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Physics moves to the provinces: the Siberian physics community and Soviet power, 1917–1940

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Abstract. The rich tradition of Siberian science and higher education is little known outside Russian academic circles. Using institutional history, this article focuses on the founding and pre-war period of the Siberian Physical Technical Institute, the establishment of its research focus and its first difficult steps to become a leading centre of R & D in Siberia. Based on archival materials, the article describes how local and national physicists justified the institute's creation by demonstrating ties with industry and building on the presence of a cohort of locally trained physicists, whose numbers were augmented by Leningrad specialists. The strength of local cadres enabled the institute to navigate civil war and cultural revolution successfully. Physicists were able to take advantage of ongoing industrialization campaigns to gain support to create the institute, although local disputes and economic problems slowed its further development. The article describes the circulation of scientific, political and philosophical knowledge between Moscow, Leningrad and the provinces, and the impact of Bolshevik rule and Stalinism on the Siberian physics enterprise.

According to some estimates, on the eve of its break-up the USSR boasted one-quarter of the world's physicists. It matched the US in the nuclear arms race, it was the first to attach a reactor to a civilian grid in Obninsk in 1954, and it put the first person into space. Its Nobel laureate physicists included Igor Tamm (1895–1971), Lev Landau (1908–1968) and Petr Kapitsa (1894–1984) – and Andrei Sakharov, who won the Nobel Peace Prize. These are all the more significant accomplishments given the modest state of physics research and development in the empire on the eve of the Russian Revolution in 1917. Working quickly with the new Bolshevik government, scientists took the initiative to establish a series of research institutes still in existence a hundred years later. They worked with fellow scientists and officials to expand the physics enterprise to Central Asia, the Urals region and Siberia. Scientists were celebratory about their institutional achievements.

Physicists established one such regional centre in Tomsk, Siberia – the Siberian Physical Technical Institute (hereafter SFTI), founded in the late 1920s with a focus

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on solid-state physics, radio and optical electronics, radiophysics and medical materials. The scientists who founded SFTI survived Russia's violent civil war and overcame powerful forces of political (and scientific) centralization to create a leading provincial centre of R & D.[1] Local physicists at Tomsk State University (TGU) who were trained in the tsarist era were joined by talented young specialists who transferred to Tomsk from Leningrad, enabling the staffing of the new institute. In the 1930s the ability of these researchers to connect their research to the ongoing mining, metallurgy and transport efforts during a period of rapid industrialization and cultural revolution protected SFTI from purges that hit other educators and researchers in the nation. SFTI thus was a product of what Graham refers to as 'revolutionary innovation' in matching the Soviet requirement that science serve the masses and especially the state, and of international borrowing from the European model of institutes that were somewhat insulated from social concerns by government support.[2] The decision to establish SFTI also benefited from the so-called empire-building efforts of Abram Ioffe (1880–1960) and other leading Leningrad physicists to establish a network of research centres near industry in the provinces. This paper explores how SFTI maintained independence in selection of research direction after lengthy debate with Leningrad physicists and Moscow officials over the research programme, for example the extent to which it should reflect the concerns of Moscow officials or the interests of Leningrad physicists.[3]

Over the past years a number of scholars have refined understandings of Soviet science concerning the circulation of knowledge, including the impact of Stalinism on the sciences. This article is centred on organizational questions, and hence more precisely is an institutional history, not a history of the movement of physical expertise per se. But we do consider circulation of physical, political, economic and ideological ideas and their impact on SFTI's history. We offer a bottom-up view of the culture and politics of science, and illuminate the dynamics of Soviet science and the surprising flexibility that existed for research programmes and scientists in a highly centralized system. Research institutes opened windows both on society and on the government. Through those on one side, the physicists engaged with citizens during very public campaigns about the transformation of a traditional agrarian society into an industrial one under the watchful direction of the Communist Party. Through the other windows the

1 I.N. Anokhina, V.M. Vymiatnin and A.I. Potekaev, *Fiziki o Fizike i Fizikakh*, Tomsk: Izdatel′stvo NTL, 1998; S.F. Fominykh *et al.*, eds., *Pism'a Fizika iz Tomska*, Moscow: Znanie-Inform, 2006.

2 Loren Graham, 'The formation of Soviet research institutes: a combination of revolutionary innovation and international borrowing', *Social Studies of Science* (1975) 5, pp. 303–329. In *Stalin's Great Science: Times and Adventures of Soviet Physicists*, London: Imperial College Press, 2004, Alexei Kojevnikov, building on the work of others, discusses the importance of a 'revolutionary combination of utopianism and utilitarianism' that emerged in Russian science after the First World War, and the difficult relationship between scientists and the Bolsheviks, although one of accommodation. Others who have covered the history of Soviet physics in this period include M.S. Sominskii, *A. F. Ioffe*, Leningrad: Nauka, 1964; and Yuri Ranyuk, Iu.V. Pavlenko and Iu.A. Khramov, *Delo UFTI*, Kyiv: Feniks, 1998. They add little to the history of SFTI or the development of research in Siberia.

3 The Cold War was crucial to the post-war growth of SFTI as the Soviet government accelerated research on Siberian resources in the effort to expand the scientific enterprise beyond the Urals, and, connected with that, to establish such closed Siberian cities connected with the nuclear weapons enterprise as Tomsk-7.

physicists engaged with the government and the Party for increased funding, new equipment and more positions for staff. They asked for flexibility to determine research programmes, including theoretical regions, at the same time as many state officials wanted immediate results of benefit to the economy. The physicists played up their contributions to industrialization, transport, electrification and so on, while finding within their budgets sufficient funds to embark on new research programmes – quantum and nuclear physics, for example.

This article makes a contribution to regional history and to understanding the role and impact of specific Siberian conditions on the development of science. At first, physicists faced the challenges of civil war, of competing with Moscow and Leningrad specialists for funding, and of navigating the powerful tendency of Bolshevism towards centralization of power.[4] They had to deal with low population densities that discouraged investment. At the same time, many officials recognized the richness of the region's natural and mineral resources that required increased budgets from Moscow to support the expansion of industry, higher education and scientific research. Next, they felt pressure to follow the research programme of the Leningrad Physical Technical Institute under Abram Ioffe, who had taken the lead to create a series of regional research centres in the late 1920s, of which SFTI was but one. The Siberian physicists managed to chart their own research programme and to demonstrate its importance during the industrialization campaign of the 1930s. Once SFTI had opened, the physicists faced pressures from the centre to confirm to political, economic and ideological dictates from Moscow. They had to engage scientific negotiation with Leningrad physicists and personal rivalries in Tomsk. In addition, close supervision of their activities by local and regional Party officials, including the threat of purges, firings and arrests, created obstacles to smoothly functioning research programmes, as happened elsewhere in the USSR.[5]

In the twentieth century, scientists generally sought maximum autonomy for determination of their research programmes with as few strings as possible on their funding and institutions. Yet at the same time they were accountable to the state for political and financial support, to their colleagues for verification and approbation, and to the public for its tacit support. Pulling them from one side was the belief that goals should be established and funds distributed by qualified, practising scientists. From the other was the demand that basic science should be accountable to the government – and in the Soviet case to the proletariat.[6] As the Soviet system evolved in the 1930s, Party officials and ideologues applied a strict notion of accountability, with research to be connected directly to state economic, military and cultural programmes as set by

4 A number of Tomsk students and professionals, and Siberian intellectuals generally, supported the idea of *oblastnichestvo* – the political (and democratic) self-rule of Siberia – in part because of the need to compete with Moscow and Petersburg for funding.

5 Russian sources on the history of SFTI include S.F. Fominykh, ed., *Sibirskii Fiziko-Tekhnicheskii Institut: Istoriia Sozdaniia i Stanovleniia v Dokumentakh i Materialakh (1928–1941)*, Tomsk: NTL, 2006; and S.A. Nekrylov, *Tomskii Universitet: Pervyi Nauchnyi Tsentr v Aziatskoi Chasti Rossii (seredina 1870-x–1919 gg.)*, Tomsk: Izdatel′stvo TGU, 2010.

6 Heather Johnston Nicholson, 'Autonomy and accountability of basic research', *Minerva* (1977) 15, pp. 32–61.

the Communist Party. Scientists worked within this system to protect their autonomy to the greatest extent possible, producing planning documents that created zones of flexibility where they might embark on new research, finding that flexibility also in the largesse given to scientific institutions during the industrialization campaigns, and negotiating the system of constraints and controls as nimbly as possible.

Siberian backwaters: Tomsk and Tomsk Region

Provincial cities in any country struggle for attention and resources from the centre, especially in those countries with highly centralized bureaucracies that focus attention on capital cities. This was one of the many reasons for the lag in the development of Siberian human and natural resources. Yet because of the tsarist practice of exiling activists and intellectuals for their dissent or crimes against the state, by the late 1800s a critical mass of the Russian intelligentsia had gathered in or near Tomsk, a picturesque town on the Tom river that became the home of the first university in the Russian Empire east of the Ural mountains.

Local initiatives and popular support were critical for provincial science before the Russian Revolution. For example, well before the Bolshevik embrace of space as a focus of research and tool of propaganda, professionals and popularizers supported research on the cosmos. This was important since there was little state backing in provincial cities for science, technology or public education.[7] In Tomsk, local initiatives led to the founding of physics as a university discipline, although its first leading figures ultimately quit Tomsk for Petersburg to be closer to cutting-edge research in their fields.

The idea for the creation of a Siberian university dated to the beginning of the nineteenth century among leading educators. Concrete efforts to establish a Siberian higher-educational institution lagged until after the great reforms of the 1860s (the emancipation of the serfs, the *zemstvo* and court reforms, and university reforms). In a choice between Tomsk and Omsk as the site of the future Tomsk Imperial University, the authorities settled on the presence of a large number of well-educated exiles of the tsarist regime – perhaps one-fifth of the city's residents – in Tomsk.[8] The university opened in 1888. Tomsk Polytechnical Institute (TTI, founded in 1896 and opened in 1900) grew out of the movement under Minister of Finance Sergei Witte to create engineering and trade schools to support industrial modernization that he saw as the key to the nation's future. Meanwhile, other such institutes opened in Odessa and Petersburg.[9]

7 Asif Siddiqi, *The Red Rockets' Glare*, Cambridge: Cambridge University Press, 2010. Scientific popularizers and voluntary associations helped secure support for cosmic research from local and national bureaucracies.

8 Fedor Grigor′ev, 'Pervyi Universit Sibiri Stroilsia Pochti 100 Let', *Kommersant*, 6 June 2011, at www.kommersant.ru/doc/1639007.

9 Sergei Witte, *The Memoirs of Count Witte* (ed. and tr. Sidney Harcrave), vol. 1, Armonk, NY: M.E. Sharpe, 1990, pp. 324–326.

Siberian physics research at the university expanded under Nikolai Gezekhus (1845–1919). Gezekhus, who lamented Russia's scientific lag behind Europe, established the university's Department of Physics. Like most other leading scientists, Gezekhus had studied abroad. He had an illustrious career, graduating from St Petersburg University, for a short time serving as secretary of the Russian Physical Chemical Society, moving as full professor to Tomsk in 1888, and briefly acting as rector there. He moved back to Petersburg after personality clashes and a growing feeling that the nascent physics in Tomsk provided little opportunity for him, and in response to his desire to be closer to unfolding Russian and European work on molecular physics. (He also pined for classical music; he played violin as a hobby in a string quartet.) In Petersburg, Gezekhus edited the *zhurnal* of the society from 1911 to 1918. But the war and Revolution placed cities under immense stress, and Gezekhus died of starvation in Petrograd – as did seven of forty-two full members of the Academy of Sciences.

Boris Veinberg (1871–1942) spent more energy than Gezekhus in building the physics discipline in Tomsk, although he too returned to the centre of Russian physics, Petersburg, due to a feeling of isolation. Veinberg organized a department of physics at TTI in 1909, giving further impetus to provincial science, and teaching there from 1909 to 1924.[10] In addition to being a researcher, Veinberg was an educator and a popularizer of science. He organized Siberian Higher Women's Courses; women did not have direct access to tsarist universities. He also created a Siberian aerotechnical club. But Veinberg saw greater opportunities to follow his astronomical interests by transferring to the Main Physical Observatory in Pulkovo as director in 1924.[11]

If the hope was to establish leading research and educational programmes in Siberia, then these efforts in Tomsk were first handicapped by inadequate support from the tsarist government and then disrupted by the Russian Revolution and Civil War, as they were throughout the nation.[12] During the First World War, scientists and the tsarist regime determined to cooperate in the national interest with the establishment, at scientists' initiative, of a commission for the study of the nation's resources for economic and military purposes, KEPS. But KEPS lacked adequate facilities or staff, and had a small budget. KEPS was a sign of what might be accomplished if the state supported the scientific apparatus in a more regular fashion, but it was grudgingly

10 See B.P. Veinberg, *Solnechnye Opresniteli*, Leningrad: VNIIVST, 1933; and Veinberg, *Led*, Moscow and Leningrad: Gosizdat Tekhteorlit, 1940. For biographical information see T.P. Kravets, 'Boris Petrovich Veinberg [Nekrolog]', *Uspekhi Fizicheskikh Nauk* (1945) 27; Iu.D.K., 'Pamiati B.P. Veinberga', *Meteorologiia i Girdologiia* (1947) 6; and especially S.I. Kuznetsova, 'Trudnaia Sud′ba Professora TTI B.P. Veinberg', *Izvestiia Tomskogo Politekhnicheskogo Universiteta* (2009) 315, pp. 198–202.

11 Galia Vsevolodovna Ostrovskaia, 'Moi Ded, Professor B.P. Veinberg: Uchastnik Sozdaniia Dorogi Zhizni', *Rosnauka*, 15 December 2015, at http://rosnauka.ru/publication/408. Veinberg refused to leave Leningrad during the blockade when his institute was evacuated, and died of starvation; one of his last contributions to the city was the ice 'Road of Life' along Lake Ladoga that enabled supplies to get in and people to get of out Leningrad.

12 Tsarist administrators were not enamoured of the hard sciences and even ignored such figures of world reputation as Dmitrii Mendeleev, who contributed greatly to the development of the nation's oil industry, yet never was elected to the Imperical Academy of Sciences.

accepted by the tsarist regime only in 1916, too late to ensure any great research results.[13]

Scientific communications were interrupted in Russia during the war, when subscriptions to international journals lapsed or were lost, when laboratories fell into disrepair and when scientific contacts with Europe ruptured. In Siberia, nearly anarchic conditions prevailed. The Civil War of 1917–1921 between the Bolsheviks and their allies (the Reds) and their opponents (the Whites, mostly monarchists, and others) displaced tens of millions of people, with as many as 12 million people dying of famine, war or genocide. Siberia was loosely under control of the Bolsheviks from autumn 1917 to summer 1918, especially along the Trans-Siberian Railway; after this Socialist-Revolutionaries (SRs) soon prevailed owing to their support among the peasantry, especially in Irkutsk and Tomsk provinces. The Whites secured vast parts of Siberia, relying on SR and European support, and also on low population densities and distances. The Whites were not a homogeneous group, but a shifting amalgamation, and they cared about power, not about classes (peasants, Cossacks) and national groups: still less about education and science.[14]

Ultimately, two rival White power centres arose, the SR-dominated assembly in Samara and the more right-wing Provisional Siberian Government in Omsk. These effectively paralysed one another. This divide led Arctic explorer Admiral Alexander Kolchak to seize power in November 1918. But while recognized for nearly two years internationally as leader of Russia, at home he was ineffectual as self-proclaimed dictator. His Council of Ministers never served as a government, and his armies arbitrarily requisitioned grain and soldiers, enforced high taxes and lived by corruption. The Russian population hardly supported the Whites in these circumstances after years of war and the hardships of civil war. In January 1920, Kolchak was arrested by the SRs in Irkutsk and handed over to the Bolsheviks, who shot him. The Bolsheviks went on to crush White opposition.[15]

Yet during this difficult time, Siberian specialists kept focus on a local agenda to advance physics research and took advantage of political turmoil to organize a new research centre, the short-lived Institute for the Study of Siberia, in which a number of physicists took part. A kind of forerunner of the Siberian division of the Academy of Sciences, it was established under Kolchak's government. Founded in January 1919 under the direction of Kolchak's minister of education, V.V. Sapozhnikov, its focus was 'scientific–practical research on nature and the peoples of Siberia toward the end

13 Kojevnikov overstates the importance of KEPS for tsarist science, although its successors in the Soviet period, including the so-called SOPS, were quite successful. Alexei Kojevnikov, 'The Great War, the Russian Civil War, and the invention of big science', *Science in Context* (2002) 15, pp. 251–254.

14 Jonathan Smele and David Collins, *Kolchak i Sibir': Dokumenty i Issledovania, 1919–1926*, White Plains, NY: Kraus International Publishers, 1988; Oliver H. Radkey, *The Unknown Civil War in Russia: A Study of the Green Movement in the Tambov Region, 1920–1921*, Stanford, CA: Stanford University Press, 1976; Peter Kenez, *Civil War in South Russia, 1918–19: The Defeat of the Whites*, Berkeley: University of California Press, 1977; and N.I. Kakurin and I.I. Vatsetis, *Grazhdanskaia Voina, 1918–1921*, St Petersburg: Polygon, 2002.

15 The Red Army beat what was left of the White forces in Crimea in late 1920, while some battles continued on the periphery for two more years, and armed national resistance in Central Asia lasted until 1934.

of the most rational use of the national wealth of the region and its cultural economic development'.[16] Sapozhnikov, a distinguished botanist and geographer whose career took him from Perm to Tomsk, organized support for scholars caught in Tomsk during the Civil War and gained subsidies for research institutions in the city. The institute had six departments, including geography, botany, history and ethnography, and was directed by Sapozhnikov, with Veinberg as deputy director. The institute sponsored expeditions and research in TGU and TTI. However, soon after the Bolshevik victory over the Whites the institute closed.

On local initiative, Tomsk scientists managed to open a physical-mathematical department at TGU. The department benefited from evacuees from the Civil War in the European part of the nation, especially faculty from Kazan and Perm University, including N.N. Semenov.[17] Semenov (1896–1986), a future Nobel laureate in chemistry, was unable to continue his studies, or to return the Petrograd University during the Civil War. He made his way to Tomsk. In September, with the retreat of the White Army from Kazan to Tomsk, a number of teachers and students of the university were evacuated, as were others in summer 1919 from Perm University. The physical-mathematical department had no vacancies, but Veinberg offered Semenov a position in his laboratory, where Semenov carried out several small independent research projects. Semenov organized a scientific seminar that built upon an important Petersburg tradition begun at the iniative of the Austrian scholar P.S. Ehrenfest to ensure familiarity among all participants with current scientific literature.[18] From October 1918, this seminar met thirty-five times and involved scholars from as far away as Omsk. In 1919 Semenov was called up into Admiral Kolchak's White Army, but managed to get a teaching deferment. In December he was mobilized into the Red Army in the radio service. After discharge, in winter 1920 Semenov found positions at Tomsk and Perm universities. With the end of the war he returned to Leningrad to head the laboratory of electronic phenomena of the newly established Leningrad Physical Technical Institute (hereafter LFTI). Semenov contributed to the founding of SFTI by supporting the efforts of the Siberian physicists, meeting officials in Moscow and on occasion journeying to Tomsk.

In spite of the hardships of 1917, the Bolshevik coup, the programme of War Communism (state control of the economy, strictures on strikes, confiscation of grain, 'military' rules in many sectors of society, rationing and so on) and the Civil War, many scientists greeted the Russian Revolution with enthusiasm – though many mistrusted the Communists. They encountered a regime that in word and in deed supported the scientific enterprise. They founded hundreds of new national and local associations and began to publish a series of new journals. Until the Communist Party subjugated their societies in the late 1920s, the scientists had relative autonomy in establishing research direction and avoided the ideological interference that later hampered their

16 *Trudy S'ezda po Organzatii Instituta Issledovaniia Sibiri*, Tomsk: IIS, 1919, part 4, p. 1.

17 A.N. Sorokin, 'Etapy Stanovleniia i Razvitiia Nauchnogo Soobshchestva Fizikov Sibiri v Kontse xix–xx v', *Fundamental'nye Issledovaniia* (2013) 11–16, pp. 1268–1272.

18 On Ehrenfest's active role in the Petrograd physics community see V.Ia. Frenkel', *Erenfest–Ioffe: Nauchnaia Perepiska, 1907–1933 gg*, Leningrad: Nauka, 1973.

work under Stalin.[19] The organizational efforts of Tomsk scientists benefited from this environment of revolutionary creativity. It helped that their demands for resources were few, and also that they sent their requests to the Bolshevik Commissariat of Enlightenment, whose European-educated commissar, Anatoly Lunacharskii, shared with Vladimir Lenin the belief that so-called tsarist specialists were necessary to the government to rebuild industry and agriculture.[20]

The experience of physicists in founding the LFTI reveals in sharp relief all of these issues. Under the leadership of director Abram Ioffe and others, Russian physicists took advantage of government interest in science to overcome poverty, international isolation and decrepit facilities to found new research centres. They did many things: renovated shells of buildings into research centres (in the case of LFTI, a former hospital); hired employees; and won government funding, including allocations of hard currency. With this they were able to buy machinery and equipment and repair facilities, to travel abroad to re-establish contacts, and to buy journal subscriptions. They worked successfully with officials in Lunacharsky's main administration for science, Glavnauka, to resolve many of these problems, and also with the Scientific–Technical Administration of the Supreme Economic Council. LFTI secured support from both sources to expand rapidly, to equip a modern institute and to pursue the expansion of the physics enterprise in the provinces.[21]

The first steps to SFTI involved the creation of an applied-physics research centre at TTI. As a later director of SFTI, M.A. Krivov (1916–1984), recalled in 1978, the creation of this Institute of Applied Physics in 1922 'revealed both the presence of sufficiently qualified scholars and their determination to organize their research'.[22] The institute had a formal structure of director, an advisory board for its day-to-day operation, and an academic council for long-range plans. However, it did not have its own laboratories, budget or staff. Rather the physicists used labs of the TTI (physical, metallographic, mechanical and mineralogical), and also the physics laboratory at the university.[23] Veinberg was the first institute director. When he left in 1924 for Leningrad, I.A. Sokolov (1881–1957) took over and remained as its head until its reorganization into SFTI. At the first meeting of the advisory board in May 1923 under Veinberg the physicists considered organizational questions, the responsibilities of existing staff and the difficulties of hiring new staff.[24] They sought to hire V.D. Kuznetsov (1887–1963) as a senior scientist, but he joined the institute only in October 1924 because of responsibilities elsewhere, in the capacity of deputy director. Serious financial problems slowed the commencement of any research.

19 On the explosion in the number of societies see S.F. Ol′denburg, *Nauka v Rossii: Spravochnik Sostavlen Kommissiei 'Nauka v Rossii' pri Rossiiskoi Akademii Nauk*, Moscow: Gosizdat, 1923. On the accommodation between scientists and the Bolsheviks see also Kojevnikov, op. cit. (2).

20 Sheila Fitzpatrick, *The Commisariat of Enlightenment: Soviet Organization of Education and the Arts under Lunacharsky*, New York: Cambridge University Press, 1970.

21 Paul Josephson, 'Science policy in the Soviet Union, 1917–1927', *Minerva* (1988) 26(3), pp. 342–369.

22 Arkhiv SFTI. f. M.A. Krivov. D. 'Doklad na Torzhestvestvennom Sobranii Kollektiva, Posviashchennogo Piatidesiatiletiiu so Dnia Organizatsii Instituta', l. 2.

23 Gosudarstvennyi Arkhiv Tomskoi Oblasti (hereafter GATO), f. R-1638, op. 1, d. 7, l. 1.

24 GATO, f. R-1638, op. 1, d. 2, l. 1.

The recovery of the Bolsheviks' New Economic Policy (NEP) of the mid-1920s led to economic and political stability in Tomsk, although it remained a poor provincial city, while Moscow and Leningrad institutes commanded the attention of, and resources from, the national Party elites. Living conditions in Tomsk remained precarious, especially after Tomsk lost its status as a provincial capital in 1925. The Revolution, Civil War and later Stalinist repressions had a tremendous impact on its social and political life and infrastructure. As one indicator, in 1930, of 125 kilometres of city roads, only five were paved or cobblestone; the rest were mud. There were virtually no automobiles, only a small government truck park, and plans for tramlines were realized only in 1949, trolleybuses only in 1965.[25]

Yet by the beginning of 1926 the Institute of Applied Physics had nineteen staff members, including four senior scientists.[26] The modest budget of the institute came mostly from local government, whose officials believed that applied science would help expand local industry. It was designated 14,738 roubles in 1927–1928 and 14,612 in 1928–1929, with over 10,000 roubles of those sums designated for salary costs.[27] (There were approximately two roubles to the US dollar at that time.) Pay was poor, the equivalent of roughly eighty roubles a month. It was on a par with other university and teaching salaries of Siberian institutions, but 50 per cent lower than an office clerk might receive. It was a pittance compared to salaries in 1913 – and much lower than those in Moscow or Leningrad.[28] This made it difficult to attract central scientists, let alone to carry out research.

The institute drew together three existing research programmes, one at TGU under Kuznetsov, the physics laboratory of TTI where Sokolov and V.M. Kudraivtseva worked, and the metallographic laboratory of TTI. With the arrival of Tartakovskii and Dmitrii Ivanenko (1904–1994), research in theoretical physics was added as a programme. The names of research groups changed and scientists moved from one group to another. In 1927–1928 the researchers engaged primarily in solid-state physics, in such projects as the photoelectric effect in mono- and polycrystals, the separation of ions in centrifuges, explanation of the mechanism of internal friction, determination of the surface energy of crystals, methods to define strength and potential in crystals, and the mechanical properties of monocrystals.[29] They considered their major achievements to lie in metallography and metallurgy, and on the strength of other materials crucial to demonstrating SFTI's responsiveness to industrial demand.

Tomsk physicists slowly gained a national reputation, in part through the increasingly active Russian Association of Physicists (RAF), a national organization that was part of the flourishing in numbers and membership of all sorts of scientific and professional societies. In 1924 the RAF held their fourth meeting, in which Tomsk physicists took part, and Kuznetsov, as their leader, gave eight talks; Tomsk physicists presented about 10 per

25 Tomskye Defektoskopy, 'Tomsk v 1930–1940-x godakh' (2012), at http://idea4.westsib.ru/tomsk.
26 Tomskye Defektoskopy, op. cit. (25).
27 Tomskye Defektoskopy, op. cit. (25).
28 V.L. Soskin, *Sibir', Revoliutsiia, Nauka*, Novosibirsk: Nauka,1989, pp. 91–92.
29 GATO, f. R-1638, op. 1, d. 3, l. 6 ob.

cent of the total number of papers.[30] The leadership of the congress (O.D. Khvolson, P.P. Lazarev, Ioffe and Ehrenfest) praised this work in a letter to the Sibrevkom (the Siberian Revolutionary Committee, the regional Party organization):

> Professor of Physics of TGU V.D. Kuznetsov in truly difficult circumstances has organized in Tomsk vital scientific work, attracted young scientific workers and students to it, and [has] achieved a series of very valuable results that were well received at the fourth congress of physicists in Leningrad. Taking into consideration the fact that Tomsk is the only large scientific centre in Siberia … we draw the attention of the Sibrevkom to the crucial necessity to support Professor V.D. Kuznetsov. We repeat, the works of V.D. Kuznetsov have great theoretical interest, and his great energy permits us to hope that he will succeed in organizing in Tomsk a first-class physical technical laboratory.[31]

Thus the nation's leading physicists endorsed the idea of establishing an independent physics institute in Siberia as early as 1924.

Established in 1918, the fledgling RAF rapidly expanded into a professional organization of corporate spirit, national significance and international reputation. After the Civil War, even as the Bolsheviks secured firm political and military power, the liberal economic policies of the NEP enabled scientists to expand professional activities, to express a corporate spirit and to work with foreign colleagues with relatively few encumbrances.[32] If the first meetings were relatively small, and held under financial strain and deteriorating professional conditions owing to civil war, then by the fourth in Leningrad in 1924 over 426 attendees gathered to hear 162 presentations and to celebrate the growing institutional foundation of their discipline. At the sixth RAF meeting in September 1928 physicists celebrated their achievements with a journey down the Volga river on a steamship, stopping in a number of cities to lecture on quantum mechanics and other new discoveries. If, to the physicists, the steamboat trip signified their achievements in ten years of Soviet power, then to increasingly militant Party bureaucrats it reflected the aloofness of scientists from the needs of industry and the demands of an intensifying class struggle. The physicists held one more meeting in Odessa in August 1930, but within a few weeks the Party subjugated their association to the Commissariat of Heavy Industry (Narkomtiazhprom), leaving no doubt that officials expected them to be accountable to economic programmes of importance to the nation.[33]

Physical technical institutes for regional industries

Building on Bolshevik interest, scientists successfully lobbied in the 1920s to establish a large number of new research centres that served as a counterbalance to the centralizing forces of Soviet science policy. Scientists learned to stress the ways in which their

30 V.N. Kessenikh, 'Nauchno-Tekhnicheskie Itogi 5 Let Raboty SFTI', *Trudy Sibirskogo Fiziko-Tekhnicheskogo Instituta* (1934) 2(3), p. 3.

31 GATO, f. R-815, op. 1, d. 546, l. 15.

32 Ol′denburg, op. cit. (19).

33 Paul Josephson, *Physics and Politics in Revolutionary Russia*, Berkeley: University of California Press, 1991, pp. 72–81, 130–138.

applied-research programmes supported state plans for economic modernization. The Bolsheviks did not, strictly speaking, interfere with scientific research and development in the 1920s. Distance from Moscow enabled the creation of new centres, although constraints in terms of funding persisted far from the centre. This distance enabled a kind of local autonomy: self-organization and initiative. Yet the organization of Soviet science reflected political tendencies: it quickly became highly centralized, especially from the Stalin era onward. This enabled not only the significant influence of the state over the direction of research, but also that of Moscow and Leningrad research centres, where one institute, individual or school of thought often dominated an entire branch of research, across the USSR.

The Tomsk physicists understood the challenge of gaining funding and from the start attempted to demonstrate how their research and the needs of Siberian industry were commensurate, especially for the development of the Kuznetsk basin located between Tomsk and Novokuznetsk, one of the largest coal mining regions in the world.[34] The Trans-Siberian Railway gave the first impulse to the development of the Kuzbass; Stalin's five-year plans for industrialization provided the second. According to its founders and Party officials, SFTI research was essential to the further exploitation of the Kuzbass.[35]

In 1927 Ioffe and Semenov set out a plan to meet growing national industrial demand by creating a network of FTIs with research to reflect interests of local industry. Within the year Ioffe had taken practical steps towards organizing institutes in Kharkiv (UFTI), Sverdlovsk (UralFTI), Dnepropetrovsk (DFTI) and Tomsk, in part with funding from VSNKh (the Supreme Economic Council). Ioffe was personally familiar with VSNKh personnel through his creation of LFTL (Laboratory), a facility immediately responsive to industry that consisted of the labs and personnel of LFTI. The FTIs would focus on concrete economic problems, for example new energy–industrial complexes in the Don basin (DFTI) and the Ural–Kuznetsk region (SFTI). Ultimately, in spite of the support of Leningrad physicists, disagreements over the institute's precise profile and its first director delayed its opening, as did the very poor conditions of life and work in Tomsk.[36]

Although LFTI physicists provided leadership, impetus, laboratory resources and several employees for the new physical technical institutes located close to industry, it was the presence of a core group of local physicists, with a research programme of relevance to local industry and transport, that was the true key to success. In this case, Vladimir Dmitrievich Kuznetsov played the vital role. He had had the idea of organizing such an institute in Tomsk since 1925. With administrative and organizational experience, he threw himself behind the effort. To help him in the effort he drew on personal

34 Fominykh, op. cit. (5), p. 70.

35 Arkhiv SFTI, Krivov, l. 2; and Elena Borisovna Kaimashnikova, 'Istoriia Stanovleniia i Razvitiia Ugol′no-Metallurgicheskikh Gorodov Kuzbassa v 20-x – seredine 80-x gg. XX v.', candidate dissertation, Novokuznetsk, Siberian State Industrial University.

36 A.D. Kosterev, 'Perepiska V.D. Kuznetsova kak Istoricheskii Istochnik', in *Sbornik Materialov III Vserossiiskoi Nauchno-Prakticheskoi Konferentsii s Mezhdunarodnym Uchastiem*, Tomsk: Izdatel′stvo TGU, 2008, p. 369; and GATO, f. 1562, op. 1, d. 698.

connnections with such Leningrad and Moscow physicists as Ioffe; Semenov; P.P. Lazarev, a biophysicist and leading Moscow specialist; Iakov Frenkel′, one of Leningrad's outstanding theoreticians; and several future scientists at SFTI, including P.S. Tartakovskii and M.I. Usanovich.

In February 1927 Lazarev (1878–1942) announced his support for the institute. He wrote to Kuznetsov, 'It seems to me that such a central institute, created under your leadership, may play a great role as a unifying force for all work in physics. From my point of view, I welcome your preliminary efforts'. Lazarev 'gladly' offered his help in the matter.[37] Simultaneously, Lazarev published an article in *Krasnoe Znamia*, the major regional newspaper, in which he detailed the need to create such an institute in Siberia. Like other physicists, Lazarev drew on the language and spirit of the time to stress industrial applications. He wrote, 'In essence we cannot refer to any region of technology or medicine where to one degree or another physics does not play a major role'.[38] He stressed the potential significant contribution of Tomsk physicists to the economy. Moreover, they would serve as the nucleus around which the other sciences would grow, especially if their efforts were joined to those of the nation's leading physics institutes.[39]

Kuznetsov was encouraged by Lazarev's article. It generated local support. The matter had already been taken up by the university administration, which requested that the Tomsk Municipal Council provide the institute with a building; in Soviet Russia, all housing, office buildings, every potential square metre of space was closely and jealously guarded by local authorities. Kuznetsov pushed for a separate facility, not only a room or rooms in an existing building. He cited Lazarev's article in support of his request, and received initial, unanimous support from the university administration.[40] The deputy director of LFTI, Semenov, also endorsed the project. In March 1927, apparently after a visit to Tomsk, he wrote an article in *Krasnoe Znamia* arguing that local physicists merited support and contended that the investment would pay for itself many times over. He wrote, 'Precisely in Tomsk, physics is in a very good situation owing to the work of Kuznetsov. We may boldly state that of all provincial centres in the USSR, Tomsk is in first place according to its significance and its research in the area of physics'.[41]

In spite of general agreement about the need for a Siberian, broad-profile institute, differences of opinion over budget and staffing led to long negotations and to bruised egos. In April 1928 Kuznetsov sent a proposal to Glavnauka in which he outlined the reasons to support the institute. He argued that local scholars and institutions were behind the project. He pointed to the crucial importance of Siberia in the economic development of the country, with the new institute to be directed towards the development of local

37 Fominykh, op. cit. (5), p. 59; and GATO, f. R-1562, op. 1, d. 718, l. 11.

38 P.P. Lazarev, 'O Fizicheskom Institute v Sibiri', *Krasnoe Znamia*, 6 March 1927, n.p. See also GATO, f. 1562, op. 1, d. 546, l. 18.

39 GATO, f. 1562, op. 1, d. 546, l. 18 and l. 87.

40 GATO, f. 1562, op. 1, d. 698, l. 37.

41 Lazarev, op. cit. (38); and G.V. Maier and S.F. Fominykh, 'Tomskii Period v Zhizni Akademika N.N. Semenova', at http://tsu.ru/university/tsutoday/semenov.php, accessed 15 December 2015.

productive forces, not to mention the nearby Kuzbass coal–metallurgical region. Kuznetsov proposed four departments: physical, electrotechnical (with laboratories of strong currents and radiology), medical physics (medical instruments and biophysics), and a production centre with its own workshop and production facility.[42] Kuznetsov anticipated generating ample funding through contracts between the production facility and businesses, research centres and hospitals around the country. Such contracts might cover repairs of X-ray apparatus, the production of measuring instruments and rheostats, repairs of motors and dynamos, and perhaps consultations with the Tomsk railway and communications offices.[43] This plan could not be met in the short term, owing to significant initial expenses required, not to mention difficulties in staffing.[44]

Kuznetsov encountered resistance first of all because of the cost of the project. He set salaries two to three times higher than those in Moscow and Leningrad as an incentive to attract physicists from the relative comfort of Moscow and Leningrad to Tomsk.[45] The equipment, much of which would have to be acquired abroad, was costly. Kutznetsov explained, 'If you begin with 40,000 roubles, then this means that several years will be occupied only with [acquisition of] equipment, and not scientific work. But if you receive immediately 300,000 or 400,000 roubles, then the organization of FTI as an independent institute may begin'.[46] His proposal hypothecated 229,825 roubles for equipment alone.[47]

The powerful Leningrad physicists proposed an alternative plan that reflected their concerns and their interest in directing the overall national physics research programme. Semenov rejected the idea for the creation of an institute entirely independent of TGU and TTI. He suggested that Kuznetsov raise the question with the Siberian Region Central Executive Commitee to enlist its support in the creation of SFTI as vital to Siberian industry, to secure the interest of the Council of Ministers and the VSNKh, and to lobby Glavnauka (with the help of LFTI physicists).[48] He recommended that he and Kuznetsov meet in Moscow with the heads of central bureaucracies. Regarding expenses, the Leningraders, knowing well the particularities of the funding mechanisms of the Soviet bureaucracy, advised Kuznetsov 'not to think too highly of himself', to 'watch his appetite' and to limit the request to 40,000 roubles.[49] LFTI offered to provide staff to the new institute, in part to keep an eye on research. Of fifteen staff positions, five would be from LFTI: the deputy director, two physicists and two assistants.[50] While he was widely respected, some people believed that Kuznetsov indeed thought too highly of himself. But he defended his plan with vigour. He wrote to Semenov to protest

42 GATO, f. R-1562, d. 698, l. 31; and Fominykh, op. cit. (5), pp. 75–80.
43 GATO, f. R-1638, op. 1, d. 6, l. 36.
44 Fominykh, op. cit. (5), p. 80.
45 Fominykh, op. cit. (5), p. 17.
46 GATO, f. R-1562, op. 1, d. 695, l. 32.
47 Fominykh, op. cit. (5), p. 80.
48 GATO, f. r-1562, op. 1, d. 718, l. 12.
49 Fominykh, op. cit. (5), p. 64.
50 GATO, f. r-1562, op. 1, d. 718, ll. 12–13.

against a budget of 40,000 roubles as wholly inadequate for staff, equipment and laboratories.[51]

Another LFTI physicist, M.I. Korsunskii (1903–1976),[52] contributed to the SFTI project. After joining LFTI, Korsunskii spent 1928 in Berlin on a fellowship in theoretical physics at a time when many Soviet physicists were abroad with support of the Rockefeller Foundation.[53] He returned briefly to LFTI, before being sent to Tomsk, where he organized X-ray and nuclear laboratories, finishing his career after the Second World War in the newly founded Kazakh Institute of Nuclear Physics. Korsunskii worried that Kuznetsov intended much too elaborate an institutional structure, and urged him to have fewer departments, especially considering the relatively small number of scientific staff.[54] LFTI, with sixty scientific workers, had in all only four laboratories, while SFTI would have a staff of forty only by the end of the first five-year plan. Generally, the Leningrad physicists agreed that higher salaries were indeed reasonable given the challenges of daily life in Tomsk, but not that Kuznetsov's plan should include also a house with spacious apartments for leading scholars.

Still other disputes about SFTI arose among the members of Tomsk scientific society. Several Tomsk physicists expressed doubts about the utility of opening an FTI and about the long-term prospects for its development given the existence of other physics laboratories. A clear indication of this was the suggestion from Leningrad colleagues that Kuznetsov transfer to Leningrad and leave Tomsk to a protégé. At one time Kuznetsov seriously considered the possibility because of the efforts of radical young communists to seize control of the university from professional educators in the name of class war. This phenomenon of conflict between so-called bourgeois specialists and communist cadres had become more pronounced since the rise of Stalin. Through a process known as *vydvyzhenie* ('advancement'), the Communist Party inserted working-class 'specialists' with the appropriate world view into educational and scientific institutes. Some of them were trained in a branch of the Institute of Red Professoriat at TGU.[55] Kuznetsov did not flatter these communists: 'This group does not consist of students who love science, who love to study and who revere science … but of people far from science who express themselves as great specialists and imagine themselves people with great bureaucratic talent'.[56] Kuznetsov continued, 'I love science and I live for it, and I cannot tolerate it if the university were transformed from a scientific institute into some kind of social institution in which, in the first instance, should prevail social, political, and union status'. He also criticized some

51 Fominykh, op. cit. (5), p. 66; and GATO, f. r-1562, op. 1, d. 698.

52 Ia.E. Genkin, 'Moisei Izrailevich Korsunskii', *Uspekhi Fizicheskikh Nauk* (1963) 81(4), pp. 778–781.

53 Viktor Frenkel′ and Paul Josephson, 'Sovetskie fiziki: Stipendiaty Rokfellerovskogo Fonda', *Uspekhi fizicheskikh nauk* (1990) 160(11), pp. 103–134.

54 Fominykh, op. cit. (5), pp. 100–101.

55 On the Institute of Red Professoriat and other such Bolshevik institutions see Michael David-Fox, *Revolution of the Mind: Higher Learning among the Bolsheviks, 1918–1929*, Ithaca, NY: Cornell University Press, 1997.

56 GATO, f. R-1562, op. 1, d. 698, l. 17.

teachers who, in his words, 'did not have any scientific baggage [but strove] with all of their power to preserve their position or advance it further'.[57]

Kuznetsov had sharp conflicts with I.A. Sokolov, TTI professor and director of the Institute of Applied Physics. Sokolov studied and taught theoretical physics at Kazan University. In September 1918 he was evacuated to TGU, like a number of other physicists who eventually settled in Tomsk. He became director of the institute, with a staff of eight physicists, including Kuznetsov. He studied radioactivity, electrolysis and medical physics. At the beginning of 1930 he was forced to cease teaching in the medical department of Tomsk University because students accused him of anti-Soviet propaganda, and in 1937 he fell under the suspicion of the NKVD. Here, as for many Soviet citizens, the twists and turns of his life become cloudy. He later worked at the Siberian Chemical Technical Institute and the Tomsk Grain Elevator Institute. He chaired a section of the 1934 West Siberian conference of physicists on coal. But there is no other information in the archives about Sokolov's activities from 1934 to 1940. Eventually he occupied the chair of the physics department at the Rostov Institute of Railway Enginers in 1939, and died in 1943.

Kuznetsov seems to have encountered hesitation, if not outright opposition, from Sokolov.[58] According to Kuznetsov, Sokolov did not see the need to organize an FTI in Siberia, asserting that industry had never sought out research from his institute. Kuznetsov believed that Sokolov would have to be forced to accept the founding of SFTI because he believed it threatened the Institute of Applied Physics, and would accept SFTI only if he became director.[59] The disagreement over SFTI also hurt the relationship between Kuznetsov and V.M. Kudravtseva. Kuznetsov offered the following not-so-flattering observation to Semenov: 'You write that I should forget about the insult from I.A.S[okolov] and fully trust V.M.K[udriavtseva], whom you praise very much. I never doubt your recommendations, but all the same it seems to me that I know V.M. better than you. I can trust only someone who is sincere from start to finish'.[60]

Vera Mikhailovna Kudriavtseva (1899–1950) may have objected to the formation of a new physics institute without her active participation in the process and because of her support for Sokolov. The career path of Kudriavtseva indicated the new possibilities for professional women after the Russian Revolution. In the autumn of 1916, Kudriavsteva entered the natural-science division of Siberian Higher Women's Courses (tsarist universities, strictly speaking, were not open to women). She stood out as an assistant at the astronomical observatory of Tomsk University, gaining Semenov's attention and an invitation to transfer to LFTI. Like other students and teachers, she struggled in cold and hungry Leningrad – the Revolution and Civil War disrupted supplies to the city, and she returned to TGU at the end of 1922 to lecture and work on a number of topics (meteorology, crystals and the solid state with Kuznetsov; photoconductivity with

57 GATO, f. R-1562, op. 1, d. 698, l. 17.

58 S.F. Fominykh, V.V. Kushch and A.I. Potekaev, 'Organizatsiia SFTI i ego Deiatel′nost′ v Predvoennyi Period: Istoricheskii Ocherk', in Fominykh, op. cit. (5), pp. 7–54, 19.

59 Fominykh, op. cit. (5), pp. 66–67.

60 GATO, f. R-1562, op. 1, d. 695, l. 74.

M.A. Bol′shannina; and gas discharge and spectra with P.S. Tartakovskii).[61] In the 1930s a conflict arose between the SFTI theoreticians under Tartakovskii, with whom Kudriavtseva allied, and the experimentalists under Kuznetsov.

In part because of these personality conflicts, and also because of the need to attract qualified young specialists, Kuznetsov considered it impossible to rely solely on Tomsk physicists to staff SFTI. He sought a healthy relationship with LFTI to solve this problem.[62] Ioffe and Semenov shared his view. The fact of the matter is that, owing to the poor material conditions of life in Siberia, few individuals in Leningrad or Moscow desired to transfer to Tomsk. They considered it provincial and distant from good physics. Kuznetsov therefore insisted upon a material stimulus, in the form of higher salaries from Glavnauka, to attract talented specialists from the centre.

For his part, Ioffe remained convinced of the necessity of scientific and cultural centres in the republics and periphery. The concentration of scientific forces in Leningrad and Moscow enabled the creation of sufficiently strong scientific schools,[63] but prevented the rapid growth of the enterprise throughout the nation. In letters to VSNKh Ioffe championed the creation of high-profile applied-physics institutes in Kharkiv, Dnepropetrovsk and Tomsk.[64] Ioffe and Semenov succeeded in convincing M.I. Korsunovskii, P.S. Tartakovskii and M.I. Usanovich, 'talented and energetic workers, fully prepared for independent activity',[65] to make the trek to Siberia given the 'national significance of this matter'. Tartakovskii agreed to become assistant director and head of the laboratory of electronic processes, while K.D. Sinel′nikov (a specialist in electrical properties of dielectrics), Korsunskii (a specialist on X-ray physics) and A.I. Leipunskii (electronic chemistry) all agreed to join him.[66]

The contribution of Petr Savvich Tartakovskii (1895–1940) to the successful opening of SFTI indicates the importance of the LFTI staff members to the future of Siberian physics. Tartakovskii, a specialist in technical electronics, popularized the field among physicists and engineers alike. Like most of the other physicists whom we have encountered, Tartakovskii came from a middle-class family. He studied the photoelectric effect at Kyiv University, publishing widely in leading national and foreign journals. Tartakovskii was a member of a fledgling Ukrainian Committee to Study Atomic Structure, moving to LFTI in 1924 and to SFTI at the beginning of 1929. In 1934 he helped organize the first Western Siberian Conference of Physicists, where he lectured

61 A.D. Kosterev, *Nauchnaia Biografii Akademika V.D. Kuznetsova*. Tomsk: n. p., 2008, p. 69. In 1938, with Natalia Aleksandrovna Prilezhavaeva, Kudriavtseva became one of the first two members of the Union of Women Physicists. In her later career she was dean of the Physics–Mathematics Department at the university and from 1944 prorector of the University of Scientific Research, and in 1949 she moved to Kazakhstan to became director of the newly founded Physics Institute of the Kazakh Academy of Sciences – as part of a national, post-war effort to continue the expansion of the scientific enterprise into the provinces and republics – but she died suddenly in 1950 before completing this assignment.

62 Fominykh, Kushch and Potekaev, op. cit. (58), p. 16.

63 GATO, f. R-1638, op. 1., d. 6, l. 41.

64 N.M. Mitriakova, N. Ia. Moskovchenko and T.M. Koroleva, *Nauchno-Organizatsionaia Deiatel′nost′ Akademika A.F. Ioffe. Sbornik Dokumentov*, Leningard: Nauka, 1980, pp. 110–128.

65 GATO, f. R-1638, op. 1, d. 6, l. 52.

66 Fominykh, Kushch and Potekaev, op. cit. (58), p. 12.

on 'Paths of development of quantum electrodynamics'. In 1937 he returned to Leningrad, where he died suddenly in 1940.[67]

Ioffe, Kuznetsov and other specialists met in Moscow in late April 1928 and together presented the project for SFTI to the deputy director of Glavnauka, M.P. Kristi. Kristi was an old Bolshevik with European, not militant, communist sensibilities; he served in Narkompros from 1918, from 1926 as deputy director, and from 1928 as the director of the Tretiakov Gallery. The meeting was a success; Kuznetsov returned to Tomsk with an agreement in principle to open SFTI. A little later, in summer 1928, Kuznetsov sent Glavnauka a 'Project Proposal for a Siberian Scientific Research Institute', in which he provided a detailed description of the institute and its major foci, as well as describing its intended cooperation with industry and its training functions.[68]

Opening the institute: local disputes over space and direction

Finding an appropriate building was a major problem. As noted, the Institute of Applied Physics did not have its own facilities, but used laboratories of TTI and TGU. Clearly a new institute could not exist in such circumstances. In spring 1927 the administration of the university energetically proposed that the municipal authorities consider a separate building for the institute. A search committee first settled on the dormitory of the workers' remedial department (*rabfak*) that had previously been the Mikhailovsk Hospital. The building was small and needed repairs, so the commission next identified a building that had served the tsarist provincial administration. More problems arose. The editorial board of *Krasnoe Znamia* had its presses, bookbindery and other facilities in this building, and refused to vacate the premises unless given a better facility and 50,000 roubles to move.[69]

Kuznetsov gave his own reasons why the institute should not coexist with a bookbindery. First, the institute planned an auditorium with a two-hundred-person capacity, and even with the press occupying only one floor, the building was too small for both inhabitants. Second, of course the 'intolerable' vibrations and noise from the printing presses would interfere with physics research – with the 'highly sensitive instruments (mirror galvanometers, electric motors and so on)'.[70] Kuznetsov wrote to the publishing house, 'You are the only obstacle at present for the realization of the physics institute'. The institute's move was put off by almost a year until the press was transferred into new quarters early in 1932. Thus, like LFTI, which inherited a tsarist hospital, SFTI took over a tsarist-era building intended for other purposes; the presence of large rooms and tall ceilings, typical for its type, enabled relatively easy remodelling into laboratories and offices.[71]

67 N.N. Petrov and I.I. Petrova, 'Rytsar Novoi Fiziki: K 100-Letiiu so dnia Rozhdeniia P.S. Tartakovskogo', *Vestnik Rossiiskoi Akademii Nauk* (1995) 65(5), pp. 443–451.

68 GATO, f. R-1638, op. 1, d. 6, l. 84.

69 Fominykh, op. cit. (5), p. 66; and GATO, f. r-1562, op. 1, d. 698.

70 GATO, f. R-1562, op. 1, d. 695, l. 50.

71 Architectures contribute to the flow of people and ideas, as Peter Galison and Emily Thompson, eds., and their co-authors show in *The Architecture of Science*, Cambridge, MA: MIT Press, 1999. The designers of

Approval of the site did not mean that things moved smoothly. First, the original plan for remodelling and equipping the building included an apartment for the director, like Ioffe's in the LFTI main building. Initially there was no objection to this. But the authorities removed the apartment from the final plan, perhaps because it was too ostentatious for Tomsk. Kuznetsov took it personally, as expression of a lack of trust and a personal insult.[72] Next, while Kuznetsov, the Leningrad physicists and Tomsk scholars largely shared a belief in the desirability of a new institute, a number of Tomsk scientists raised concerns about aspects of its structure, financing and status. The plans climbed slowly up the bureaucratic ladder. Finally, on 8 August 1928, Kuznetsov presented the formal project to the presidium of the Sibkraiispolkom. He argued that the creation of SFTI would strengthen science throughout Siberia, attract new scientific cadres, and guarantee highly qualified specialists for industry. He underlined the fact that the foci of the institute coincided with problems of the economic development of Siberia, in particular exploitation of the resources of the Ural–Kuznetsk basin.[73]

After brief discussion, the Sibkraiispolkom approved the opening of SFTI in Tomsk in the autumn of 1928. They informed VSNKh about the transfer and reorganization of the Institute of Applied Physics into SFTI, and approved LFTI's close supervisory role for the new institute. Of course, Sibkraiispolkom members considered it vital that SFTI focus in the first place on questions of Siberian industry, and ordered interested local and regional economic, public-health and trade organizations (Kraisovnarkhoz, Kraizdrav and Kraitorg) to give material support to the institute for equipment in the amount of a very modest 10,000 roubles.[74] Narkompros in Moscow passed along a sheaf of documents to the Council of Ministers, securing SFTI's creation. Korsunskii arrived at the end of September in Moscow with instructions from Ioffe and Semenov to get SFTI up and running as well as possible. He brought along a historical study composed by leading physicists about the creation of research institutes in the periphery intended for Tomsk and Kharkiv scientific audiences.[75] In a telegram of 22 October, Narkompros confirmed the creation of SFTI as of 1 October; the temporary director of SFTI would be Sokolov until 8 March 1929, when Kuznetsov would become its first director.[76]

Kuznetsov was quite upset that he was not appointed immediately. He complained to Korsunskii,

> I presented the organization of SFTI this way. First, a director, his deputy and the academic secretary would be appointed; this advisory board would be charged with the organization of the institute and hiring of workers. What's happened here? Temporarily I.A. Sokolov remains the director. You could suppose that [he] is charged with the organization of SFTI, with the

Akademgorodok chose the architecture of buildings and their physical layout with respect to one another in part to promote interdisciplinary scientific discussions and research.

72 GATO, f. R-1562, op. 1, d. 695, l. 52 об.

73 Fominykh, Kushch and Potekaev, op. cit. (58), pp. 21–22.

74 Fominykh, op. cit. (5), p. 89.

75 Fominykh, Kushch and Potekaev, op. cit. (58), p. 23.

76 GATO, f. R-1638, op. 1, d. 6, l. 132.

allocation of budget and for the preliminary selection of staff. There will be a competition for the position as director.[77]

Kuznetsov knew that the competition would drag out and that Sokolov would remain director, at least until 1929. Consequently, all preliminary organizational issues fell on someone whose leadership was likely only temporary.

Of course, it was hard to organize SFTI in such difficult conditions and without the full support of the university faculty. Was Kuznetsov merely consumed by self-interest to head the first physics institute in the eastern part of the country, or did he have a sincere desire to develop science and Siberian industry? Kuznetsov was clearly a careerist and he reacted with great hurt to the designation of Sokolov as first director of SFTI. At the same time, his actions as director indicate that he fully sought to create a centre for Siberian science. He defended the physicists from growing attacks among Party officials concerning the utility of their work and the consonance of their philosophical views with dialectical materialism.

Siberian physics in the 1930s: centralization and provincial science

While the Bolsheviks created a highly centralized political, economic and cultural system, local concerns and conditions continued to matter. For SFTI they mattered during the Civil War, when Siberian scientists struggled to keep at work in most unpropitious conditions. They mattered again in the 1920s, during the boom in science when Party officials and specialists worked relatively well together to increase the scale, quality and international reputation of Soviet science. They mattered yet again in the 1930s during the broader dislocations and national traumas, together with the achievements of the Stalinist cultural revolution, rapid industrialization and forced collectivization. At times forced to pick up the scraps of funding allocated from Moscow to better-known institutes, at other times benefiting from the significant expansion of the R & D network nationwide; at times escaping the great pressures to conform to central dictates, and at others succumbing to the ideological forces of Stalinist science policy, Siberian physicists succeeded in establishing a strong regional centre that operates to this day.

On the surface, SFTI physicists quickly became regional leaders in the efforts to create a Siberian scientific enterprise, even if the institute did not significantly grow in terms of number of personnel. In 1929 the institute had twenty staff members, seventeen graduate students and seventeen laboratory workers. With roughly the same numbers, its research programme by 1934 covered three major areas with ties to industry: solid-state physics, physics of electromagnetic waves, and spectroscopy. On the eve of the Second World War, sixty scientists filled the institute.

Stalinist science policies nonetheless had a significant impact on the practice of Siberian physicists. This was due to the power of the government's various commissariats, ministries and administrations, together with the power of the presidium of the

77 GATO, f. R-1638, op. 1, d. 695, l. 45.

Soviet Academy of Sciences, to insist upon and enforce politico-cultural norms. By the late 1920s, the Communist Party sought to direct educational and cultural activities through the imposition of Stalinist conventions and the establishment of autarky. In the 1930s the government subjugated the Academy of Scientists to central control, moved its presidium from Leningrad to Moscow, and pushed for communist cadres to occupy positions of responsibility throughout the scientific enterprise. Granted, the number of research centres outside Moscow and Leningrad increased, at the same time as those in Moscow and Leningrad grew in size substantially, and state funding expanded, all of which gave scientists greater flexibility in pursuing such new directions of research as nuclear physics and low-temperature physics.[78] But the ability to embark on new fields of research was accompanied by new forms of 'accountability'. First, Party officials and bureaucrats endlessly pressurized scientists to find connections between their research and the burgeoning needs of industry.[79] Second, researchers were now accountable to ideological and philosophical constructs and slogans of 'class war', 'no fealty' to the West, the rooting out of 'wreckers' and the rejection of 'idealism'.

Recent literature on the nature of Stalinist science has focused on the dynamism of a variety of disciplines during the Stalin era, and the ability of specialists, working together with political authorities, to develop ways and rituals of dealing with the pressures to conform to new dictates for science, at the same time influencing and altering those dictates.[80] We do not deny the existence of these rituals, nor their importance to the vitality of Soviet science. In the Soviet system, as in any system, it was important to play by the rules of the game and cultivate patrons. Nor do we assert in the least that this period was uniform in the nature and variety of political pressures, economic imperatives and ideological concerns that surrounded scientists. But the human costs of the system under Stalin cannot be ignored, nor the way in which scientists, philosophers and others took advantage of that system for personal gain.

As an institute distant from Moscow in space and time, SFTI may have avoided the most powerful forces of control during the Stalin period and was of less interest to the authorities because it was not so large and well equipped as UFTI or LFTI. But its personnel always faced pressures to respond to central dictates of science in support of industry and an ever-growing intrusion of Party institutions into the sphere of research. Indeed, the case of SFTI reveals that, while disagreement over the nature of Stalinist science remains among historians to this day, there can be no doubt that extrascientific adjudication of disputes was a feature of that science – that philosophical concerns had

78 V.M. Tuchkevich and Viktor Frenkel', *Vklad Akademika A.F. Ioffe v Stanovlenie Iadernoi Fiziki v SSSR*, Leningrad: Nauka, 1980.

79 On the pressures of working at UFTI in this environment see Ranyuk, Pavlenko and Khramov, op. cit. (2); and B.F. Gromov, ed., *A.I. Leipunskii: Izbrannye Trudy i Vospominaniia*, Kyiv: Naukova Dumka, 1990.

80 Krementsov explores the influence of the Stalinist system on the professional culture of scientists and how they learned to work the system. Focusing on the First World War and the Cold War, Krementsov explores the foreign-policy determinants of domestic science policy, and especially the Cold War. Still, most of the policies and practices of Stalinist science were already in place already in the mid-1930s. See Nikolai Krementsov, *Stalinist Science*, Princeton, NJ: Princeton University Press, 1997. Siberian scientists did not develop the patron–client relationship that Petr Kapitsa, Sergei Vavilov and other central specialists had with Stalin. See, for example, P.L. Kapitsa, *Pis'ma o Nauke, 1910–1980*, Moscow: Moskovskii Rabochii, 1989.

great urgency and often intruded dangerously into the daily work of specialists. Its scientists toiled in international isolation, and careers and lives suffered.[81]

What was this Stalinist system for science? The self-proclaimed Stalinist 'great break' with past practices involved cultural revolution and an overturning of institutions and ideologies in any way connected with the bourgeois past. For education, cultural revolution meant relying heavily on the class origin of individuals to determine their fitness for matriculation – and the creation of special workers' departments to help the proletariat advance.[82] According to Vladimir Lenin, the tsarist expert or 'bourgeois specialist' was a 'natural materialist' and must be trusted to assist in building the industry and technology needed to modernize the USSR.[83] Under Joseph Stalin, specialists of any stripe, but especially bourgeois specialists, were treated with mistrust and were seen as irremediably hostile to the working class. Party officials attacked the old professoriat with the goal of replacing it with scholars of the proper social origin and world view. The first show trials in the USSR, known as the Shakhty and Industrial Party 'affairs', precisely brought engineers and other specialists to account for alleged wrecking.[84] If the Communist Party needed specialists to modernize industry, its members never really accepted the 'bourgeois specialists' as reliable, and the Leninist view of the need to rely on them for expertise was replaced by Stalinist mistrust.[85]

In this environment, while not to the degree in Moscow, Leningrad or Kharkiv, Tomsk physicists fell under attack for perceived programmatic and ideological failings. Three events or phenomena indicate that the circulation of extrascientific ideas from Moscow to the provinces – to Tomsk – had unexpected and dangerous impacts on science generally and on physics in particular. These were the rise of autarky in science, the blanketing of science with dialectical materialism and the pressure to conduct research of an applied nature at the expense of basic research.

81 In the review essay 'Was there ever a "Stalinist science"?', *Kritika: Explorations in Russian and Eurasian History* (2008) 9(3), pp. 625–639, Michael Gordon addresses such issues as autarky and international circulation of knowledge, Bolshevik intensions and programmes, and what the study of disciplines other than biology can tell us in answering the titular question.

82 On cultural revolution in Russia see Sheila Fitzpatrick, 'Cultural revolution in Russia 1928–32', *Journal of Contemporary History* (1974) 9(1), pp. 33–52; and Fitzpatrick, ed., *Cultural Revolution in Russia, 1928–32*, Bloomington: Indiana University Press, 1978. On the Chinese experience see Chunjuan Nancy Wei and Darryl E. Brock, eds., *Mr Science and Chairman Mao's Cultural Revolution: Science and Technology in Modern China*, Lanham, MD: Lexington Books, 2013. On scientific dissidence in China see Richard C. Kraus, 'The lament of astrophysicist Fang Lizhi: China's intellectuals in a global context', in Arif Dirlik and Maurice Meisner, eds., *Marxism and the Chinese Experience: Issues in Chinese Socialism*, White Plains, NY: M.E. Sharpe, 1989, pp. 294–315.

83 V.I. Lenin, 'O Znachenii Voinstvuiushchego Materializma', *Pod Znamenem Marksizma* (March 1922) 3, pp. 5–12.

84 Loren Graham, *The Ghost of the Executed Engineer*, Cambridge, MA: Harvard University Press, 1993.

85 L.I. Pystina, *'Burzhuaznye Spetsialisty' v Sibiri v 1920-e – Nachale 1930-kh Godov. Sotsial'no-pravovoe Polozhenie i Usloviia Truda*, Novosibirsk: Izd-vo Instituta Arkheologii i Etnografii SO RAN, 1999; S.A. Krasil'nikov, *Shakhtinskii Protsess 1928 g*, 2 vols., Moscow: Rosspen, 2011–2012; and Krasil'nikov, *Inteligentsiia Sibiri v Pervoi Treti XX Veka*, Novosibirsk: Sova, 2007. See also V.L. Soskin, S.A. Krasil'nikov, T.N. Ostashko and L.I. Pistina, *Vlast' i Intelligentsiia v Sibirskoi Provintsii. Konets 1919–1925 gg.: Sbornik Dokumentov*, Novosibirsk: Ekor, 1996.

First, an autarkic environment prevailed in Soviet science from the 1930s until the 1950s, the brief period of contact permitted between the USSR and its Western allies during the war notwithstanding. Granted, scientific activities were carried out in laboratories and university classrooms against the backdrop of national and international physics research, and in this way autarky hardly existed. Yet at the end of the 1920s, the Soviet government gradually closed the borders on science, limiting travel and publication. The scientists felt this isolation keenly. The exceptions prove the rule. For example, a small number of physicists – Lev Landau, Iakov Frenkel′ (1894–1952), George Gamov (1904–1968), among others – had travelled to Europe and the US with Rockefeller International Education fellowships. But these were ended by 1931, and in all only seven of twenty-three total fellows were physicists.[86]

The door closed firmly. On Stalin's orders, the secret police put future Nobel laureate Peter Kapitsa under house arrest, forcing him to give up his position in Cambridge, England, to remain in Moscow. George Gamov eventually escaped to the West, but from this point on very few individuals travelled abroad to meetings or conferences – until the late 1950s. Soviet scientists felt immense pressure not to publish abroad. Soviet physicists published fully 16 per cent of the articles in *Zeitschrift für Physik* in 1926, but 0 per cent in 1937, while the UFTI journal *Physikalische Zeitschrift der Sowjetunion*, established to ensure scientific priority for Soviet physicists through publication in German, was shuttered that same year.[87] Some scientists who had been abroad or had published in Western journals risked the serious charge of anti-Soviet activity. A campaign against them in the central press eventually spread to the provinces. In academic councils around the nation, scientists voted whether to send an article or reprint abroad, and usually refused rather than risk a charge of sharing information with a foreign agent. To our knowledge, none of the Siberian physicists travelled abroad.

Judging by materials in the physics institute archives of Kyiv, Moscow and Leningrad, scientific exchanges and visits recommenced after Stalin's death, at first with scientists from the socialist countries of Eastern Europe. Greater openness in exchanges with Western specialists followed the Geneva conferences on the peaceful uses of atomic energy in the mid-1950s. But control of bodies and information remained the rule until the collapse of the USSR. Nobel laureate Vitaly Ginzburg (1916–2009), a loyal Communist Party member, sharply criticized the bureaucracies of science that were geared to isolating it both at home and abroad, slowing information flows, preventing publication, restricting use of copying machines and preventing travel abroad as late as 1988.[88]

By the same token as physicists' ideas circulated between Moscow, Leningrad and the provinces, so too did concerns about the Marxist philosophy of science, dialectical materialism (sometimes called *diamat*) and the sciences. In the area of physics many philosophers were concerned that new discoveries in relativity theory and quantum

86 Frenkel′ and Josephson, op. cit. (53). Kojevnikov, op. cit. (2), pp. 80–85, notes the support for theoretical physicists in the Soviet Union in philanthropy from the Rockefeller Foundation that allowed them to travel abroad, but does not acknowledge this article.

87 Josephson, op. cit. (33), pp. 170–171.

88 V. Ginzburg, 'Protiv Biurokratizma, Perestrakhovki i Nekompetenentnost', in Iu.N. Afanas′ev, ed., *I Nogo ne Dano*, Moscow: Progress, 1988, pp. 136–144.

mechanics (the 'New Physics') suggested subjectivity and indeterminacy, not the existence of objective reality and determinism. They accused the physicists of idealism. It is true that many physicists engaged with Marxist philosophy over these points in their work as a matter of conviction.[89] Many others engaged with Marxist philosophy because of the debates swirling around them, some because epistemological questions of relativity theory and quantum mechanics interested them, others because they took note of debates among Marxist scholars about the issues. Still others considered Marxist philosophical concerns out of a sense of urgency to protect their discipline from encroachment from Stalinist ideologues against charges of idealism in the New Physics. Among those physicists who engaged with Marxist philosophy, many observers have pointed to the efforts of Igor Tamm, Lev Landau and Boris Hessen. Perhaps the most famous case is Hessen (1893–1936), still known for his 1931 London presentation on the economic roots of Newton's *Principia*.[90]

If dialectical materialism provided fertile ground for several physical ideas, then certainly the majority of physicists would have preferred to do their research without it being forced upon them – judging from extensive archival evidence and the large numbers of leading physicists who wrote nothing on the subject. And if physics experienced great successes – Landau, Kapitsa and Tamm completed work in the 1930s for which they won Nobel Prizes after Stalin's death – it also faced significant ideological interference. Landau served time in prison. Kapitsa was under house arrest again in the late 1940s and lost the directorship of his own institute. Matvei Bronshtein was arrested and shot. Virtually the entire astrophysics community in Pukovo, outside Leningrad, was purged and several of its members were murdered.[91] In many cases it did not help to know the rituals, lexicons and rules of the Stalinist game of science to avoid arrest and the gulag.

89 See Loren Graham, *Science, Philosophy and Human Behavior in the Soviet Union*, New York: Columbia University Press, 1987; David Joravsky, *Soviet Marxism and Natural Science, 1917–1931*, Cambridge, MA: Harvard University Press, 1961, among many others, have examined the important place of *diamat* in Soviet science. We would propose that as soon as Stalin died this importance nearly vanished. Quickly such physicists as Ginzburg agitated for an Academy of Sciences convocation to celebrate the fiftieth anniversary of relativity theory two years hence. In 1958 leading Academy of Sciences personnel held a special so-called All-Union Convocation of Conference of Philosophers, to re-establish their priority in philosophical matters, to insist that philosophical concerns were subservient to scientific ones. See P.N. Fedoseev *et al.*, eds., *Filosofkie Problemy Sovremennogo Estestvoznaniia*, Moscow: Izdatel′stvo AN SSSR, 1959.

90 It must be noted that Hessen's work on Newton was his only effort in historical-materialist explanations, and likely an Aesopian defence of relativity theory and quantum mechanics. See Loren Graham, 'The sociopolitical roots of Boris Hessen: Soviet Marxism and the history of science', *Social Studies of Science* (1985) 15(4), pp. 705–722. Hessen's works on relativity theory, quantum mechanics and *diamat* did not provoke broad response among physicists, but only among Marxists. See Boris Hessen, *Osnovnye idei teorii otnositel′nosti*, Moscow: Moskovskii Rabochii, 1928; and Hessen, 'K voprosu o probleme prichinnosti v kvantovoi mekhanike', introduction to Artur Gass, *Volny Materii i Kvantovaia Mekhanika*, trans. P.S. Tartakovskii, Moscow and Leningrad: Gosizdat, 1930, pp. v–xxxii. See the classic study of the debate between the Mechanists and the Deborinites, Joravsky, op. cit. (89), which describes the epistemological concerns raised by both groups and the outcome of their confused and confusing discussions. See ibid., pp. 279–287, for a discussion of the reception of relativity among different schools of physicists and Marxists.

91 Robert McCutcheon, 'The 1936–1937 purge of Soviet astronomers', *Slavic Review* (1991) 50(1), pp. 100–117.

Scientists in Tomsk faced similar processes and pressures that challenged them to defend their discipline from charges of lack of commensurability with industrialization plans or such ideological failings as fealty to Western scholarship. They attempted to engage, if not to forestall, Party interference by creating open seminars that publicly demonstrated concert between research and politics. At SFTI Tartakovskii led a general institutional seminar to discuss current works of Soviet and foreign scholars, for example on the nature of the electrical breakdown of dielectrics.[92] V.N. Kessenikh (1903–1970) initiated a campaign of resistance against the militant Marxists whose main targets were Tartakovskii and Korsunskii. The Marxists accused Tartakovskii and Korsunkii of holding metaphysical beliefs, denying Marxist–Leninist dialectics and displaying counterrevolutionary sentiments. The campaign against the two physicists did not become large in scale, perhaps because the local contingent of Marxist philosophers was not well versed in the New Physics. In any event, after the theoreticians publicly confessed mistakes the matter faded away.[93] In 1933 Tartakovskii was accused again of surrounding himself with 'hostile social elements' that he had allegedly brought into the department of theoretical physics.[94]

Another major concern of Stalinist leadership was applied science in service of the economy, the military and the proletariat. SFTI physicists pointed to the promise of industrial applications and local economic benefits through contracted research directed towards concrete problems. They celebrated their early successes in April 1934 when they organized a west Siberian conference of physics in which 130 delegates took part, including forty-three from other cities. Tomsk, Novosibirsk, Omsk and Krasnoiarsk institutes were represented, as were workers from factory laboratories in Stalinsk (Novokuznetsk), Anzhero-Sudzhensk, Sverdlovsk (Ekaterinburg) and others. Physicists from Moscow and Leningrad (Ioffe, Lazarev, Semenov and others) participated in the organization of the meeting. The conference included six sections: metallurgy (under Kuznetsov), coal, physical chemistry, general physics, radiotechnology and instruction. A major focus was the effort to accelerate the industrialization of Siberia and to transform the Kuzbass into a second Don river coal and industrial centre (the Donbass). Participants proposed the establishment of stronger ties between scholars and representatives of industry, to ensure exchange of information towards solution of industrial issues. At the end of the conference the participants agreed to engage in socialist competitions to push their research rapidly into production; these were supposed to engender healthy economic growth without capitalist class conflict.

At the opening session of the conference, the new director of SFTI, Kessenikh, reported on the successful completion of the institute's five-year plan and set forth the major foci of the second one. Siberian physicists would work closely with the Stalin Kuznetsk Metallurgical Factory; with research institutes of the Commissariat of Ways of

92 A SFTI, F.M.A. Krivov, t. 60, l. 70.

93 *Krasnoe Znamia*, 2 August 1933, n.p.; and A.V. Litvinov, 'Professorsko-Prepopavatel′skii Korpus Tomskogo Universiteta (20–30-e gg. XX v.)', candidate dissertation, history, Tomsk State University, 2002, p. 238.

94 Tartakovskii apparently knew Boris Hessen, and worked with him to see German books and articles on quantum mechanics translated into Russian.

Communication; with the Tomsk and Omsk Railways; with the Energy Administration of the Commissariat of Heavy Industry on topics of interest to power stations in Moscow, in Ukraine and along the Volga river; with the Nitrogen Fertilizer Factory in Kemerovo, among a series of Kuznetsk basin nitrogen factories; and with many other businesses. In keeping with Stalinist 'self-criticism', the participants noted weak spots of SFTI research, for example the lag in solution of problems facing the economic giants of the Urals and Kuzbass, and inadequacies in training young specialists quickly. To the dismay of the scholars, the next such conference was not held until 1947, in large part because of Stalinist attacks connected with the purges and the repression of the intelligentsia.[95]

By 1936 and the Great Terror that enveloped society, the situation for Tomsk physicists had become more dangerous. First, they felt the impact of the so-called Luzin affair. The Luzin affair (or *Luzinshchina*) involved an attack on the leading mathematician Nikolai Luzin. It began with criticism of Luzin, and led to a purge of the Moscow Mathematical Society in 1930. A new chairman of the society was appointed, Ernst Kolman. He was a Stalinist ideologue, although later a political émigré to Sweden, who vigorously persecuted leading scientists for their allegedly anti-Soviet philosophies of nature in the 1930s. In 1936 a series of articles appeared in *Pravda*, likely authored by Kolman, accusing Luzin of plagiarizing his own students, of being a fascist disloyal to the USSR and of having published in foreign journals. An Academy of Sciences commission investigated and approved all charges, and Luzin lost his official positions and department. He was not arrested, however, nor expelled from the academy. While, according to Levin, there was no significant drop in foreign publications of Soviet mathematicians after *Luzinshchina*, its message to scientists was clear: be wary of publishing abroad, and stress nationalism over internationalism.[96]

If normal 'rules' existed in this system that enabled them to navigate a complex, highly centralized and often arbitrary system, then this system also enabled – indeed encouraged – personal attacks from without rule-bound science that led to loss of career, exile, arrest, even execution. Once an article appeared in a central newspaper no one could question it. Hence several Siberian scientists used the *Pravda* articles as a way to begin their own campaign against such alleged supporters of Western science as Luzin. The campaign in Tomsk took place half a year after the first publications in Moscow. We do not know why there was this lag, but perhaps it was because Tomsk mathematicians at first saw no need to engage with the Luzin 'affair' until they recognized that it had become a national phenonomen.

95 A.N. Sorokin, 'Pervaia Regional′naia Fizicheskaia Konferentsiia v Tomske Vesnoi 1934 Goda kak Iavlenie Konsolidatsii Nauchnogo Soobshchestva dlia Resheniia Zadach Industrializatsii Sibiri', *Vestnik NGU. Seriia: Istoriia, Filologiia* (2012) 11(1), pp. 131–136.

96 S.S. Demidov and B.V. Levshin, eds., *Delo Akademika Nikolaia Nikolaevicha Luzina*, St Petersburg: Russkii Khristianskii Gumanitarnyi Institut, 1999. See also Aleksey E. Levin, 'Anatomy of a public campaign: "Academician Luzin's case" in Soviet political history', *Slavic Review* (1990) 49(1), pp. 90–108. S.S. Kutateladze, 'Korni Dela Luzina', *Sibirskii Zhurnal Industral′noi Matematiki* (2007) 10(2), pp. 85–92, argues that Luzin's students rudely and with full understanding used the Stalinist system to weaken Luzin, whom they disliked as a scientific director, and also likely for mathematical disagreements with him.

The Luzin affair embroiled SFTI, at first sparking public attacks on German immigrant mathematicians Stefan Bergman, who escaped Nazi persecution in Berlin for Tomsk and then fled Tomsk for Paris because of Stalin's purges, and Fritz Netter, both of whom worked at the university. On 15 September 1936, four SFTI staffers published an article under a typical headline for the time, 'Mercilessly expose and denounce concrete examples of servility before the bourgeois science', singling out Bergman and Netter and attacking the leadership of Tartakovskii. Two days later, *Krasnoe Znamia* published another article signed by a second group of staffers that criticized theoretical physicist Dmitrii Ivanenko for his extensive contacts with foreign colleagues.[97]

Kuznetsov was decisive and courageous in defending his colleagues, likely saving them from arrest.[98] At an institute meeting, he discreetly shifted the focus from punishment to re-education and rehabilitation, whilst duly condemning those who 'crawled on their bellies to fascism'.[99] At that time Kuznetsov, like any leading scientist, also had many foreign publications, especially in German journals, but it may be that the contribution of his research to local industrial production made it less likely that he would be criticized for philosophical mistakes. While neither Kessenikh nor Kuznetsov suffered, several other physicists were repressed, although many of them succeeded in escaping before the mass terror of 1937–1938. For example, Netter, although not officially a staff member of SFTI, was arrested in September 1937, and one month later was found guilty of anti-Soviet activity, among other charges. He received a twenty-five-year sentence, was jailed and was summarily executed in September 1941. At the same time, another institute in the LFTI family, UFTI, was rocked by mass purges.[100]

A second national trauma in physics also had an impact on SFTI. At a March 1936 Academy of Sciences conference, Abram Ioffe fell under sharp criticism for his alleged failings. Even his close associates criticized his 'empire-building'. The LFTI had failed to accelerate physical discoveries into a productive process, and had been subject to other class and ideological errors. If, as according to one analyst, the conference ended in a draw, with Ioffe holding on to the directorship, then the government succeeded in demonstrating that technical physics was central to its concerns and that even the leaders of the physics community were at risk.[101] Lev Landau and Igor Tamm publicly took Ioffe to task for his claims that the LFTI network was on a par with many other physics establishments in the world. In particular they charged Ioffe

97 'Besposhchadno Razoblachat′ i Osuzhdat′ Konkretnykh Nositelei Rabolepiia pered Burzhuaznoi Nauki', *Krasnoe Znamia*, 17 September 1936, n.p.; and S. A Krasil′nikov and M.V. Klikushin, *Anatomiia Odnoi Ideologicheskoi Kampanii: 'Luzinshchina' v Siberi*: *Sovetskaia Istoriia: Problemy i Uroki*, Novosibirsk: Nauka, 1992.

98 *Materialy k Bibliografii Uchenykh TGU: V.D. Kuznetsov*, Tomsk: TGU, 1972, pp. 53–54; and Kosterev, op. cit. (61), p. 90.

99 GANO, f. 3, op. 10, d. 1095, l. 47 and f. r-1562, op. 1, d. 578, ll. 29–30.

100 Ranyuk, Pavlenko and Khramov, op. cit. (2).

101 V.P. Vizgin, '"Iavnye Skrytye Izmereniia Prostranstva" Sovetskoi Fiziki 1930-x gg. (po Materialam Martovskoi Sessii AN SSSR 1936 g.)', *Voprosy Istorii Estestvoznaniia i Tekhniki* (1990) 1, pp. 63–84. On the debates in the sciences over philosophical issues see Krementsov, op. cit. (80).

with an overemphasis on experimentation and with a failure to consult properly with theoreticians.[102]

It appears that news of the March 1936 session came to Siberian physicists through personal communications, although we are not certain. In any event, the 1936 session found response in provincial centres in form and content. At SFTI the directors re-created the theme of Ioffe's self-defence around the slogan 'Physics – is the scientific foundation of socialist technology'. Seeing the need for close connection between physics research and the demands of industry, yet seeking to shield research from excessive pressure to produce results of immediate utility, Kuznetsov declared that science was the 'consultant' of technology, and not its prime mover.[103] SFTI, with its rigidly industrial orientation, could ignore the charge of empty 'idealistic theorizing'.[104] But in the atmosphere of the Great Terror, Kuznetsov caved in to the pressure to single out enemies. In summer 1936 he wrote to the Commissariat of Enlightenment of the RSFSR to point out errors in the ways of the theoretician Tartakovskii. Tartakovskii, he claimed, had ignored socialist construction and had not yet found 'ways of communicating with industry'.[105]

Tartakovskii rejected the assertion that he somehow supported 'the separation [of science] from practice'. He claimed, 'I have recommend using the most prominent scientists in the research institutes of industry so that the fruits of their research were immediately used in practice. Where is this "gap"? On the contrary, there is a full synthesis of theory with practice'.[106] But in 1937 Tartakovskii was forced to leave Tomsk for his mother city, Kyiv, and to keep a low profile.[107] He managed to make his way to Leningrad later in the year, and died of a heart attack in 1940. Kuznetsov himself was hit by reckless Stalinist accusations of permitting 'the breakdown of scientific work' in the institute.[108] He and Kessenikh were accused of wrecking, of divorcing the production themes of the institute from the needs of industrial enterprises, and of permitting 'enemies of the people' to fester in the institute.[109] It is no wonder that Kuznetsov recalled 1938 as the worst time of his life.[110]

Ivanenko also had to leave Tomsk at this time because of the attacks of other physicists. From 1929 to 1931 Ivanenko worked at UFTI, being the first director of its theoretical

102 Karl Hall, 'The schooling of Lev Landau: the European context of postrevolutionary Soviet theoretical physics', *Osiris*, 2nd series (2008) 23, pp. 235–236.

103 Kosterev, op. cit. (61), p. 94.

104 *Krasnoe Znamia*, 9 April 1936, n.p.

105 GATO, f. r-1562, op. 1., d. 700, l. 27.

106 GATO, f. r-1562, op. 1., d. 700, l. 3 ob.

107 S.F. Fominykh, *Professora Tomskogo Universiteta: Biograficheskii Slovar'*, vol. 2, *1917–45*, Tomsk: TGU, 1994, p. 414.

108 GATO, f. r-1562, op. 1, d. 883, l. 27.

109 GATO, f. r-1562, op. 1, d. 882, l. 27.

110 Kuznetsov, 'Moi Put' v Nauke', typed manuscript, Archive of the Museum of History of TGU, p. 216. Kuznetsov wrote his memoirs after the death of Stalin, as a pensioner yet still director of SFTI. The 250-page text is engaging, but often based on faulty memories of events long before. Some of its content can be balanced against his personal fund at GATO (F. R-1562), which holds a rather complete record of documents, accounts, correspondence and so on with all of the institutions and organizations that played a role in Tomsk physics. Unfortunately, Kuznetsov's diaries are nearly impossible to read because of miserable handwriting.

division and one of the founders of the *Physikalische Zeitschrift der Sowjetunion*.[111] In 1935 Ivanenko was arrested in Leningrad in the fallout of the Kirov (Leningrad) affair, orchestrated by Stalin to sweep up tens of thousands of innocent individuals as complicit after the assassination of Sergei Kirov, the Leningrad Party chief murdered at Stalin's order.[112] Ivanenko survived in the Karaganda labour camp and was exiled to SFTI, where he led theoretical and nuclear seminars and edited the *Proceedings* of SFTI. From Siberia, Ivanenko made his way to Moscow State University, where he grumpily sided with anti-Semites in battling 'idealism' in physics, and resented never having become a member of the Academy of Sciences.[113] SFTI lost an excellent physicist.

Many, many innocent Siberian scholars were repressed through the actions of the state, and a great number of them died in labour camps or were executed; Tomsk escaped the worst of it in comparison with central Russia and Ukraine. The terror acquired a mass character in the 1930s, in national campaigns connected with the 'struggle with wreckers' and other alleged enemies of the state. For Siberia, the affected specialists included those in regional higher-educational, branch or academic institutes, as well as those from other areas of the USSR who were sent into Siberian exile. As Krasil′nikov notes, the return from a marginal life to scientific society was not absolutely closed to these people (for example, the rocket designers S.P. Korolev and V.P. Glushko from the scientific camps – the *sharashki*). But quite often the destruction of a scientific career, disappearance for several decades or execution was the result. The country lost tremendous scientific force as the Soviets continued the tsarist tradition of exile to Siberia, although some of these individuals contributed to further Siberian development – geologists, mining specialists, botanists, forestry specialists, civil engineers and soil scientists.[114] Across the empire the Stalinist system enabled wholesale purges of specialists, more violent in some settings than in others. A difference in Tomsk was that local physicists received 'indulgences' through their applied research.

What was it like to be a scientific leader far from major cities in the early Stalin era? Such scholars as Kuznetsov strove to be apolitical and to keep their noses to the lab

111 G.E. Gorelik and V.Ya. Frenkel′, *Matvei Petrovich Bronstein and Soviet Theoretical Physics in the Thirties*, Basel: Birkhäuser, 2011, pp. 22–26.

112 Our thanks to Gennady Gorelik, who shared material from Russian archives on Ivanenko's arrest, incarceration and exile to Tomsk in December 1935, and his 'rehabilitation' in August 1989.

113 Ivanenko grew bitter over his fate, and became a vocal critic of fellow theoreticians for their alleged idealism and angry that he never gained admission to the prestigious academy, nor received proper credit for his discoveries on nuclear structure. In 1944 he participated in a movement originating at MGU that attacked academy physicists that was anti-Semitic in tone, and criticized servility before the West that grew to national proportions during the *Zhdanovshchina*. For more on Ivanenko's thinking and motivations see Gennadii Gorelik, 'Razmyshleniia Posle Kruglogo Iubeliia', *Znanie-Sila* (2005) 11, pp. 28–39.

114 S.A. Krasil′nikov, '"Repressivnyi Vektor" Nauki v Vostochnykh Regionakh Strany', in A.K. Kirillov, ed., *Lichnost′ v Istorii Sibirii XVIII–XX Vekov: Sbornik Biograficheskikh Ocherkov*, Novosibirsk: Sova, 2007, pp. 271–281. Some of those repressed included N.A. Chinakal, director of the Mining Geological Institute; V.V. Reverdatto, director of the Medico-Biological Institute; and Iu.B. Rumer, director of the Institute of Radiophysics and Eletronics who was in an aviation *sharashka* from 1938 to 1950, but was released under the personal recognizance of Lev Landau and moved to Akademgorodok. Many other Akademgorodok scientists were children of repressed parents, including the one-time chair of the Siberian division, V.A. Koptiug.

bench, a task made easier because in Kuznetsov's case solid-state physics was closely linked to transport and electrification. He and his colleagues created a new research institute staffed with young and capable researchers. They no doubt lamented the lack of support for research, new staff and new instruments and apparatus that they needed and which, unlike them, their Leningrad, Moscow and Kharkiv scholars received. They recognized they were in a backwater of science, even if their research was important to regional development.

It was difficult to be director in such taxing circumstances. Kuznetsov had to use his full abilities to maximize his contacts and connections in academic circles. Thanks to the help of Ioffe, Semenov and others was he able to carry scientific support over to the political sphere, as the creation of such a large centre as SFTI required. After the Civil War, regional centres were relatively weak, and their weakness required that they receive central political and financial support to function. Local support was vital but not decisive, and Kuznetsov knew how to work the system. Kuznetsov focused his energies on ties in the academic world – and on his political connections. He engaged the national physics community in his relationship with Ioffe and LFTI, the regional economy and society; through applied research and via regional conferences; and in local politics.[115]

Yet Kuznetsov ultimately was caught up in the fervour to identify and attack enemies. After the Second World War, in an article written with V.P. Kopnin on 'Partisanship in physics' (published sometime between 1948 and 1952), Kuznetsov criticized bourgeois science for ignoring dialectical materialism, and attacked several Soviet physicists for the 'kow-towing' before the West. Kopnin defended his candidate degree (roughly the Soviet equivalent of the PhD) on 'The struggle of materialism and idealism in the development of the doctrine of the essence of judgement' (1947) and rapidly rose through the system to direct the Institute of Philosophy of the Academy of Sciences. In their article Kuznetsov and Kopnin rejected bourgeois science for its failure to use the progressive methodology of *diamat*. Kuznetsov attacked theoreticians for falling for the mathematical idealism of Western scientists, and objected to the way that many Soviet mathematicians and physicists had turned to mathematical models as a substitute for reality.

In the same way as Soviet biologists were attacking genetics and geneticists at home and abroad as part of the Lysenko campaign, physicists were attacking their own. Physics was not immune during the late Stalin period, even if it did not suffer the debilitation of Lysenkoism. We see similar patterns in the treatment of theoretical physicists and geneticists: accusations that they were under Western influence, the assertion that a 'proletarian science' different from Western science existed, and that above all else scientists were beholden to government dictates.[116] Ioffe himself tried his hand at

115 M.V. Kabanov, *60 Let Sibirskomu Fiziko-Tekhnicheskomu Institutu: Istoriia i Perspektivy Razvitiia*, Tomsk: Izdatel′stvo TGU, 1988, pp. 7–11.

116 GATO, F. R-1562, op. 1, d. 524, l. 8 and d. 506, l. 27; and GATO, f. R-1638, op. 1, d. 90, ll. 7–8. See also Aleksander Sorokin, 'Vzaimodeistvie Nauchnogo Soobshchestva Fizikov Sibiri i Vlasti v Pervoe Poslevoennoe Desiatiletie (na Primere Tomskogo Nauchno-Obrazovatel′nogo Kompleksa)', *Bylye Gody* (2013) 27(1), pp. 120–125. On Lysenkoism see, among many other works, David Joravsky, *The Lysenko Affair*, Chicago: The University of Chicago Press, 1970. See also Gordon, op. cit. (81), for discussion of the importance of not tarring the history of Soviet physics with the brush of Lysenkoist vernalization.

defending the New Physics, publishing a major book in 1949 that, at least initially, was well received. But then in the anti-Semetic and violently anti-West period of Cold War high Stalinism, he too fell. He gamely defended himself at an LFTI council meeting, but this time was removed from directorship of the institute he founded and pushed into intellectual exile from the FTI empire.[117]

Conclusions

The focus of this article has been on how physicists succeeded in building a new institute in Siberia in conditions of civil war, the NEP, cultural revolution and Stalinism. They had the benefits of the local circumstances of a strong academic tradition, good connections with Leningrad colleagues and a vision of a research centre with ties to industry. Participating in regional, national and international communities, Tomsk physicists were part of the rapid expansion of the physics enterprise in the pre-war USSR. Not only scientific ideas circulated through their institute, but also political, economic and ideological concerns that were endemic to the Soviet system in the organization of science. The physicists largely managed to navigate through the maze of concerns, to gain local and national financial support, and to engage cultural and philosophical priorities that emanated from Moscow.

One of the reasons for the relative safety of Siberian physics – and at the same time its precarious position – is that the Bolsheviks looked at Siberia, once the Civil War was over and the peasants had been subjugated, as a source of wealth, and therefore sought to develop it for national goals of resource extraction. They encountered difficulties, of course, of climate, remoteness and thin settlement, and they pursued resource development with inadequate investment in factories, higher education and the sciences. Forced labor helped to a small extent to overcome this difficulty, and unrealistic pricing mechanisms in a relatively autarkic economy diverted attention from the inefficiencies and high costs of Siberian development. We have also explored how changes in policy regarding basic and applied research accompanied the rise to power of Joseph Stalin. This was Stalinist science in the extent of autarkic relations, vigilance of Communist Party oversight, accountability of scientists, emphasis on planned results, and philosophical interference.

In this environment, the hopeful beginnings for Siberian scientists at SFTI on the eve of Stalin's five-year plans, collectivization and industrialization gave way to the same human dramas and losses that hit the entire country. For scientists this meant frequent criticism for failure to connect their research to industrial demands, ideological interference in their work, and purges, although not arrests. We can explain the success of Siberian scientists, like those of other Soviet scientists, in their capable and sometimes lucky manoeuvring through Party intervention, ideological control and political pressure to produce practical results quickly. They were not, as a group, highly philosophical.

117 A.F. Ioffe, *Osnovnye Predstavleniia Sovremennoi Fiziki*, Moscow: Gostekhteorizdat, 1949; and Arkhiv LFTI, f. 3, op. 1, ed. Khr. 195. For an example of the press attack on Ioffe see I.V. Kuznetsov and N.F. Ovchinnikov, 'Za Posledovatel′noe Dialektiko-Materialisticheskoe Osveshchenie Dostizhenii Sovremennoi Fiziki (o Knige A.F. Ioffe "Osnovnye Predstavleniia Sovremennoi Fiziki")', *Uspekhi Fizicheskikh Nauk* (1951) 45(1), pp. 113–140.

It may be that Tomsk physicists avoided more direct interference because of their crucial position not only in Siberian development, but also in Cold War physics research connected to the atomic bomb. When the Nazi armies invaded in June 1941, the Soviets quickly retreated, but succeeded in evacuating trainloads of machinery and equipment to the Urals and beyond. These served as the foundation of the defence industry. The scientific performance of SFTI and the presence of large numbers of faculty and students made Tomsk a good choice as a location for the nuclear weapons enterprise in the city of Tomsk-7, a closed military, production and R & D city, twenty minutes by bus from SFTI and TGU.

Founded in 1949 and originally noted only as a post office box, Tomsk-7, called today Seversk, produced highly enriched plutonium and uranium in the Siberian Chemical Combine. Personnel operated five production reactors, brought into operation between 1955 and 1967. Three of these were shut down in the early 1990s under the joint effort of Russian and American anti-proliferation specialists; to this day Seversk has nuclear warheads stored on-site. Many of the individuals who work in the plant at present received training in Seversk Technological Institute – a branch of the 'MIT' of the Soviet nuclear industry, the Moscow Engineering Physics Institute, and the Seversk Industrial College, both of which have faculty trained in Tomsk higher-educational institutions. SFTI's own nuclear research largely ended with Ivanenko's departure in 1938.[118] The fact that Tomsk became a closed city had a dual effect on SFTI. On the one hand, research on military subjects unfolded rapidly and strengthened the tie between military enterprises and other closed cities. On the other hand, this led to the contraction of fundamental physics research and to fresh difficulties in communicating with foreign scholars, for example through the free exchange of reprints.

Thus the problem of movement of ideas and people in Russian science remains to this day. President Putin's government is convinced that Siberian resources must be developed in the twenty-first century to maintain Russia's position as a great economic power. His cabinet is pushing large-scale Siberian development projects that may divert scarce resources from other sectors and regions of the economy, perhaps also from Tomsk region and its research and educational institutions.[119] In 2016 Tomsk had eight higher-educational institutions and eight Academy of Science institutes. Yet it is safe to argue that Russian science in the twenty-first century remains highly centralized in Moscow and St Petersburg, with the Putin administration recently subjugating the Academy of Sciences to the Federal Agency for Scientific Organizations and establishing a very firm hand over universities in terms of funding and programmes. For regional science in Russia to be productive, the government in Moscow must figure out how and to what extent to support science and education on the periphery. The question remains as current today as it was in 1929.

118 One of the world's most serious nuclear accidents occurred at the Chemical Combine on 6 April 1993, when a tank containing a highly radioactive solution exploded. See IAEA, *The Radiological Accident in the Reprocessing Plant at Tomsk*, Vienna: IAEA, 1998. See also Rashid Alimov, 'People vs. Siberian Chemical Combine', *Bellona Foundation*, 2 October 2001, at http://bellona.ru/bellona.org/english_import_area/international/russia/nuke_industry/siberia/seversk/22031.

119 Fiona Hill and Clifford Gaddy, *The Siberian Curse: How Communist Planners Left Russia Out in the Cold*, Washington: Brookings Institution, 2003.