

Universities and Empire

**MONEY AND POLITICS
IN THE SOCIAL SCIENCES
DURING THE COLD WAR**

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Writing History in the Present Tense:

Cold War-era Discursive Strategies of Soviet Historians of Science and Technology

The study of Soviet discourse is a fascinating journey through multiple layers of meaning, exquisite rhetorical feats, and intentional paradoxes. Soviet leaders fairly early arrived at the idea of supplementing direct political censorship with more subtle ideological controls over disciplinary discourses. However, their attempts to supervise and homogenize public discourse simply did not reach its goals. The fragmented and unstable reality of Soviet discourse was a far cry from the (purported) perfect orderliness of totalitarian discourse, so vividly imagined in George Orwell's *1984* and in various Orwell-inspired studies.¹

Only recently have scholars begun to explore the tensions, inconsistencies, and uncertainties of Soviet discursive practices. Studies of political discourse provided a few illustrative examples of the complexities involved. Michael Gorham, for instance, has pointed to an essential conflict in Soviet political discourse: The more colloquial a tone Soviet propaganda assumed, the less it was capable of conveying abstract ideas and political symbols of the central state. When sophisticated political language was employed, it often caused frustration, distrust, and alienation on the part of peasants and workers.² In another study, Rachel Walker

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identified a “linguistic paradox” in Soviet political discourse, which stemmed from the necessity for Soviet leaders to maintain the appearance of continuity with the teachings of Marx and Lenin, and at the same time “creatively develop” Marxist-Leninist doctrine.³

An even more complex picture emerges when we turn from political texts to various disciplinary discourses characteristic of the Soviet academic community. The Soviet state both tried to control professionals and needed their expertise, and this resulted in a tangled and paradoxical structure of discourse. State and party officials promoted those practices that fit the contemporary political agenda, while professionals sought legitimation and support from those in power. Tensions within both official political discourse and professional discourses produced a considerable room for maneuver and negotiation.

Rather than portraying professional discourses as mere servants of the state or victims of totalitarian oppression, it may be more productive to speak of *discursive strategies* developed by professionals themselves in attempt to adapt their knowledge to the current political, socioeconomic, and cultural situation, and to influence this situation at the same time. Such discursive strategies had to be flexible enough to take advantage of the tensions within public discourse. On the other hand, in order to keep up with sociopolitical changes, professionals would have to frequently modify these strategies.

In this article, I will argue that Soviet historians of science and technology have developed a number of such discursive strategies and that these have shaped the face of their discipline as a whole, as well as influenced those historians' individual research agendas and methods. I will examine how Soviet historians of science and technology shifted their discursive strategies in parallel with the political and social evolution of Soviet society. I will attempt to place Soviet historical research in an institutional context, focusing on the role of the Academy of Sciences. In the conclusion, I will compare the discursive strategies that American and Soviet scholars developed in the context of the Cold War.

Early Soviet Years: Two Academies Contend for the Past

The Soviet Union was the first country in the world to institutionalize the study of the history of science and technology.⁴ On the initiative of the prominent geochemist and mineralogist Vladimir Vernadskii, the Russian Academy of Sciences set up the Commission on the History of Knowledge in May 1921.⁵ The commission, he hoped, would help raise the prestige of national science and remind the Bolshevik authorities (like the tsarist authorities before them) of the necessity to support academic research, particularly in view of proposals to close the academy down that were circulating at the time.

Vernadskii ascribed a primary role in the advancement of science to the periodic “clustering” of individual geniuses, which he viewed as a natural phenomenon subject to quantitative regularities. At the same time, however, he stressed the importance of favorable social and economic conditions—which was to say, adequate financial and political support—for great “explosions” of scientific thought. “As a professor under tsarism [Vernadskii] had witnessed the blighting effects of politics and inadequate funding on science, and he hoped for better conditions under the Soviet government,” the American historian of Russian science Loren Graham has noted.⁶

Militant Marxists scientists of the day downplayed the achievements of national science in their attempt to undermine the prestige of the Academy of Sciences, in which many saw a stronghold of the old regime and a rival to a recently founded Communist Academy.⁷ Many regarded Tsarist Russia as an oppressive regime under which nothing, science included, could possibly have prospered.⁸ Vernadskii’s commission, in contrast, chose to capitalize on Russia’s prerevolutionary scientific heritage and take advantage of Marx and Lenin’s vision of scientific advancement as integral to socialism as an effective discursive strategy for political protection of the Academy of Sciences under Bolshevik rule.

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Probably the most famous manifestation (in the West) of the discursive style of the Marxist-oriented Soviet historians of science and technology during this period was Boris Hessen's paper "The Social and Economic Roots of Newton's *Principia*," which created a furor at the Second International Congress of the History of Science in London in 1931. Elaborating on the Marxist thesis of the primacy of productive forces in the development of knowledge, Hessen contended that Newton's scientific activity was in essence a response to the social and economic needs of contemporary England—building new machines and weapons, as well as the creation of a new worldview that could reconcile religious dogmas with a new social and economic order. "Newton," Hessen maintained, "was a typical representative of the rising bourgeoisie, and in his philosophy he embodied the characteristic features of his class."⁹

Hessen, a prominent physicist and historian of science, had himself come under fire inside the Soviet Union when he attempted to defend Einsteinian physics, which was viewed by militant Marxist critics with considerable suspicion. Hessen's analysis of Newton became in part a means for him to challenge his opponents with their own weapon—a Marxist analysis of science—taken to the extreme. Hessen subjected Newton to the same kind of class-based criticism as his opponents were directing against Einstein. "Hessen was illustrating that Marxists should simultaneously recognize the value of Newton's physics, even though it developed in mercantilist England and was used as a tool to support religion, and the value of Einstein's and Bohr's physics, while acknowledging that they arose in imperialist Europe and are often used to counter Marxism," as historian Loren Graham has written.¹⁰

Hessen's discursive "ju-jitsu" strategy produced a piece of scholarship that was taken quite seriously in the West.¹¹ According to the *Dictionary of the History of Science*, Hessen's paper has become instrumental in establishing the "externalist" methodological approach to historical studies, which emphasizes the

role of broad social and economic forces in defining the content and evolution of scientific knowledge.¹²

By the early 1930s, the Bolshevik Party established its strong political influence in the Academy of Sciences and trusted the latter with virtual monopoly over fundamental research.¹³ As the academy was gaining political respectability, study of the history of science obtained new legitimacy and influence. In 1932, the Academy of Sciences established the Institute for the History of Science and Technology under the direction of the prominent Bolshevik Nikolai Bukharin.¹⁴ On becoming the institute's director, he encouraged a broad range of historical studies, not necessarily Marxist. Unfortunately, Bukharin's political career was already in decline when he became the Institute's director, and soon an association with him cast a deep shadow on the entire field of the history of science and technology. Bukharin was arrested and accused of treason, which led to the denunciation and closure of the institute in February 1938. Many independent-minded Marxist scholars including Hessen and Bukharin, fell victims to the Great Terror.

The crackdown on prominent, yet independent Marxist scholars "signaled the demise of systematic efforts to apply classical Marxist theory to the study of the history of science," the American historian of Russian science Alexander Vucinich has written.¹⁵ This is not to say that the number of reverential quotations from Marx and Marxist sounding terms to any degree decreased in academic writings; on the contrary, such signs of loyalty were being packed into historians' works more densely than ever. The new scholarship, however, was not Marxist, but rather "Marxy," that is, imitating Marxist language with little real correlation with Marx's method or teachings. Being a language with little theoretical substance, "Marxyism" had almost unlimited malleability, which allowed it to be shaped to the political requirements of any given moment. Serious Marxist research was no longer a successful discursive strategy and could in fact be dangerous. The display of "partyiness" (loyalty to the party line) became the order of the day.

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Ideological controls were relaxed somewhat in the harsh conditions of the Great Patriotic War that followed the Nazi invasion of the Soviet Union in 1941. Many in the academy chose the genre of commemorative events to revive history of science studies. The “great men of (Russian) science” type of discourse fit the prevailing patriotic mood, underscored the value of scientific traditions for the state, and unobtrusively reminded the authorities of the necessity to support science. Between 1941 and 1945, Soviet historians of science and technology held numerous meetings to celebrate anniversaries of various scientific discoveries, institutions, and great Russian and foreign scientists.¹⁶ The message finally reached Stalin’s ears. With his personal approval, the Academy of Sciences established the Institute for the History of Natural Science in 1945.

War-time cooperation with the Western Allies brought significant changes for the Soviet scientific community. For a short time after 1943, Soviet scholars were again allowed to publish their papers in American and British journals. Historical studies of Russian science as an integral part of world science were now encouraged.¹⁷ At the 1945 academy session devoted to the celebration of the 220th anniversary of the Academy of Sciences, Soviet foreign minister Vyacheslav M. Molotov spoke of closer ties between Soviet science and the global scientific community. This session was the first Soviet scientific meeting to which foreign guests were invited since 1937. Similarly, one of the leading party ideologues, Georgii F. Aleksandrov, published a fundamental textbook on the history of Western philosophy; and throughout the book, Russian scholars’ debt to the great Western thinkers was clearly acknowledged.

The Cold War Discourse for Internal Use

The situation for scientists and particularly for historians of science and technology changed dramatically with the erosion of East-West relations from early 1946 on. The tone of the Soviet official discourse produced by Agitprop—the Department of Agitation and Propaganda of the Party Central Committee—grew

much more hostile and became widely employed for internal use in a series of campaigns against “cosmopolitanism” and “servility to the West.”¹⁸ Beginning with party resolutions on literary journals, theater, movies, and music, this wave quickly spread into science. In 1946, Agitprop’s mouthpiece *Culture and Life* (*Kul’tura i zhizn’*) reprimanded academy institutes for their uncritical attitude toward the economics and politics of the United States and Britain. Just a few months earlier, those institutes’ activities had perfectly followed the party line, but now the line had turned, and scholarship was expected to turn along with it. In early 1947, two Soviet medical researchers were put on trial by a special “court of honor” for sharing scientific information with their American colleagues—an act now regarded as highly unpatriotic and equivalent to divulging a state secret.¹⁹ By 1947, Georgii F. Aleksandrov’s 1946 text *History of Western Philosophy* (*Istoriia zapadnoi filosofii*) was accused of distorting Marxism and inappropriately exaggerating the role of Western philosophy in the development of Russian thought.²⁰

This highly publicized affair sent a clear message to the history of science community, and the point was well taken. In May 1948, historians convened a conference on the history of Russian chemistry in Moscow, with the announced goal of defending “the scientific priorities of Russian scientists in important discoveries and inventions often attributed to scientists or pseudoscientists from capitalist countries.”²¹

“The struggle for establishing national priorities in science is part of the war against cosmopolitanism,” wrote one campaign activist. “The cosmopolitan conception of world science is theoretically unfounded and politically reactionary. World science is not nonnational; it does not grow apart from specific historical forms. Any science, like any culture in general, is national in form and class-oriented in content.”²²

The history of science again found itself at the center of political tension. Its arguments became a widely used resource for criticizing an opponent or legitimizing one’s own position within the scientific community.²³ One of Trofim Lysenko’s favorite rhe-

torical arguments was linking his opponents—Soviet geneticists—with the Western “Mendel-Morgan” tradition.²⁴ He legitimized his own approach, in turn, by referring to the indigenous “Michurinist” tradition in biology. In another academic storm over the content of physiology, rival biographies of the late Russian Nobel Prize laureate Ivan Pavlov, each written by his disciples, lay conflicting claims to his heritage. The infamous 1950 “Pavlovian” joint session of the Academy of Sciences and the Academy of Medical Sciences turned into a contest over rights to the genuine Pavlovian tradition. Those who failed to prove the purity of their scientific genealogy, lost their positions. These debates had little to do with serious historical questions; the actual links between Pavlov’s theory and the contestants’ views were much less important than the contestants’ position in the then-current academic and political rivalries. In this debate as in others, the history of science did not decide contemporary issues; on the contrary, historical questions were claimed resolved depending on the outcome of current power struggles.

Governmental actions underscored the political importance of historical studies. Between 1947 and 1952, for example, six books on the history of science and technology were awarded the highly prestigious Stalin Prize, which instantly made them an object of eager imitation. The most notorious among them was Victor Danilevskii’s *Ruskaia tekhnika* (*Russian Technology*), which called for repulsion of “all those who infringe on Russian primogeniture in great deeds.”²⁵ In January 1949, the Academy of Sciences held a special session on the history of national science, thus putting historical questions on the top of the current agenda for the Soviet scientific establishment.²⁶

Just as the Soviet Union was competing with the West in the political arena, Soviet historians fought their Cold War on the discursive fields of the past. They gave the credit for the discovery of the law of the conservation of mass, research on atmospheric electricity, and the theory of atomism to the “father of Russian science” Mikhail Lomonosov, proclaimed Alexander Butlerov the founder of structural chemistry and Alexander Popov the inven-

tor of the radio. To meet the high quotas of priority claims, some Soviet historians began to manufacture evidence for such claims. A senior Soviet historian later confessed that “the deeply rooted tradition of work aimed solely at quantitative output led to the promotion of publications based on volume and filled with sets of assembled ‘facts’ which, at best, were linked together in a chain by their time coordinates. It was even sometimes the case that these historical ‘facts’ detailed in our history of science literature never actually took place.”²⁷ Among such imaginary “facts” were a balloon flight in 1731, the invention of a submarine in 1829, and the invention of a bicycle in 1801.²⁸

While employing the language of the official nationalist discourse, some Soviet scholars were able to use flexible strategies to advance their own causes, which were not necessarily consistent with the dominant scientific interpretation. A rhetorical appeal to the authority of a long-dead “great Russian scientist” could well serve the defenders of an ideologically suspect contemporary theory. For example, Soviet physicists quickly moved to establish links between Nikolai Lobachevskii’s non-Euclidean geometry and Einstein’s theory of relativity.²⁹ An association with Lobachevskii, the famous nineteenth-century Russian mathematician, who had been represented in a recent biography as an exemplary scientist by Stalinist standards,³⁰ substantially shored up the shaky ideological foundations of Einstein’s born-in-the-West theory of physics.

Paradoxically, this ideologically inspired search for the lost and forgotten Russian discoveries and inventions moved Soviet historians to explore central and regional archives more thoroughly, and eventually greatly enhanced general knowledge of the history of national science. The then-president of the Academy of Sciences, Sergei Vavilov, gave great praise to the pre-revolutionary achievements of the St. Petersburg Academy of Sciences and Mikhail Lomonosov.³¹ What a remarkable reversal of Vavilov’s earlier statement about the total absence of physics in Russia before the twentieth century! While earlier Vavilov had expressed the dominant view of prerevolutionary Russian science as totally

oppressed and unworthy, now the academy through its "chief rhetorician" could proudly claim its deep roots in a venerable historical tradition.

Internalist Histories as Opposition to "Marxism"

The post-Stalin political era in the Soviet Union, known as the "thaw," was marked by significant liberalization of the intellectual sphere. The new regime denounced some of Stalin's crimes and rehabilitated many victims of the Great Terror; the new party leader Nikita Khrushchev attempted to put an end to many aspects of Stalin's isolationist policy. The antic cosmopolitanism campaign was over. Soviet scientists gradually began to broaden contacts with their Western colleagues and to develop research in such previously banned or restricted fields as genetics, cybernetics, sociology, and social psychology. Meanwhile, the successes of the Russian atomic weapons and space programs dramatically expanded the prestige and legitimacy of Soviet science, both at home and abroad.

Soviet historians of science and technology took full advantage of the new developments—both institutionally and intellectually. As early as September 1953, the Academy of Sciences set up an Institute for the History of Natural Science and Technology (*Institut istorii estestvoznaniia i tekhniki*, hereafter IIET), which exists to the present day.³² After the 1956 twentieth Party Congress, where Khrushchev gave his famous anti-Stalinist "secret speech," the changes sped up. The new director of IIET Nikolai A. Figurovskii came out against the previous distortions of the history of Russian science and called for restoring its historical links with world science. He condemned recent works in the field as amateurish, compilatory, and lacking analysis.³³ In 1956, a Soviet delegation attended an International Congress of the History of Science for the first time since 1931.³⁴ By 1959, the Academy had launched a book series, *Scientific Biography*, in which many prominent Western scientists were given an extensive and favorable treatment for the first time.³⁵

Soviet historians who had resented the nationalist fervor of the Stalin era and attempted to free their studies from propaganda clichés frequently turned to what is today termed “internalist” historical narratives as a means of both analysis and self-protection.³⁶ That is, they tended to isolate their historical subject from its social context and instead emphasized the inner logic of the development of scientific thought. Bonifatii Kedrov—the director of ILET from 1962 to 1974—justified this change of discursive strategy by citing the example of prerevolutionary Russia as an argument *against* socioeconomic determinism: despite its successes in science (which had been acknowledged during the Stalinist/nationalist campaigns), tsarist Russia was hardly more advanced socially, economically, or technologically than the Western nations. Thus, it could not be seen as supplying better external factors for the development of science and technology. That meant, then, that the history of science should emphasize internalist explanations and the disciplinary context, rather than the socioeconomic context.³⁷ Thus, the earlier degeneration of Soviet historical studies into “Marxyism” had ended up facilitating a shift from Marxist socioeconomic explanations to a self-consciously apolitical, “logical” form of historical discourse.

When Soviet historians of science and technology began to gravitate toward an internalist approach, their main concern became “objectivity,” meaning an effort to ground their narrative in hard facts rather than in purely ideological or speculative interpretations. For this reason, Soviet historians took to filling their works with “factological” material and made little or no attempt to analyze and interpret it. This strategy was politically safe, and at the same time the author could demonstrate some personal intellectual independence by disregarding “Marxyist” interpretative clichés. The ideological censors of the day could not point to “bias” in a paper in which there was no explicit analysis and facts “spoke for themselves.” An attentive reader, however, could find the author’s “subjectivity” transferred from the analytical to the factological level, revealed in the selection of evidence and construction of historical narrative.³⁸

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The historians' focus on the "inner logic" of scientific development had an important connection with the scientists' own preferred vision of science as an essentially self-driven enterprise. For example, the prominent mathematician and rector of Leningrad University, Alexandr Alexandrov, asserted in his 1970 article: "Guided by the inherent regularity in the growth of scientific thought, the scientists concern themselves primarily with problems generated within their disciplines. . . . The most significant achievements of modern technology have been produced by scientific research guided by a quest for pure knowledge rather than by practical tasks."³⁹ The internalist history of science shored up scientists' appeals for greater autonomy in setting their current research priorities and elaborating long-term plans.

Internalism had a lasting effect on Soviet historical research; the appeal (and the effect) of this discursive strategy went beyond its immediate utility as a rhetorical device that historians could use to sidestep ideological watchdogs. By defining some type of questions as appropriate for study and excluding others, the internalist method and strategy of discourse affected the historians' own mode of thinking. The generation that had adopted this approach in the 1960s, as will be seen in a moment, had great difficulty overcoming its limitations even decades later. Within such discourse, many historical problems necessarily seemed unsolvable, because their answers lay outside the accepted terrain of internalist analysis. And with the field of study so narrow, academic criticism sometimes degenerated into a list of misprints, rather than a discussion of substance.⁴⁰ Thus emerged what the American sociologist of Russian science Linda Lubrano has mildly called a "nonpolemical, academic style."⁴¹

In the community of Soviet historians, criticism or disagreement was often perceived as an attempt to brand an opponent and to revive the tradition of politically motivated attacks of the 1930s and 40s. Instead, a common object of criticism was Western scholarship—yet this was often offered not to degrade it but rather to introduce it to the Soviet reader. Titles like "The Critique of the Bourgeois Concepts of X" served more than once as an

umbrella for discussion of scholarly ideas that would otherwise be inaccessible in printed form in the USSR. This particularly paradoxical discursive strategy permitted Soviet historians to mask their disagreement (with one another) by the lack of criticism, while downplaying their accord (with some Western colleagues) by the presence of criticism. This made Soviet historical scholarship look rather cryptic to most Western observers, who were occasionally deluded by “Marxyist” rhetoric and pro forma criticism. Among Soviet readers, however, the meanings that lay between the lines were usually clear enough.

The Brezhnev-era Communist Party in the USSR—which is to say, from the mid 1960s through the early 1980s—usually focused its efforts at ideological control of the social sciences and humanities. Not surprisingly, most Soviet historians of science clearly preferred to explore the inner mechanisms of the development of knowledge rather than study science as a social phenomenon. The choice of “apolitical” scientific knowledge instead of social processes as the subject of study made the historians less vulnerable to ideological control. Nevertheless, some historians soon managed to incorporate sociology into their studies without submitting to the official “Marxyist” social theory. The discursive technique that opened this door was treating the development of science as a “natural process” subject to quantitative regularities which (purportedly) could be studied by the exact methods of natural science.⁴²

Soviet science studies (the “science of science,” or *naukovedenie*) thus attempted to constitute themselves as an exact science, whose vocabulary and methods were distinct from the calcified dogmas of Marxyist-style historical materialism. This was presented as a “science of science” rather than one of the social sciences, as the name “sociology of science” would have suggested.⁴³ One of the most important arguments in support of *naukovedenie* was its promise to optimize national science policy in an era of intense international competition. A popular literary magazine wrote in 1968: “The race for scientific and technological superiority gives a momentum to *naukovedenie*. The scientific

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study of scientific activity thereby becomes an essential condition of success in the struggle of the two political systems for supremacy in the scientific community.”⁴⁴

This Soviet “science of science” was created by a diverse group of scholars—historians, philosophers, sociologists, specialists in cybernetics, psychology, systems approach, and so on. They put forward a variety of logical, sociological, and informational models of science.⁴⁵ Nevertheless, “there was no standard format for Soviet studies of science, no single set of issues constituting the subject of research, and no unified theory underlying it all,” as Linda Lubrano has observed.⁴⁶ What was common for most of these studies, however, was their view of science from scientists’ *own* perspective, which put the questions of increasing “scientific productivity” and improving conditions for the scientific community to the forefront, and pushed examination of the social role of science to the background.

Soviet specialists in *naukovedenie* played an important role in turning the formula from the Communist Party Program about science becoming a “direct productive force” to the advantage of the scientific community. The historian Yakov Rabkin explained the issue at stake as follows: “At least two opposed interpretations of the formula have been made by officials engaged in science policy. One is that science has to be brought ‘back to production,’ reduced to applied research and development and thus to become a ‘real productive force.’ The other interpretation advocates that pure and basic research should be fostered on the grounds that ‘science’ as such is a ‘productive force’ which leads in the course of time to important technological and economic benefits.”⁴⁷

Expressing the opinion prevalent in the research-oriented academy, science studies specialists usually advocated the second view and turned this ambiguous ideological pronouncement into a powerful rhetorical argument for state support of basic research.

Soon Soviet science studies became a field contested by both

party and government officials (the State Committee for Science and Technology was a major patron of *naukovedenie*) and Soviet scientists. The authorities wanted to have a tool to monitor and manage the scientific community, while the scientists needed convincing-sounding quantitative data to lobby for more state support. The direction of science studies was thus an outcome of combined pressures from the two groups.

Perestroika: From Black-and-White to White-and-Black History

Perestroika, a great social reconstruction of Soviet society, ended with the disappearance of the reconstructed object—the Soviet Union—in December 1991. Something else, however, was reconstructed: people's thinking, their attitude to socialism, to their history, and to themselves. Remarkable changes also emerged in Soviet research on the history of science and technology, both reshaping the thematic profile and altering the discursive strategies.

In 1985, Mikhail Gorbachev, the new general secretary of the Central Committee of the Communist Party, launched *perestroika* and announced the policy of openness (*glasnost*) in many areas of public concern that had been previously closed to discussion. For historians, this shift meant the weakening of ideological censorship and access to newly opened archives.⁴⁸ Up to that point, Soviet censorship had two major consequences—one direct, the other indirect. The direct was an unwritten prohibition on exploring certain topics, such as Lenin's attack on "bourgeois" intelligentsia in the 1920s or the impact of Stalinist purges on the Soviet scientific community in the 1930s. The indirect effect was a particular Soviet style of historical narrative—internalist, factological, and discussion-avoiding. When censorship was to a large degree eliminated, the direct consequences, naturally, were the first to share the same fate. The indirect effects, however, appeared much more difficult to overcome.

Among the first, most obvious, signs of *perestroika* in the history of science and technology were publications of previously

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censored or forbidden works. For example, all the passages from Vladimir Vernadskii's *Scientific Thought as a Global Phenomenon* (1938) which had been cut out earlier by censors were published for the first time.⁴⁹ It also became possible to study the nature and impact of Stalinist purges and ideological campaigns in physics,⁵⁰ cybernetics,⁵¹ genetics,⁵² and physiology.⁵³ Before *perestroika*, the historian A. A. Berzin could not publish his study of the northern railroads, built between 1947 and 1953 by Gulag prisoners; now it came out under the title, "A Road to Nowhere."⁵⁴ Berzin even managed to get access to KGB archives and publish materials concerning engineer prisoners of the Gulag, who built a new engine for passenger trains, later named *JS*, after Joseph Stalin.⁵⁵

Another conspicuous sign of change was a sharp reduction in the number of ritual references to Marx and Lenin in scholarly articles appearing in ILET's academic journal, *Voprosy istorii estestvoznaniia i tekhniki* (hereafter *VIET*). At the outset of *perestroika* in 1986, about one-third of *VIET* publications appealed at least once to the authority of the "classics." By 1991, however, only one in twenty-five *VIET* articles contained *any* direct reference to Marxism. Indeed, the strong wave of criticism of Marxist political theory at that time rendered it very awkward to make any positive mention of Marxist methodology at all. If the ideological climate of pre-*perestroika* years had often forced historians to declare themselves Marxists when they were not, *perestroika* had the opposite effect, wiping any surface signs of Marxism from historical discourse.

As *perestroika* opened formerly forbidden areas for exploration and discussion, a remarkable thematic shift followed that now stressed creating a social history of Soviet science, particularly that of the Stalinist era. That shift in turn has been accompanied by corresponding changes in the geographic and temporal patterns of research with the general trend in the direction of "closer in time, nearer in space."⁵⁶ That is, historical discourse gravitated toward twentieth-century Russia. Since 1986, Soviet research published in *VIET* has concentrated more and more on

modern history of Russian science and technology, reaching a peak of some 80 percent of the articles published in 1991. New opportunities for study in previously inaccessible archives and concern that this chance might soon be lost to yet another shift in party policy spurred researchers to work intensely with new historical material and to publish old studies that had previously been censored.

Political debates of the *perestroika* period over the future of the Soviet Union drew heavily on historical discourse about the communist past. Liberal-minded intellectuals often chose denunciation of Stalinism (and later, Leninism) as a powerful argument for a radical reform that would make a "return to the past" impossible. Scientists, historians of science, and journalists searching for evidence of party interference with scholarship began to systematically explore newly accessible Communist Party archives, KGB files, and the archives of various academic societies of the Soviet period. Not surprisingly, the materials they uncovered strongly suggested that the development of science and technology in the Soviet Union had not been a self-determined or "natural" process. Instead, it had been strongly affected by the political and ideological context of the time, as well as by the party apparatus and various governmental agencies.

New archival findings, however, were often regarded simply as a source for new facts, rather than the catalyst of new interpretations. Those who understood the recovery from enforced amnesia as merely adding new facts effectively perpetuated the factological approach that had been serving Soviet historians since at least the mid-1950s. This approach presumed a model of history in which the general picture had already been drawn (in this case, it was the image of the communist regime oppressing scientific thought); only some "dark spots" were left. As historians discovered forgotten facts, the dark spots would disappear, and the picture would finally become clear and complete. This view of history required recollection, not reinterpretation.

As in previous historical periods, the various interpretations of the past became weapons in contemporary political struggles,

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and the political struggles in turn exerted some measure of influence on the content of historical debates. Today's "gold rush" atmosphere in archival research in the former USSR is more than simply a matter of entrepreneurship it also has a distinctly political character. In the intense process of restructuring the field of power/knowledge relationships, any new interpretation of the role of scientists and engineers in decisive moments of Soviet history is a statement laden with political values.

For example, in the summer of 1992 *VIET* sparked a major controversy when it published a number of historical documents concerning the history of the Soviet atomic project.⁵⁷ Among the documents uncovered by a former KGB officer were two memoranda revealing that Soviet nuclear physicists in the 1940s had access to Soviet intelligence information on certain details of the Manhattan Project as well as to the design of the first American plutonium bomb. The key issue where historical interpretation converged with political campaigns of the 1990s was the evaluation of the degree to which the Soviet atomic project actually depended on the intelligence information about its American counterpart.

After an issue of *VIET* containing this article was already in print, prominent Soviet physicists made every possible effort to stop publication. They warned that some data contained in these 1940s documents might prove useful to those who were trying to build a bomb now, in the 1990s. Moreover, it turned out that the materials in question had been declassified by the KGB but not by the Ministry of Atomic Energy. Although many copies of the journal had already been sent to subscribers, all remaining copies were immediately confiscated.⁵⁸

In the dispute that followed, the well-known Russian scientist Roald Sagdeev contended that the KGB had selectively disclosed the valuable archives in order to present KGB officers as the true "heroes of the Soviet nuclear miracle,"⁵⁹ As for the physicists, one reason for their objection to publication was a desire to prevent the devaluation of their own, more strictly scientific, contribution. The journalist Sergei Leskov suggested that "the reason for the

ban on publishing the intelligence record on the bomb program [in *VIET*] is part of the struggle for a place on the Mount Olympus of history rather than a concern with nuclear nonproliferation. Experts who saw the banned text told me that even Edward Teller and Andrei Sakharov would not have been able to build a bomb based on the information it contained."⁶⁰

Taking credit for the Soviet atomic bomb was not just a matter of the reputation of two professional groups, the physicists and the intelligence officers. It became instead part of a larger political dispute among the Russian democratic movement, communists, and Russian nationalists. For many communists, it was particularly important to give the credit for major scientific and technological accomplishments of the former Soviet Union not to the scientists and engineers with their liberal, pro-Western views, but instead to the Soviet intelligence officers, who were presented as "patriots" and "dedicated communists." Nationalists, on the other hand, were more willing to give credit for the Soviet atomic project to Russian science, rather than to its Western counterpart. Liberal journalists meanwhile tried to turn both interpretations to the advantage of further criticism of Stalin's government. Among journalists, some claimed that Soviet scientists achieved their goal independently, despite the intrigues on the part of the intrusive secret police. Others preferred the version of the "stolen bomb," thus depriving Stalinism of one of its proudest accomplishments.

Later the ban on the issue of *VIET* in question was lifted, and the journal is now available. Nevertheless, Russian historians of science frequently confront debates over the political meaning of their research. While Brezhnev-era internalist histories could pose as "apolitical," today's analysis of science and technology in a social context cannot, and that in turn raises complex questions for Russian and other students of the history of science and technology.

The historian Joseph Agassi once warned that the "approach of the up-to-date textbook worshipper paints all events in the history of science as either black or white, correct or incorrect."⁶¹

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When internalist scholars applied this approach, they tended to evaluate scientists according to their attitude toward whatever theory was thought to be correct at the moment. The same usually was true of Soviet official histories of science and technology. Before *perestroika*, for example, Soviet historiography traditionally ascribed major scientific contributions to “progressive” scientists, while portraying those who were politically “imperfect” as scientists whose research was in error. This was an integral part of the general ideological framework in which good science could only be done by scientists with dialectical materialist views on both nature and society. Changes in the assessment of the scientific merits of a given scholar typically could be made only if a corresponding political reconsideration took place. In such a case, the consequences for the history of science and technology followed the political decision, rather than the other way around.

After his posthumous rehabilitation in 1988, Nikolai Bukharin—a prominent Bolshevik, one of the organizers of the study of the history of science and technology in the Soviet Union, and long labeled a “black”—instantly became a “white.” *VIET* published a highly laudatory article about him and reprinted the text of one of his 1936 speeches.⁶² There were even suggestions to rename IET in his honor.⁶³

Similarly, Nikolai Vavilov, a famous Russian geneticist who perished in a Stalinist prison, became for many historians a symbol of Stalinist intrusion in science. Vavilov’s scientific merits were generously complemented by the image of good citizenship; the historian V. M. Surinov portrayed him as pristinely “white”, writing that, “In every situation [Vavilov] displayed himself as a statesmanly leader, as a scientist citizen.”⁶⁴ In another prominent case, the theoretical physicist Leonid Mandel’shtam had been severely criticized on ideological grounds in the 1940s and 1950s. Now, historians of science have quite properly exposed these notorious accusations as another example of political pressure on science, then gone on to idealize Mandel’shtam as a perfect scientist: he is said to have been “almost absolutely unable to make mistakes on questions of physics.”⁶⁵

Thus, the old heroic history has been supplanted by a new form that is sometimes disturbingly similar. Today's (revised) "true" heroes are still giants, not living people with complex lives. We have been given an updated textbook of political history in which the previous black-and-white history of science and technology often becomes white-and-black.

From Science in a Vacuum to Science in Context

When *perestroika* reduced ideological barriers and opened the social context of science and technology for study, that certainly implied changes in the thematic discourse of Soviet historians. It took some additional time, however, for historians to realize that not only themes, but also research methodologies, ought to change.

In early 1987, the editorial board of *VIET* was changed, and in an editorial in the first issue of that year one can find a promise "to extend the publication of materials that relate to the social history of science—such an intensively growing and problematic field and one that has provoked sharp discussions."⁶⁶ Nevertheless, the new board at *VIET* still considered social history to be problematic, standing apart from the main path of development of the history of science. The examination of sociocultural context was relegated to the special (that is, problematic) field of social history, while nonproblematic traditional history was encouraged to develop within the tried-and-true internalist paradigm.⁶⁷

Soon, however, the drastic methodological shifts then underway among historians significantly altered the terrain of the history of science and technology in the Soviet Union. The share of internalist articles in *VIET* sharply declined from 57 percent in 1986 to 16 percent in 1991. The internalist tradition was now being challenged by those historians who began to put more emphasis on the cultural and political context of science and technology.

In May 1989 in Leningrad, young scholars organized a confer-

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ence called "Sociocultural Aspects of the Development of Soviet Science." When the science-state relationship was discussed, the sharpest debates focused on the question: Which external factor influenced the formation of the cognitive agenda of the scientific community more—the dominant ideology or the direct administration of political power? The participants divided into two groups, which observers named "statists" and "ideologists."⁶⁸ The "statists" insisted on preserving the image of science as a system of knowledge with its cognitive traditions largely isolated from society. In this view, all external influences are reduced to administrative state measures—either support and funding, or interference and oppression. The "ideologists," on the contrary, envisioned science as an integral part of the sociocultural continuum and maintained that although the "virus of ideology" does not always infect the scientific community from above, ideology nonetheless inevitably penetrates scientists' consciousness.

Interestingly enough, this argument became possible only after historians of science had begun to examine the *negative* aspects of the state's relationship with the scientific community, particularly during the Stalinist purges. Now it became possible to consider scientists as independent-thinking individuals whose views could differ from the official ideology, and there emerged a tension between science and the state. The "good Soviet state, good ideology, good science" model had not permitted any distance between the "good state" and "good science." The relationship between the two was not conceived of in terms of influence, acceptance, or resistance. Good Soviet scientists developed the only possible Soviet science, and that was, of course, good. In this scenario, scientists' internal motives never contradicted external ones, either as individuals or as members of a group. But when *perestroika* led to the reevaluation of the former Soviet regime as totalitarian, in which the state imposed "bad ideology" on science, a significant gap suddenly appeared between science and the "bad state." The statistists chose a model "bad state, good science." The ideologists argued for a more

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subtle picture, where the actual operation of power in Soviet society was not simply a top-down process, where political and ideological controversies could emerge under certain conditions within a scientific community, and where ideology served as a language of negotiation among various groups of scientists and bureaucrats.

Two historians from St. Petersburg, Daniel Alexandrov and Nikolai Kremetsov, developed the views of the "ideologists" further in "An Experimental Guide to an Unknown Land: A Preliminary Outline of a Social History of Soviet Science from 1917 to the 1950s."⁶⁹ They maintained that the Soviet scientific community was not separated from the rest of society; the established model of power in science was to a large extent supported by scientists themselves. Alexandrov and Kremetsov described Soviet scientists' striving for the monopolization of power in science and the use of political arguments in scientific discussions as examples of scientists' internalization of state ideology. The portraits of scientists who were formerly considered black, then white, now became a bit gray. Alexandrov and Kremetsov emphasized, for example, that the concentration of power in the hands of a few top administrators (among them such heroes of historical narratives as Nikolai Vavilov or Leon Orbeli) effectively intensified power struggles within the scientific community and paved the way to the top for such individuals as Trofim Lysenko.⁷⁰

Generations Come and Methodologies Go

In May 1990, a second conference on the social history of Soviet science was held in Moscow. Here, the division between the proponents and the critics of new methodological approaches increasingly resembled a generational conflict. The elder generation, long compelled to keep silent about the state's negative impact on science, at last obtained a chance to tell more of the truth as *perestroika* developed. Such truth-telling was the aim of most contributors to the published collection *Science Re-pressed*, which exemplified the new "white-and-black" history.⁷¹

The younger generation, on the other hand, had developed an

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approach they called “social history.” The historian Alexei Kojevnikov wrote, “This term [social history] implies a certain disagreement with an approach that dominates in publications during *perestroika* and may be conventionally characterized by the term ‘science repressed.’ Instead of considering the science-power relationship solely in a passive voice, in terms of violence, with a stress on its most notable forms—repression and ideological interference—we would like to make a more sober and integrated representation of the highly specific mode of the existence of science in our society, a mode that determines its successes and failures. We would like to attach great significance to sociological, institutional, and cultural factors. The scientific community in this process is believed to play a highly active and ambiguous role.”⁷² Thus, as Loren Graham has commented, “the coming generation of historians of science in the former Soviet Union go beyond the mere identification of heroes and villains and instead look for institutional and social reasons for the emergence of such individuals.”⁷³

The manifesto of the younger generation, Alexandrov and Kremmentsov’s “Experimental Guide to an Unknown Land,” was met by senior scholars with distrust and skepticism, and labeled “vulgar sociology.” Many supporters of the “statist” analysis perceived ideology as something inherently alien to the science enterprise.⁷⁴

There emerged a pronounced conceptual and linguistic gap between the two generations.⁷⁵ In its first issue of 1990, *VIET* published an article by the American historian of science Paul Forman in which he criticized the tendency to look for a rational reconstruction of scientific discovery and argued for greater attention to the external factors of scientific development.⁷⁶ In his response, the retired former director of IJET, Semen Mikulinskii, called Forman’s approach an “extreme externalism” and continued: “We must say that a crude externalist interpretation of social influences on science is not a harmless thing. It leads to the blurring over and even erasing the boundary between science and ideology, and this predetermines the end of science and

makes it possible to conceive of scientists as proponents of alien ideology, resulting in grave consequences."⁷⁷ In this way, many of the elder generation of Soviet historians of science and technology rejected the externalist methodology on what might be termed moral rather than cognitive grounds. Science, they maintained, had suffered so much because of the Soviet state, why must it suffer once again today because of social history? One result has been that, in 1993, *VIET* opened a regular rubric or section on the social history of Russian science and technology, thus reserving a space for this approach while remarkably separating it from "normal" history of science and technology.

As *perestroika* made it possible to travel to the West for scholarly meetings and research, Soviet historians vastly broadened the contacts with their Western colleagues. If before the academy authorities appointed the members of Soviet delegations to international conferences and granted permission for publication abroad, now such contacts became largely the result of individual efforts. The younger researchers, more mobile and proficient in foreign languages, took a greater advantage of this opportunity. Aimed at publishing in the West,⁷⁸ their discursive strategy has been shaped by the necessity to fit in the current trends in Western scholarship, for writing grant proposals and preparing papers for publication are among the best-known means to internalize the norms of the dominant discourse. The younger generation began to shift their attention from analyses of the science-state relationship to some more popular in Western historiographical approaches, such as social constructivism, historical anthropology, studies of laboratory culture, informal social networks, rhetoric, visual representations, scientists' games, rituals, and so on. The collapse of the old system of state support for science spurred their interest in various forms of science patronage—from both historical and contemporary perspectives.⁷⁹

History of Science, Discourse, and Structure

Another important factor in understanding the development of science and technology—and by extension the intellectual his-

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tory of science and technology—is the institutional or administrative structure of the discipline under review. In his detailed study of the evolution of the Soviet-era Institute of Experimental Biology, the American historian of Russian science Mark Adams argued that, “Ideology has played a less significant role than we have tended to assume, and . . . structure played a more significant role. Ideological shifts without structural alterations produced very little effect on the character of the scientific work done; structural changes without ideological concomitants have played a much greater role.”⁸⁰

The implications of Adams’s insight can only be touched on here. Nevertheless, it is worth noting that Soviet research in the history of science and technology has been institutionalized within the Academy of Sciences in a somewhat similar manner to that documented in Adams’s study—namely, as a separate institute—so it is reasonable to suspect that here, too, the disciplinary and administrative structure of the field might have played an important role in the content of studies. Indeed, IET is built around disciplinary departments (history of physics, mathematics, chemistry, biology, aerospace technology, shipbuilding technology, and so on), while the Science Studies Department (sociology of science, social psychology of science, complex problems of the scientific-technological revolution, and so on) exists as a separate unit. This institutional structure itself suggests that the social context is to be studied by sociologists and the psychological subtext by psychologists, while historians of science and technology are to do little more than “collect facts.”⁸¹ Like specialization in science itself, internalist specialization in the history of science has erected conceptual barriers among historians of different disciplines. “What do historians of mathematics have in common with historians of biology, if they both honestly follow the internalist tradition?,” as Daniel Alexandrov has queried. “In this case, there is no common language or common problems. Internalist history of science divides and thereby conquers.”⁸²

Can we then, following Adams, conclude that in our story, too,

structure has played a more significant role than ideology? First, we have to clarify the meaning of "ideology" here, and that is always a vexed process. Adams builds his case upon the separation of "science" ("the actual experimental and theoretical work") from "ideology" ("statements about the scientific enterprise"—"not only what government or party officials say about science in approved statements, but also what the Academy as a whole, and individual influential scientists, say about science").⁸³ Ideology in this vision serves "as a flexible language of justification, the legitimizing 'glue' between the scientific institution and its political patron."⁸⁴

Given that history of science discourse is nothing other than the production of "statements about the scientific enterprise," it therefore should have been called "ideology" in its entirety, at least in Adams' terms. In the history of science and technology one can hardly separate scholarship from ideology,⁸⁵ for, as I have attempted to show, discursive strategies of Soviet historians of science and technology have been tightly connected with the role of historical knowledge in the discourses of politicians, bureaucrats, and scientists. Whether construing a heroic historical tradition of national science, emphasizing the class roots of a particular scientific theory, focusing on the logic and beauty of ideas, or arguing that greater funding would increase scientific productivity, Soviet historians of science and technology shaped their research agenda both in response to the current political and cultural situation and in attempt to influence it.

The structure of Soviet research in the history of science and technology was itself formed as an institutional support for a particular kind of discourse. The Institute for the History of Natural Science was founded as a center for the study of national traditions in various scientific disciplines; later on, basically the same structure supported internalist studies. Less orthodox trends in science studies found (or produced) their own microstructures: informal seminars, summer schools, and an oral culture of discussion.⁸⁶ When *perestroika* changed a general political climate in the country, the old ILET structure proved unable to con-

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tain new trends in the discourse. Although the structure of IJET remains much the same even now, the discursive terrain of the history of science and technology has completely changed.

Thus, the role of structure in this case is important, yet it is but one of a larger mix of forces. Structural factors such as departmental divisions, patterns of education for specialists, and control of key academic publications, for example, each channeled the discourse and fostered some discursive strategies over others. For the moment—and a “moment” could last forty years—structure has emerged as the embodiment of power relations of the dominant discourse. But during sharp sociopolitical and ideological changes in the broader society, the determinative authority of institutional structure can erode rather quickly. Further study of the evolution of both administrative structures and discursive strategies may help us better understand the constraints imposed by structure, and the reasons for its change.

Conclusion: Is the Soviet Case Unique?

In this article, I have examined several of the discursive strategies that Soviet historians developed over the past eighty years in their attempt to make history respond to contemporary concerns. Instead of portraying Soviet scholarship as driven by a single set of ideological assumptions or theoretical presuppositions, I focused on the ways historians varied their narrative strategies, rhetorical techniques, and patterns of criticism, while they worked to adapt their discourse to the changing sociopolitical situation. Whether praising or denying the achievements of pre-revolutionary Russian science, integrating national traditions with world science, or isolating them from it, portraying science as a purely intellectual enterprise, or emphasizing its role as a “direct productive force,” Soviet historians employed flexible discursive strategies to convey the desired meaning without violating the constraints of the then politically acceptable language. I argued that rather than being a mere servant of political authorities or victim of ideological pressure, Soviet discourse on the history of

science and technology played an active role in advancing contemporary agendas through historical narrative.

In the *perestroika* years, and especially in the post-Soviet period, historical questions have loomed large in current political debates. The history of science and technology became a contested field for critics and defenders of the Communist regime. Different generations of Soviet historians have chosen different strategies: while much of the elder generation advanced the image of science as purely cognitive activity to condemn totalitarian pressures on science, many of the younger generation began to emphasize socioeconomic and cultural aspects of scientific developments.

Soviet historians' tendency to construct a historical image of science with an eye on contemporary debates is hardly unique. Throughout the Cold War, many American historians of Soviet science focused their attention on social environment of Soviet research. As the historian Susan Gross Solomon has argued, in the 1950s, American specialists developed "different rules for the study of Western and non-Western science. Whereas emphasis on the societal environment of science was taboo in the study of American or British science, stress on the societal setting of foreign science was broadly accepted."⁸⁷ Their depiction of Soviet science largely as a victim of political intrusion shored up the totalitarian model of Soviet society, which was one of the cornerstones of the intellectual basis for American foreign policy of the day. At the same time, this double standard in science studies marginalized the issue of the relations between science and politics in the West, thereby contributing to the image of an "objective," "unbiased" Western science. Soviet science was thus portrayed as "deviant" compared to its Western counterpart.

By the early 1960s, however, after Sputnik and other notable successes of Soviet science and technology, the tone of American discourse on Soviet developments had changed. The Soviet case was now seen as a strong argument in favor of greater governmental support for science. In the flood of literature on Soviet science policy that followed, "the [Soviet] government was no

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longer portrayed as an intruder in science; instead, it was treated as the agent responsible for shaping, engineering, and even facilitating scientific development.”⁸⁸ American specialists no longer described the Soviet case as “deviant,” but rather “normal” and in some respect even instructive for Western policymakers concerned with science. Thus, the various images of Soviet science, whether “deviant” or “normal,” served specific discursive strategies, which American scholars developed in the changing sociopolitical contexts of American intellectual life.

In this essay, I have attempted to present academic discourse not as a container of a particular ideology or theory, but rather as a mechanism for advancing a certain agenda via disciplinary knowledge. Many ideological beliefs and theoretical concepts can be viewed as the result of conscious attempts to explicate and rationalize discursive norms, in much the same way that grammatical rules are evoked to describe and prescribe linguistic practices. Instead of depicting the Cold War solely as a clash of ideologies, it may be more productive to examine the discursive strategies that were employed to shape the image of the opponent and to build up “our” ideology against “theirs.” In both American and Soviet academic discourses, at various moments in history, evaluation of the “academic other” ranged from total negation (with the use of such labels as “bourgeois pseudo-science” or “dogmatic and servile scholarship”) to its elevation as an exemplar to be imitated (“innovative and dynamic” or “rationally planned and organized”). Soviet historians actively developed various discursive strategies to appropriate the image of the opponent to the needs of the current situation.

The American sociopolitical situation differed in many ways, of course, but nevertheless frequently was more closely related to its Soviet counterpart than most observers preferred to admit. Academics in both countries ingeniously shifted the focus of their analysis from the differences between the two countries to the similarities, and vice versa, depending on a larger political agenda. American and Soviet scholars often employed similar discursive mechanisms for similar goals, for example, by choos-

ing an internalist methodology to retreat to politically safe forums, or by creating disciplinary structures that damped out conceptual and methodological challenges to the status quo. One could compare scholarship in the two countries to the two faces of the same coin, for the Soviet Union and the United States viewed each other and to a certain extent defined themselves against the background of the Cold War. Although on the surface their Cold War—era ideologies seemed totally incompatible, the discursive mechanisms that constructed those ideologies have been very similar for some decades, and remain so today.

Notes

1. Such studies touch only the surface of Soviet discourse. See, for example, N. A. Kupina, *Totalitarnyi iazyk: Slovar' i rechevye reaktsii* (Ekaterinburg—Perm': Izdatel'stvo Ural'skogo universiteta, 1995); Françoise Thom, *Newspeak: The Language of Soviet Communism*, trans. Ken Connelly (London: The Claridge Press, 1989).
2. Michael Gorham, "Tongue-tied Writers: The *Rabsel'kor* Movement and the Voice of the 'New Intelligentsia' in Early Soviet Russia," *Russian Review* 55 (July 1996), p. 414.
3. Rachel Walker, "Marxism-Leninism as Discourse: The Politics of the Empty Signifier and the Double Bind," *British Journal of Political Science* 19 (1989), p. 179–80.
4. On the history of science and technology studies in the Soviet Union, see Loren R. Graham, *Science in Russia and the Soviet Union: A Short History* (Cambridge, England: Cambridge University Press, 1993), esp. pp. 137–55; Irina Gouzevitch, "The History of Technology in Today's Russia," *SHOT Newsletter* No. 72 (June 1996), pp. 13–16; David Joravsky, "Soviet Views on the History of Science," *Isis* 46 (1955), pp. 3–13; Linda L. Lubrano, *Soviet Sociology of Science* (Columbus, Ohio: AAASS, 1976); Yakov Rabkin, "'Naukovedenie': The Study of Scientific Research in the Soviet Union," *Minerva* 14 (1976), pp. 61–78; Alexander Vucinich, *Empire of Knowledge: The Academy of Sciences (1917–1970)* (Berkeley: University of California Press, 1984); Alexander Vucinich, "Soviet Marxism and the History of Science," *Russian Review* 41 (1982), pp. 123–42; Maria S. Bastrakova, "Iz istorii razvitiia istoriko-nauchnykh issledovaniï," *VIET* 61–63 (1978), pp. 34–47; Simon S. Ilizarov, *Materialy k istoriografii istorii nauki i tekhniki: Khronika: 1917–1988 gg.* (Moscow:

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- Nauka, 1989); Vladimir S. Kirсанov, "Vozvratit'sia k istokam? Zametki ob Institute Istorii Nauki i Tekhniki AN SSSR, 1932–1938 gg." *VIET* (1994), no. 1, pp. 3–19; Alessandro Mongili, "Priklucheniia nauko-vedeniia: sluchai Instituta istorii estestvoznaniia i tekhniki," *VIET* (1995), no. 1, pp. 116–137 (a summary of A. Mongili's doctoral dissertation "Sociologues et sociologie des sciences en U.R.S.S.: Le cas de l'Institut d'Histoire des Sciences Naturelles et de la Technologie de Moscou" defended in Paris in 1993).
5. This paper will focus on the historical research done at the Academy of Sciences, rather than in Soviet universities. This is because throughout the Soviet era, the Academy of Sciences (now a network of hundreds of institutes with tens of thousands of full-time researchers) conducted the lion's share of fundamental research, while the institutions of higher education (the universities and technical institutes) fulfilled mostly pedagogical functions. True, some universities maintained strong traditions of research in mathematics, physics, and biology, but in the field of the history of science and technology the divorce of research and teaching was nearly complete. For Vernadskii's biography, see Kendall Bailes, *Science and Russian Culture in an Age of Revolutions: V. I. Vernadsky and His Scientific School, 1863–1945* (Bloomington: Indiana University Press, 1990).
 6. Graham, p. 138.
 7. In 1918, the Bolsheviks founded the Socialist (later Communist) Academy as a center of Marxist studies and a counterweight to the traditional Academy of Sciences.
 8. Prominent Soviet physicist Sergei Vavilov, for example, claimed that "up to the 20th century there was really no physics in Russia."
 9. Boris Hessen, "The Social and Economic Roots of Newton's *Principia*," in *Science at the Crossroads* [1931], ed. Nikolai I. Bukharin et al., reprint ed. (London: Frank Cass, 1971), p. 182.
 10. Graham, p. 149. For an example of criticism of Einstein's physics, see Arkadii K. Timiriázev, "Teoriiia otnositel'nosti Einsteina i dialekticheskii materializm," *Pod znamenem marksizma* (1924), no. 8–9, pp. 142–57; no. 10–11, pp. 92–114. In the late 1920s, Hessen attempted to argue that relativity theory was fully compatible with dialectical materialism in his *Osnovnye idei teorii otnositel'nosti* (Moscow, 1928).
 11. In the Soviet Union, Hessen's work was immediately criticized for establishing mere "mechanical" and "formal" links between Newton's ideas and the societal needs (Matvei A. Gukovskii, "Tseli i zadachi istorii nauki," *Vestnik AN SSSR* (1934), no. 1, p. 39).
 12. *Dictionary of the History of Science*, eds. William F. Bynum, E. Janet Browne, and Roy Porter (Princeton, N.J.: Princeton University Press, 1981), pp. 145–46.

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13. On the "Sovietization" of the Academy of Sciences, see Loren R. Graham, *The Soviet Academy of Sciences and the Communist Party, 1927–1932* (Princeton, N.J.: Princeton University Press, 1967); and Feliks F. Perchenok, "Akademiia Nauk na velikom perelome," in *Zven'ia*, vol. 1 (1991), pp. 163–238. The Communist Academy lost its autonomous status and was incorporated into the Academy of Sciences in 1936.
14. For a standard biographic source on Bukharin, see Stephen Cohen, *Bukharin and the Bolshevik Revolution: A Political Biography, 1888–1938* (New York: Knopf, 1973).
15. Vucinich, "Soviet Marxism and the History of Science," p. 130.
16. The wide celebration of Newton's tercentennial anniversary in 1943 was politically significant as a friendly gesture toward the British allies.
17. Some Soviet historians' discursive strategy was flexible enough in this context to implement what amounted to a hidden agenda. The "great men of science" discourse with its strong emphasis on moral virtue, could well be used for implicit criticism of the current regime. The historian of antiquity S. Ia. Lur'e, for example, opened his 1945 book *Archimedes* with what was seen even at the time as a thinly veiled attack on Stalin's rule: "Tyranny is a horrible and vile disaster which owes its origin to only one cause: people no longer feel the necessity for the law and justice that would be one and the same for everyone" (quoted in Ilizarov, *Materialy*, pp. 24–25).
18. The question whether the Cold War prompted the anticommopolitanism campaigns, or they had a different origin (in the struggle within Soviet leadership, for example) and simply utilized the Cold War rhetoric as a convenient language, is too complex to deal with here. In any case, the Cold War in international politics and anti-cosmopolitanism in the domestic sphere soon began to reinforce each other, and so the origins question became irrelevant.
19. See Nikolai Kremontsov, "The 'KR Affair': Soviet Science on the Threshold of the Cold War," *History and Philosophy of the Life Sciences* 17 (1995), pp. 419–46.
20. See Vladimir D. Esakov, "Kistorii filosofskoi diskussii 1947 goda," *Voprosy filosofii* (1993), no. 2, pp. 83–106.
21. *Materialy po istorii otechestvennoi khimii: sbornik dokladov na Pervom Vsesoiuznom soveshchaniu po istorii otechestvennoi khimii, 12–15 maia 1948 g.* (Moscow and Leningrad: AN SSSR, 1950), p. 4.
22. Ivan I. Potekhin, "Kosmopolitizm v amerikanskoj etnografii," in *Anglo-amerikanskaia etnografiia na sluzhbe imperializmu*, ed. Ivan I. Potekhin (Moscow: AN SSSR, 1951), pp. 36–37.
23. On Soviet science under Stalin, see Loren R. Graham, *Science, Philosophy, and Human Behavior in the Soviet Union* (New York: Columbia University

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- Press, 1987); Nikolai Kremmentsov, *Stalinist Science* (Princeton, N.J.: Princeton University Press, 1997); and Vucinich, *Empire of Knowledge*.
24. This argument was reinforced by Stalin in his personal editing of Lysenko's 1948 speech. See Kirill Rossianov, "Editing Nature: Joseph Stalin and the 'New' Soviet Biology," *Isis* 84, no. 4 (December 1993), pp. 728–45.
 25. Victor V. Danilevskii, *Russkaia tekhnika*, 2nd ed. (Leningrad: Lenizdat, 1948), p. 468.
 26. See the proceedings of this meeting in *Voprosy istorii otechestvennoi nauki: Obshchee sobranie AN SSSR, posviashchennoe istorii otechestvennoi nauki, 5–11 ianvaria 1949 g.* (Moscow and Leningrad: AN SSSR, 1949).
 27. Vladimir I. Kuznetsov, "Ob osnovnykh napravleniiakh issledovaniia v oblasti istorii estestvoznaniia i tekhniki i naukovedeniia," *VIET* (1987), no. 1, p. 12.
 28. See Vitalii I. Dovgopol, "O velosipede Artamonova" *VIET* no. 1 (1989), pp. 149–50; Leonid E. Maistrov and N. L. Vilionova, "O velosipede Artamonova," *VIET* no. 1 (1983), pp. 89–96; Victor S. Virginskii et al., "Kak tvoriatsia mify v istorii tekhniki," *VIET* no. 1 (1989), pp. 150–57.
 29. Vucinich, *Empire of Knowledge*, p. 236.
 30. Sofia Ia. Ianovskaia, *Peredovye idei N. I. Lobachevskogo—orudie bor'by protiv idealizma v matematike* (Moscow and Leningrad, 1950).
 31. Alexei Kojevnikov, "President of Stalin's Academy: The Mask and Responsibility of Sergei Vavilov," *Isis* 87 (March 1996), no. 1, p. 35.
 32. In the late 1980s, ILET employed some two hundred full-time researchers. For a survey of the Institute's activities, see *Institute of the History of Natural Sciences and Technology*, ed. Nikolai D. Ustinov (Moscow: Nauka, 1989). Between 1954 and 1962, the Institute published forty-five volumes of its *Transactions*, which was then succeeded by the series *Problems in the History of Science and Technology* (68 volumes); the latter in 1980 was turned into a quarterly journal under the same title (*Voprosy istorii estestvoznaniia i tekhniki, VIET*). For a brief, but informative review of *VIET*, see Paul R. Josephson, review of *Voprosy Istории Estestvoznaniia i Tekhniki Isis* 82 (1991), pp. 298–300.
 33. Nikolai A. Figurovskii, "Zadachi issledovaniia po istorii nauki," *Vestnik AN SSSR* (1959), no. 11, p. 31.
 34. A report filed by this delegation on their return, is preserved at the archive of the Central Committee of the Communist Party (Center for the Preservation of Contemporary Documents (TsKKhSD), f. 5, op. 35, d. 30, ll. 57–61).
 35. To the present, more than 400 biographies have been published. See a guide to this series: Zoia K. Sokolovskaia, *400 biografii uchenykh* (Moscow: Nauka, 1988).
 36. In 1968, the American historian

- of science Thomas Kuhn distinguished “internalist” and “externalist” approaches to historical studies in the West this way: “The still dominant form, often called the ‘internalist approach,’ is concerned with the substance of science as knowledge. Its newer rival, often called the ‘externalist approach,’ is concerned with the activity of scientists as a social group within a larger culture.” Kuhn saw “putting the two together” as “the greatest challenge” for the historian of science (Thomas Kuhn, “The History of Science,” *International Encyclopedia of the Social Sciences*, ed. D. L. Sills, vol. 14 (New York: Macmillan, 1968), p. 76). The American historian of technology John Staudenmaier later classified articles on the history of technology in a similar way: “[T]hose focused on the data of technical design alone (‘internalist history’), those focused on contextual evidence alone (‘externalist history’), and those attempting to integrate both types of evidence (‘contextual history’).” (John Staudenmaier, *Technology’s Storytellers: Reweaving the Human Fabric* (Cambridge, Mass.: MIT Press, 1985), p. 25).
37. For discussion of this argument, see Bonifatii M. Kedrov, *O marksistskoi istorii estestvoznaniia* (Moscow: Nauka, 1968), pp. 20–21. Kedrov’s own work provides a brilliant example of logical reconstruction of a scientific discovery; see B. M. Kedrov, *Den’ odnogo velikogo otkrytiia* (Moscow: Izdatel’stvo sotsial’no-ekonomicheskoi literatury, 1958).
 38. Under Stalin, such strategy would have been labeled “objectivism,” for it placed “impartial facts” over loyalty to ideological dogmas (see Vucinich, *Empire of Knowledge*, p. 235). In the post-Stalin period, avoidance of explicit historical interpretation was allowed, and it often meant implicit disagreement with the official viewpoint.
 39. Aleksandr D. Alexandrov, “Razuzh zagovorili o nauke,” *Novyi mir* (1970), no. 10, p. 210.
 40. In one particularly absurd example, a senior Soviet historian of mathematics reviewed a 1987 book noting, for instance, “the incorrect position of letters in the first table on p. 76 and the loss of a bracket on p. 163, in the second paragraph from the top” (Fedor A. Medvedev, review of *Metodologicheskoe problemu intuitsionistskoi matematiki*, by Mikhail I. Panov, *VIET* (1987), no. 1, p. 151).
 41. Lubrano, p. 6.
 42. To avoid potential accusations of reductionism, Soviet scholars, of course, acknowledged that quantitative data must be complemented by qualitative analysis. Then they simply stated that calculating three parameters—scientific discoveries, tests of existing theories, and new theories proposed—would provide a quantitative measure for qualitative change in science (Semen R. Mikulinskii and Naum I. Rodnyi, “Nauka kak predmet spetsial’nogo issledovaniia,”

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- Voprosy filosofii* (1966), no. 5, pp. 31–32).
43. This made Soviet science studies less susceptible to “Marxist” rhetoric. According to Yakov Rabkin’s data, articles in the leading science studies journal in the late 1960s and early 1970s contained on average ten times fewer references to official ideological documents than comparable journals in philosophy, history, or economics (Rabkin, p. 77).
 44. M. Petrov and A. Potemkin, “Nauka poznaet sebia,” *Novyi mir* (1968), no. 6, p. 250.
 45. See Vladislav Zh. Kelle, “Stanovlenie v SSSR sotsiologicheskikh issledovaniï v poslevoennyi period,” *VIET* (1995), no. 2, pp. 41–48.
 46. Lubrano, p. 13.
 47. Rabkin, p. 77.
 48. In 1938, the state archives were transferred under the secret service’s oversight, and thereafter Soviet historians had very limited access to the government archives; only party members with special clearance could work in local party archives, and the records of the KGB and the Party Central Committee were completely closed to researchers. For updated information on newly opened Russian archives, see *Archives in Russia, 1993: A Brief Directory*, ed. Patricia K. Grimsted, (Washington, D.C.: IREX, 1993); Vitaly Chernetsky, “On the Russian Archives: An Interview with Sergei V. Mironenko,” *Slavic Review* 52 (Winter 1993), pp. 839–46; J. Arch Getty and Oleg V. Naumov, eds., *Research Guide to the Russian Center for the Preservation and Study of Documents of Contemporary History* (Moscow, 1993); Gordon M. Hahn, “Researching Perestroika in the Archive of the TsK KPSS (Soviet Communist Party Central Committee archive, Center for the Preservation of Contemporary Documents),” *Russian Review* 53 (July 1994), pp. 419–23; David L. Hoffman, “A first glimpse into the Moscow Party Archives,” *Russian Review* 50 (October 1991), pp. 484–86; Nikolai Kremntsov, “Footprints of a Vanished Science: Russian Archival Sources for the History of Soviet Genetics,” *Mendel Newsletter* no. 4 (1994), pp. 2–4.
 49. See Vladimir I. Vernadskii, “Nauchnaia mysl’ kak planetnoe iavlenie (1938 g.) (Neopublikovannye fragmenty),” *VIET* (1988), no. 1, pp. 71–79.
 50. Gennadii E. Gorelik, “Obsuzhdenie ‘naturfilosofskikh ustanovok sovremennoi fiziki’ v Akademii nauk SSSR v 1937–1938 godakh,” *VIET* (1990), no. 4, pp. 17–31; Vladimir P. Vizgin, “Martovskaia (1936 g.) sessiia AN SSSR: sovetskaia fizika v fokuse,” *VIET* (1990), no. 1, pp. 63–84; (1991), no. 3, pp. 36–55.
 51. Iliia B. Novik, “Normal’naia lzhenauka,” *VIET* (1990), no. 4, pp. 3–16.
 52. Stranitsy istorii sovetskoï genetiky v literature poslednikh let,” *VIET* (1987), no. 4, pp. 113–124; (1988), no. 1, pp. 121–31; (1988), no. 2, pp. 91–112.
 53. “‘Pavlovskaiia sessiia’ 1950 g. i sud’by sovetskoï fiziologii,”

- VIET (1988), no. 3, pp. 129–41; (1988), no. 4, pp. 147–56; (1989), no. 1, pp. 94–108.
54. A. A. Berzin, "Doroga v nikuda. Materialy o stroitel'stve zheleznoi dorogi Salekhard-Igarka. 1947–1953," *VIET* (1990), no. 1, pp. 38–49.
 55. A. A. Berzin, "Parovozy za kolichei provolokoi: Novye materialy o sovetskom parovozostroenii iz arkhivov KGB," *VIET* (1991), no. 4, pp. 35–38.
 56. Here I draw upon my quantitative analysis of the changes in the methodological, thematic, temporal, geographic, and disciplinary patterns of Soviet historians' research as reflected in *VIET* articles during the *perestroika* period, 1986–91. The details of that study, and a comparison with the results of John Staudenmaier's similar analysis based on the content of the journal of American historians of technology, *Technology and Culture*, from 1959 to 1980 (see Staudenmaier, *Technology's*), can be found in my "Perestroika of the History of Technology and Science in the USSR: Changes in the Discourse," *Technology and Culture* 37, no. 1 (January 1996), pp. 102–34.
 57. "U istokov sovetskogo iadernogo proekta: rol' razvedki, 1941–1945 gg.," *VIET* (1992), no. 3, pp. 103–34.
 58. See Gennadii E. Gorelik, "Iadernaia istoriia i zloba dnia," *VIET* (1993), no. 2, pp. 159–61.
 59. Roald Sagdeev, "Russian Scientists Save American Secrets," *The Bulletin of the Atomic Scientists* 49 (1993), p. 32.
 60. Sergei Leskov, "Dividing the Glory of the Fathers," *The Bulletin of the Atomic Scientists* 49 (1993), p. 38.
 61. Joseph Agassi, *Toward an Historiography of Science* (Gravenhage: Mouton, 1963), p. 2.
 62. See Mikhail Ia. Gifter, "V predverii: gibeli," *VIET* (1988), no. 4, pp. 4–10; Nikolai I. Bukharin, "Osnovnye problemy sovremennoi kul'tury," *VIET* (1988), no. 4, pp. 10–31.
 63. Later, when criticism of the Communist regime deepened and reached the Lenin generation (to which Bukharin belonged), Bukharin again became a controversial figure—not just a victim of Stalinism, but perhaps a guilty party himself. The plans to give his name to IJET were abandoned, and the institute was renamed in the honor of the former academy president Sergei Vavilov, an acceptable candidate for both Communists and democrats.
 64. V. M. Surinov, "N. I. Vavilov kak organizator nauchnykh issledovanii," *VIET* (1988), no. 1, p. 45.
 65. Sergei M. Rytov, "Ideinoe nasledie L. I. Mandel'shtama i ego dal'neishee razvitiie," *VIET* (1988), no. 3, p. 45.
 66. Zadachi zhurnala v usloviiakh perestroiki," *VIET* (1987), no. 1, p. 6.
 67. In an article on the history of computing in the USSR, for example, the section on the background of the topic was entitled, "On Some Technical

and Mathematical Problems of the 1930s," and included nothing about the social context. The article left the reader with the impression that under Stalin's regime in the 1930s, the only problems relevant to the history of computing were technical and mathematical ones.

See Andrei N. Tikhonov et al., "Integrator Luk'ianova v istorii vychislitel'noi tekhniki," *VIET* (1990), no. 1, pp. 49–57.

68. Daniel A. Alexandrov and N. L. Kremontsov, "Sotsiokul'turnye aspekty razvitiia sovetskoi nauki v 1920-1930 gg.," *VIET* (1990), no. 1, pp. 166–68.
69. Daniel A. Alexandrov, N. L. Kremontsov, "Opyt putevoditel'ia po neizvedannoi zemle. Predvaritel'nyi ocherk sotsial'noi istorii sovetskoi nauki (1917-1950-e gody)," *VIET* (1989), no. 4, pp. 67–80.
70. A somewhat parallel methodological controversy was meanwhile taking shape among historians of Soviet technology. One senior researcher, G. N. Alekseev, presented a manifesto entitled "The Subject, Method, and Foundations of the Concept of the Development of History of Technology (and Natural Sciences) as an Independent, Complex Scientific Discipline." In his theoretical framework, technology was depicted as a direct derivative of science: "The activity of technical specialists is as follows: (1) scientists transform natural sciences' knowledge into scientific-technological knowledge; (2) designers, engineers, inventors, etc., materialize

scientific-technological knowledge into various technical objects. [Thus,] the subject of the history of technology as a scientific discipline . . . ought to be exposing causal links and qualitative-quantitative complex regularities of the development of technical objects and creating on this basis a picture of their [the objects'] historical development along with the assessment of prospects and prognostic orientation."

(Georgii N. Alekseev, "Predmet, metod i osnovy kontseptsii razvitiia istorii tekhniki (i estestvoznaniia) kak samostoiatel'noi kompleksnoi nauchnoi distsipliny," *VIET* (1989), no. 3, p. 111). Alekseev's manifesto culminated in a proposal for a mathematical formula which "fully expresses" a general state of the development of the natural sciences and technology at any given moment.

The most surprising aspect of the debate around Alekseev's article was not that he presented the old internalist doctrine as a revelation, but rather that this tactic was not seriously questioned. His colleagues confined their criticism to the discussion of the limits of formalization and the role of prognosis in a historical study.

71. *Repressirovannaia nauka*, ed. Mikhail G. Iaroshevskii, 2 vols. (Leningrad [St. Petersburg]: Nauka, 1991–94).
72. Alexei B. Kojevnikov, "Vtoraia konferentsiia po sotsial'noi istorii sovetskoi nauki," *VIET* (1991), no. 1, p. 154.

73. Graham, *Science in Russia and the Soviet Union*, pp. 154–55.
74. One senior physicist noted, for example, that “in physics such extrascientific factors could not operate . . . because the structure of physical science is much harder”; “in the case of physics, ideologization occurred somewhere in the periphery (the situation was different in the humanities, psychology, and biology), although physicists, of course, had to put a lot of effort in order to preserve the autonomy of scientific research and to guard science from the dangerous intrusions of alien ideological elements,” (Vladimir P. Vizgin, “Neskol’ko zamechanii k stat’e D. A. Alexandrova i N. L. Kremntsova ‘Opyt putevoditelii po neizvedannoii zemle,’” *VIET* (1989), no. 4, p. 84).
75. When Daniel Alexandrov used the terms broker and client to describe the relations of science patronage in his paper at a 1994 Russian-American workshop, “New Directions in the History and Sociology of Science and Technology,” a senior historian indignantly replied that “great Russian scientists never ever were brokers.”
76. Pol Forman [Paul Forman], “K chemu dolzhna stremit’sia istoriia nauki,” *VIET* (1990), no. 1, pp. 3–9.
77. Semen R. Mikulinskii, “Po povodu stat’i Pola Formana,” *VIET* (1990), no. 2, p. 85.
78. Daniel Alexandrov has noted that this communicative strategy is characteristic of those in relatively lower positions in the academic hierarchy: “The academic establishment is undoubtedly deeply entrenched in the national structure of science and has a vital interest to support and develop further a network of national journals in Russian. Yet those who do not have a firm standing in the power structure of science and do not identify themselves with it, are mostly oriented toward foreign languages and journals published abroad,” (Daniel Alexandrov, “Pochemu sovetskie uchenye perestali pechatat’sia za rubezhom,” *VIET* (1996), no. 3, p. 22).
79. See Daniel Alexandrov, “The Historical Anthropology of Science in Russia,” *Russian Studies in History* 34 (1995), pp. 62–91; a special issue of *Configurations: A Journal of Literature, Science, and Technology* 1 (1993), no. 3, ed. Daniel Alexandrov; essays by Daniel Alexandrov, Mikhail Konashev and Nikolai Kremntsov in *The Evolution of Theodosius Dobzhansky: Essays on His Life and Thought in Russia and America*, ed. Mark B. Adams (Princeton, N.J.: Princeton Univ. Press, 1994); Elena A. Gorokhovskaya and Elena L. Zheltova, “Myth of Flight and the Flying Machine,” *Phystech Journal* 1 (1994), no. 1, pp. 59–68; Alexei Kojevnikov, “President of Stalin’s Academy”; Alexei Kojevnikov, *Games of Soviet Democracy: Ideological Discussions in Sciences Around 1948 Reconsidered* (Max-Planck-Institut f. Wissenschaftsgeschichte, Preprint #37 (1996) (forthcoming in *The Russian*

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- Review*); Nikolai Kremontsov, *Stalinist Science*.
80. Mark B. Adams, "Science, Ideology, and Structure: The Kol'tsov Institute, 1900–1970," in *The Social Context of Soviet Science*, eds. Linda L. Lubrano and Susan Gross Solomon (Boulder, Colo.: Westview Press, 1980), p. 198.
81. When in October 1986, Soviet historians held a conference to discuss the "basic directions of *perestroika* within IJET," typical proposals for improvement did not challenge the existing "division of labor" between sociologists and historians, but rather reinforced it: "One department will study a certain field of science from the history of science viewpoint, while another will examine it from the sociocultural context, a third from the context of the structure of science and of the interaction of different sciences, a fourth through the methods of measuring the parameters of science." ("Ob osnovnykh napravleniiakh *perestroiki* raboty IJET AN SSSR (Materialy nauchno-prakticheskoi konferentsii)," *VIET* (1987), no. 1, p. 25.) Thus, the historian of science may ignore the social context of science—it is the business of people in another department!
82. Daniel Alexandrov, "Istoriia nauki dlia istorikov nauki, ili Slovo o pol'ze obrazovaniia aspirantov," *VIET* (1996), no. 1, p. 94.
83. Adams, pp. 173–74.
84. *Ibid.*, p. 195.
85. Whether this can be done with science itself, is also a question.
86. On the interplay of formal/informal and written/oral culture in Soviet science studies, see Mongili, pp. 130–131.
87. Susan Gross Solomon, "Reflections on Western Studies of Soviet Science," in *The Social Context of Soviet Science*, eds. Linda L. Lubrano and Susan Gross Solomon (Boulder, Colo.: Westview Press, 1980), p. 5.
88. *Ibid.*, p. 12.