Egle Rindzeviciute

Purification and Hybridisation of Soviet Cybernetics

The Politics of Scientific Governance in an Authoritarian Regime

To date, histories of Soviet sciences and technologies have been organised around an analytical distinction between the political and techno-scientific spheres.[1] The relations between the state, governance and techno-science have been described in line with neo-liberal thought as linear, top-down oppression.[2] The norm that techno-science should be free from state political apparatus was implicitly and explicitly asserted in path-breaking studies by Loren Graham, Paul Josephson, Alexander Vucinich, Nikolai Krementsov and Slava Gerovitch.[3] These and other scholars recognised that there was a positive side to techno-science's dependence on authoritarian government: a secure flow of funding. In the context of a shortage economy those branches of Soviet techno-sciences that provided weapons for Cold War competition, such as nuclear physics, were highly prioritised.[4] On the other hand, some scholars expressed hope that the development of techno-science, and especially computerisation, would liberalise the Soviet regime.[5] For example, in 1967 the American economist Herbert Levine wrote that

»cybernetics, which has become a new faith in the Soviet Union, may turn out to be the ideological prop the Soviets need to permit them to accept the use of market mechanisms. It may allow them

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1 In line with Bruno Latour the term »techno-science« is used instead of »sciences and technologies«; *Bruno Latour*, Science in Action: How to Follow Scientists and Engineers through Society, Cambridge, MA 1988.

2 *Michael Polanyi*, The Contempt of Freedom: The Russian Experiment and After, New York 1975 [1940]; *Friedrich A. Hayek*, The Road to Serfdom, London/New York 2008 [1944].

3 *Loren Graham*, Science, Philosophy and Human Behavior in the Soviet Union, New York 1987; *idem*, Science and the Soviet Social Order, Cambridge, MA 1990; *Nikolai Krementsov*, Stalinist Science, Princeton, NJ 1997; *Slava Gerovitch*, From Newspeak to Cyberspeak: A History of Soviet Cybernetics, Cambridge, MA 2002; *Alexander Vucinich*, Empire of Knowledge: The Academy of Sciences of the USSR (1917–1970), Berkeley 1984; see also *Stephen Fortescue*, The Communist Party and Soviet Science, London 1986.

4 *David Holloway*, The Soviet Union and the Arms Race, New Haven/London 1983; *Paul Josephson*, Red Atom. Russia's Nuclear Power Program from Stalin to Today, New York 1999. Under the Soviet regime scientists lost a lot of professional autonomy and independence, but in turn acquired a lot of social prestige and a political role; *Alexei Kojevnikov*, The Phenomenon of Soviet Science, in: Osiris 23, 2008, pp. 115–135, here: pp. 121 f.; for more about the shortage economy see *János Kornai*, Economics of Shortage, Amsterdam 1980.

5 *Zhores A. Medvedev*, Soviet Science, Oxford/Melbourne 1979. Rooted in writings about the third »industrial revolution«, »cybernation« and »coming of post-industrial society« there emerged a so-called convergence school. According to convergence theorists, the advancing technologies would make class differences obsolete and as a result capitalist and state socialist systems would converge. For more see *Frederic J. Fleron* (ed.), Technology and Communist Culture: The Socio-Cultural Impact of Technology under Socialism, New York/London 1977; *Erik Hofman*/*Robin F. Laird*, Technocratic Socialism: The Soviet Union in the Advanced Industrial Era, Durham 1985; *Zbigniew Brzezinski*, Ideology and Power in Soviet Politics, New York/Washington 1967; for a more sceptical evaluation of the impact of cybernetics to political change see *David Holloway*, Innovation in Science – the Case of Cybernetics in the Soviet Union, in: Science Studies 4, 1974, pp. 299–337.

to view the meanderings and fluctuations of markets not as signs of anarchy (as Marx saw them), but as responses to feedback mechanisms«.[6]

Nevertheless, a different view prevailed, which regarded the Soviet Union as a »computopia« or »technotopia«: a regime which both invested unrealistic hopes into the economic and social effects of the development of techno-sciences and at the same time built structural obstacles to the realisation of these hopes.[7]

Besides being subjected to this Manichean dualism of techno-science versus political system, the history of Soviet techno-science was emplotted in a tragic narrative of rise and fall.[8] The best example is the history of Soviet cybernetics. Since the 1960s Soviet cybernetics has attracted the attention of quite a few scholars, with the most significant recent contribution by Slava Gerovitch. In his comprehensive study Gerovitch drew on a widespread narrative of a rebellious science of cybernetics: first banned by the Soviet government, cybernetics was later rehabilitated, officially promoted, transformed into a »handmaiden of ideology« and consequently lost scientific reputation.[9] The degradation of cybernetics, according to Gerovitch, resulted from blending together scientific and political components: the »precise« terminology of cybernetics was taken over by political discourses of governance. Denominated as *the* science of governance, cybernetics was harnessed to achieve the goals of communism. In this way cybernetics was transformed from a proper (pure) science into a political hybrid. As it became a political hybrid, cybernetics lost its scientific power, became useless and irrelevant. Having failed to foster free development of techno-science, the Soviet regime collapsed economically. In this way the case of Soviet cybernetics was inscribed in the traditional narrative of Soviet historiography which suggested that hybridity was bad for both science and politics.

It is curious that social constructionist studies of the intertwining of the techno-scientific and political spheres in an authoritarian regime concentrated on the history of Nazism and state socialist Germany and less so the Soviet Union. Drawing on German cases, such influential historians as Mitchell G. Ash have convincingly demonstrated the mutuality of the relationship between techno-science and the political.[10] This article suggests that it is time to reinterpret the history of Soviet cybernetics as an ongoing co-construction of techno-science, governance and the political.[11]

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6 *Herbert Levine*, Introduction, in: *John P. Hardt/Marvin Hoffenberg/Norman Kaplan* et al. (eds.), Mathematics and Computers in Soviet Planning, New Haven/London 1967, here: p. xxi.

7 *Harley D. Balzer*, Soviet Science on the Edge of Reform, Boulder 1989; *Manuel Castells/Emma Kiselyova*, The Collapse of Soviet Communism: A View from the Information Society, Berkeley 1995.

8 *Hayden White*, Metahistory. The Historical Imagination in Nineteenth-Century Europe, Baltimore/London 1975.

9 *Gerovitch*, From Newspeak. The rise-and-fall narrative of cybernetics was constructed both in scholarly discourses and popular imagination among Soviet scientists since the 1960s. Early accounts highlighted the politicisation of Soviet cybernetics although at the same time they treated the meaning of the political as self-evident. See *Maxim Mikulak*, Cybernetics and Marxism-Leninism, in: Slavic Review 1965, pp. 450–465; *Richard D. Gillespie*, The Politics of Cybernetics in the Soviet Union, in: *Albert H. Teich* (ed.), Scientists and Public Affairs, Cambridge, MA 1974; the rise-and-fall narrative was also used to describe the history of cybernetics in East Germany: *Frank Dittmann/Rudolf Seising*, Kybernetik steckt den Osten an: Aufstieg und Fall einer interdisziplinären Wissenschaft in der DDR, Berlin 2007; failure to use computer based techno-sciences, particularly cybernetics, was emphasised in *Peter Rutland*, The Myth of the Plan. Lessons of Soviet Planning Experience, London 1985, pp. 191–194.

10 *Mitchell G. Ash*, Scientific Changes in Germany 1933, 1945, 1990: Towards a Comparison, in: Minerva 37, 1999, pp. 329–354.

11 This study is based on constructionist approach to techno-sciences, developed in the literature which is associated with actor-network theory. *Steve Brown*, Michel Serres: Science, Transla-

Gerovitch's exhaustive study constitutes a major contribution in acknowledging the power of discourse in the organisation of Soviet science. Soviet cybernetics was subject to changing relations with the authoritarian government apparatus, which stimulated reflexivity about relations between governance, politics and techno-science. The history of Soviet cybernetics, therefore, is a particularly useful case, enabling us to look inside the black box of meaning-making practices that articulated the boundaries between techno-science and the Soviet government. Once this process of boundary making is understood as a matter of negotiation, the rise-and-fall narrative becomes less relevant. Once this narrative is abandoned, scholarly attention can be shifted from a study of »how Soviet cybernetics failed« to an inquiry about the productive roles that cybernetics assumed in Soviet techno-sciences, economy, society and state politics. This article seeks to demonstrate the interpretative nature of the relations between techno-science and the political. In his study Ash focused on moments of political upheaval because the construction of boundaries was particularly evident in that context.[12] The case of Soviet cybernetics, consequently, can also be regarded as a similar inquiry into a moment of political upheaval stirred by the beginning of the Cold War. However, this analysis suggests that the negotiation of the boundary between the techno-sciences and the political sphere was not limited to a period marked by an extraordinary event. Instead, the negotiation was an ongoing process, which did not lose its salience during periods of normalisation.[13]

Concepts

This study shares some concerns with the debates of the 1960s to 1970s, which questioned whether the Soviet Union was becoming a »technocracy«.[14] These writings about Soviet technocracy focused on changes in the educational background of Soviet leaders and were less interested in changing meanings of governance and the political. Here the focus is on meaning-making. Indeed, the notion of »the political«, the key term that this edited volume engages with, is particularly difficult because it entails a choice from a plethora of definitions. One of the aims of this study was to discern the meanings of the political as they were assembled in the studied discourses. The study revealed that, firstly,

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tion and the Logic of the Parasite, in: Theory, Culture, Society 19, 2002, no. 1, pp. 1–27; *Bruno Latour*, Re-Assembling the Social, Oxford 2005; *Michel Callon/John Law*, On the Construction of Sociotechnical Networks: Content and Context Revisited, in: Knowledge and Society 8, 1989, pp. 57–83; *John Law*, Organizing Modernity: Social Ordering and Social Theory, Oxford/Cambridge, MA 1994.

12 Ash stresses that »resource ensembles are politically and ideologically multivalent and mutually mobilisable«. He therefore rejects an »essentialistic or normatively derived division between science as the realm of truth and politics as the realm of power« and instead proposes to analyse »the multiple interconnections of these two fields of action«; *Ash*, Scientific Changes, p. 330.

13 *Barbara Shapiro*, Probability and Certainty in Seventeenth-Century England. A Study of the Relationships between Science, Religion, History, Law and Literature, Princeton, NJ 1983; *Mary Poovey*, A History of the Modern Fact: Problems of Knowledge in the Sciences of Wealth and Society, Chicago 1998. More recent cases were studied by Thomas Gieryn and Sheila Jasanoff. For Gieryn »boundaries around or between natural and social sciences« are »rhetorical accomplishments« that »advance somebody's interests«; *Thomas Gieryn*, Cultural Boundaries of Science: Credibility on the Line, Chicago 1999, p. 65; *Sheila Jasanoff*, The Fifth Branch: Science Advisers as Policy Makers, Cambridge, MA 1990.

14 A useful discussion of the paradoxical rise of technocracy during Stalin's era is *Kendall Bailes*, The Politics of Technology: Stalin and Technocratic Thinking among Soviet Engineers, in: The American Historical Review 79, 1974, no. 2, pp. 445–469. For a sociological survey of the Soviet intelligentsia and their relation with central government institutions, see *Vladimir Shlapentokh*, Soviet Intellectuals and Political Power: The Post-Stalin Era, London 1990.

the notion of »the political« referred to the structure of the Communist Party (henceforth the Party) and Party officials. Secondly, »the political« was used to discern an friend-enemy divide.[15] It was in relation to these two meanings of the political that Soviet techno-sciences mobilised hybridisation and purification strategies.

So far the term »purification« has had a strong currency in recent studies about Soviet and Nazi German biopolitics. Amir Weiner, for example, outlined the meaning of »purification« as the »cleansing« of populations in order to create »perfect« and »harmonious societies«, which was achieved mainly by mobilising biological/racial and ethnic categories.[16] Indeed, there is a close affinity between the uses of »purification« in studies of biopolitics and social studies of science.[17] Bruno Latour defined the strategy of purification as one of boundary making, which also operated as a critical device. In relation to nature and society, purification entailed a philosophical distinction between natural and social forces. As »natural mechanisms« were purified from »human passions, interests or ignorance«, natural sciences were transported into an autonomous sphere, where social or political rationales could be suspended. Purification, according to Latour, was a reaction to hybridisation, or ongoing translations between society, nature and techno-science. On the other hand, although working for different aims, the strategies of purification and hybridisation could be adopted in parallel.[18] In line with Latour's and Weiner's work, this study approaches hybridisation and purification as processes of categorisation and institution building.[19]

The issues that are captured by the concepts of hybridisation and purification had previously been analysed by the historians of Soviet cybernetics, but from the above-mentioned neoliberal point of view. Consequently, hybridisation, or intertwining with the political (but also with the social sphere and other scholarly disciplines), was regarded as a negative phenomenon that distorted the ›true‹ scientific core of cybernetics. This article suggests a different approach. It argues that both purification and hybridisation were used as pragmatic strategies of survival by *both* Soviet scientists *and* official policy-makers. Furthermore, purification and hybridisation were used by Soviet scientists as critical devices to distance themselves from the communist regime, but were used differently in different contexts. As such distance-building critical devices, both purification and hybridisation were mobilised to draw a boundary between proper and less-proper sciences. It was purification that constituted a very important critical stance against the Stalinist authoritarian regime. However, post-Stalinist purification quickly transformed into multiple hybridisation strategies. After the end of the Thaw in the second half of the 1960s purification again resumed the critical role.

The article is organised as follows: First, it briefly discusses the Stalinist period as the rise of hybridisation: Techno-sciences were heavily politicised, with the exception of mathematics that was constructed as ›the pure‹ natural science. In a later stage of Stalinism this purified mathematics was used to politically legitimise the introduction of computer

15 This Soviet use of »the political« interestingly relates to the thought of the controversial philosopher Carl Schmitt. See *Carl Schmitt*, The Concept of the Political, Chicago 1996 [1927]; see also *Mika Luomo-Aha*, Carl Schmitt and the Transformation of the Political Subject, in: The European Legacy 5, 2000, no. 5, pp. 703–716.

16 See for example, *Amir Weiner* (ed.), Landscaping the Human Garden. Twentieth-Century Population Management in a Comparative Framework, Stanford 2003; *idem*, Making Sense of War: The Second World War and the Fate of the Bolshevik Revolution, Princeton, NJ/Oxford 2001, pp. 21–39.

17 *Bruno Latour*, We Have Never Been Modern, London 1991.

18 Ibid., pp. 35 f.

19 It has to be noted that Soviet studies somewhat disregarded the sibling of purification, that is hybridisation.

technologies. After Stalin's death cybernetics also tapped into the symbolic resource of neutrality offered by mathematics. Nevertheless, cybernetics was soon subjected to the interrelated strategies of hybridisation and purification. The following analysis focuses on two fields: economic planning and semiotics. The fields of economy and semiotics constitute two cases of the politicisation and de-politicisation of techno-science and governance as devices of survival and critical-distance building. The final section discusses the limitations of hybridisation and purification strategies as techniques of survival and critical-distance building.

I. Techno-Science, Governance and the Political under Stalin

According to Latour purification is logically impossible without hybridisation.[20] Few eras make this more evident than the time of Stalin's rule from 1928 to 1953.[21] Starting in 1929, the politicisation of techno-science involved direct intervention of the Party officials in the production of fundamental and applied sciences.[22] This constituted a break with Leninist policy, which co-opted rather than forced scientists to address state needs.[23] The new, tightened control was executed by the Party ideologues and state security organs (first the United State Political Directorate, or OGPU, in 1934, which was renamed the People's Commissariat for Internal Affairs, or NKVD, and later the State Committee of Security, or KGB). The security apparatus was mobilised to support the plans for speedy industrialisation, which consisted of megalomaniac projects for heavy industrial plants and the collectivisation of agriculture. In November 1929 »Pravda« printed Stalin's declaration that the Soviet Union would catch up and overtake the industrial West: »We shall see which countries may then be ›classified‹ as backward and which as advanced«.[24]

While it were the Party leaders who dictated the tempo of construction, little could be achieved without direct and continuous monitoring from the centre.[25] Governance and the political were perceived as tightly related and structured around Party membership and a friend-enemy divide. Although Western experts were called into help to design some of the key plants[26], the friend-enemy divide was mobilised in its full terrible force to cleanse

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20 *Latour*, We Have Never Been Modern.

21 It would be possible to trace hybridisation back to the Revolution of 1917 and Lenin's policies.

22 This point is covered by vast literature that describes scientific prisons and absurdly incompetent decision-making that guided industrial development in the Soviet Union. See *Loren Graham*, The Ghost of the Executed Engineer: Technology and the Fall of the Soviet Union, Cambridge, MA 1993; *Stephen Kotkin*, Magnetic Mountain: Stalinism as a Civilization, Berkeley/Los Angeles etc. 1995.

23 *Krementsov*, Stalinist Science, pp. 17–33.

24 *Kotkin*, Magnetic Mountain, p. 29.

25 For example, only a continuous flow of telegrams from Molotov ensured that the centrally taken decisions, such as to build a cinema for workers in Magnitogorsk, would be implemented. See *Kotkin*, Magnetic Mountain, p. 117. Gregory noted the sheer diversity of decisions that Stalin routinely had to sign off: It would not be unusual for one communication to contain orders to shoot officials, fire the minister of transport, instructions on foreign exchange, major foreign policy initiatives alongside with a discussion of the production of vegetables near Moscow and whether to give a Ford automobile to a particular official and which journals and newspapers contained ideological errors. See *Paul R. Gregory*, The Political Economy of Stalinism: Evidence from the Soviet Secret Archives, Cambridge/New York 2004, pp. 71 f.

26 This was particularly the case in heavy industries. For example, the American company Arthur McKee and Co. were hired to design the giant steel plant Magnitogorsk and the German architect Ernst May was invited to design a socialist city around this plant. Western organisational models were copied even in building Stalinist state administration: So the Main Administration

the techno-scientific personnel and the population in general.[27] Starting with the Shakhty trial of engineers accused of sabotage in May/June 1928, the »bourgeois intelligentsia« were targeted as an element of class struggle. Both staff and students identified as of bourgeois origin were expelled from academic institutions and industrial enterprises; on the other hand, students with a working class background were promoted and their number grew significantly between 1928 and 1940.[28] The suppression of ›bourgeois elements‹ in the technical intelligentsia was somewhat relaxed after 1931; however, in 1934 the bloody party purges of the »enemies of the people« reached new heights. Politicised in this way, Stalinist governance was not to be questioned or reflected upon.[29] The operational power of the friend-enemy categorisation was breathtaking, whereas its application was perceived as quite arbitrary and often impossible to predict.[30]

Furthermore, Stalin was against any scholarly pretensions in intellectual disciplines associated with state governance. The original economic and management scholarship, which emerged and came to flourish in the young communist Russia in the 1920s, was suppressed. Writings of eminent management and organisation theorists, such as systems theorist Aleksandr Bogdanov (1873–1928) and economist Stanislav Strumilin (1877–1974), were banned. The famous propagator of scientific management and the creator of the scientific organisation of labour movement, Aleksei Gastev (1882–1939), was executed.[31] Commenting on this period Moshe Lewin argued that even »economy disappeared into politics«.[32] Meanwhile, the understanding was retained that political power, or a monopoly of violence, was concentrated in the hands of local and central bureaucracies; the ongoing

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of the Metallurgical Industry (GUMP) was organised after the example of the U.S. Steel Corporation in 1931. See *Kotkin*, Magnetic Mountain, pp. 56 f. and 108 f.

27 This sorting-out drew on the lists of »enemy elements« produced in the 1920s and was assisted by cataloguing the population in the archives. For more see *Peter Holquist*, State Violence as Technique: The Logic of Violence in Soviet Totalitarianism, in: *Amir Weiner* (ed.), Landscaping the Human Garden: Twentieth-Century Population Management in a Comparative Framework, Stanford 2003, pp. 19–45, here: pp. 32–38.

28 *Moshe Lewin*, The Making of the Soviet System: Essays in the Social History of the Interwar Russia, London 1985, pp. 232–236.

29 This was because any form of governance was perceived as stemming directly from Stalin himself. As Jeffrey Brooks noted, such words as »task« and »assignment« from Stalin prevailed in the 1930s; *Jeffrey Brooks*, Thank You, Comrade Stalin! Soviet Public Culture from Revolution to Cold War, Princeton, NJ 2000, p. 12. When it came to revealing enemies, the practice of »denunciation« was crystallised. See *Vladimir Kozlov*, Denunciation and its Functions in Soviet Governance: From the Archive of the Soviet Ministry of Internal Affairs, 1944–53, in: *Sheila Fitzpatrick* (ed.), Stalinism: New Directions, New York/London 2000, pp. 117–141.

30 For grasping the internalised legitimacy of friend-enemy divide combined with a sense of the arbitrary execution of this categorisation, best is to consult the Russian memoir writings that deal with this period. See, for example, a memoir by a Russian art historian who came of age during the 1930s and 1940s; *Moisei Kagan*, O vremeni i o sebe, Saint Petersburg 1998.

31 Bogdanov died during his experiment on blood transfusion that he conducted on himself. The work of Strumilin was rehabilitated after the death of Stalin. For more about Gastev see *Mark R. Beissinger*, Scientific Management, Socialist Discipline and Soviet Power, London 1988; *Kendall Bailes*, Alexei Gastev and the Soviet Controversy over Taylorism, 1918–24, in: Soviet Studies 29, 1977, no. 3, pp. 373–394.

32 *Moshe Lewin*, Society and the Stalinist State in the Period of the Five-Year Plans, in: Social History II, 1976, pp. 139–175; cf. *Pekka Sutela*, Socialism, Planning and Optimality. A Study in Soviet Economic Thought, Helsinki 1984, p. 56. In turn, when commenting on the de-Stalinisation Lewin added that politics was absorbed into economy and the Party turned into »an economic-administrative agency«. *Moshe Lewin*, On Soviet Industrialization, in: *William G. Rosenberg*/*Lewis H. Siegelbaum* (eds.), Social Dimensions of Soviet Industrialization, Bloomington/Indianapolis 1993, pp. 272–284, here: p. 276.

shock industrialisation strengthening the role of party organs as administrators of the economy.[33] As a result, Stalinist planners were Party officials *and* engineers and for them planning meant mobilisation of resources.[34] Accounting and statistics played a rudimentary role in the first five-year plans, which provided only very crude and insufficient information on control figures for output targets; the second five-year plan was even written retrospectively.[35] In 1933 universities replaced the theory of Soviet economy with a descriptive course on »Economic policy«, dedicated to the current five-year plan and economic history.[36] The quantitative theories were abandoned and intellectualisation of the organisation of labour was suppressed. Only narrow formulations of economic thought, canonised in the doctrine of Marxism-Leninism, were permitted. Governance was identified with the central party and security apparatus, in which decision-making and command lines were strictly hierarchical and vested in an individual person. Forged in 1929 the principle of *edinonachalie* (one-man leadership) emphasised personal loyalty and responsibility.[37] The awareness that anyone at any time may fall victim to arbitrary terror became the main feature of the Stalinist mentality of governance.[38]

Although primarily directed at the cleansing of the Party, purges were replicated across academic institutions. During the 1930s and 1940s any scientific theory could be criticised as »bourgeois« and therefore not only unfit, but also extremely dangerous for the building of communist society. Graham and Krementsov, for example, detailed the harsh consequences of the categorisation of »appropriate« and »false« sciences as they caused both institutional and personal human casualties.[39] These purges were not only channelled down from above: So-called appropriate and false sciences were conceptualised and distributed internally by academic institutions, particularly the Academy of Sciences. There was little philosophical coherence in these categorisations: Scholars diverged in their interpretations and applications of Marxism-Leninism.[40]

It is rather telling that in this context mathematics, the field in which Russian and generally Soviet scientists achieved and retained world-leading status, was relatively little affected by the Stalinist politicisation.[41] To be sure, this should not be surprising given the

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33 *Lewin*, The Making of the Soviet System, pp. 31 f. Having coined the influential account of the Soviet system and particularly of Stalinism as a pervasive bureaucracy, Lewin however operated with a clear-cut normative distinction between the »political« and other spheres, such as economy. Consequently, Lewin could not help but see the governmentalisation of the Soviet state as a paradox: »[T]he party cells, to begin from below, most of which were operating in the economic sphere anyway, now became brokers in the service of their branch of economy, sometimes even of just one enterprise. The same applied to higher rungs of the administration, mostly composed of party people, who were undergoing similar processes of ›depoliticization‹, their professional activities becoming their only task, their main and only ›politics‹. […] The burden of controlling the managerial bureaucracies was now devouring the political leadership«; ibid., p. 32.

34 *Sutela*, Socialism, Planning and Optimality, p. 56.

35 *Gregory*, The Political Economy of Stalinism, pp. 110–118.

36 *Sutela*, Socialism, Planning and Optimality, p. 55.

37 The principle of *edinonachalie* was formalised in decrees and applied to the highest and lowest levels; *Gregory*, The Political Economy of Stalinism, pp. 162–165.

38 Slavoj Žižek described this Stalinist mentality of governance as »humanisation« of the scientific management. Intended to be a controversial paradox, Žižek's argument is hardly persuasive, because he forgets the rise of human relations approach in the Western countries, which took place simultaneously with Stalinist terror. See *Slavoj Žižek*, In Defence of Lost Causes, London 2008.

39 *Loren Graham*, Science in Russia and the Soviet Union. A Short History, Cambridge 1993, pp. 121–136; *Krementsov*, Stalinist Science.

40 *Alexei Kojevnikov*, Rituals of Stalinist Culture at Work: Science and the Games of Intraparty Democracy circa 1948, in: Russian Review 57, 1998, no. 1, pp. 25–52.

41 *Graham*, Science in Russia, pp. 213–220.

history of mathematics and numeric representation as an objective arbiter of knowledge in the modern period.[42] Although during the 1930s there were cases of persecution of eminent mathematicians, such as Nikolai N. Luzin (1883–1950), founder of the Moscow school, mathematics as a scientific discipline enjoyed relative immunity to ideological criticism. It may also have helped that, as observed by Graham, mathematics acquired an aura of being »a Russian science« and therefore was well fitted for the nationalising ambitions of Soviet policy.[43] After the Second World War, Gerovitch noted, Stalin himself ridiculed an attempt at finding ideological contradictions in mathematics, because he thought that this abstract science could hardly feature any content of political relevance.[44] Following Pierre Bourdieu, it can be argued that mathematics, both fundamental and applied, retained and even increased its particularly valuable symbolic capital in the Soviet Union: that of being a-political.[45] Being purified as a science that was independent of the political, mathematics could be used as an instrument for purification of other scientific disciplines and governance.[46]

II. Soviet Cybernetics, Computers and Purification

Unlike mathematics, cybernetics experienced a lot of difficulty before it was recognised as a politically neutral science. Popularised by the famous American mathematician Norbert Wiener with his book »Cybernetics: Or Control and Communication in the Animal and the Machine« (1948), the theory of communication and control was firmly rejected by Soviet ideologues.[47] Cybernetics joined the ranks of other banished sciences: Trofim Lysenko declared genetics erroneous and advanced his theory of the inheritance of acquired qualities; Albert Einstein's relativity theory postulated the end of the deterministic worldview, which was perceived as a threat to the deterministic Marxism-Leninism.[48] The main criticism of cybernetics concerned its notion of information, defined not as matter

42 *Theodore M. Porter*, Trust in Numbers: The Pursuit of Objectivity in Science and Public Life, Princeton, NJ 1995.

43 Also mathematics was perceived as more detached from immediate social and political issues than biology or nuclear physics, and therefore more popular with scientists who did not sympathise with Soviet regime; *Graham*, Science in Russia, pp. 216 and 218.

44 *Gerovitch*, From Newspeak, p. 34.

45 *Pierre Bourdieu*, Distinction: A Social Critique of the Judgement of Taste, London 1999 [1979].

46 It is appropriate to note that mathematics itself had to be constructed as a reliable science. As Mary Poovey has noted, mathematics had dubious reputation because it was seen as related to magic numerology in the early modern period. For this reason rhetorics was used to lend its higher cultural authority to the use of arithmetical operations in commercial transactions; *Poovey*, A History of the Modern Fact.

47 The history of cybernetics often concentrated on, but was not limited to Norbert Wiener's legacy. For a detailed account about the history of feedback before electronic engineering, see *Otto Mayr*, The Origins of Feedback Control, Cambridge, MA 1970; *Stuart Bennett*, A History of Control Engineering 1800–1930, London/New York 1979; *David A. Mindell*, Between Human and Machine: Feedback, Control and Computing before Cybernetics, Baltimore/London 2002; Wiener's biography was described by *Rusom Masani*, Norbert Wiener 1894–1964, Basel/Boston etc. 1990; *Flo Conway/Jim Siegelman*, Dark Hero of the Information Age: In Search of Norbert Wiener, the Father of Cybernetics, New York 2005; finally, for a history of cybernetics in Great Britain, see *Andrew Pickering*, The Cybernetic Brain: Sketches of another Future, Chicago 2010.

48 *Graham*, Science in Russia, p. 147; *David Holloway*, Innovation in Science – The Case of Cybernetics in the Soviet Union, in: Science Studies 4, 1974, no. 4, pp. 299–337; *Slava Gerovitch*, »Mathematical Machines« of the Cold War: Soviet Computing, American Cybernetics and Ideological Disputes in the Early 1950s, in: Social Studies of Science 31, 2001, no. 2, pp. 253–287.

or energy, but as a substance of its own.[49] Furthermore, cyberneticians regarded a man-machine relation as an integrated system and drew analogies between neuron functions in the human brain and electric signals in a computer.[50] This analogy was the main reason for the ideological criticisms of cybernetics.[51] A long article, published in the influential journal »The Issues of Philosophy« in 1953, attacked cybernetics as a theory, which erroneously identified the work of computer with the human brain. First and foremost this article cast cybernetics as an external attack against Soviet psychology. Cybernetic applications in neuroscience were seen as threatening to undermine the established Russian school of psychology, based on the work of Ivan Pavlov and Ivan Sechenov. Acknowledging the unparalleled popularity of cybernetics in the West, the article called it »wicked ideological goods«, which were exported by »imperialist capitalists«, that is Americans. Cybernetics was called a »pseudo-science« and a »Cold War weapon against I. Pavlov«: »cybernetics – one of those *pseudo-sciences* that are created by contemporary imperialism and are condemned to die even before the death of imperialism«.[52] The promise of an automated factory and automation of the entire industrial sector was another feature that caused ideological distress. The anonymous writer highlighted that it was the fear of the working class masses that stimulated cybernetic fantasies about robot-powered factories. On the other hand, these robotic visions disclosed the indifference of capitalists, as cyberneticians did not engage with an issue of what to do with workers made redundant by the computer:

> »the production process, which is implemented without workers, only with machines, which are controlled by a giant brain of the computer! No strikes, no clashes, no revolutionary uprisings! Machines instead of the brain, machines without people! What a fascinating prospect for capitalism!«[53]

It can be argued that cybernetics became a victim to the political as friend-enemy divide. The above criticisms took place in the context of an escalating Cold War. An anti-Western campaign, which especially targeted the arts and sciences, was launched by Andrei Zhdanov in 1946.[54] Although Zhdanov died in 1948, his anti-Western campaign was continued well into the 1950s. East-West relations deteriorated following the establishment of the North Atlantic Treaty Organisation (NATO) in 1949. In the same year the Coordinating Committee for Multilateral Export Controls (CoCom) was organised and declared a high technology embargo on the Soviet Union.[55] Although, as Gerovitch has pointed out, similar ideas to Wiener were developed by the innovative Russian mathematician Andrei Kolmogorov, cybernetics was officially classified as an American science and was at odds with Soviet anti-Western and nationalising policies.[56]

Both Party ideologues and scientists regarded cybernetics as a political phenomenon, but for different reasons. As Gerovitch demonstrated, Party ideologues had only a very

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49 According to Wiener, »information is information, not matter or energy. No materialism which does not admit this can survive at the present day«; *Norbert Wiener*, Cybernetics, or Control and Communication in the Animal and in the Machine, New York 1954, p. 132.

50 *Gerovitch*, From Newspeak.

51 For a detailed analysis of the ideological criticisms of cybernetics in the Soviet Union, see ibid.

52 *Materialist* (pseudonym), Komu sluzhit kibernetika?, in: Voprosy Filosofii 1953, no. 5, pp. 210–219, here: pp. 212 ff.

53 Ibid., p. 219. It is rather striking that in 2010 these criticisms of an automated factory do not sound wholly ungrounded.

54 For more about Zhdanov's campaigns in techno-sciences, see *Krementsov*, Stalinist Science, pp. 129–157.

55 *Sari Autio-Sarasmo*, Soviet Economic Modernisation and Transferring Technologies from the West, in: *Markku Kangaspuro/Jeremy Smith* (eds.), Modernisation in Russia since 1900, Helsinki 2006, pp. 104–123, here: pp. 114 f.; *Gerovitch*, From Newspeak, pp. 17, 19 and 40.

56 Ibid.

poor understanding about cybernetics as a scientific theory. Therefore they criticised cybernetics on the grounds of its US-American origin, in this way trying to score some points against capitalism.[57] In turn, Soviet scientists perceived cybernetics not only as a new, groundbreaking science, but also as a practice that was loaded with political meaning, awkward enough to launch the purgatory apparatus. For some autonomy-seeking professionals cybernetics appeared attractive. In this way Soviet cybernetics emerged as »more than just a science« for both scientists and Party ideologues.[58]

The construction of the first original Soviet computers took place in parallel with this anti-cybernetic campaign. Designed and built by a Kiev-based electrical engineer, Sergei Lebedev, computers could not be easily discarded as »bourgeois machines« because they were essential for the Soviet military defence and space programmes.[59] On the other hand, connections between computer machines and cybernetics were both material and intellectual: The cybernetic principle of feedback-based control was implemented in signal switching in the computer, and cybernetic theory emphasised the analogies between the functioning of computers, organisms and organisations. The article mentioned above criticised cybernetics as a way of thinking that suggested that the principle of digital computers could be used to explain natural and social phenomena.[60] Therefore, although the design of first computers was kept strictly secret, computer scientists took extra precaution to insure themselves against possible ideological attacks, which could wreck their careers.[61]

Indeed early computers were connected first and foremost with mathematics both in East and West.[62] However, this connection was considerably stronger in the Soviet Union. In the context of arbitrary terror exercised in relation to the friend-enemy category, and witnessing the unfortunate fate of cybernetics, Soviet computer scientists had good reason to tap into the resource of politics-free mathematics. The Soviet computer was therefore constructed as a giant calculator, the main purpose of which was to make ever speedier calculations. As such a calculating device, the computer was presented as wholly independent of any »philosophical implications«. As a result, the work of a Soviet computer scientist could be presented as politically neutral.[63] By contrast, the definition of a computer as a machine of communication was carefully avoided because communication was more evidently infused with social, political and economic implications.[64] In com-

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57 *Slava Gerovitch*, ›Russian Scandals‹: Soviet Readings of American Cybernetics in the Early Years of the Cold War, in: The Russian Review 60, 2001, pp. 545–568.

58 This statement draws on interviews with leading Lithuanian scientists who made their careers during the 1950s and 1960s. For an in-depth analysis of the views of Lithuanian scientists, see *Egle Rindzeviciute*, Constructing Soviet Cultural Policy: Cybernetics and Governance in Soviet Lithuania After World War II, Linköping 2008; *eadem*, Internal Transfer of Cybernetics and Informality in the Soviet Union: The Case of Lithuania, in: *Sari Autio-Sarasmo/Katalin Miklossy* (eds.), Reassessing Cold War Europe, London 2010 (forthcoming).

59 The first Soviet computers were called the Small and then the Large Calculation Machine (*malaia* and *bol'shaia shchetnaia mashina*, respectively MESM and BESM). For more see *Dmitriĭ Aleksandrovich Pospelov/Ya.I. Fet* (eds.), Ocherki istorii informatiki v Rossii, Novosibirsk 1998.

60 *Materialist*, Komu sluzhit kibernetika?, p. 212.

61 *Gerovitch*, »Mathematical Machines«.

62 The first digital computers were used to solve theorems; *Paul E. Cerruzzi*, A History of Modern Computing, Cambridge, MA/London 2003. For comparison, although the computer was invented to calculate theorems, in the West computers as calculating machines were initially treated rather sceptically by mathematicians, especially when it came to calculating proofs. See *Donald MacKenzie*, Mechanizing Proof: Computing, Risk, and Trust, Cambridge, MA/London 2001.

63 *Gerovitch*, »Mathematical Machines«.

64 Ibid., p. 270. Only in the late 1970s/early 1980s Soviet computers were increasingly described as machines of communication, which would transcend the borders between the Soviet Union

parison, American computers were also kept outside the political friend-enemy divide: They were perceived as instruments for administrative centralisation, surveillance and control, and not for direct attacking of enemies outside of the country through missiles and bombs.[65] In the USA, computers came to be understood as located outside the exercise of violence because they assisted administration and communication and, conesquently, came to be regarded as a ›liberal‹ and therefore a-political technology of governance. At the same time, Soviet propaganda obviously criticised Americans for using computers as war machines.[66]

It can be argued that the individualising and atomising Stalinist terror was counteracted by intensive efforts to construct spheres with their own laws, which would be disconnected from the laws of politics and society. Fundamental mathematics and computer science, such as applied mathematics, computers as giant calculators that speeded up mathematical operations, purified themselves as such spheres. After Stalin's death in 1953 and the condemning of the Stalinist regime in Nikita Khrushchev's secret speech in 1956 this process of the purification of mathematics and computers was approaching completion. At the same time, a new political rationale was mobilised by the central policymakers, which came to assist further purification of techno-science from the political. This political rationale was the international transfer.

Technology transfer from the West to the Soviet Union resumed in the second half of the 1950s. By the 1970s the Soviet leaders relied heavily on high technology transfer from the USA, instead of investing internally in technical innovation.[67] The impact of the transfer was particularly significant in high-technology fields, but also in those technosciences that were meant to assist governance of the economy and organisations. Besides cybernetics and general systems theory, operation research, programme budgeting and game theory were introduced in the Soviet Union.[68] These sciences of management and control were declared to be universally valid and free from political bias. Although Western sociology was officially treated with suspicion, highly positioned Russian scholars such as Jermen Gvishiani could write a dissertation about Western management theories.[69] Gvishiani facilitated the transfer of a number of management tools developed in the USA, such as cost-benefit analysis, critical path methods, trees of goals and programme evaluation and review techniques. Nevertheless, techno-scientific transfer was often problematic. If in 1966 Gvishiani called for wide application of cybernetics as a general management science, at the beginning of the 1970s he issued repetitive warnings about the subversive and reactionary effects of Western management theories. He also questioned the legitimacy of a purely technical or cybernetic approach to management.[70] However, at the same time the West-East transfer of management techniques was further institutionalised. An important platform for collaboration was the International Institute

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and ›Eastern bloc‹ and the West. The key platform for this development was IIASA. *István Sebestyén*, Experimental and Operational East-West Computer Connections: The Telecommunication Hardware and Software, Data Communication Services and Relevant Administrative Procedures, Laxenburg 1984; *Frank Dittmann*, Technology versus Conflict: How Data Networks Penetrated the Iron Curtain, in: Osteuropa 2009, no. 10, pp. 101–120.

65 *Paul N. Edwards*, Meteorology as Infrastructural Globalism, in: Osiris 21, 2006, pp. 229–250, here: pp. 242 f.

66 *Materialist*, Komu sluzhit kibernetika?, p. 212.

67 *Castells*/*Kiselyova*, The Collapse of Soviet Communism, p. 36.

68 *Philip Hanson*, Trade and Technology in Soviet-Western Relations, New York 1981; *Autio-Sarasmo/Miklossy*, Reassessing Cold War Europe.

69 Although Michel Foucault's »Archaeology of Knowledge« was translated into Russian already in 1978.

70 *William J. Conyngham*, The Modernisation of Soviet Industrial Management: Socioeconomic Development and the Search for Viability, Cambridge 1982, pp. 44–49.

of Applied Systems Analysis (IIASA), founded in Laxenburg, Austria, in 1972. The key funding members, the Soviet Union and the USA, sent their best scholars to develop methodologies and models rooted in the systems approach and advise their home governments on such global problems as the environment, demography and economy.[71] IIASA emerged as an important platform, not only for transfer between West-East, but also between ›Eastern bloc‹ and the Soviet Union.

It can be argued that a pressing need for techno-scientific transfer from the West stimulated both the discursive purification and hybridisation of the techno-sciences. In order to be moved across national borders, techniques had to be purified. However, the travelling of neutral techno-sciences took place not only across geographical, but also disciplinary boundaries. Purification was inevitably followed by hybridisation.

III. The Production of Universal and Hybrid Cybernetics

Cybernetic research studies control and communicate processes in machines, biological organisms, society and the economy. The terms »cybernetics« and »systems theory« were used interchangeably.[72] Soviet cybernetics was, according to Gerovitch, »not a settled discipline, but rather an ambitious project of introducing mathematical methods and computer models into the life sciences and the social sciences«.[73] This, as well as other definitions, asserted that cybernetics' connection with mathematics was of utmost importance. For example, the influential Soviet philosopher Boris Biriukov defined cybernetics as

> »a science about the processes of control [*upravlenie*] and informational processes in complex dynamic systems, which is based on the theoretical fundamentals of mathematics and logics and […] the use of the means of automation, particularly computing, controlling and informational-logical machines, systems and complexes«.[74]

The concepts of cybernetics, such as information and control, were applied across different scientific disciplines and were able to bridge these different fields. In turn, cybernetics was defined as »a style of scientific and engineering thought«, which was applicable to various new spheres.[75] As a result cybernetics was declared to be a »universal« scientific approach, which could be applied to any man-made or natural systems.[76]

It is difficult to overestimate the significance of the application of cybernetics, systems theory and computer technologies to Stalinist governance. »Management« or »governance« (*upravlienie* in Russian) was defined as being constituted by informational processes re-

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71 For more about IIASA, see *Roger E. Levien*, RAND, IIASA, and the Conduct of Systems, in: *Agatha C. Hughes/Thomas P. Hughes* (eds.), Systems, Experts, and Computers: The Systems Approach in Management and Engineering, World War II and After, Cambridge, MA/London 2000, pp. 433–461.

72 *Conyngham*, The Modernisation of Soviet Industrial Management, p. 52.

73 *Slava Gerovitch*, InterNyet: Why the Soviet Union Did Not Build a Nationwide Computer Network, in: History and Technology 24, 2008, no. 4, pp. 335–350, here: p. 337. See also *idem*, Striving for ›Optimal Control‹: Soviet Cybernetics as a ›Science of Government‹, in: *Miriam R. Levin* (ed.), Cultures of Control, Amsterdam 2000, pp. 247–264.

74 *Boris V. Biriukov*, Kibernetika, informatika, vycheskitel'naia tekhnika, avtomatika: problem stanovleniia i razvitiia. Vklad otechestvennoi nauki, in: Kibernetika: proshloe dlia budushchego. Etiudy po istorii otechestvennoi kibernetiki, Moscow 1989, pp. 7–45, here: pp. 7 f. This broad definition of cybernetics was institutionalized in the Scientific Council for Cybernetics; *M. I. Makarov*, Ot radiotekhniki i elektroniki – k kibernetike i robototekhniki: v mire myslei A. I. Berga, in: Kibernetika: proshloe dlia budushchego, pp. 171–178, here: p. 171.

75 *Biriukov*, Kibernetika, informatika, p. 37.

76 See also *Geoffrey Bowker*, How to Be Universal: Some Cybernetic Strategies, 1943–70, in: Social Studies of Science 23, 1993, pp. 107–127.

gulated via cybernetic control, based on continuous goal setting and ongoing corrections via feedback.[77] At the same time, cybernetic control was used as a synonym for any kind of governance, even political steering. Called the »mathematical revolution«, this process referred to the organisational and conceptual revision of the notions of governance, first of the economy and then of the society.[78] The rehabilitation of cybernetics was accompanied by vigorous institution building. In 1954/55 an eminent Russian mathematician, Aleksei Liapunov, organised a series of seminars about cybernetics at Moscow State University (MGU) and later at Novosibirsk University. In total 121 seminars were attended not only by mathematics students from MGU, but also by biologists, engineers, philosophers and members of the wider intelligentsia, such as writers, journalists and film makers.[79] On the 10th of April 1959 the »Scientific Council on Cybernetics and Computers« was established by the academician, admiral and ex-vice minister of defence Aksel' Berg under the All-Union Academy of Sciences. At the same time as the Soviets declassified the computer and cybernetics was rehabilitated, the mathematical methods of economic planning were legitimised. In July 1956 Central Committee plenum Nikolai Bulganin emphasised the significance of the techno-sciences. The Party programme declared the need to mobilise advanced scientific methods to rejuvenate the Soviet economy. As of 1957 the statistical input-output analysis was propagated. It was recognised that mathematical economics was better developed in the West and measures were taken to rehabilitate the earlier banned work of Russian scientists. In 1958 the work produced by Leonid Kantorovich in the 1930s now could be reintroduced under the banner of economic cybernetics. In the same year the Russian translations of Wiener's »Cybernetics and The Human Use of Human Beings« and William Ross Ashby's »Introduction to Cybernetics« were published. In 1958 a periodical publication »Problemy kibernetiki« was launched by Liapunov's circle; 41 volumes were published until 1984. In scientific policy, cybernetics emerged at the top of the Soviet priority pyramid.

The shift away from Stalinist anti-intellectualist norms and chaotic ways of governance was immanent to the cybernetic revolution. Computers were to complement, if not replace many positions in the managerial strata. Lewin spelled it out: »[T]he party wanted the bosses to be efficient, powerful, harsh, impetuous and capable of exerting pressure, crudely and ruthlessly and getting results ›whatever the cost‹«. Such bosses were endowed with quasi-police power and exercised governance through fines and dismissals.[80] From the mid-1960s Soviet management discourses eventually adopted Stafford Beer's notion of control that, as Beer insisted, could not be identified with a repressive type of system.[81] Cybernetic governance through information loops was to replace Stalinist governance through violence.

Hybridisation 1: Economic Planning

In the 1961 Party programme cybernetics was hailed as the science that would resolve all economic problems. It was in the Soviet Union, argued Berg a year later, that the oppor-

77 Different aspects were emphasised by scholars. Aksel' Berg defined cybernetic management as the optimal control of a system's transition from one state to another. Victor Glushkov rather focused on input-output processes; *Conyngham*, The Modernisation of Soviet Industrial Management, pp. 54 f.

78 *Alfred Zauberman*, The Mathematical Revolution in Soviet Economics, London/New York 1975; *Sutela*, Socialism, Planning and Optimality.

79 *Modest G. Gaaze-Rapoport*, O stanovlenii kibernetiki v SSSR, in: Kibernetika: proshloe dlia budushchego, pp. 46–73, here: pp. 65 f.

80 *Lewin*, The Making of the Soviet System, p. 237.

81 *Stafford Beer*, Cybernetics and Management, London 1973 [1959], p. 28. The Russian translation of this book was published in 1965.

tunity to establish a »unitary, state-wide optimal and continuous planning of all the economy« emerged.[82] Computers were pronounced to be »machines of communism«[83]; in turn »cybernetisation« often meant »computerisation«. Recent research has shown that the projects to computerise the governance of Soviet economy had already been launched under Khrushchev: In 1957 the Soviet Academy of Sciences (SAS) produced a confidential report, which stressed the »absolutely exceptional significance« of the use of »computers for statistics and planning«.[84] The Soviet idea of a computer network that would assist national economic governance was inspired by the development of SAGE (Semi-Automatic-Ground-Environment) in the USA, and in 1956 »Scientific Research Institute No. 101« was established to develop a similar national air defence system. At about the same time a laboratory headed by Isaak Bruk started developing a network of computers for collecting, processing and transmitting of economic data. In 1958 this laboratory was reformed into the Institute of Electronic Control Machines, which three years later was transferred to the State Economic Research Council (later the State Planning Committee).[85]

The threatening shadow of the political, however, was still ever present. In the first all-union conference on the use of mathematical methods in economic planning (1961) a warning was voiced that mathematical methods were »a Trojan horse«, which would introduce »bourgeois economic modes of thought«.[86] Consequently, some scholars argued, during 1956 and 1963 mathematics and computers were very carefully conceptualised simply as »tools« which were »merely« applied to the existing management system of central planning. On the other hand, seeing enormous support for electronic data processing and cybernetics, economists increasingly emphasised that they also practised an exact science and called it »economic cybernetics«. Important conducers of legitimacy for this discipline were not academic, but governmental institutions, the »Economic Scientific Research Institute« at Gosplan (as the Soviet State Planning Committee) and the Statistical Administration.[87] In 1963 the »Central Economic Mathematical Institute« at SAS in Moscow was founded and headed by Nikolai P. Fedorenko. The same year an eminent economist, Vasilii Nemchinov, declared that economists had to assume the role of social engineers and assist decision-making. Economic experts, backed with computer-processed quantitative data, were to replace the Khrushchev style voluntary decision-making, which, according to Nemchinov, could bring about economic damage equally serious as that one entailed by anarchic capitalist competition.[88]

In 1967 the Central Committee stressed that the task of social sciences was to develop a theory and methods for an optimally functioning socialist economy.[89] This task was undertaken by a number of organisations, many of them were situated under the umbrella term of cybernetics. Under the Academy of Science the key organisations were the Institute of Problems of Administration, the Siberia Division's Institute of Mathematics, the Institute of the Economics and Organisation of Industrial Production. Special institutes for cybernetics research were mainly established in relation to mathematics departments, as in Estonia, Lithuania and Ukraine, where Victor Glushkov's Institute of Cybernetics

82 *Aksel' Berg*, Nauka velichaishikh vozmozhnostei [1962], in: *Pospelov/Fet*, Ocherki istorii informatiki v Rossii, pp. 213–222, here: p. 215.
83 *Gerovitch*, »Mathematical Machines«, p. 276.
84 *Gerovitch*, InterNyet, p. 337.
85 Ibid., p. 338.
86 *Sutela*, Socialism, Planning and Optimality, pp. 94 f.
87 Ibid., pp. 76 and 82 f. The leading figure was Vasilii Nemchinov, who worked at Gosplan (1949–1963) and Academy Presidium (1953). Notably, East German sources were used in reshaping the Soviet planning models, particularly mathematical methods developed by Oskar Lange and Georg Klaus.
88 *Sutela*, Socialism, Planning and Optimality, p. 87.
89 Ibid., p. 101.

in Kiev was an important centre for the development of automated management systems (ASUs).[90] Capitalising on the Soviet participation in IIASA, Gvishiani established the Institute on Systems Research in Moscow in 1976. In this way the 1960s and 1970s saw the academic institutionalisation of cybernetic research for governance purposes.

The increased use of computers in actual economic planning dated from the mid-1960s. In 1964 a decision was taken at the Council of Ministers to develop a unified »automatic system of management«. This decision foresaw a network of interconnected computer centres that communicated with enterprises and government agencies.[91] The Organisation of the Automated Planning Calculations System sub-department was established at Gosplan on all-union and republic levels in the late 1960s and expanded quickly in the 1970s. In addition, ASUs were developed for ministries, administrative regions, cities and industrial territorial complexes. Their task was to speed up information processing, which was so far done manually, and it took long time to locate data and to calculate it.[92]

In 1965 the Gosplan »Department for the Introduction of New Methods of Planning and Economic Stimulation« was created.[93] These »new« methods mainly consisted of input-output tables which were compiled by the Central Statistics Administration (TsSU) in 1959, 1966 and 1972. The methodology, instructions, computer programs and database for these tables were developed at the Scientific Research Economic Institute and the Main Computer Centre. In the beginning, Gosplan only used its own final data, but in 1972/73 it undertook a more active role and ordered ministries to calculate their own data on the technological coefficients of material and energy expenditures.[94] The plan from 1971 to 1975 was the first one to be checked with input-output and production functions.[95] The post-Khrushchev period was associated with the paradigm of the system of optimal functioning of the economy (SOFE), associated with Nemchinov. However, in the 1970s economic cyberneticians softened their argument about the neutrality and universality of mathematical methods.[96] It became clear that it was impossible to achieve the necessary formalisation of economic activities in order to capture them mathematically. After all, even the Gosplan decisions were mainly made on arbitrary grounds and were a matter of bargaining between the heads of industries and central planners. Everyone knew that the information about the actual performance of industries was more than imperfect.

Despite this awareness of the informal character of the Soviet economy, in the 1970s computerisation emerged as a major strategy to replace the paradigm of economic reforms in the 1960s.[97] But it was soon to appear that computerisation was limited on all levels, with the exception of the military. Few scientists had access to powerful computers, which were concentrated in Moscow and Leningrad and the capitals of state socialist republics. The creation of OGAS, the all-union system for collection and processing information for reporting, planning and management of the national economy, was stipulated by the 24th Party Congress in 1971. However, it was estimated that only 5 to 10 per cent of planning and reporting data were automated by 1975.[98] Even in the late 1980s the Soviet Union experienced a painful shortage of computer machinery.[99] These short-

90 See *Conyngham*, The Modernisation of Soviet Industrial Management, p. 49.
91 *Eugène Zaleski*, Planning Reforms in the Soviet Union, 1962–1966, Chapel Hill 1967, p. 55.
92 *Fyodor I. Kushnirsky*, Soviet Economic Planning, 1965–1980, Boulder 1982, p. 119.
93 Ibid., p. 38.
94 Ibid., pp. 115 f.
95 *Sutela*, Socialism, Planning and Optimality, p. 121.
96 *Conyngham*, The Modernisation of Soviet Industrial Management, pp. 66 ff.
97 Ibid., p. 176.
98 Ibid., p. 128; for more see *Gerovitch*, InterNyet.
99 *Itzchock Adirim*, Current Development and Dissemination of Computer Technology in the Soviet Economy, in: Soviet Studies 43, 1991, no. 4, pp. 651–667.

ages were accompanied with growing evidence about the failures of planning. For instance, in January 1976 it became clear that only about half of the 520 items of technical equipment planned in the 9th five-year plan was produced.[100] Furthermore, Gosplan could not rely on the official statistics and internally circulated secret memos, which provided planners with some information about the ›actual state‹ of economic sectors.[101] This was quite necessary, because it took two to three years to collect information for a branch optimising model and about two years for a district model and about five years were needed to collect the information for a more complex model.[102] Furthermore, the spread of personal computers was particularly limited. In 1988 there were about 100,000 PCs in the Soviet Union, while there were five to six million PCs possessed by individuals (not businesses or government) in the USA.[103] Although Soviet government theorists advocated self-regulation and free information flows as a necessary condition for the viable functioning of any system, these principles obviously clashed with the practices of intelligence control and censorship. Anything that would obstruct the work of these agencies, such as civil use of computers for communication, posed a risk for the Party's monopoly of power.[104]

Nevertheless, the hybridisation of cybernetics and governance successfully erased the meaning of governance as a political practice that was structured around the friend-enemy divide and political loyalty to the Party. It was permitted to acknowledge that cybernetisation as the automation of production processes was a process of the »liberation of human beings« from »routine, exhaustive and dangerous operations«.[105] Cybernetics could modify the industrial Taylorist paradigm of the organisation of work because Taylorist management was recognised as a »science«. It was admitted that special scholarly competence was necessary to master economic planning and the management of plants and enterprises. Finally, the idea that the economic governance of the Soviet Union in principle could be, and in reality should be fully automated gained high legitimacy. The explosive potential of these principles to the centralised and coercive communist regime was, however, quite visible. It was probably not by chance that any reference to self-governance had to be accompanied with an explicit statement of the continuing importance of the role of the Party and its directives.

Hybridisation 2: Semiotics

Besides management and economic planning, one of the most salient cases of the hybridisation of cybernetics is its application in the fields of linguistics and structural analysis. As recently detailed by Celine Lafontaine, cybernetics directly influenced the formation of French structuralism.[106] In the Soviet Union the cybernetisation of the humanities was even more explicit and self-conscious than in France, because this process was seen as an act of de-politicisation. Although semiotics had never become a mainstream discipline in the Soviet Union, it was tolerated. The reason was that semiotics positioned itself as a theory that sought to improve language inputs into computers, especially those intended to govern complex systems. On the other hand, the cybernetic theory of meaning production and self-organisation via communication, as well known as social interact-

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100 *Kushnirsky*, Soviet Economic Planning, p. 84.
101 Ibid.
102 *Sutela*, Socialism, Planning and Optimality, p. 130.
103 *Balzer*, Soviet Science on the Edge of Reform, pp. 101 and 188.
104 Ibid.
105 *Avenir A. Voronov*, Teoriia upravleniia – proshloe dlia nastoiashchego i budushchego, in: Kibernetika: proshloe dlia budushchego, pp. 179–189, here: p. 187.
106 *Celine Lafontaine*, L'empire de cybernétique. Des machines à penser à la pensée machine, Paris 2004.

tionism, developed by Gregory Bateson and Margaret Mead, was not acceptable for Party ideologues.

In the beginning, cybernetic ideas were adopted and disseminated by linguists who worked with the creation of computer language. Already in 1955/56 seminars on machine translation and mathematical linguistics were organised at the philological faculty at MGU. In 1957 the Association for Machine Translation was founded by Viachislav Ivanov, I. I. Revzin and Boris Uspenskii in Moscow.[107] The newly founded Scientific Committee for Cybernetics (1959) included six linguists, among whom were eminent Moscow School scholars Petr Kuznetsov and Aleksandr Reformatski and the highly reputed Lev Zinder from the Leningrad School, who had a track record of collaboration with radio engineers before the war. Soon thereafter a linguistic section headed by Ivanov was established to employ 18 scholars from fields of theoretical and applied linguistics, mathematics, psychology and engineering.[108] The initial focus on writing a language for computing machines was quickly broadened into a study of verbal and non-verbal languages as processes of signification. It can be argued that Soviet semiotics was assembled as a »hybrid sphere of knowledge« par excellence.[109] Actively supported by Berg, this new discipline of the science of signs was explicitly connected with cybernetics and the official priority to develop automatic technologies:

> »In relation to the great significance of automatisation in the national economy it was necessary to develop fully-fledged research in the fields of cybernetics and the entire complex of scientific disciplines that use the achievements of cybernetics. Such disciplines included language studies (*iazykoznanie*) within which emerged intensively developed structural and mathematical methods for studying language (structural and mathematical linguistics).«[110]

It was cautiously added that »structural methods« could never replace the methods used by Marxist »language studies«, such as historical and historico-comparative analysis. It was on the initiative of Berg that the Semiotics Institute at the Academy of Sciences was planned. Although such eminent scientists as Kolmogorov, Andrei Markov senior and Liapunov were named as candidates for director, the idea of a separate institute did not materialise. Instead, a Section for Structural Typology with Vladimir Toporov as director was established under the Slavic Languages Institute in spring 1960. Further efforts at establishing a separate institute of semiotics capitalised on the support of Berg, the power broker at the academic institutional building, and the connection with cybernetics was explicated in the suggested title »the Institute of Cybernetic Linguistics and Semiotics«.[111] However, this elaborate title was used only to rename the linguistic section under the Committee of Cybernetics in the 1980s. Lacking an autonomous institutional base, Soviet semiotics developed through rather informal circles organised around two Russian scholars, Iurii Lotman at Tartu University, Estonia, and Ivanov in Moscow.

It has been argued that Soviet semioticians forged their connection with cybernetics in an attempt at institutionalising their new field, which was not attracting sufficient recognition from traditional Marxist linguists.[112] Indeed, since the Symposium for the Structural

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107 *Vladimir A. Uspenskii*, Serebrianny vek strukturnoi, prikladnoi i matematicheskoi lingvistiki v SSSR i V.Iu.Rozentsveig, in: *Pospelov/Fet*, Ocherki istorii informatiki v Rossii, pp. 276–279.

108 *Viachislav V. Ivanov*, Akademik A. I. Berg i razvitie rabot po strukturnoi lingvistike i semiotike v SSSR, in: *Pospelov/Fet*, Ocherki istorii informatiki v Rossii, pp. 257–273, here: pp. 258 f.

109 *Iurii Lotman*, Iskusstvoznanie i ›tochnye metody‹ v sovremennykh zarubezhnykh issledovaniiakh, in: *idem/Volodymyr Mykolajevyč Petrov* (eds.), Semiotika i iskusstvometriia, Moscow 1972, pp. 5–23, here: p. 5.

110 *Ivanov*, Akademik, p. 265.

111 Ibid., pp. 265–271.

112 *Aleksei Semenenko*, In Search of Universal Language: The Case of Tartu-Moscow Semiotic School. A paper presented at the conference »Cold War Interactions Reconsidered«, University of Helsinki, October 30, 2009.

Study of Sign Systems was organised in Moscow (1962), Soviet semiotics positioned itself as a hegemonic approach that could devise a ›neutral‹ and ›exact‹ science of culture and society.[113] Retrospectively, Soviet semioticians explained their choice for a more ›mathematical‹ approach as an opportunity to purify their traditionally humanities subject, which was deeply saturated with Marxism-Leninism.[114] Although this attitude could never be openly voiced at that time, it probably was known and contributed to the fact that semiotics never became mainstream in the Soviet humanities.

There was also an intellectual affinity between semiotics and cybernetics. Soviet semioticians emphasised that semiotics, being a hybridised cybernetics or a purified linguistics, could be used as a politically ›neutral‹ instrument of governance. Besides obvious contributions to designing computer language, both mathematical linguistics and semiotics, especially Vladimir Propp's and Algirdas Julius Greimas's theories of narrative, were offered as a resource for decision-making and the modelling of large systems. Lotman, for example, stressed that narrative theory echoed the principles of cybernetics. Although a particular narrative sets constraints on possible turns (read: a physical trajectory in a cybernetic radar control system) by defining the programmatic action of an actor, it also allows a number reflexive choices of possible alternative options at various points.[115] Seeing semiotics as a close sibling of cybernetics[116], Lotman developed a theory of the fine arts as a system that modelled society, for which he was criticised.[117] The leader of the Moscow School, Ivanov, also saw semiotics as an important subfield of cybernetics. According to him, a study of the exchange of signs could be used to regulate human behaviour.[118] This rapprochement opened a new intellectual perspective on governance as a meaning-making process that was not limited to the control of physical information flows and ideological censorship of the contents.

However, it should not be concluded that Soviet semiotics evolved as another tool for the tightening of Party control. In contrast, the translation of semiotics into governance had transformative effects upon the latter. Semiotics smuggled in new normative approaches to meaning-making and communication, which demanded revision of linear, top-down ideological control. For example, a cybernetic model of social development provided an additional rationale for critical studies of the past that went beyond the cliché of class struggle (this approach was best expressed in Lotman's essays on the history of Russian literature). A cybernetic theory of culture and society thus insisted on a more

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113 Lotman argued that there was no need to limit »exact sciences« to mathematical methods. Instead, he suggested the formulation of a metalanguage that would evaluate the statements in all scholarly disciplines against universal criteria of exactness. To construct such a language was the task of semiotics. See *Lotman*, Iskusstvoznanie, pp. 5 f.

114 Author's interview with a Soviet Lithuanian semiotician, Vilnius, Lithuania, April 2006.

115 *Lotman*, Iskusstvoznanie, pp. 15 f.; see also Semioticheskie metody upravleniia v bol'shikh sistemakh, Moscow 1971; *B. V. Biriukov/E. S. Geller*, Kul'tura, iskusstvo – i nauchnaia strogost', in: Tochnye metody v issledovaniiakh kul'tury i iskusstva. Materialy k simpoziumu, Vol. 1, Moscow 1971, pp. 4–16.

116 *Daniel P. Lucid*, Introduction, in: *idem* (ed.), Soviet Semiotics. An Anthology, Baltimore/London 1977, here: p. 2.

117 The criticism of Lotman was part of a broader appeal against the use of methods borrowed from mathematics, information theory and cybernetics in fields of aesthetics and literary criticism. See *Mikhail B. Khrapchenko*, Literatura i modelirovanie deistvitel'nosti, in: Kontekst. Literaturno-teoreticheskie issledovaniia, Moscow 1974, pp. 11–33, here: pp. 11–19.

118 Man can be defined as a mechanism that performs operations on signs and sign sequences. »Semiotics erects a bridge between the human sciences, experimental psychology, physiology, and other natural sciences engaged in the study of man«, *Viachislav V. Ivanov*, The Role of Semiotics in the Cybernetic Study of Man and Collective [1965], in: *Lucid*, Soviet Semiotics, pp. 27–38, pp. 28 and 30 f.

open – both in terms of time and space – model of the Soviet state. On the other hand, the semiotic approach claimed that the signs' systems actively govern human behaviour and, in turn, every receiver is also an active transformer of the signs.[119] This was a significant modification of the authoritarian approach of the one-way and top-down instruction of the population.

IV. The Limits of Purification and Hybridisation

It is rather symbolic that in the Soviet Union a digital computer replaced the popular arithmometer »Feliks«, named after Feliks Dzerzhinskii, the head of the NKVD.[120] However, the power of mathematics, and later cybernetics, to neutralise the techno-sciences and governance from »the political« was rather limited. The strategy of purification was particularly strong at the beginning of the Cold War. Its strength, however, drew on the extreme hybridisation of science and politics under Stalin. The Soviet government had a strong economic rationale for espousing the political neutrality of computer-based sciences, because this legitimised the transfer of these technologies from the West. Soviet scientists in turn had a strong rationale for espousing the political neutrality of the mathematical sciences, because they attempted to reinvent themselves as a professionally autonomous group.

Although constructed as non-political, cybernetics and management science did not have enough power to rehabilitate those individuals, who were already regarded as politically dangerous. Such was the case of Aleksandr Bogdanov, the author of tectology, a theory of universal organisation. Written from 1912/13 to 1922, tectology was conceived as a systems theory which predated some ideas later developed in Ludwig von Bertalanffy's General Systems Theory and Wiener's Cybernetics. Bogdanov's misfortune was that his political views opposed Lenin's vision of a future communist society.[121] Although Bogdanov used such terms as feedback and entropy, as Vesa Oittinen noted, the first positive entry on cybernetics in a Soviet encyclopaedia only listed Wiener, Claude Shannon and John Neumann as key scientists in this field.[122] Only during the relaxation brought about by *perestroika* were the contributions of Bogdanov briefly acknowledged in the first historical overview of Soviet cybernetics, published in 1989.[123]

In the 1970s, for Soviet policy-makers cybernetics was non-political, immune to the friend-enemy divide and therefore useful for governance. Many scholars saw an opportu-

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119 See *Lucid*, Introduction, p. 20. Another famous Russian literary scholar, Mikhail Bakhtin, developed similar ideas about plurality of languages and was inspired by the general systems theory. See *Michael Holqvist*, Dialogism and Aesthetics, in: *Thomas Lahusen/Gene Kuperman* (eds.), Late Soviet Culture: From Perestroika to Novostroika, Durham/London 1993, pp. 155–176.

120 *Ilmari Susiluoto*, The Unfulfilled Promise: Tectology and ›Socialist Cybernetics‹, in: *Vesa Oittinen* (ed.), Aleksandr Bogdanov Revisited, Helsinki 2009, pp. 81–104, here: p. 93.

121 *Aileen M. Kelly*, Red Queen or White Knight? The Ambivalences of Bogdanov, in: The Russian Review 49, 1990, pp. 305–315; *Arran Gare*, Aleksandr Bogdanov's History, Sociology and Philosophy of Science, in: Studies in History and Philosophy of Science 31, 2000, no. 2, pp. 231–248.

122 *Vesa Oittinen*, Preface, in: *eadem*, Aleksandr Bogdanov Revisited, here: pp. 16 f. For more on relation between tectology and cybernetics, see *Ilmari Susiluoto*, The Origins and Development of Systems Thinking in the Soviet Union, Helsinki 1982.

123 *Biriukov*, Kibernetika, informatika, p. 29; *Gaaze-Rapoport*, O stanovlenii kibernetiki v SSSR, p. 60. Although published in the period of increasing freedom of speech (*glasnost*), this volume carefully avoided the discussion of the ban of cybernetics in the 1950s. Rapoport, for example, blamed the »foreign popular press« for misleading interpretations of Wiener's cybernetics that reportedly led to prohibition of cybernetics in the Soviet Union; ibid., p. 63.

nity to hybridise their own disciplines with cybernetics. The application of the cybernetic approach to the economy, linguistics, philosophy and art history was an expression of the hope that cybernetisation would purify these disciplines from the political content. However, in such cases the purifying effect was limited. This was especially evident in ideologically sensitive disciplines like language studies. Regardless of strong backing from Berg, the Institute of Semiotics was never established. Some mathematical linguists were subject to ideological criticisms. For example, Igor Mel'chuk was expelled from the Slavic Languages Institute in 1976 and emigrated to Canada a year later. The next year the Soviet Lithuanian semiotician and poet Tomas Venclova emigrated to the United States.

The high visibility of the hybrid character of cybernetics, as it travelled from one discipline to another, constituted another problem. Although cybernetics assumed the role of a vehicle for mathematical purification, its neutral status as a component of non-political governance was gradually eroded. This was particularly evident in the economic sphere. As Pekka Sutela put it, systems theory and cybernetics were not fit to set particular goals. The goals were still described by the political economy of socialism.[124] Another case of the limitations of purification via cybernetics was internal institutional competition. For instance, Soviet management thought was increasingly specialised into different schools[125]; members of the game theory school were eager to make a distinction from the cybernetics school.[126] The visible hybridity of cybernetics was at odds with the notion of a proper science which was unitary, located within clearly delineated disciplinary and institutional boundaries. Probably it was a will to mask this hybridity of cybernetics which drove the replacement of the term »cybernetics« with »informatics« in the 1980s.[127]

V. Conclusion

According to Alexei Kojevnikov the notion of pure science bordered on the »nonsensical« in the socialist regime. However, this article suggests that post-Stalinist governance had a strong demand for ›pure‹ techno-science. Pure techno-science was a resource that was non-political: Emancipated from the friend-enemy divide, it was therefore politically useful. From this resource of pure techno-science Soviet policy-makers could borrow neutral instruments of governance. Accordingly, they could copy the models of governance developed in capitalist countries. Furthermore, they could directly collaborate with capitalist scientists in developing such models, as happened at IIASA. It is not a paradox that the introduction of cybernetics, or a theory of control, could be and was a liberalising force in the Soviet Union.

Soviet cybernetics played a particularly important role in the boundary making between governance and the political. Starting with the 20th Party Congress (1956), governance was increasingly de-politicised in the Soviet Union. This was achieved by mobilising a double strategy: a) declaring that *some* sciences and techniques were politically neutral, b) applying these sciences and techniques to the intellectual and material organisation of governance. In the terms of actor-network theory, Soviet governance underwent purification. Post-Stalinist and post-Khrushchev campaigns were very sensitive to the ›cult of personality‹. For this new ideological orientation, cybernetics and systems theory appeared to offer a kind of ›governance without the government‹. Economic data processed

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124 *Sutela*, Socialism, Planning and Optimality, p. 175.

125 *Richard F. Vidmer*, Soviet Studies of Organization and Management: A ›Jungle‹ of Competing Views, in: Slavic Review 40, 1981, pp. 404–422.

126 Author's interview with a Soviet Lithuanian economist, Vilnius, Lithuania, December 2005.

127 *Dmitrii Aleksandrovich Pospelov*, Stanovleniie informatiki v Rossii, in: *Pospelov/Fet*, Ocherki istorii informatiki v Rossii, here: p. 38.

by computer could be understood as a disembodied ›governor‹. As Pertti Lindfors put it: »[A]n ›Alphaville-type‹ cybernetic-automated scientific dictatorship is still a lesser evil than the Stalinist-Hitlerian party-bureaucratic artists' dictatorship«.[128]

Cybernetics was increasingly hybridised as it was institutionalised as a ›science of governance‹, translated into Marxist-Leninist terms and used as an umbrella term for all computer-technology hungry disciplines. In this way cybernetics came to mean many things in the Soviet Union: It became synonymous with management, but was also identified with computer-based steering and computer technologies in general. As a result, cybernetics emerged as a genuine hybrid that cut across different natural science, engineering and humanities disciplines. It escaped from laboratories into public discourses: It was not unusual even for a chairman of a decrepit collective farm to declare that one applied the foremost, cybernetic methods of management.[129]

This hybridisation of cybernetics stirred a new purification reaction. If in the 1950s a cybernetician was regarded as politically suspicious by the authorities, in the 1980s a cybernetician was regarded as scientifically suspicious by many scientific communities. Once again, Soviet cybernetics was ›more than just a science‹: It was regarded as an occupation which was not worthy of proper scientific status. As one Soviet scientist put it: »[C]ybernetics was and remained a pseudo-science«.[130] Indeed, this quote expresses the key result produced by the international and interdisciplinary travels of cybernetics, namely, the revelation that both techno-science and politics actively co-produce each other through intertwined practices of purification and hybridisation.

128 *Pertti Lindfors*, Marxilaisuus ja tiede. Tutkielma tieteellisestä sosialismista, Helsinki 1967; cf. *Susiluoto*, The Unfulfilled Promise, p. 82.

129 *Rindzeviciute*, Constructing Soviet.

130 Author's interview with a Soviet Lithuanian mathematician, Vilnius, Lithuania, December 2005.