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Les vies de la science sous le socialisme tardif, 1945-1991
Dossier. Les vies de la science sous le socialisme tardif, 1945-1991

The lives of late Soviet science, 1945-1991

Introduction

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Texte intégral

1 Much as it did for the entire field of Soviet history, the collapse of the Soviet Union has given impetus to rethinking and reconfiguring the history of Soviet science. The enthusiasm generated by access to archival sources, novel approaches in social history and a greater circulation of ideas have marked the generation that today is associated with the so-called "revisionist account" of Soviet science — that is, studies that look beyond the opposition of experts and state power.[1] When, in 2004, historians of Russian Science gathered at the conference "Intelligentsia: Russian and Soviet Science on the World Stage, 1860-1960," the agenda of the meeting had been shaped by a decade-long effort to establish post-Cold War approaches to Russian and Soviet science. In the resulting 2008 *Osiris* volume, "Intelligentsia Science: The Russian Century, 1860-1960," the "intelligentsia" was understood as "an international category closely identified with educated elites that simultaneously carries a strong Russian contextual specificity."[2] That volume's collective contribution established an intellectual program that has guided the field up to this day. It revealed important continuities throughout the Revolution of 1917 and put forward dynamic relations between national — culturally specific — elements of Russian science and the international context, in which ideas, people, and scientific objects transcended political, linguistic, and disciplinary boundaries.[3]

2 However, the chronological frame of the 2004 conference and the follow-up volume, while breaking with the Cold War exceptionalism of Russian and Soviet Science, left out the last Soviet decades. Such an omission, justified by the Russian — not Soviet — focus on "intelligentsia science," calls attention to a more general relative negligence of the period in historiography. In order to fill the gaps, dialogues between the history of science and general Soviet history are particularly promising for the period after World War II. A growing interest in the Thaw and the Brezhnev era (as can be seen in pages of *Cahiers du monde russe*, among other important contributions) signals that the questions arising at the nexus of power and expertise in the late Soviet Union are ripe for reconsideration.[4]

Science and politics: A (re)negotiated relationship

3 This special issue is the second installment of the papers presented during several meetings that took place from 2016 to 2019 as part of the "Governing Science, Governing by Science" project led by Larissa Zakharova († in March 2019) and Grégory Dufaud. Conceived as a meeting-ground between the history of science and Soviet cultural, social and political history, the project aimed to look beyond a history of ideas and scientific practices to examine the interactions between late Soviet science and technology and a broader set of institutions and publics at home and abroad.[5]

4 That such interactions were definitive of the entire span of the Soviet political project is nothing new in itself. Notoriously, in the immediate aftermath of the October Revolution, the Bolsheviks located science at the core of their transformation project: aiming not simply to change economic structures, social relations and natural environments by applying scientific knowledge, the Bolshevik leaders promoted a whole novel mode of knowing in the scientific philosophy of Marxism-Leninism. Scientific developments thus acquired the double role of enabler of historical change on the one hand, and the very expression thereof, on the other. The not-very-sympathetic observation of the physiologist Ivan Pavlov comes across as particularly apropos: "You must give our barbarians one thing: they understand the value of science."[6] The central role attributed to knowledge was reaffirmed in the late Soviet ideological discourse through the notions of Scientific-Technical-Revolution and Scientific-Technological Progress.

5 Moreover, not limited by the realm of ideas, the privileged status of science and technology had a material counterpart in the ever-growing number of scientific and technical experts, publications, and infrastructures. Loren Graham and Irina Dezhina have said of the Soviet science system on the eve of the collapse of the Soviet regime that "[t]o the eye of the foreign observer, two of the most notable characteristics of the science establishment of the former Soviet Union were its bigness and its high degree of centralization."[7] In other words, the importance of science and technology to the Soviet political project and its embodiment in particular organizational forms are seen to be the very function of the tremendous size of the scientific system. But what is the nature of this corresponding relation? What does it say on the modes of governing? And what are the implications for the actors *in situ*? A full historical assessment is yet to be carried out.

6 This special issue aims to probe that ground. Going beyond a general understanding of the sheer numbers of scientific and technical experts mobilized within the Soviet Union, the texts in this issue focus on specific historical episodes during which power structures and scientific developments came into interaction. The main questions posed here are how the authority of scientific knowledge and political imperatives were negotiated and how such negotiations were experienced in the post-war Soviet Union in a variety of disciplinary contexts such as agricultural sciences, mathematics, and physical sciences.

7 Marc Elie zooms in on the controversy involving the proponents of drainage and those believing that cover crops could prevent soil salinization. Reaching its apogee in the late 1940s, the controversy is revealing of the delicate balancing of ideological and transformational imperatives and adds a fresh perspective on Lysenkoism as one of the defining elements connecting the practices of Stalinist to post-Stalinist science and technology. Agricultural sciences more generally appear as a key site of negotiation, as their transformative potential was instrumentalized ideologically, to affirm human power over nature, and for pragmatic reasons, namely, to put an end to the infamous episodes of famine plaguing the regime. Timm Schönfelder demonstrates how this double prerogative generated a multitude of roles that a single scientist could juggle during the entire span of his career. Schönfelder follows the soil scientist Viktor Kovda across the Soviet century. Not only does Kovda appear navigating the twists of the domestic salinization controversy of the 1940s, but we also see him achieving international renown and institutional power by the late 1960s as the president of the International Society of Soil Science and as one of the chief experts of the Soviet irrigation program.

8 Two other articles focus on the international dimension. Jean-Philippe Martinez analyses the establishment of scientific diplomacy under the framework of peaceful coexistence in one of the most strategically significant Cold War fields, namely nuclear physics. To this end, he traces the path of eminent physicists such as Vladimir Fock or Dmitrii Blokhintsev. Sophie Cœuré takes the case of the international defense of Leonid Pliushch and Iurii Shikhanovich, who were isolated and underwent forcible treatment in psychiatric hospitals in the early 1970s, to examine international connections between Soviet and Western mathematicians. These two studies point out the difficulties of generalizing across disciplinary communities and yet allow for their interconnection to be appreciated, in this particular case through a demonstration of the influence exercised by the figure of Andrei Sakharov.

9 Last, Galina Orlova studies the transfer of the Soviet nuclear program from the military to the civilian sphere by tracing the production, distribution, and consumption of nuclear isotopes. Orlova's recreation of the complex topography of Soviet nuclear optimism and its gradual demise decenters the ruptured chronology focusing on the Chernobyl disaster and establishes continuities by following isotopes to their eventual commercialization in the new Russia. Putting aside the conventional argument of size — the big tech of bombs and reactors — to privilege the notion of boundary objects, she productively exploits the limited lives of the isotopes (the duration of the isotopes' physical existence) to reveal some of the challenges posed to Soviet efforts towards using radiation to modernize all spheres of life. Overviewing a range of industries from metalworks to chemistry, medicine, and agriculture, the article thus completes the circle of themes embraced by the issue.

Governing science and technology, governing by science and technology

10 From the governing of science to governing by science, these articles trace the evolution of late Soviet science and technology in several areas: forms of expert engagement, power relations within expert communities, international cooperation, and the place of science and technology in the everyday. This evolution gains in significance when considered in the light of several key episodes marking the Soviet state's attitudes toward science during Stalinism. Related to both the domestic and international contexts, these episodes belonged to the Soviet public sphere and influenced the early professional careers of many protagonists in the five articles.

11 In December 1930, Stalin launched the campaign known as the "struggle on two fronts" — against "menshevizing idealism and mechanistic materialism."[8] Initially targeting philosophy, the campaign extended to all disciplines and came to be

significant for its emphasis on three principles contributing to the building of an authentically Soviet science: its class nature, its applied character, and the central role of the "party spirit" [*partiinost´*]. According to Nikolai Krementsov, this campaign aimed to place science in the service of socialist construction and to redefine professional loyalties.[9] Unlike the Industrial party trial, which took place just before the campaign and was an expression of terror against the old technical intelligentsia, this infringement on scientific autonomy from above came with a bargain: if the party spirit determined scientificity and operated by replacing an epistemic criticism with a socio-political one, the experts gained direct access to the top of the party for support and priority in funding.[10]

12 That internal contradictions among scientific communities had political repercussions was made plain during the second half of the 1940s, when several public conferences were organized with the goal of coordinating ideology, modes of scientific knowledge, and Soviet rituals. Conducted according to the party's rules of internal democracy (discussion, criticism, and self-criticism), the debates focused on controversial theoretical issues on which the party had not taken a stance. But while the rites themselves were shared, they did not determine the outcomes for each single disciplinary community, as not all of the outcomes were at all relevant.[11] Rather, both the process and the results came to depend on many factors ranging from personal rhetorical skills to inter-institutional alliances orchestrated well in advance of the public confrontation. As the most salient example of ideological infringement, marked by the August 1948 meeting of the Lenin Academy of Agricultural Sciences (VASKhNIL), biology has attracted the lion's share of interest from historians and has been studied from multiple perspectives.[12] Several works shed light on the role of Stalin himself in the conception of public controversies and on his conviction that confrontation allowed scientific advancement by staging argumentation as a step towards more accurate judgement.[13] Ethan Pollock has thus demonstrated Stalin's preoccupations with science in general and, in particular, his urge to know whether Trofim Lysenko or the geneticists were right.[14]

13 Eventually, Stalin even set the limits of ideological intrusions. In an article published in *Pravda* in June 1950, he repudiated linguist Nikolai Marr's theory on the origin and evolution of world languages and affirmed that language did not belong to either substructure or superstructure.[15] This article had the merit of placing linguistics outside of the competencies of the Party. Even more importantly, its ideological significance lay in the fact that it placed entire fields of knowledge outside of the sphere of ideological intervention. Even though the party remained the major actor in regulating the institutional and material resources of the Soviet scientific community, this case set a precedent for limiting ideological intervention in scientific content.[16]

14 Concurrently, as the relationship between Soviet power holders and experts oscillated, 20th-century scientific internationalism had a checkered history at the intersection of geopolitical imperatives and transnational community building efforts. While the shared status of international pariahs drove Soviet and German scientists to form closer ties in the aftermath of WWI, by the early 1930s, Soviet scientific efforts drew the attention of intellectuals of all stripes, and visits to Soviet scientific centers became common.[17] Conversely, limited but not insignificant numbers of young Soviet scientists travelled abroad as international fellows or took part in international conferences. The mounting international tensions of the late 1930s, however, led not only to difficulties in physical travel, but to a more general atmosphere of suspicion towards taking active participation in foreign intellectual life. These attitudes reversed once more with the war alliance and cooperation in numerous technical and scientific fields, from penicillin to radar. But the limits of internationalism were drawn with the case of Grigorii Roskin and Nina Kliueva in 1947. First propelled to fame as a picture-postcard of Soviet science at the forefront of international cooperation for their work on cancer, they were publicly blamed in the context of the post-war rise of tensions and the instauration of cultural autarchy associated with Zhdanovshchina.[18] Nevertheless, the transnational circulation of ideas never stopped throughout these ups and downs and

the pre-war contacts helped to re-establish personal and institutional international links later on.

15 The respective efforts, by the party to instrumentalize science, and by scientists to instrumentalize the party, did not result in a static settlement: on the one hand, scientific victories were not absolute; on the other hand, however, never-ending political debates without scientific closure did not become a new norm. Overviewing the entire arc of the salinization controversy, a polemic previously neglected by historians of science and environmental studies, Marc Elie demonstrates that Lysenko's 1948 victory did not translate into the full triumph of the proponents of grassland rotation to combat salinization despite their Michurinist credentials. What with the partial compromises sought through collective resistance and the personal ability of individuals such as Kovda (who lost his most important function in 1948, but won the Stalin prize in 1951), the salinization controversy was ultimately resolved through concrete policy making decisions on concrete agricultural projects within concrete territories. Lysenko maneuvered his way out and abandoned his direct supporters, causing a redistribution of the institutional balance in soil science well before the official embrace of drainage as the leading paradigm.

16 Timm Schönfelder's portrait of Kovda is nothing but ambiguous. Compromised by the controversy, Kovda did not shy away from securing alliances and demonstrating loyalty to the party. Qualified an "opportunist" by Schönfelder, Kovda published propagandist writings that helped him get through several waves of purges and eventually lay the foundations for a long academic career. At the same time, throughout his career, he exerted his expertise to embrace the Soviet ideal of "rational development" and publicly criticized certain agricultural practices and therefore, can hardly be seen exclusively as a spineless and servile opportunist; rather – if we choose to think in these terms – his opportunism was of an entrepreneurial kind, one tool among others that he used to promote his field of knowledge. Jean-Philippe Martinez demonstrates that Soviet physicists' international trips and international authority continued to depend on the economy of trust between the experts and the authorities originally established during Stalin's times. While the political foundations did change, inviting novel reconfigurations, the general formula of loyalty compensated by privileges was maintained as demonstrated in the case of Fock, renowned for his contributions in quantum mechanics and the general theory of relativity as well as for his Marxist convictions. Although some contemporaneous observers, and later historians, interpreted this type of arrangements as a compromise (their interpretation found an extreme expression in the very redefinition of Soviet science as a "pseudoscience" in the case of Lysenkoism), Jean-Philippe Martinez demonstrates the fecundity of such service for the scientists' personal and disciplinary interests.[19] Recognition of the diversity of such interests, which ranged from personal to epistemic, as well as their role in shaping the image of Soviet science, contributes to a reevaluation of the balance between the scientific and political elements structuring the top-down and bottom-up agency in the realm of scientific diplomacy during the Cold War.

17 The heavy bureaucratic arrangements around exit visas from the early 1950s, and on a larger scale, as part of the "peaceful coexistence" agenda, did not prevent contact with the rest of the world. Travel "authorizations" signaled the trust accorded by the regime. "Representing" the interests of the Soviet state played a crucial role in international cooperation because the politics of "peaceful coexistence" did not mean an end to the distinction between Soviet and bourgeois science. On the contrary, the Cold War dynamics transformed Soviet science and technology into a major showcase of Soviet accomplishments: unlike the Americans' exportation of American material life, the Soviets exported the regime's power to stimulate human creativity.[20] Whereas Sputnik was but a single event, the prestige of Soviet science abroad was maintained through the systematic work of several individuals taking on the administrative burdens of international cooperation. The physicist Blokhintsev, who served as the president of the International Union of Theoretical and Applied Physics (1966-1969) and as a member

of the consulting scientific committee at the general secretariat of the United Nations, provides one such example.

18 Although the status of "traveling" [*vyezdnoi*] scientist allowed one to convey his (rarely her) vision of disciplinary developments, the flip side of showcasing was the imperative to hide cases of internal political or scientific dissent. Sophie Coeuré reminds us of the limits of the efforts exercised by Western and Soviet mathematicians to rebuild community trust around the notion of apolitical and universal mathematical truths. If the Soviet maneuvering to exclude the logician Aleksandr Esenin-Vol'pin from the 1966 Mathematical International Congress did not provoke much ado, the cases of Pliushch and Shikhanovich led to a systematic campaign at the risk of compromising previous institutional and personal collaborative projects.[21] As they were relatively little known for their mathematical work, the episode involving Pliushch and Shikhanovich is radically different from that of the international defense of the celebrated mathematician Nikolai Luzin, who came under domestic attack in the 1930s.[22] Rather, in the 1970s, the work of the committee in defense of the mathematicians' human rights represented an important shift in the epistemic and moral economy underlying international community building during the Cold War.

19 Ideological constraints and power imbalances notwithstanding, the experts saw their work and respective disciplines as a factor of social modernization. While these issues have been discussed in historiography devoted, for example, to the early projects of electrification and the failed projects of late Soviet computer networking, the articles by Timm Schönfelder and Galina Orlova add another dimension that cannot be fit into a narrative of either total success or complete failure.[23] Timm Schönfelder demonstrates soils scientists' complicity in the growth of the agromeliorative complex with its 1.7 million employees by 1985. At the same time, Kovda tried to restrain the growth imperative by pointing out the "wrongful" practices (leading to the loss of arable land) that were carried out on the premise of "correct theories." Though unique in his disciplinary standing, Kovda was not exceptional in his ambitions. Galina Orlova traces the transformation of isotopes into Soviet commodities and reveals the disjuncture between the control over nature, obtained in the closed spaces of laboratories, and the constant leaking of radiation across all Soviet infrastructures. She also shows how the short-lived isotopes redefined the ratio of time, radioactive matter, and living matter affected by radiation. Dependent on the rational arrangements of planned socialism as much as on the *ad hoc* maneuvering of personal favors, nuclear modernity was thus uncontainable, reversing the arrow from the celebration of scientific prowess to questioning the nature of the Soviet system.

Life and trajectories of science

20 Despite the diversity of the contributions — in terms of the communities studied, the historical sources mobilized, and the theoretical inspirations called upon — one common feature refers us back to the title of this special issue. The notion of "life" in late Soviet science, understood both as a heuristic of "trajectory" and a narrative tool of "biography," begets additional reflection and grounding.[24] It can be helpful in articulating the historiographical stakes brought to light by the articles gathered here, from the periodization of experts/power relations to internationalization and its delineation of the boundaries between domestic and international epistemic communities, and, ultimately, to modernization that could be realized through gigantic irrigation projects or in the form of radiation invisible to the human eye.

21 With topics ranging from Lysenkoism to dissent to radioactive fertilizers and addressed in their local, domestic and international dimensions, these articles describe dynamic trajectories of individuals, ideas, and objects. Timm Schönfelder and Jean-Philippe Martinez reveal the know-how of individual experts and their ability to skillfully optimize their intellectual, social, and political "capital" in their scientific careers, reaching positions of influence at home and abroad. The scientists' strategies

and compromises show how they embodied their "habitus" and interiorized potentialities as prospects. Marc Elie, Galina Orlova and Sophie Cœuré follow not so much the individual trajectories of ideas, objects, and persons, but their imbrications in the reconfiguration of epistemic and social orders. Elie sheds light on how Lysenko was brought to reconsider his own statements and judgments on the issue of soil salinization in the context of the concrete irrigation tasks at hand; Coeuré unfolds the shifts in group relations between mathematicians and in the very definition of community; and Orlova traces the isotopes' circulation from secrecy to publicity and the ensuing pulverization of conventional mechanisms of the social order. All these studies show the importance of individual choices and actions as well as their limits.

22 The interweaving of these trajectories illuminates the place of science in both the late Soviet Union's political project and quotidian. At stake in these articles is a reevaluation of the distinct historical periodization that leaves late Soviet science out of the master narrative arc — from the Revolutions to Stalinism to Collapse — and maintains it as subordinate to the chronological divisions of late Socialism under the trinity of Thaw, Stagnation and Perestroika.[25] Influenced but not determined by political ruptures, scientific and technical lives-cum-trajectories are coextensive with important continuities from pre- to post-war periods and provide a glimpse of political and economic transitions up until and after 1991. Moreover, the defining role of science and technology in the geopolitical balance of the Cold War era only furthers the need for a historiographical revision of late Soviet science as belonging simultaneously to the realms of ideas, materiality, and governance, and interconnecting national and international contexts as well.

23 All the articles of this issue offer a multifaceted picture of late Soviet science as a post-Stalinist phenomenon. Here, "post-Stalinist" means that numerous structures and experiences of different aspects of scientific practices established under Stalin maintained a degree of influence on later events. From theories of salinization to modes of international communication and to the impact of secrecy regimes, scientific and technical practices kept some traces of Stalinist rule and resistance strategies as part of institutionalized culture.[26]

24 These contributions also challenge certain ideas formulated by a historiography compartmentalized by scientific disciplines. Studies are often organized according to the intellectual and organizational history of disciplines. Life sciences, and physical sciences in particular, present contradicting narratives of triumph and disaster. Meanwhile, despite recent works on the internal fracturing of the mathematical community, the standard reference to Soviet mathematics still depicts the discipline as an apolitical and esoteric activity practiced with chalk in hand.[27] As a result, what these disciplinary accounts have in common lies in their respective claims to be representative of a "national" situation. Offering novel and even unexpected descriptions of these three major scientific areas, the five articles, taken together, help shift one's attention from differences to intersections and commonalities between epistemic communities.

25 For instance, while the loss of scientific autonomy to ideological considerations was synonymous with Lysenkoism and its disastrous consequences for genetics, the achievement of nuclear parity came hand in hand with the high status of physicists; their relative autonomy was manifest in the liberties they exercised within the closed spaces of nuclear cities. Unlike this Manichaean image, certainly simplified but still capturing the tension between the synthetic accounts of biological and physical sciences, the five articles document a much more nuanced and dynamic evolution of scientific disciplines in juncture with the developmentalist imperatives of Soviet high modernism. They provide insightful perspectives on Lysenko's rational maneuvering and considerations against his intellectual convictions and institutional alliances. On the other hand, the self-serving invocation of the power of the atom for fertilizing Central Asian territories by the head of the Institute of Atomic Energy Igor Kurchatov serves as a striking example of ideology in full swing.

26 Although confined to disciplinary affiliations, the strategies of leading figures in Soviet agricultural science, mathematics, and physical sciences are not that dissimilar. Combining particular political abilities, technoscientific optimism and, eventually, a certain measure of disillusionment, all the scientific lives recounted in the present articles embrace the full set of contradictions presented by the late Soviet socio-political order irrespective of their stance regarding the official party line.

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27 Richly documented and in dialogue with multiple historiographies, the cases assembled in this special issue combine insights of the intellectual, political, and social history of late Soviet science and technology. Together they address the relation between political chronology and the internal developments of various disciplines. They shed light on the various aspects of the historicity of social objects and on the complex relationship between political authorities and science through an analysis of personal commitments and the role of scientific objects and ideas. The lives of late Soviet science described in these articles shared the ideological context of Stalinism and its aftermath but unfolded according to their own temporalities (that ranged from the several-day shelf lives of certain isotopes to decades-long careers) and went through a series of transitions and transformations that shaped their trajectories. Opening more questions, this issue calls for a continuation of studies focused on the categories used to attribute meaning to the lives of late Soviet science and technology. The terms that power holders and experts shared in order to work through the negotiations described in this issue, such as “rational development,” “scientific technical progress,” and “applied knowledge,” call for further elucidation.

Notes

1 For insiders’ recollections of the intellectual ferment, see: A. Kojevnikov, “Introduction: A New History of Russian Science,” *Science in Context*, 15, 2 (2002): 177-182. The key works include Nikolai Krementsov, *Stalinist Science* (Princeton: Princeton University Press, 1997); and Alexei B. Kojevnikov, *Stalin’s Great Science: The Times and Adventures of Soviet Physicists* (London: Imperial College Press, 2004). On the “archival revolution,” see: Nicolas Werth, “L’historiographie de l’U.R.S.S. dans la période post-communiste,” *Revue d’études comparatives Est-Ouest*, 30, 1 (1999): 81-104; Donald J. Raleigh, “Doing Soviet History: The Impact of the Archival Revolution,” *The Russian Review*, 61, 1 (Jan. 2002): 16-24; Sophie Cœuré, “Le siècle soviétique des archives,” *Annales. Histoire, Sciences Sociales,* 74, 3-4 (2019): 657-686.

2 Michael D. Gordin, Karl Hall, and Alexei Kojevnikov, “Intelligentsia Science: The Russian Century, 1860-1960,” *Osiris,* 23, 1 (2008): 11.

3 For example, Russian scientists abroad reproduced a distinct Russian form of intelligentsia sociability, the “kruzhki.” See: Karl Hall, “The Schooling of Lev Landau: The European Context of Post-Revolutionary Soviet Theoretical Physics,” *Osiris*, 23, 1 (2008): 230-259.

4 See Eleonory Gilburd and Larissa Zakharova, eds., “Repenser le Dégel,” *Cahiers du Monde russe*, 47, 1-2 (2006); Marc Elie and Isabelle Ohayon, eds., “L’expérience soviétique à son apogée. Culture et société des années Brežnev,” *Cahiers du Monde russe*, 54, 1-2 (2013) ; Stefan Guth, Klaus Gestwa, Tanja Penter and Julia Richers eds., “La modernité nucléaire soviétique. Dimensions transnationales, processus décentrés et héritages persistants,” *Cahiers du Monde russe*, 60, 2-3 (2019).

5 For a first installment uniting papers, see Grégory Dufaud and Larissa Zakharova, “Science, Fiction and Power in the USSR,” *Kritika: Explorations in Russian and Eurasian History*, 20, 4 (2019). The project was supported by the Labex TEPSIS and the CERCEC (Paris).

6 Daniel P. Todes, *Ivan Pavlov. A Russian Life in Science* (Oxford: Oxford University Press, 2014), 481.

7 Loren Graham and Irina Dezhina, *Science in the New Russia: Crisis, Aid, Reform* (Bloomington: Indiana University Press, 2008), 1.

8 On the relationship between philosophy and science before the 1930s, see David Joravsky’s classical work, *Soviet Marxism and Natural Science, 1917-1932* (New York: Columbia University Press, 1961).

9 Krementsov, *Stalinist Science*.

10 To compare with the Industrial party trial, see: Bailes, *Technology and Society under Lenin and Stalin: Origins of the Soviet Technical Intelligentsia, 1917-1941* (Princeton University Press, 1978).

11 Alexei Kojevnikov, "Rituals of Stalinist Culture at Work: Science and the Games of Intraparty Democracy Circa 1948," *The Russian Review*, 57, 1 (1998): 25-52.

12 An overview of the relevant literature is beyond our scope, for a reflection on some recent trends, see: Nikolai Krementsov and William de Jong-Lambert, "'Lysenkoism' Redux: Introduction," *The Lysenko Controversy as a Global Phenomenon,* Vol. 1 (Cham: Palgrave Macmillan, 2017), 1-34. For classic accounts, see: Nils Roll-Hansen, *The Lysenko Effect. The Politics of Science (*Amherst: Prometheus, 2005); David Joravsky, *The Lysenko Affair* (The University of Chicago Press, 1970).

13 To gauge the detailed nature of Stalin's interventions, see: Kirill O. Rossianov, "Stalin as Lysenko's Editor: Reshaping Political Discourse in Soviet Science," *Configurations*, 1, 3 (1993): 439-456.

14 Ethan Pollock, *Stalin and the Soviet Science Wars* (Princeton University Press, 2008).

15 For more on Marr's intellectual evolution and political strategies, see: Vladislava Reznik, "Succession or Subversion: Professional Strategies of Soviet Cultural Revolution. The Case of Nikolai Marr," *Slavonica*, 13, 2 (2007): 150-167; and Louise McReynolds, "Nikolai Marr: Reconstructing Ani as the Imperial Ideal," *Ab Imperio*, 1 (2016): 102-124.

16 Ethan Pollock, "From *Partiinost´* to *Nauchnost´* and Not Quite Back Again: Revisiting the Lessons of the Lysenko Affair," *Slavic Review*, 68, 1 (2009): 95-115.

17 For examples see: Susan Gross Solomon, ed., *Doing Medicine Together: Germany and Russia between the Wars* (University of Toronto Press, 2006). Nikolai Krementsov, *International Science between the World Wars: The Case of Genetics* (Routledge, 2004). For a broader context positioning Moscow as the guardian of "world culture," see Katerina Clark, *Moscow, the Fourth Rome* (Harvard University Press, 2011). On the exchange in psychiatry, Grégory Dufaud, Lara Rzesnitzek, "Soviet Psychiatry through the Prism of Circulations: The Case of Outpatient Psychiatry in the Interwar Period," *Kritika: Explorations in Russian and Eurasian History*, 17, 4 (2016): 781-803.

18 Nikolai Krementsov, *The Cure: A Story of Cancer and Politics from the Annals of the Cold War* (University of Chicago Press, 2004).

19 Michael D. Gordin, "How Lysenkoism Became Pseudoscience: Dobzhansky to Velikovsky," *Journal of the History of Biology,* 45, 3 (2012): 443-468.

20 On the Siberian science city as a showcase of the Soviet way of producing scientific knowledge, see Ksenia Tatarchenko, "Calculating a Showcase: Mikhail Lavrentiev, the Politics of Expertise, and the International Life of the Siberian Science-City," *Historical Studies in the Natural Sciences*, 46, 5 (2016): 592-632.

21 Dissident scientists have been previously studied from the point of view of rights-based discourse and the redefinition of the psychiatric discourse. How they were organized, however, has not; see: Benjamin Nathans, "The Dictatorship of Reason: Aleksandr Vol´pin and the Idea of Rights under 'Developed Socialism,'" *Slavic Review*, 66, 4 (2007): 630-663. Rebecca Reich, "Inside the Psychiatric Word: Diagnosis and Self-Definition in the Late Soviet Period," *Slavic Review*, 73, 3 (2014): 563-584. On psychiatry, see Grégory Dufaud, *Une histoire de la psychiatrie soviétique* (P.: EHESS, 2021).

22 The full overview of the Luzin affair is beyond the scope of this introduction; for an example, see: Sergei S. Demidov and Boris V. Lëvshin, eds., *The Case of Academician Nikolai Nikolaevich Luzin* (Providence, RI: American Mathematical Society [History of Mathematics, 43], 2016).

23 Jonathan Coopersmith, *The Electrification of Russia, 1880-1926* (Cornell University Press, 2016); Larissa Zakharova, *De Moscou aux terres les plus lointaines. Communications, pouvoir et société en URSS (*P.: Éditions de l'EHESS, 2020). On the failure to unify Soviet computer networks, Benjamin Peters, *How not to Network a Nation: The Uneasy History of the Soviet Internet* (MIT Press, 2016).

24 On the concept of "trajectory" and its uses in the social sciences, see Pierre Bourdieu, "L'illusion biographique," *Actes de la recherche en sciences sociales*, 62 (1986); Anselm L. Strauss, *Continual Permutations of Action* (New York: Aldine de Gruyter, 1993). For a broad use of the notion of biography for describing the trajectories of scientific objects, see: Lorraine Daston, ed., *Biographies of Scientific Objects* (University of Chicago Press, 2000).

25 For debates on the chronology of late Socialism, see: Denis Kozlov and Eleonory Gilburd, eds., *The Thaw: Soviet Society and Culture during the 1950s and 1960s* (University of Toronto Press, 2013). See also: Eleonory Gilburd, *To See Paris and Die. The Soviet Lives of Western Culture* (Cambridge: Harvard University Press, 2018).

26 On the non-unity of Stalinist Science, see: Michael D. Gordin, "Was There Ever a 'Stalinist Science'?" *Kritika: Explorations in Russian and Eurasian History*, 9, 3 (2008): 625-639.

27 See Loren Graham, *Science in Russia and the Soviet Union: A Short History* (Cambridge University Press, 1993). For a counternarrative, see: Slava Gerovitch, “Parallel worlds: Formal Structures and Informal Mechanisms of Postwar Soviet Mathematics,” *Historia scientiarum*, 22, 3 (2013): 181-200.

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