

Russia, Science, and Social Constructivism

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Why do I find the study of natural science in Russia to be of compelling interest? First, because it presents so many insights different from those usually offered by Russian area specialists. Take the question (almost never asked by Western specialists on Russia today), Was there anything good about the Soviet Union? Even the most devoted anti-Communist among us, if he or she thinks about the evidence, will have to admit that the Soviet scientific and educational system produced some remarkably strong products. After all, many, if not most, American universities today employ scientists produced by the Soviet system, including tenured professors at Harvard, Princeton, California, MIT, Minnesota, and many other leading universities. Much of the research of Western specialists on Russia and the Soviet Union reveals stories of oppression, corruption, and disaster; it is refreshing to do research on an area of Soviet culture where one meets products that demand respect. Science is certainly one of these areas of Soviet culture, and the performing arts is another.

Another reason that I find the study of science in Russia and the Soviet Union to be of compelling interest is that it sheds light not only on the nature of Russia and the Soviet Union but also on science itself. In that sense, the study of Russian and Soviet science is a study of science everywhere, including America. In this short article, drawing on a forthcoming book of mine entitled *What Have We Learned about Science and Technology from the Russian Experience?* I would like to illustrate this thesis by showing how the study of Russian science helps to answer one of the main questions being asked today by historians and sociologists of science in the West: To what degree is science a social construction, and to what degree is it a reflection of the natural world?

In the West, in the fields of the history and sociology of science the most striking change in recent decades has been the rise in contextualism, a growing recognition that science is embedded in society and must be studied in societal terms. The older Mertonian sociology of science studied the norms of science, its reward system, and the growth and demise of disciplines and subdisciplines, but it did not study the content of science itself. An assumption of the Mertonian school was that

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social context may influence the careers of scientists and their institutions but not scientific knowledge, which was treated as a “black box” left for scientists to discuss. But the new sociologists of science who began to emerge in the 1970s addressed the question of whether the very knowledge produced by scientists, including what is accepted as the best knowledge, is not shaped and formed by the society that surrounds it. According to the new approach, even the content of the most dense, “hard” sciences, such as physics, mathematics, and biology, can be seen as socially formed. This new trend became known as “constructivism.”

In the last several years, “social constructivism” has become a hot intellectual topic, bringing prominent natural scientists and sociologists of science into open conflict. The natural scientists have accused the social constructivists of reducing science to “social discourse,” to lowering the cognitive significance of natural science to that of literature, philosophy, or even pseudo-science. The social constructivists have replied that the natural scientists are “naïve realists” who claim the status of “objective truth” for views of nature that are actually heavily influenced by the social environments in which they work. The battle reached a peak in 1996 when Alan Sokal, a physicist at New York University, wrote a hoax article in which he pretended that theories of quantum gravity could be linked to postmodernist social views. His hope that the social constructivist editors of the journal *Social Text* would not detect the hoax and would publish his article as a serious one was fulfilled. After the hoax appeared, Sokal turned around and published another article in which he revealed that he did not believe any of the claims he had made in the first article, which he had purposely designed with the goal of parodying and ridiculing the views of social constructivists.

The result of this series of sensational events was that the topic of social constructivism reached the pages of mass circulation publications such as *Newsweek* and *The New York Times*. In recent months the controversy has continued, with a number of social constructivists coming to the defense of their views, even while (sometimes) admitting the cleverness of Sokal’s foray.

When one considers that the basic thesis of the social constructivists is that science is shaped by the society in which it develops, one would think they would want to compare science in societies with strikingly different cultural and political traditions. Oddly enough, very little such comparative work has been done. Instead, most social constructivist research has been on topics in Western science, such as the scientific revolution of the seventeenth century, or modern physics and biology in Europe and America.

I would like to propose Russia as a particularly appropriate case study for the examination of the social constructivist hypothesis. No one will deny that Russian society and culture have in the thousand years of Russian history differed from society and culture in Western Europe, where modern science was born. Russia has followed a different economic path from that of Western Europe and America, and it has religious, political, and cultural traditions quite unlike those of its Western neighbors. If the social constructivist thesis is correct, Russian science should be very different from Western science.

In my forthcoming book, I explore this question in considerable detail. Here

I would like to abbreviate that analysis by presenting my conclusions in advance and then providing, in the space available, some supporting evidence. The conclusion that I draw is that the Russian example illustrates both the *strengths* and the *weaknesses* of the social constructivist viewpoint. Many aspects of Russian science, including whole schools of thought, do indeed reveal the influence of the specific social environment in which they developed. These influences extend, surprisingly, even to “hard” sciences such as physics and mathematics. Other developments in Russian science equally convincingly show that science is not entirely a social construction, but that it does indeed have a relationship to objective reality, and this relationship to reality is the reason science in Russia is far more similar to science elsewhere than is Russian philosophy or literature to those disciplines elsewhere.

For most people approaching this issue for the first time, the strength of the anticonstructivist viewpoint will probably seem obvious, while the constructivist approach will seem counterintuitive. Many people, after all, look on science as “truth,” or something close to it, and therefore fully expect science to be the same everywhere, to be “international.” For this reason, I will start my argument with the hardest part, the illustration, with examples taken from Russian science, of the strength of the social constructivist viewpoint.

The Strength of the Social Constructivist Viewpoint

A close study of the history of Russian and Soviet science, including its greatest achievements, shows that it was significantly influenced, even in its most technical and abstract features, by social currents. Those influences include a variety of ideological, philosophical, religious, and economic factors, some of them contradictory. In the Soviet period, both overt (and officially supported) Marxist influences and covert (and officially opposed) anti-Marxist influences were at work. In his research in physics, the great Soviet physicist and mathematician V. A. Fock developed interpretations of general relativity that won international attention and yet were based, in part, on an effort to reconcile relativity physics and dialectical materialism. The internationally known Soviet mathematician Alexei Kolmogorov did something similar in his work on the foundations of mathematics, in which he tied the growth of mathematics to economic and technological demands, referring to the works of Friedrich Engels to show that mathematics was a reflection of material relationships and answered practical needs. The Soviet psychologist Lev Vygotsky, acclaimed by Harvard psychologist Jerome Bruner as “plainly a genius,” worked out a Marxist explanation of the relationship of thought and language that continues today, decades after its elaboration, to attract international attention. The influence of ideology on Soviet astrophysicists was noted by the British cosmologist Stephen W. Hawking in his best-selling book *A Brief History of Time*, in which he explained their opposition to “big bang” theories of the universe by Marxism; Hawking, no Marxist himself, was so impressed by their work that he came to oppose the big bang theory himself, supporting instead a version of an “inflationary model” worked out by Soviet researchers and others. Other internationally known Soviet scientists who

connected Marxism to their work in interesting ways included the psychologists A. R. Luria, S. L. Rubinshtein, and A. N. Leontiev; the physiologist P. K. Anokhin; the biologists A. S. Serbrovsky and N. P. Dubinin; the mathematician A. D. Alexandrov; the astronomer-mathematician O. Yu. Shmidt; the physicists S. Yu. Semkovsky, D. I. Blokhintsev, and G. I. Naan; and the astrophysicists V. M. Ambartsumian and A. L. Zelmanov.

But if some Soviet scientists were influenced by Marxism in their theoretical work, others, witnessing the dogmatic nature of Soviet ideology and the persecution of scientists that occurred under the Soviet regime, became bitter, often disguised, opponents of Marxism. Their work was sometimes influenced by their secret opposition to Soviet policies. As Douglas Weiner of the University of Arizona is showing in his work, resistance to Soviet industrial development by ecologists strengthened their commitment to the theoretical concept of "biocenosis," the self-enclosed ecological community protected from all industrial incursions. These ecologists created what Weiner has called "archipelagos of freedom," nature preserves (*zapovedniki*) off-limits to all intruders, including Soviet ideologists. Related opposition to Soviet industrialization was an influence on Vladimir Vernadsky's work on the biosphere and the *nöosphere*, which is now attracting attention throughout the world. In Russia, Vernadsky is today one of the best known of all Soviet-era scientists, and a large private foundation has just been named for him. Similarly, Karl Hall of Harvard is showing how Stalin's dogmatic insistence on engineering practice influenced the work of theoretical physicists who opposed him, including two of the most famous ones, Igor Tamm and Lev Landau. And one of the most interesting oppositional social influences in Soviet science was in mathematics. The great mathematician N. N. Luzin, a founder of the Moscow School of Mathematical Functions, one of the significant movements in mathematics of this century, was a secret advocate of Russian Orthodoxy, and he was convinced that mathematics and religion are connected. Luzin carried on an extensive correspondence in the 1920s with Pavel Florensky, a Russian Orthodox priest and mathematician, and Luzin promoted an intuitive approach to mathematics linked to religion that became a hallmark of his work and that of his followers.

In all of the above cases (the number could be easily expanded) social influences were at work in the published and internationally recognized work of leading Soviet scientists. These cases are all illustrations of the strength of the social constructivist point of view because they show the influence of the social milieu on science. But the history of Russian and Soviet science also points to the weakness of social constructivism, and it is to this portion of my argument that I now wish to move.

The Weakness of the Social Constructivist Point of View

The Lysenko affair, the most infamous episode in the history of Soviet science, points clearly to a great weakness in social constructivism. This weakness shows up not in the onset of Lysenkoism but in its demise.

The basic story of Lysenkoism should be well known to specialists in Russian

affairs. For over thirty years, from the early 1930s to the late 1960s, the Soviet agronomist Trofim D. Lysenko opposed the Mendelian genetics that was accepted elsewhere in the scientific world and favored in its place a form of Lamarckism, the doctrine of acquired characteristics.

At the time Lysenko began his campaign for a socialist agriculture in the 1930s there were few agricultural specialists who were willing to work energetically for the success of the new and troubled collective farms. Many agronomists of the time were educated before the revolution; even among the younger ones with Soviet educations, many disagreed with the collectivization policies, seeing the damage that had been done in the countryside. Among the biologists in the leading universities and research

institutes, the most exciting topic of the time was not agriculture but the new genetics arising out of research on the fruit fly *Drosophila melanogaster*. Only later would it become obvious that this research had great agricultural value, producing many agricultural innovations like hybrid corn. In the late 1920s and early 1930s,

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it was easy for radical critics like Lysenko to castigate the theoretical biologists as they bent over trays of fruit flies in their laboratories at a time when famine stalked the countryside. Lysenko was a master at propaganda directed against these academic biologists; he called them “fly-lovers and people-haters.” Because many of the professional biologists had bourgeois backgrounds, their political loyalties were always suspect to the regime. The unwillingness of many theoretical biologists to work directly on agricultural problems was seen by the radicals as purposeful “wrecking,” an effort to disable the Soviet economy and cause it to fail, rather than the result of the common division the world over between theoretical and applied biology. And the higher status claimed by many biologists of theoretical over applied investigations exacerbated the issue.

Lysenko was strikingly different from the majority of biologists and agronomists. He came from a peasant family, he was a vociferous champion of the Soviet regime and its agricultural policies, and he offered his services to agricultural administrators. Whenever the party announced plans to cultivate a new area, or plant a new crop, Lysenko came up with practical suggestions on how to proceed with the plan. He developed his various nostrums so rapidly—from cold treatment of grain, to plucking leaves from cotton plants, to removing the anthers from spikes of wheat, to cluster planting of trees, to unusual fertilizer mixes, to methods of breeding cows—that before the academic biologists could show that one was valueless or harmful, Lysenko was announcing another technique. The newspapers invariably applauded Lysenko’s efforts and questioned the motives and political backgrounds of his critics. In this environment, a peasant agronomist

who promised a revolution in agriculture had enormous political advantages over sober academic geneticists who—in a time of crisis—appeared to be restraining progress by crying “not so fast,” or “inadequate verification.”

Completely aside from the poverty of his genetic views, Lysenko’s work had significant psychological value. The primary question of the times was not so much whether his biological theories would work but whether the peasants would work. Still alienated by the collectivization program, the peasants at first found difficulty seeing very much “new” about “socialist agriculture” except the fact of dispossession. Lysenko and his followers introduced much that was new, and they worked side-by-side with the peasants. Every peasant who participated in Lysenko’s projects was enrolling in the “Great Soviet Experiment”; a peasant who at Lysenko’s urging planted wheat clearly graduated from the stage when he destroyed his wheat so that the Soviet government would not receive it. Every one of Lysenko’s projects was surrounded with the rhetoric of socialist agriculture, and those who liked his projects committed themselves to that cause.

Using methods such as these, Lysenko won enormous support in political circles, among Communist journalists, and among the nonscientific leaders of the educational and agricultural establishments. The fact that Lysenko was simultaneously denying the existence of the gene, that he was discarding all of modern genetics, meant less to these people than the fact that he was actually getting Soviet peasants to work in the fields and that crops were being harvested. The academic scientists could not, at that time, point to any such concrete and immediate results or benefits to society from their work.

Here, then, is an example of when social and political influences were having a massive impact on science. The social construction of science was proceeding at a breathtaking pace. In 1948, the Soviet regime and the Communist Party officially recognized Lysenkoism as the ruling doctrine in Soviet biology and banned teaching and research in Mendelian genetics. Many academic biologists who opposed Lysenko were arrested and sent to labor camps. They were replaced by hordes of followers of Lysenko.

And yet Lysenkoism was eventually overthrown, in the late 1960s, and Mendelian genetics came back to the Soviet Union. It is this episode in the Lysenko story that social constructivism explains least well.

The rejection of Lysenkoism and the embracing of Western-style genetics in the Soviet Union in the 1960s was a disruptive discontinuity that violated Soviet ideological principles that had been developed over a period of several decades and was therefore resisted by the political establishment. The Communist Party apparatus, the education ministries, and the agricultural research institutions were filled with officials who had made their careers supporting Lysenkoism and who firmly resisted any attacks on it. The forces responsible for the social construction of Lysenkoism were still very powerful in the early 1960s when Lysenkoism came under serious attack. That attack was at first advanced by a minority who had little administrative, political, or social clout. In the face of such strong social forces favoring Lysenkoism, how did the critics eventually succeed? An adequate explanation of how this success occurred must devote more attention to factors

social constructivists often ignore: the relative strengths of differing internalist and technical arguments about nature and the relative success of differing agricultural practices. To put the matter more simply, the classical genetics practiced in the West was based on much more convincing scientific evidence and more tightly argued theory than Lysenkoism, and the agricultural applications that resulted from classical genetics were outperforming over time the agricultural applications promoted by the Lysenkoites in the Soviet Union. In other words, the socially constructed doctrine of Lysenkoism was being undermined by contradictory scientific evidence, a powerful alternative cognitive scheme, and the convincing results of agricultural practices based on Western-style genetics.

Lysenkoism was constructed in the Soviet Union before the revolution of modern genetics had occurred in Western society. In the 1930s, when Lysenko built his power, the role and structure of DNA were not yet understood. Although hybrid seed corn and a few other products of genetic breeding were beginning to be applied to agriculture in the West, they were not yet well known. In other words, it was possible in the 1930s to deny the existence of the gene and still pursue agriculture. It was even possible to doubt the existence of a specific hereditary substance and be a scientist. Among Western geneticists in the 1930s, there was still uncertainty over heredity; some scientists believed that protein was the carrier of heredity, while others were beginning to suspect that DNA was the important substance.

By the early 1960s, when Lysenkoism began to come under heavy criticism in the Soviet Union, all this had changed. In 1953 James Watson and Francis Crick did the work that won them the Nobel Prize and revolutionized biology: they described the structure of DNA. By the 1950s and 1960s the practice of agriculture was being transformed by modern genetics. When Nikita Khrushchev visited Roswell Garst's corn farm in Iowa in the early 1960s, he was staggered to learn that no farmers in Iowa still grew their own seed corn; instead, they all purchased their seed corn from commercial breeders, who used the principles of Mendelian genetics that Lysenko denied.

Lysenkoism was being threatened by scientific developments and agricultural practices in the West, which had become so cognitively convincing and so agriculturally effective that they could no longer be ignored. It would, in my view, be accurate to describe what was happening as "the obtruding of reality into the social construction of Lysenkoism." A massive social construction was being broken up by scientific evidence in favor of a material carrier of heredity—DNA—and equally massive agricultural evidence in favor of the Western form of Mendelian genetics. All of Lysenko's denials of the existence of the gene and his criticisms of Mendelian genetics could not stand up to this evidence. A social construction was being overturned.

I realize that quite a few historians and sociologists of science will say that Western genetics and agricultural practices were also social constructions at that time, and that what was happening is not best described as the refutation of Lysenko's genetics by scientific and agricultural reality but the substitution of one social construction of genetics by another—the replacement of Lysenko's genet-

ics by Western genetics, both of which are social constructions. In my opinion, such a criticism is valid but very limited in its scope and misleading in its direction. Of course, all science is a social construction in the sense that it is created by members of society; it cannot be otherwise. But to insist on social construction (as it is usually understood) as the key to what was going on when Lysenkoism was overthrown by Western genetics is to miss the most important elements—the roles of cognitive factors, theoretical rigor, and practical success. I certainly do not see Western genetics at the time it displaced Lysenkoism—or at any time—as representing *absolute truth*, devoid of elements of social construction. We all know that genetics will continue to change, and we all know that social influences have played and will continue to play important roles in the construction and development of genetics. Recent research on modern Western genetics is showing us the importance of social influences in its formation. However, the case of the displacement of Lysenkoism by Western genetics should make clear that when we analyze the formation of ideas about genetics we should include, along with social factors, scientific evidence and cognitive rigor. Experimental evidence and straight thinking *do matter*, and Lysenko was deficient in both.

Conclusions

Is science a social construction? The experience of Russian science provides two different answers to this question for two different groups of people. The different answers are required by the assumptions that these people are likely to possess before they consider the question. For natural scientists and those members of the educated public who often believe that science is “truth,” that it is an objective description of nature, the Russian experience demonstrates that science contains many elements of social, political, philosophical, and ideological influence. Even the best Russian science, including internationally recognized schools of thought in “hard” sciences like physics and mathematics, demonstrates the unmistakable influence of social factors.

For extreme social constructivists, those people who think that science is a social product to the same degree as literature or philosophy, the Russian experience provides a different answer. It demonstrates that sometimes social influences lead so far away from empirical evidence and cognitive rigor that “reality” eventually demands a correction. That happened in Soviet biology, and it also happened in a number of other fields. The victory, after a thirty-year struggle, of the critics of Lysenkoism in the Soviet Union over its supporters—who had enormous social and political advantages—is an example where empirical evidence and cognitive rigor vanquished a rival theory constructed largely for social reasons.

The experience of Russian science provides useful insights into the great debate over the social construction of science that has occurred recently in the United States and Europe. Science is a social construction in the sense that scientists, members of society, make it, and they are inevitably influenced by social factors in the process. Contrary to the views of many natural scientists, the influence of social factors extends to the core of science itself, the theories of explanation around which the scientists of a field frequently unite. But natural science deals

with objective reality to a much higher degree than the humanities, and therefore empirical evidence is often much more influential. The leash that ties scientific theories to reality is far longer and slacker than most people know, but it does exist. Reality is our friend, because it gives us a means of reining in our hypotheses, abandoning those that are not supported by our attempts to verify them.

In this article I have concentrated not on the nature of the Soviet Union and Soviet history but instead on science and the history of science. Now I would like to apply some of what I have said to the Soviet Union itself. Just as the Lysenkoist description of biology fell short of an adequate explanation of natural reality and failed to produce successful applications in agriculture, so also the Soviet Marxist explanation of society fell short of an adequate explanation of economic reality and failed to produce the prosperous society that had been promised. The revolutionary effort to build a totally new society in the Soviet Union, one different from and superior to all others in the world, was a grand effort in social constructivism, probably the most ambitious such effort in history. In a fashion similar to the way Lysenko and his supporters denied the existence of the gene, Marxist economists and their supporters denied the existence of the market. Despite all the social constructivist support that Soviet theorists and politicians tried to give to Lysenkoism and Marxist economics, both have fallen into eclipse. Both the gene and the market have re-emerged, one is tempted to add "with vengeance." Natural and economic realities have obtruded. The history of the Soviet Union is an important lesson in the importance of reality, both natural and social.