon," Sechenov writes.⁹

⁵ Ivan M. Sechenov, trans. S. Belsky, *Reflexes of the Brain* (Cambridge MA: MIT Press, 1965), 8, 3 Hereafter abbreviated RB.

⁶ *Ibid.*, 20

⁷ *Ibid.*, 33

⁸ *Ibid.*, 7

⁹ Shaternikov, "The Life of I. M. Sechenov," xxii

In fact, Sechenov's work was innovative and controversial not because of how he defined reflex movement, but rather because of the unprecedented scope he gave this definition. For Sechenov, all movement, even voluntary movement and the production of thoughts or emotions, fell under this heading of reflex movement. "All psychical acts without exception...develop by way of reflex," Sechenov writes.¹⁰ "Hence all conscious movements resulting from these acts and usually described as voluntary are reflex movements in the strict sense of the term."¹¹ *Reflexes of the Brain*, Sechenov proudly claimed, was the "first attempt to interpret the phenomena of voluntary movements as the machine like activity of a relatively simple mechanism."¹²

Sechenov based this extraordinary claim, that voluntary movements are essentially the same as involuntary ones, on a the phenomenon of inhibitory reflexes, which he discovered while conducting research with Claude Bernard in Paris a year before *Reflexes of the Brain* was published. "It appears that the brain mechanism producing involuntary (reflex) movements of the trunk and extremities possess two appendages," Sechenov writes, "one suppresses movements, while the other, on the contrary, intensifies them depending on the strength of the stimulus."¹³ This idea of inhibitory reflexes is the conceptual framework upon which Sechenov builds his idea of man as a totally mechanical creature. In this system, Sechenov defines thought and emotion as reflexes, albeit reflexes that do not result in movement. A thought is merely *the absence* of action in response to sensory stimuli, the "most important result of man's capacity to inhibit the last member of a reflex."¹⁴ Similarly, willpower, the will not to act or not to move in the presence of certain stimuli also traces back to inhibitory connections in man's psyche. "There can be no doubt that any resistance to sensory stimulation is caused by mechanisms that inhibit reflex movements," Sechenov asserts.¹⁵

This theory of man as a machine gives the environment around him extraordinary power. If the body is properly stimulated, "movements are as inevitable as...the works of a machine which has been set in motion," Sechenov writes.¹⁶ The only variable in this equation of conduction and action is the original stimulus—varying the environment is the only way to vary the response. "The initial cause of any human

¹⁰ RB, 80

¹¹ *Ibid.*, 80

¹² *Ibid.*, 43

¹³ *Ibid.*, 19

¹⁴ *Ibid.*, 86

¹⁵ *Ibid.*, 14

¹⁶ *Ibid.*, 7

activity lies outside of man,” Sechenov argues.¹⁷ “Given the same internal and external conditions, the activity of man will be similar,” he continues, “choice of one of the many possible ends of the same psychological reflex is absolutely impossible; its apparent possibility is merely a delusion of self consciousness.”¹⁸ And self consciousness itself “is also based on a more or less complex reflex.”¹⁹

Reflexes of the Brain although ostensibly a work of experimental science, makes claims far beyond the scope of Sechenov’s laboratory experience. From this text, a novel vision of man as mechanism emerges, which subsumes all voluntary movements, thoughts and emotions under the rubric of external stimuli and resultant action.²⁰ This machine is dynamic; Sechenov defines all bodily processes by their relationship to muscular action. Under Sechenov’s scheme the physical environment bleeds into the physiological body, comprising an important link in the “chain of machine-like processes” which make up the whole.

The revolutionary implications of this totally mechanical, environmentally determined, model of man were not lost on the Petersburg Censorial Committee. After issuing their 1866 indictment, the Committee quickly moved to bring Sechenov to court. Although they built their case on religious laws and a vague statement that *Reflexes of the Brain* was “dangerous reading material for the youth and those without well formed ideas,” the specific reason for the Censorial Committee’s meddling was obvious.²¹ Functioning mechanically, “even the best of men” was absolved of any responsibility for his actions. Materialist physiology could be used as a justification for anything, from common crime to revolutionary agitation, even for most the recent crisis—the student radical Dmitri Karakozov’s assassination attempt on the tsar that had occurred previously that spring. Ultimately, Sechenov and *Reflexes of the Brain* were called to trial precisely because the mechanical man produced in this work could not be.

And yet, Sechenov’s mechanical man was doubly threatening, because, even though he was beyond legal investigation, he was already the product of an entirely different kind of investigation. “Any machine, no matter how intricate, can be subjected to investigation” Sechenov

¹⁷ Ibid., 106

¹⁸ Ibid., 105

¹⁹ Ibid., 63

²⁰ Although earlier conceptions of man-as-machine exist in European scientific and philosophical texts, Sechenov’s explicitly physiological and experimentally produced “mechanical man” was a departure from these earlier models. For more on the history of mechanical conceptions of man, see Anson Rabinbach, *The Human Motor: Energy, Fatigue, and the Origins of Modernity* (Los Angeles: University of California Press, 1992).

²¹ NN, 66

argues.²² Man, “the most fantastical of all machines” is an ideal candidate for this kind of investigation, but the only proper way to conduct it is through laboratory science. For Sechenov, the results of this second investigation were already indisputable. When he first heard about the indictment, according to one contemporary critic, Sechenov joked, “why should I need a lawyer? I shall take a frog with me to court and perform my experiments in front of the judge.”²³ This joke is an implicit threat, a challenge which pits two different ways of knowing against one another, and which reveals what was really at stake in the censorship of *Reflexes of the Brain*. Sechenov provides an alternate way of understanding and investigating man and his actions that does not require the intermediary of church or state. The particular kind of science Sechenov practiced has its own set of core principles and its own rubrics. How then do these particular principles of scientific investigation participate in the making of Sechenov’s mechanical man?

Mechanical Objectivity

In fact, by claiming that man is a machine, Sechenov confused what he was observing with the process of observation itself. It is not that man is mechanical and thus can be studied experimentally, rather it is the process of this experimental investigation that makes him a machine. This mechanized man has as his roots not so much the facts of Sechenov’s experimental discoveries, but the philosophy behind Sechenov’s scientific study. An engineer by training before entering the medical profession, Sechenov was fascinated at an early age by simple mechanical solutions to complicated problems.²⁴ As a scientist, this fascination translated into an enthusiasm for laboratory apparatuses as objective recorders of physiological phenomena. In *Reflexes of the Brain* these laboratory machines, which are optimized to record from the environment around them, provide the model for man’s sensory system and actions. If Sechenov was, as historian David Joravsky has written, “the first thoroughly modern professor of physiology” in Russia, then his vision of man was equally modern, both understood via and constructed

²² Ibid., 8

²³ Annenkov, quoted in Kh. Koshtoiants, *Essays on the History of Physiology in Russia* (Washington, D.C.: American Institute of Biological Sciences, 1964), 149

²⁴ Ivan Mikhailovich Sechenov, *Autobiographical Notes* trans. Kristen Hanes (Washington, D.C.: American Institute of Biological Sciences, 1965). See especially Chapters 1 and 2. Hereafter abbreviated as AN.

from an amalgam of laboratory machines, which would have been unthinkable even a decade prior.²⁵

Sechenov's enthusiasm for scientific apparatuses was certainly unparalleled in mid-nineteenth century Russia. In his *Autobiographical Notes*, Sechenov remarks that at the time of his training, "Moscow had not yet thought of a microscope," even though microscopic analysis was routine in the hospitals and universities of Western Europe.²⁶ Frustration with Russia's technical backwardness drove Sechenov to study in Germany in the late 1850s.²⁷ For his first independent project, a study of various blood gasses, Sechenov's re-designed one of his advisor's machines, and published his first paper on the success of this new apparatus, which was subsequently adopted by other laboratories.²⁸ Upon returning to Russia, Sechenov brought with him an induction coil and a galvanometer, two essential pieces of equipment for the study of the nervous system, which, while common in Germany, had never before made an appearance in Russia.²⁹ When Sechenov gave a series of incredibly popular lectures on "animal electricity" in 1861, these machines featured prominently. Historian of science Alexander Vucinich writes that Sechenov's "audiences were impressed both by the ideological undertones of his lectures and by his skill in handling modern electrical apparatus while demonstrating the workings of the nervous and muscular systems."³⁰

Sechenov's love of mechanical systems, although novel for a Russian scientist, was not unique to him. In fact, the mid-nineteenth century was the golden age for the scientific apparatus throughout European laboratories. Never before or since did scientists put such faith in the production of scientific truth through mechanical means. Historians of science, Lorraine Daston and Peter Galison have named this turn towards technological solutions "mechanical objectivity."³¹ Taking its cue from the industrialization of labor, this new scientific ethic idealized the machine as "a new model of perfection toward which working objects of science might strive."³² The scientist himself took a backseat to this new

²⁵ David Joravsky, *Russian Psychology: a Critical History* (Oxford, UK: Blackwell, 1989), 64

²⁶ AN, 46

²⁷ *Ibid.*, 64

²⁸ Shaternikov, "The Life of I. M. Sechenov," xii

²⁹ Mary Brazier, *A History of Neurophysiology in the 19th Century* (New York: Raven Press, 1988), 214

³⁰ Alexander Vucinich, *Science in Russian Culture* (Stanford: Stanford University Press, 1963), 123

³¹ See: Lorraine Daston and Peter Galison, *Objectivity* (Cambridge, Mass.: MIT Press, 2007)

³² *Ibid.*, 138

mechanical investigator, which “embodied a positive ideal of the observer...patient, indefatigable, ever alert, probing beyond the limits of the human senses.”³³

This new ideal of mechanical objectivity was especially important in the study of the nervous system and sensation. The establishment of a scientific ethic of objectivity, as Daston and Galison point out, “necessarily goes hand in glove with the emergence of scientific subjectivity.”³⁴ And nowhere was this “enemy within” more prominent than in the nervous system itself, in the subjective sensory experience of each organism.³⁵ In their application of mechanical objectivity to the study of the senses, Western neurobiologists attempted to understand subjectivity within an objective scientific framework. In *Reflexes of the Brain*, Sechenov takes this ethic of mechanical objectivity even further, redefining the sensory system itself, the seat of subjectivity, as an objective machine.

In *Reflexes of the Brain* Sechenov likens the body to an experimental apparatus through his choice of analogies. “The brain.... produce[s] movements as inevitably as any machine,” Sechenov writes early in his essay, “just as, for example, the hands of a clock inevitable move when the clock wheels are turned by the weights”³⁶ Thus, the body functions as a kind of stopwatch, as exact, dependable, and uniform as the clock that might be used to time a chemical reaction or the delay between stimulus and response. In the next few pages, Sechenov compares the nervous system to an electrical magnet, an apparatus which also appears on the list of scientific equipment that Sechenov brought back to Russia from Germany.³⁷ The eye becomes a “photographic plate,” the experimental apparatus of mechanical objectivity *par excellence*, while “the ear perceives combinations of sounds in a concrete way and decomposes these combinations into separate musical tones” in the same way that the scientist reduces a complex physiological phenomena to its component parts.³⁸ Sechenov’s mechanistic laboratory science is particularly modern, because it is modern experimental technology that provides Sechenov with both his experimental data and the analogies by which he explains it.

³³ Ibid., 139

³⁴ Ibid., 197-198

³⁵ Ibid., 197-198

³⁶ RB, 8

³⁷ Ibid., 18

³⁸ Ibid., 58, 47

A Fantastical Machine

However modern and rational Sechenov's vision of man may appear, it in fact gives rise to striking peculiarities. Although the external environment is supposed to determine the actions of Sechenov's mechanical man, in fact, it is his sensory systems which determine this environment. In Sechenov's work, the only definition for time and space is physiological. "Motion is comprised of the displacement of the body in space as well as of the time spent on this displacement," Sechenov writes.³⁹ The ear, "an analyzer of time," determines the chronological framework in which the mechanical man lives.⁴⁰ "The day lasts like a sound, the year lasts like a sound," Sechenov asserts.⁴¹ Even the memory of space and time is just as physiologically based as their initial perception. "Visual and purely tactile memory can be described as memory of space," Sechenov writes, "while aural and muscular memory can be described as memory of time"⁴²

In fact, the physiological body, functioning as a dependable scientific instrument for recording its surroundings, is the only way that the external environment can be known. In this way, Sechenov's philosophy is not, as the tsarist state feared, one of radical exclusion, but rather one that is radically inclusive. Sechenov does not disprove everything that is immaterial, but instead raises the immaterial to the level of the real. Absolutely everything that the body senses must be treated as real, because all sensations result in reflexes with real physiological consequences leading to real muscular action. Images are just as real as a physical touch to the body because they have the same result. "An involuntary start caused...by an unexpected touch on the body, or by the abrupt emergence of a certain image before our eyes, can be described as reflex movement," Sechenov writes.⁴³ "We experience fright at the unexpected touch to our trunk...as easily as we do at the unexpected emergence of a strange image before our eyes"⁴⁴ Even intangible imagination must be treated as material when it provides a stimulus that results in real movements. In the cases of "sleeper who screams and moves under the influence of a terrifying dream...[or] the delirium and violent movements of a maniac during an attack of his disease" Sechenov

³⁹ Ibid., 56

⁴⁰ Ibid., 59

⁴¹ Ibid., 65

⁴² Ibid., 74

⁴³ Ibid., 7

⁴⁴ Ibid., 17

asserts that these are still reflex movements in response to “some kind of imagination, which of course, is as real as any reasonable notion.”⁴⁵

Sechenov argues that the physiological structure of the body itself, possesses a kind of “unconscious rationality,” like the experimental machine, which is a crucial but unconscious participant in the rational production of scientific knowledge. He begins with the example of a decapitated frog placed in different environments. Although it “cannot reason,” this frog “reacts rationally as in the case when the brain is intact, i.e. when it possesses will and capacity for thinking.”⁴⁶ Experiments prove that, “the [decapitated] animal is conscious of its environment: on the table it creeps, in the water it swims.”⁴⁷ The case is the same when extended to humans. Some involuntary reflex movements are so logical, Sechenov argues, that “to the observer the movement no longer seems automatic and acquires a rational character”⁴⁸ In an absurd twist, Sechenov argues that the simple machinery of the body is sometimes even more rational than the mind. “Sometimes involuntary movements are not only equal to conscious movements in seeming rationality, but even surpass them in this respect,” he writes, “the apparent rationality of a movement...does not exclude the mechanical nature of its origin.”⁴⁹

For Sechenov, this same kind of “unconscious rationality” present in experimental machines and physiological bodies also exists in society as a whole. In the preface to *Reflexes of the Brain*, the only part of the essay in which Sechenov explicitly discusses the social and political context of his work, Sechenov writes about the contemporary popular fascination with scientific ideas. On the surface, the discussion of scientific ideas in non-scientific circles, and the application of scientific ideas outside of the laboratory appears to be “chaotic fermentation of unsettled thought.”⁵⁰ Although “some gentlemen” fear these popular discussions,

These gentlemen forget that there have been cases when unrestrained fermentation of minds eventually led to the emergence of truths. They should recall, for example, what mankind gained from the medieval thought which gave rise to alchemy. It is terrible to think what would have become of mankind if the rigid medieval guardians of public opinion had succeeded in burning and drowning as sorcerers and evildoers all those who worked hard at imageless ideas and who were unconsciously creating chemistry and medicine. People who value truth

⁴⁵ Ibid., 34

⁴⁶ Ibid., 32

⁴⁷ Ibid., 32

⁴⁸ Ibid., 32

⁴⁹ Ibid., 34

⁵⁰ Ibid., 2

in general i.e. not only present, but also future truth, will never ridicule any popular idea, no matter how strange this idea may seem to them.⁵¹

Here, the history of science itself moves by a physiological process—Sechenov's "unconsciously creating" alchemists are perfect analogues to his vision of an unconsciously rational physiological body. But this paragraph also reveals another oddity. Sechenov identifies the roots of his modern science in the mystical, occult, and ancient practice of alchemy. When the tsarist censors (appearing here in a perhaps too thinly veiled critique as "rigid medieval guardians of public opinion") impounded *Reflexes of the Brain* in fear of the hyper-rational modern automaton that it produced, they missed what was actually most absurd, and most radical, about Sechenov's work.

For it is not only scientists and sorcerers that participate in this unconscious creation. "Future truth" for Sechenov does not lie in the sterile, mechanized laboratory, but rather in society as a whole, in ideas which seem popular and ridiculous now, but which carry within them the seeds of the "chemistry and medicine" which will save mankind in the future. In this sense, Sechenov's work is utopian and inclusive. Like the mechanical body he envisions, Sechenov's sense of scientific truth is also modern, but in a different way. It is modern because it is explicitly oriented towards the future. For Sechenov, real scientific truth is always "future truth," knowledge that appears strange now only because it is always a step ahead of its cultural context.

For Sechenov, the creation of scientific truth is the job of the entire society, not of one individual scientist. And yet this all-inclusive framework has a necessary corollary: if all of society participates in the scientific process, then all of society becomes a laboratory. There are absolutely no limits to this "unrestrained fermentation" of scientific creation. Sechenov's science is not only total in terms of its application to the body (all movement is reflex movement) and in the extent to which it is applied ("any machine, no matter how intricate, can be subjected to investigation") but also in terms of where it is applied, and by whom. Scientific doctrines "creep into literature," spark public debates, are "passed from hand to hand among educated society" (as the scientist Elie Mechnikov wrote describing Sechenov's own essay).⁵² All different categories of actors—material and immaterial, animate and inanimate, fiction and machines, scientists and writers—are swept up in and united in this production of "imageless ideas."

⁵¹ Ibid., 2

⁵² I. I. Mechnikov, *Stranitsi Vospominanii* (Moscow: Izdatel'stvo Akademii Nauk SSSR, 1946), 46

Science/Fiction

Sechenov's total commitment to his experimental science is not without its analogues in the Russian revolutionary intelligentsia. This trope is often articulated as an application of European political ideas far beyond their logical limits, coupled with an ideal of self-sacrifice—total commitment, body and soul, to the revolutionary cause. Historian Isaiah Berlin roots this theme in the romantic idealism of the radicals of the 1840s, with the passionate literary critic Vissarion Belinsky as its exemplary figure.⁵³ However, a more striking example of this total revolutionary commitment lies chronologically closer to Sechenov's own work.

Published in *Sovremennik* just three months before Sechenov submitted the manuscript of *Reflexes of the Brain* to that same journal, Chernyshevsky's radical novel *What is to be Done?* introduced to the Russian intelligentsia the character of Rakhmetov, the "extraordinary man." The model of an ideal revolutionary, Rakhmetov dedicates his entire life to revolutionary activity, is single minded of purpose and action, and exhibits an iron will. Sechenov, an acquaintance of Chernyshevsky's and a habitual reader of *Sovremennik*, very likely read *What is to be Done?* while he was writing *Reflexes of the Brain*. The two works are remarkably similar in terms of narrative style, images, and themes.⁵⁴ In fact, the character of Rakhmetov appears, albeit in an oblique fashion, in the text of Sechenov's essay. In explaining the reflex origins of voluntary movements, Sechenov uses the example of "a man of ideally strong will...acting according to some high moral principle and perfectly conscious of what he does."⁵⁵ This description is a perfect match for Rakhmetov. Sechenov argues that even this "extraordinary man", who's movements are "voluntary in the highest degree" acts by mechanical reflex movements in response to external stimuli.⁵⁶

In fact, as Sechenov's text points out, Rakhmetov is extraordinary because he is extraordinarily mechanical. With the rise of mechanical objectivity, the scientific "observer now aimed to be a machine," scholars Daston and Galison write, and "this scientific self required restraint, a will strong enough to bridle itself."⁵⁷ Rakhmetov, the

⁵³ Berlin, esp. pages 147, 171-211

⁵⁴ Although it is impossible to concretely show that Sechenov read Chernyshevsky, it is highly likely that he did given Sechenov's reading habits, the timing of publication Chernyshevsky's novel, and the many textual parallels between the two works.

⁵⁵ RB, 43

⁵⁶ RB, 43

⁵⁷ Daston and Galison, 187, 140

“professional revolutionary” embodies this ideal of professional science. “The rigorist,” as some of the novel’s characters call him, subjugates everything in his life to the revolutionary cause, functioning coldly, rationally, and mechanically, all in the service of his revolutionary aims. Rakhmetov does not partake in “luxuries or whims” and makes acquaintances rationally, only with those people who are well connected and have influence over others.⁵⁸

And yet, just like Sechenov’s mechanical man, there is more to Rakhmetov than his coldly rational exterior suggests. As historian Claudia Verhoeven points out in her work *The Odd Man Karakozov: Imperial Russia, Modernity, and the Birth of Terrorism*, Chernyshevsky often deliberately makes Rakhmetov appear ridiculous.⁵⁹ Describing Rakhmetov’s type of “extraordinary people,” Chernyshevsky writes, “in fact, there was a great deal that was very amusing about them: everything of importance about them was amusing, everything that characterized them as a breed apart.”⁶⁰ Rakhmetov is ridiculous, but it is precisely this ridiculousness that shows him to be a truly revolutionary figure. Like Sechenov’s “future truth” which appears strange because it is actually a step ahead of other modes of understanding, Rakhmetov is ridiculous because he is ahead of his time.

And yet, in characterizing Rakhmetov, this most modern of revolutionaries, Chernyshevsky also draws deeply on far older source material. In their definitive edition of Chernyshevsky’s novel, Michael Katz and William Wagner suggest that Rakhmetov’s mannerisms may have been inspired by the aesthetic rituals of early Christian sects. The other characters in *What is to be Done?* often refer to Rakhmetov as “Nikitushka Lomov,” a reference to a popular hero from folktales.⁶¹ Just like Sechenov’s argument that the roots of truly modern science can be traced back to the ancient practice of alchemy, Chernyshevsky’s quintessentially modern revolutionary is in fact far closer to folkloric and ancient practices than any of the novel’s other characters.

Rakhmetov’s nickname also calls up another similarity between Sechenov’s view of scientific process and Chernyshevsky’s characterization of Rakhmetov, namely that Rakhmetov, despite being an “extraordinary man” is also a “popular idea”, a man capable of representing all mankind. And this ability is inscribed in his very physiology. “We demand complete enjoyment of life for all people,”

⁵⁸ Chernyshevsky, 282

⁵⁹ Claudia Verhoeven, *The Odd Man Karakozov: Imperial Russia, Modernity, and the Birth of Terrorism*. (Ithaca: Cornell University Press, 2009). See especially chapter 2.

⁶⁰ Chernyshevsky, 274

⁶¹ *Ibid.*, 278

Rakhmetov reasons, “therefore in our own lives, we must demonstrate that we demand this...not for ourselves alone, but for man in general.”⁶² Because of this reasoning, Rakhmetov will only eat what is available for the common man to eat, dresses simply, and sleeps on a hard floor—all physiological markers that allow him to stand for the common man.

In this way, Rakhmetov’s character is a general model, not only for the plight of the Russian people, but also for a particular kind of professional revolutionary. This model could be, and was, repeated. Historian Irina Paperno, in her seminal work, *Chernyshevsky and the Age of Realism* demonstrates that many real-life revolutionaries did indeed imitate mannerisms and habits of the fictional Rakhmetov during the 1860s. *What is to be Done?* also produced a striking number of literary parodies and imitations, the most famous being Dostoevsky’s *Notes from Underground*.⁶³ In fact, the “man of ideally strong will” in Sechenov’s own text may be considered one of the first Rakhmetov imitations. And yet, *What is to be Done?* is itself already an imitation of reality. In the novel, Chernyshevsky claims to have actually known the fictional Rakhmetov, as well as the other main characters. Although the real-life model for the “extraordinary man” is unknown, Chernyshevsky’s novel also contains a character who is almost a perfect match for Sechenov himself. This character, a young scientist named Kirsanov, spends a similar amount of time abroad as Sechenov, studies with the same scientists that Sechenov worked with in Germany and France, and becomes a professor at a Petersburg medical institution on exactly the same timeline as Sechenov.

Thus, what is produced in the intersection between Sechenov’s scientific essay and Chernyshevsky’s novel is an odd blending of fiction and life, experimental science and literary technique, real people and “imageless ideas.” These various elements are connected by a chain of imitations, like the “chain of mechanical processes” that makes up Sechenov’s man. This process of imitation, too, has its own roots in the modern ethic of laboratory science that governs Sechenov’s work. The true utility of an experimental apparatus lies not in its ability to produce faithful representations of physiological phenomena, but in its ability *to produce the same representations every time*. Thus, the rise of mechanical objectivity was also the rise of a new kind of scientific production based not on one careful observation, but on the continued reproduction of the same observation. It is only through the accumulation of data points, all taken using the same machines with the same settings, that new scientific knowledge can emerge. Revolutionary experience and scientific experiment both mobilize reproduction in order to produce something

⁶² Ibid., 281

⁶³ Irina Paperno, *Chernyshevsky and the Age of Realism: A Study in the Semiotics of Behavior*. (Stanford University Press, 1988), 30

new. The goal of Chernyshevsky's ideal revolutionary, the production of a new society, has to be achieved through reproduction, through the reproduction of reality in fiction, and then the converse: through the translation of these fictional types back into reality. Similarly, in order to produce new scientific understanding, experimental science relies on the mechanical reproduction of the same results over and over.

When the Censorial Committee impounded *Reflexes of the Brain* in the spring of 1866 in conjunction with Dimity Karakozov's attempted attack on the tsar, perhaps they did in fact understand its true revolutionary potential. This scientific production of the new through popular reproduction is nowhere more apparent than in the revolutionary philosophy of terrorism. In her book on Karakozov's assassination attempt, Verhoeven writes, "the solution to the irregularity of regicide is to regularize it: to repeat, systematize, or scientize the singular." And this mechanized "principle of repetition marks not only Karakozov's own commitment...but also...his conviction that others will follow his example."⁶⁴ For terrorism to be effective, one single action, the assassination of the head of state, must be both repeatable and actually repeated. This process of action and imitation itself takes on the character of a reflex in the body politic, a stimulation transduced through one body to produce a response, its repetition, in the body of others. Sechenov's total vision of scientific experiment is also a radical one, the modern mindset behind the ideal revolutionary, and his radical imitation.

Experiment Without End

While the enthusiasm for natural science faded within revolutionary circles after the 1860s, and Sechenov never again attempted a project as politically controversial as *Reflexes of the Brain*, the fascination with the revolutionary potential for scientific work never quite left the Russian intelligentsia. In the fledgling Soviet Union of the 1920s, this same popular, irrational, all-inclusive, and utopian scientific ethic re-emerged full force. Cultural historians such as Richard Stites have famously documented these 20th century "laboratories of revolution," but few scholars have traced this radical science back to its 19th century roots.⁶⁵ *Reflexes of the Brain*, and the literary-politic milieu in which it first appeared, reveals that the utopian science of the 1920s did not arise out of nothing, but rather has as its antecedent Sechenov's peculiar kind of

⁶⁴ Verhoeven, 148

⁶⁵ For just one example see: Richard Stites, *Revolutionary Dreams: Utopian Vision and Experimental Life in the Russian Revolution*, (New York: Oxford University Press, 1989)

neurobiology—consciously popular, irrational, revolutionary, and total in its application.

Ultimately, the only limit to this total application of experimental logic is an organic one—the physiological exhaustion of the body. Fatigue is a natural limit, the unsavory reminder that the flesh and blood body does not always function like a machine. Although Chernyshevsky writes that Rakhmetov, the ideal revolutionary, “needed no rest,” Sechenov was constantly troubled by the idea of fatigue.⁶⁶ For Sechenov, fatigue was where the machine of the body broke down, where the senses stopped, and movement ceased. “A man in deep sleep and having no sensory nerves would not awaken till his death,” Sechenov writes in the conclusion to *Reflexes of the Brain*. Fatigue was death because it was the limit of sensation, and because it was the limit of sensation, it was also the ultimate limit of mechanical experimentation. At the end of his life, Sechenov built a variety of machines to test the impact of fatigue on the nervous processes. A photograph of Sechenov from this time shows him strapped into one of these machines, which encloses him from all sides and connects to each one of his appendages. This image is striking, as it exemplifies Sechenov’s particular kind of scientific investigation, which subjects everyone and everything to investigation, even the experimenter himself, mixing the real with the fictional, the man with the machine. And the search for this future truth through radical experimentation comes at a cost to the present. Walter Benjamin, writing about the Russia of the 1920s in his *Moscow Diary* could very well have been writing about Sechenov’s scientific alchemy. “Each thought, each day, each life lies here as if on a laboratory table,” Benjamin writes, “and as if it were a metal from which an unknown substance is by every means to be extracted, it must endure experimentation to the point of exhaustion.”⁶⁷

⁶⁶ Chernyshevsky, 282

⁶⁷ Benjamin, 28

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