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Nuclear Technopolitics in the Soviet Union and Beyond – An Introduction

Nuclear energy epitomises the ambiguity of high modernity like no other technology. In the history of the Soviet Union, it played an exceptionally prominent role, initially accelerating its ascent to superpower status and bolstering its visions of the future, but eventually hastening its demise in the wake of the Chernobyl disaster in 1986.

There can be little doubt that without nuclear weapons, the Soviet Union would not have been able to consolidate its hard-won victory in World War II and to achieve superpower status. In a massive effort that combined domestic research in nuclear physics with the knowledge of captive German scientists and intelligence about the American Manhattan project and drew on the resources of the country's military-industrial complex and the Gulag system, the Soviet Union developed its own atomic bomb in record time and tested its first nuclear device in 1949. By 1953, it was also in possession of the hydrogen bomb and had thus achieved technological parity with the United States.¹ In fact, with the successful test of the world's first intercontinental ballistic missile in 1957, the Soviet Union had taken the lead in developing a powerful launch vehicle to deliver thermonuclear warheads across the globe.

No less important – in ideological terms even more so than in economic ones – was the Soviet Union's civilian nuclear programme. Soviet atomic scientists advocated harnessing the atom's power for electricity generation as early as the late 1940s,² and the CPSU was quick to realise the economic and propagandistic potential of nuclear power.³ Only one year after the detonation of their first H-bomb, and in response to Dwight D. Eisenhower's *Atoms for Peace* speech, Soviet nuclear scientists connected the world's first nuclear power plant to the grid in Obninsk near Moscow. While the quantity of energy produced was negligible, the amount of publicity it generated for the Soviet state was enormous.⁴ Soviet propaganda could now juxtapose the belligerent capitalist atom of Hiroshima and Nagasaki with its seemingly peaceful socialist twin, eager to serve the

1 HOLLOWAY Stalin; COCHRAN [et al.]: Bomb; GORDIN Cloud.

2 SIDORENKO *Istoriia*, vol. 1, pp. 5, 16; HOLLOWAY Stalin, p. 346; SCHMID *Culture*, p. 87.

3 JOSEPHSON *Communism*.

4 ICHIKAWA *World's First*.

cause of human progress.⁵ Following up on the initial success with a series of important technological innovations and the eventual mass deployment of power reactors, the Soviet Union managed to further underscore its technological prowess in this field. From the 1960s to the 1980s, atomic energy lent much-needed credibility to the concept of the Scientific-Technological Revolution (STR) – the promise that technoscientific progress would accelerate socio-economic development and quickly create universal wealth.⁶

In international perspective, the nuclear power programme added greatly to the Soviet Union's appeal as a partner in technoscientific matters.⁷ In the 1960s and 1970s, Western countries such as the United States and France thought it in their best interest to closely cooperate with the USSR in the field of civilian nuclear research and development, and right until the end of the USSR – undeterred even by the Chernobyl accident – most socialist countries in Central Europe were eager to partner with the Soviet Union to increase their share of nuclear power generation.⁸ Atomic energy, alongside space-flight, was thus one of the few fields where the Soviet Union could plausibly claim to be at the helm of human progress.

In the long run, however, Soviet nuclear modernity came at a cost that was prohibitively high in more than just monetary terms. Keeping pace with the United States in the nuclear arms race required enormous investments which put significant strain on the Soviet state budget, while nuclear power stations fell decidedly short of the promise to provide “energy too cheap to meter.”⁹ An even more important aspect was the social and ecological cost of the Soviet nuclear programme – from the massive exploitation of forced labour in its early phase (and, to some extent, also in its later ones) to the ecological and health calamities associated with the release of radioactivity in the wake of bomb tests, accidents and negligent waste disposal. In 1986, the Chernobyl catastrophe – the largest civilian nuclear accident to date – ushered in the final demise of “atomic-powered Communism.”¹⁰ Five years later, Soviet Communism ceased to exist – but surprisingly, a quarter of a century later, visions of nuclear futures once again abound in Russia and other countries of the post-Soviet and post-socialist space, such as Kazakhstan, Belarus and Hungary – a development that will also be reflected upon in this volume.

5 As a Soviet author claimed in 1968, Soviet man ‘rehabilitated’ the atom after Hiroshima and Nagasaki. GUBAREV Goroda, p. 18. On Hiroshima as a central topos in Soviet nuclear-related discourse, see RENNER Ort.

6 HOFFMANN/LAIRD STR and Soviet foreign policy; GUTH Future. For samples of the contemporary Soviet literature on the STR, see e.g. Man, Science, Technology; VOLKOV Man; FEDOSEYEV Significance. The concept was originally inspired by the British Marxist philosopher J. D. Bernal. See TEICH Bernal.

7 See Stefan Guth's contribution to this volume.

8 For cooperation across the bloc divide, see the contributions by Stefan Guth and Fabian Lüscher to this volume. For collaboration within the CMEA, see SCHMID Colonization.

9 This notorious expression was coined by Lewis Strauss, the chairman of the U. S. Atomic Energy Commission, in 1954, but the alleged “cheapness” of nuclear energy was just as important to Soviet proponents of nuclear energy. See SCHMID Producing Power, pp. 22, 28, 36–37.

10 JOSEPHSON Communism.

I. Bridging the Gap between Stalin’s Bomb and Chernobyl: a Long-Term View

In view of these momentous developments, Soviet nuclear history has attracted keen interest from researchers ever since the collapse of the USSR. Unsurprisingly, its tumultuous first and last phases have garnered the lion’s share of scholarly attention. Thus, the era of “Stalin and the bomb” was not only the subject of David Holloway’s pioneering study under that very title and a number of later books,¹¹ but also of a comprehensive Russian edition of archival materials.¹² Its final phase – the era of Chernobyl and Gorbachev – has also prompted numerous studies.¹³

By contrast, after two and a half decades of research, the interim period (1953–1986) has yet to receive comparable attention. More often than not, it is treated as a mere epilogue to the bomb project or as a preface to the Chernobyl catastrophe.¹⁴ This glaring omission has motivated the first purpose of this volume: to provide a *long-term perspective* on Soviet nuclear history with an emphasis on the Khrushchev and Brezhnev periods. This three-decade long interim phase of Soviet atomic history deserves to be studied in its own right. Despite obvious continuities, it differed markedly from the period of Stalin and the Bomb; and while it undoubtedly created institutional, economic and technological preconditions for the Chernobyl catastrophe, its storyline still cannot be reduced to the declensionist narrative of the third phase without losing sight of many important developments.

To outline just a few of these processes, the mid-1950s to 1970s saw the transformation of what had hitherto been an atomic *project* still very much rooted in the all-out mobilisational culture of the wartime effort into a regular industry comprised of a sprawling archipelago of nuclear cities, production facilities and test sites. As improvisation gave way to expert culture,¹⁵ the Soviet nuclear sector became highly institutionalised.¹⁶ Between the mid-1950s and the mid-1970s, Soviet nuclear research and development proceeded at a quick pace, producing impressive technological innovation (such as breeder reactors) and cutting-edge scientific advancements in fields such as nuclear fu-

11 HOLLOWAY *Stalin*; GORDIN *Cloud*; COCHRAN [et al.]: *Bomb*. Kate Brown’s recent study also focuses mainly on the early phase of the Soviet (and American) military atomic project. BROWN *Plutopia*.

12 RIABEV (ed.): *Proekt*.

13 To cite the most recent: SCHMID *Power*; GEIST *Fallout*; ARNDT (ed.): *Politik*; DALHOUSKI *Tschernobyl*; KUCHINSKAYA *Politics*; GESTWA *Katastrojka*.

14 Sonja Schmid’s recent study is to date the only analysis to treat the history of the Chernobyl nuclear power plant (and RBMK reactors in general) in its own right rather than merely as a prehistory to the 1986 accident. SCHMID *Power*.

15 On expert culture, see KOHLRAUSCH/TRISCHLER *Building Europe on Expertise*; KOHLRAUSCH/STEFEN/WIEDERKEHR (eds.): *Expert Cultures*; WUNDERLE *Experten*.

16 Research on the institutional development of the Soviet nuclear sector is still scarce, although SCHMID *Power*, pp. 41–65, and VASILIEVA *Soleils*, pp. 163–192, offer first insights. Post-Soviet insiders’ accounts such as the compendium by PETROS’IANTS [et al.] (eds.): *Industriia*, provide further valuable information. Additionally, a wealth of chronicles and memoirs about individual nuclear research, planning and production facilities is available at <http://elib.biblioatom.ru> (27.10.2017).

sion and the study of transuranic elements.¹⁷ The same period also witnessed the Soviet Union's integration in international, multilateral and bilateral networks of technological exchange as well as in the new field of nuclear diplomacy. The USSR successfully positioned itself as a major player within the framework of the UN-sponsored Geneva Conferences and the newly founded International Atomic Energy Agency (IAEA),¹⁸ promoted and coordinated nuclear research and development throughout the socialist countries (and, to some extent, the Third World),¹⁹ and entered substantial cooperation agreements with capitalist countries, in particular with France and the United States.²⁰ Between the late 1960s and early 1980s, the USSR embarked on a large-scale deployment of nuclear power plants, a programme epitomised by the *Atomash* factory, whose giant assembly lines were to churn out standardised reactors at low costs, although this vision never fully materialised.²¹ Feasibility fantasies were up-scaled even faster: in the 1970s and 1980s, Soviet technologists envisioned the construction of large-scale nuclear-powered desalination plants along the arid Southern flank of the Union from Ukraine to Vladivostok, and, as a next step, peaceful nuclear explosions and nuclear-powered pumping stations were to make possible the diversion of Siberian rivers to the South of the Soviet Union.²² However, these utopias were juxtaposed by the nightmares of nuclear accidents long before Chernobyl, the largest of them being the explosion of a storage facility of liquid radioactive waste at the Maiak processing plant in 1957.²³ Accidents such as this one, combined with the more gradual effects of radioactive pollution of the environment and dose accumulation in human bodies, afforded the Soviet *atomshchiki* ample experience of the ecological and health calamities associated with nuclear modernity. Influenced by insights into the devastating consequences of nuclear war and proliferation, many nuclear scientists and engineers gradually adopted a more nuanced and ambiguous stance towards the opportunities and risks associated with nuclear technologies. Apart from a few spectacular cases – the most prominent being Andrei Sakharov and Zhores Medvedev – the resulting discussions remained concealed from the public behind a façade of official confidence and secrecy, but differences of opinion on questions such as military versus civilian priorities or technological audacity versus

17 For an overview of technological developments, see JOSEPHSON *Atom*. For a more detailed account of the civilian nuclear programme, see SIDORENKO *Istoriia*.

18 On Soviet participation in international conferences and organisations such as the IAEA, see Fabian Lüscher's contribution to this volume; HOLLOWAY *Creation*.

19 For Soviet nuclear cooperation with Central European socialist countries, see SCHMID *Colonization*. The nuclear research centre at Dubna (JINR), which developed into a "Soviet CERN", has yet to be studied in depth. It is the subject of Roman Khandozhko's ongoing research. Starting in 1959, the CERN and the JINR collaborated in several projects and organised mutual visits by research teams. LOCK *History of the Collaboration*.

20 On trans-systemic cooperation, STEFAN GUTH in this volume, and also PETROS'IANIS [et al.] (eds.): *Industriia*, pp. 991–1024.

21 On deployment, see Sonja Schmid's contribution to this volume. On *Atomash*, see JOSEPHSON *Atom*, pp. 81–108.

22 WEINER *Corner*, p. 422 f.; JOSEPHSON *Atom*, p. 248; WHITE *Water*.

23 See Laura Sembritzki's contribution to the present volume. The first account of the Maiak accident was MEDVEDEV *Nuclear Disaster*.

safety were substantial and can now be partly unearthed in archival records and memoirs. The contributions to the present volume provide new insights into many of these aspects, thus adding considerably to our knowledge of this protracted interim period of Soviet nuclear history. At the same time, most contributions view this in-between period in a larger, long-term perspective beyond conventional chronological divides of Soviet political history.

II. Technopolitics – An Interdependent Perspective

Considering its significant implications for many domains of human existence, nuclear technoscience has been studied from a broad range of angles over the last few decades – including political and geopolitical, economic and social, cultural and ecological perspectives. At the same time, it has prompted heated debates between technological determinists and social constructivists: were the ambiguities of nuclear civilisation an inevitable consequence of the unstoppable juggernaut of technoscientific progress or should they rather be seen as the outcome of specific agendas promoted by powerful interest groups and coalition builders? Recent approaches strive for a middle ground by acknowledging *both* the ways in which social and cultural factors predicate technological choices *and* the potential of technological artefacts, institutions and networks to channel further socio-economic and political developments.²⁴ These STS discussions have added further depth to the historical study of science and technology and its broader implications.

In response to the collapse of the USSR and the end of the Cold War arms race, historiography first approached Soviet nuclear history from a (geo)political perspective.²⁵ Josephson's *Red Atom* offered an early technological outline of the Soviet civilian nuclear programme, focussing on overarching visions and decision-making processes. Josephson also explored the cultural dimension of what he aptly described as "atomic-powered Communism" – a line of inquiry which has since been pursued further in a number of articles by Sonja Schmid and others.²⁶ More recently, ecological and human health aspects, particularly those of the Chernobyl catastrophe and, to some extent, the Maiak processing plant and the Semipalatinsk test site, have been studied in depth.²⁷ Other scholars have investigated the effects of these calamities on the formation of civil society in the Gorbachev era and the post-Soviet period.²⁸ Interest in the social history of the Soviet nuclear programme has hitherto mostly crystallised around its early

24 Among these approaches, actor-network theory (Bruno Latour and Michel Callon) and co-production theory (Sheila Jasanoff) have been the most prominent. See, e.g. JASANOFF *Idiom*; LATOUR *Reassembling*; CALLON *Acting*.

25 HOLLOWAY *Stalin*.

26 JOSEPHSON *Atom*; JOSEPHSON *Communism*; SCHMID *Celebrating*; VIZGIN *Fenomen*; VAN LENTE (ed.): *Age*.

27 PETRYNA *Life*; KUCHINSKAYA *Politics*; STAWKOWSKI *Radioactive Mutant*.

28 ARNDT (ed.): *Politik*; DALHOUSKI *Tschernobyl*; DAWSON *Eco-Nationalism*.

phase,²⁹ but has recently also turned to the social microcosms of late Soviet and post-Soviet *atomogrady*.³⁰

While Soviet nuclear history has thus clearly become a multifarious object of study, the interrelations between its various aspects have remained somewhat understudied to date. Drawing on recent work by scholars from outside the field of Soviet history who rely on hybridity, actor-network and co-production theories, the present volume explores possibilities for bringing these aspects closer together. One of the inspirations for such an attempt is Gabrielle Hecht's study of the French nuclear power programme, in which she sets out to "trace the social, political, and cultural life of reactors" – artefacts which, she argues, are best understood as "hybrids of technology and politics".³¹ *Technopolitics* can thus be defined as "the strategic practice of designing or using technology to constitute, embody, and enact political goals".³² Hecht's approach is beneficial in that it transcends old dichotomies between allegedly ideological politics and seemingly objective technoscience, thus offering a framework which allows us to more fully evaluate to what extent technologists shared the CPSU's teleological idea of progress³³ and, vice versa, to what degree late Soviet visions of the future depended on technoscientific development.³⁴ This can help us to better appreciate the work of our protagonists, who often moved with dexterity between technoscientific and political-ideological contexts.

Sara Pritchard's *envirotech* approach represents another useful application of the co-production paradigm. It offers a comprehensive understanding of the "dynamic imbrication" of natural and technological systems which has proven so fatefully important for nuclear history.³⁵ Central to Pritchard's approach is the argument that nature and technology must not be seen as opposite and tightly delineated spheres, but rather as a single *enviro-technical* system³⁶ composed of ecologies, artefacts, people, practices and institutions.³⁷ *Technopolitical accidents*, she argues, often result from reductionist understandings of this highly dynamic and complex interaction.³⁸

Yet another approach with valuable implications for Soviet nuclear history is Sheila Jasanoff's concept of *sociotechnical imaginaries*, which she defines as "collectively held [...] visions of desirable futures [...] attainable through, or supportive of, advances in

29 BROWN *Plutopia*; MELNIKOVA *Artisans*.

30 *Atomogrady* ("nuclear cities") refers to the new towns built for the employees of nuclear power plants and their families. STORM *Scars*, pp. 75–100; ŠLIAVAITĖ *Social Memory*; BALOČKAITĖ *Visaginas*; WENDLAND *Geschichte*; EMELIANTSEVA *Privilege*.

31 HECHT *Radiance*, p. 5.

32 HECHT *Radiance*, p. 15.

33 LIPOVETSKY *Poetics*.

34 Surprisingly, while the Soviet system was described as "technocratic socialism" decades ago, the approach of technopolitics is yet to gain broader appeal in Soviet studies. On "technocratic socialism", see HOFFMANN/LAIRD *Technocratic Socialism*. A fairly recent article on Cold War technopolitics is based on out-dated literature on the Soviet side of the story. HECHT/EDWARDS *Technopolitics*.

35 PRITCHARD *Disaster*, p. 223.

36 PRITCHARD *Disaster*, p. 223.

37 PRITCHARD *Confluence*, p. 19.

38 PRITCHARD *Disaster*.

science and technology”³⁹ She draws attention to the public dimension of technology by emphasising that “ideas about scientific and technological futures need to gain assent outside [the] bounded communities [of scientists and technologists] in order to become full-fledged imaginaries. Often, they must latch onto tangible things that circulate and generate economic or social value [...]. This hybridisation, or co-production of ideas, materiality, and sociality happens through processes that we call embedding.”⁴⁰ Importantly, Jasanoff reminds us that investing imaginaries with concrete materiality can serve both to legitimise and to delegitimise sociotechnical orders and the technopolitics which produce them – a point which can only gain further analytical acuity from an analysis of the Soviet and post-Soviet case with its consecutive phases of legitimisation, delegitimation and re-legitimation following on each other’s heels.

Taken together, these approaches have, in recent years, drawn attention to the intricate web of interdependences which link the history of technoscience to almost every other field of history, thereby not only rendering the history of technoscience more multi-faceted, but also highlighting its pivotal significance for the history of high modernity as a whole.

III. Encompassing the Local and the Global: a Multi-Level Analysis

The insight that manipulating matter at an atomic level holds the potential to change the course of human history at a global scale has been a cause of fascination and concern ever since the dawn of the nuclear age.⁴¹ Accordingly, the history of nuclear power has been told at various orders of magnitude, from the level of secluded laboratories to that of industrial production facilities, national nuclear programmes and superpower politics. Traditionally, for lack of access to source materials or reasons of methodological preferences, analysts of nuclear history have often followed a top-down approach which began with a bird’s eye view and then attempted to fill in details where possible – an approach which was certainly justified by the sheer scope of the field of research, but is inevitably prone to the omission of important evidence.

Recently, inspired by developments in the history of science and STS scholarship, an increasing number of historians, including the contributors to this volume, have taken a different approach. They begin with a *close reading* of specific milieus – be they nuclear research facilities,⁴² atomic cities or international forums of nuclear scientists – in order to then broaden the scope of their analysis and study the larger national and international preconditions and effects of their specific object of study. As a result of this approach,

39 JASANOFF *Future Imperfect*, p. 4.

40 JASANOFF *Worlds*, p. 326. For the sociotechnical imaginaries concerning nuclear energy, see JASANOFF/KIM *Containing*. For the Soviet case, see SCHMID *Shaping*; VIZGIN *Fenomen*.

41 Motion pictures such as the American *A is for Atom* (1952) or the Soviet *Nash Atomnyi vek* [Our Nuclear Age] (1976) provide illustrative examples of this fascination.

42 Laboratory studies offer an elaborate methodological toolkit for this kind of investigation. For an overview of the field, see LIBURKINA/NIEWÖHNER *Einführung*; DOING *Laboratory*.

the present volume is conceptualised as a *multi-level analysis* of Soviet technopolitics in its local, all-Union and international dimensions. All five contributions link the local micro-logic of “doing technology” in nuclear research and production centres with the macro-logic of Soviet and global Cold War politics. Anchoring each contribution in a specific milieu uncovers largely unknown protagonists, their outlook and their particular scope of action and reveals highly situational local dynamics that are not easily visible at superordinate levels. In many cases, this approach constitutes the only way to track the actions of higher-level bodies, whose records are usually still classified for the most part. In a second step, every contribution to this volume situates the findings in an all-Union context. The government level has traditionally been the preferred frame of reference for nuclear histories,⁴³ but only recent studies have fully exposed the intricate complexity of competing actors, shifting agendas and conflicting priorities at play here.⁴⁴

Concerning the transnational and international level, recent studies have emphasised the importance of trans-systemic comparisons across the blocs and identified the study of transnational and international entanglements as a greatly rewarding subject.⁴⁵ Kate Brown’s comparative study of Richmond and Ozersk has highlighted striking parallels between the American plutonium production town and its Soviet counterpart.⁴⁶ Gabrielle Hecht has also shifted from national to transnational nuclear histories in her recent works. In *Being Nuclear*, she has painstakingly traced the global-scale ramifications of uranium trade out of Africa.⁴⁷ However, surprisingly little research has been conducted in the field of contacts and cooperation across the bloc divide.⁴⁸ Even the scholarly examination of the IAEA’s history is still in its early stages.⁴⁹ With a strong focus on trans-systemic actors and their respective networks, the contributions to this volume attempt to fill in this lacuna and offer numerous insights into the global entanglement of Soviet nuclear technoscience. They trace Soviet nuclear scientists’ encounters with peers from the United States and other Western countries, shed light on how Soviet radiobiology influenced and was influenced by international research in the field and track the technological collaboration between Soviet, French and U.S. nuclear engineers in fast breeder development.⁵⁰ By embedding Soviet nuclear history more comprehensive-

43 For an overview of national nuclear histories, see KALMBACH *Revisiting*, pp. 52–57.

44 HECHT *Radiance*; SCHMID *Power*.

45 TURCHETTI [et al.]: Introduction; GESTWA/ROHDEWALD *Verflechtungsstudien*. For an overview of transnational and international approaches to nuclear history, see KALMBACH *Revisiting*, pp. 58–61. The term “transsystemic” has been introduced by PÉTERI *Nylon Curtain*. See also DAVID-FOX *Iron Curtain*.

46 BROWN *Plutopia*.

47 HECHT *Nuclear*. She has also edited *Entangled Geographies*, which includes a contribution by Sonja Schmid on CMEA cooperation in the field of nuclear energy. SCHMID *Colonization*.

48 One of the few exceptions to the rule is Eliza Gheorghe’s work on Romania’s cooperation with the United States. GHEORGHE *Building Détente*. Matthew Evangelista does adopt a transnational perspective, but focuses on political initiatives to limit nuclear testing rather than on techno-scientific contacts in the field of nuclear energy; EVANGELISTA *Forces*.

49 Elisabeth Röhrlich’s IAEA history project in Vienna is currently investigating the history of this important organisation; ROEHLICH *Cold War*; see also HOLLOWAY *Creation*.

50 See the contributions by Lüscher, Sembritzki and Guth in this volume.

ly into a transnational perspective of entangled history, the research presented in this volume contributes to envisioning the Soviet Union in the emerging historical picture of global technopolitics. In doing so, it also helps to delineate the place of Eastern Europe more clearly in the global history of high modernity.

IV. Overview of the Contributions

This special issue is the first output of an international research cluster on nuclear technopolitics in the Soviet Union.⁵¹ The idea for this cluster, and also for the present volume, was developed during a workshop at the University of Bern in the summer of 2015 which discussed links and mutual benefits between several existing research projects in the field.⁵² Some of these links were outlined above and are considered – to varying degrees – in the following articles, all of which deal with the exploitation of atomic energy in the Soviet Union, from different perspectives but with similar key questions.

Taking the Geneva Conference on the Peaceful Uses of Atomic Energy in 1955 as a point of departure, FABIAN LÜSCHER's study focuses on the internationalisation of nuclear knowledge by analysing post-Stalinist Soviet nuclear history in conjunction with the early history of the IAEA. The Soviet Academy of Sciences played a key role in re-establishing ties with the international scientific community and serves as a vivid example allowing general reflections on the Soviet re-emergence in international discussions on nuclear energy. Although it soon handed over parts of its responsibilities for nuclear science diplomacy and international cooperation to newly founded branches of the Atomic Ministry (*Sredmash*), the Academy remained an important policy advisory body, maintaining close ties with research institutes and their staff as well as with the Party and state elites. With its focus on the late 1950s and early 1960s, the article reflects important transformations in Soviet nuclear history in the context of de-Stalinisation. It covers a period marked by a limited liberalisation of trans-systemic knowledge circulation in the field of nuclear science and highlights the interdependence of developments in top-level nuclear science, domestic and foreign science policy-making and diplomacy in the framework of international organisations, thereby analysing nuclear internationalism as a multi-faceted Cold War phenomenon which was staged in various arenas, from the Palais des Nations in Geneva to the Kremlin in Moscow.

In 1957, two years after the first Geneva Conference, a major accident in a Soviet military nuclear facility in Maiak in the Southern Urals region caused the contamination of vast areas around the Kyshtym river. While the Soviet press was always quick to point out the radiation hazards associated with British and American arms testing, the Kyshtym disaster remained shrouded in secrecy for decades. Still, the catastrophe trig-

51 For an overview of the project and its activities, see <https://nuctechpol.org> (29.10.2017).

52 For a summary of the conference papers, see report of the conference *Zwischen Utopie und Apokalypse. Nukleare technopolitics in der Sowjetunion*, University of Bern, September 23, 2015, in: H-Soz-Kult, 04.09.2015, <http://www.hsozkult.de/conferencereport/id/tagungsberichte-6142> (19.12.2017).

gered the production of radiation-related knowledge, as LAURA SEMBRITZKI demonstrates in her case study. Her analysis describes how the emerging scientific discourse on radiation hazards influenced political decisions on radiation protection measures. While the author points out that international knowledge exchange in these fields was tightly restricted due to secrecy considerations, local research in the Kyshtym region nevertheless provided knowledge for radiation-related research on the all-Union level which later started to circulate internationally in more generalised forms. Although focussing on the Maiak incident and its aftermath in the 1960s, the article also provides a survey of the Perestroika period, thus highlighting lines of continuity between the radiation discourses surrounding the two largest Soviet nuclear catastrophes, Maiak and Chernobyl.

STEFAN GUTH studies the ambivalence of Soviet nuclear history through the lens of a multi-purpose atomic city on the Caspian Sea. Shevchenko/Aqtau started life in the 1950s as a uranium mining camp but was later transformed into a showcase of atomic-powered Communism relying on novel reactor technology and nuclear-powered water desalination. A close reading of this chronotope of Soviet nuclear modernity makes visible the persistent parallelism of civilian and military priorities and highlights the puzzling synchrony of a model urban microcosm of Soviet STR civilisation and a forced labour complex created after the official dissolution of the Gulag. The analysis juxtaposes the project of Promethean nature improvement with its problematic ecological consequences and demonstrates how the city's sealed-off nuclear complex nevertheless became a hotspot of cooperation across the bloc divide. In a long-term perspective, the history of Shevchenko/Aqtau thus reveals the multiple and often conflicting priorities of Soviet nuclear technopolitics, tracing how they shifted over time and how they created enduring socio-economic and enviro-technical configurations which continue to shape technopolitics in present-day Russia and Kazakhstan.

Yet another facet of Soviet nuclear cities is taken up by ROMAN KHANDOZHKO. Based on biographical interviews, he analyses emerging dissident networks in the nuclear research city of Obninsk and traces the complex ties which linked the local representatives of the liberal intelligentsia to their peers in other science cities. The article discusses how the opening of a formerly 'closed city' in the wake of a partial demilitarisation of nuclear science affected its social and political dynamics and facilitated the emergence of a Soviet dissident movement. In so doing, the contribution couples local processes with overarching developments in Soviet history and shows how they radiated far beyond Moscow's sphere of influence. Beginning with a local case study, the article leads to questions of all-Union and international significance and highlights the long-term consequences of political dissent which came into effect in the nuclear scientists' political activities during Perestroika.

SONJA SCHMID's contribution presents another long-term perspective on Soviet and post-Soviet nuclear history, discussing the ways in which promoters of nuclear energy succeeded in obtaining the necessary political support for the development of a vast power industry. With its emphasis on lobbying, this contribution focuses on the intersection of economic, scientific-technological and political considerations regarding

energy development and demonstrates how resource allocation was a decisive factor for Soviet nuclear history. By analysing arguments for and against the deployment of nuclear power over the course of several decades, the study shows how criteria for evaluating nuclear energy's potential shifted over time. It highlights the continuities and ruptures which characterised the promotion of nuclear energy in a long-term perspective. An especially instructive aspect is the inclusion of post-Soviet nuclear policy which allows the author to show how recent developments are deeply rooted in the history of the Soviet atomic project.

V. Outlook

The contributions to the present volume invite scholars to view not only Soviet *nuclear* history, but also Soviet history *in general* from new angles. To begin with, a long-term perspective on Soviet (and post-Soviet) nuclear history helps us understand the history of nuclear power not only in accumulative and linear terms, but also stresses the impact political and societal changes have on scientific-technological developments. Conversely, it also invites us to re-evaluate the conventional periodisation of Soviet political history, which still relies heavily on the tenures of Party leaders and a limited number of alleged watershed events. Recent research has increasingly drawn attention to the shortcomings of such an approach,⁵³ and the Soviet nuclear project offers a telling case in point illustrating why such scepticism is warranted. Tracking the Soviet nuclear project across the 1953 divide highlights the extent to which the technocratic state, commonly associated with the Khrushchev and Brezhnev periods, was already taking shape under postwar Stalinism. Much of the infrastructural and organisational groundwork for both the military and the civilian nuclear programmes was laid in the late 1940s and early 1950s, and the scientists, engineers and administrators who became key figures in the Soviet Union's civilian nuclear programme all went through the offices and laboratories dedicated to Stalin's bomb before they started inventing, constructing and managing power reactors and particle accelerators. But at the same time, it should not be ignored that Stalin's death *did* herald significant paradigm changes for Soviet nuclear development, ranging from the re-establishment of international techno-scientific contacts to a notable expansion of the civilian nuclear programme. "Stagnation" is another label of periodisation for which nuclear history can offer useful qualifications. The fact that the deployment of the Soviet nuclear power programme gained its greatest momentum in the 1970s and 80s certainly defies the cliché of standstill conventionally associated with the period. On the other hand, the fact that Soviet experts perceived the Soviet nuclear programme as falling behind the curve internationally from the mid-1970s onward shows that there was indeed a contemporary perception of deceleration. For

53 On the problems of rigid periodisation, see e.g. PLAGGENBORG *Sowjetische Geschichte*. For studies which transcend traditional chronological boundaries, see FÜRST/JONES/MORRISSEY (eds.): *Relaunch; GESTWA Großbauten*.

the Perestroika and post-Soviet periods, nuclear history raises particularly puzzling questions with regard to how political and technological developments set each other's pace. Ironically, while Gorbachev's initial programme of scientific-technological acceleration assigned key significance to nuclear power, it was the catastrophic failure of that very technology which then hastened the shift to Glasnost' as the new mainstay of his transformative agenda. Still more paradoxically, while nuclear power and the disaster at Chernobyl played a central role in delegitimising the late Soviet system, governments in the post-Soviet space (particularly in Russia) have meanwhile fallen back on nuclear technologies in a renewed attempt to bolster their legitimacy as technocratic modernising regimes.⁵⁴

Second, an interdependent perspective can draw attention to the complex ways in which techno-scientific, socio-economic, political and cultural aspects interrelate to reinforce or hamper each other's development. A number of questions raised in this volume merit further consideration. For instance, what does the Soviet case tell us about the compatibility of techno-scientific and political-ideological visions of progress,⁵⁵ particularly if compared to other countries such as France? Does the Soviet and post-Soviet case testify to a particular affinity between big science on the one hand and autocratic governance on the other?⁵⁶ How do the vastly incommensurable timescales of nuclear technologies and nuclear ecologies affect the perception and evaluation of atomic energy over time? What can we learn about the power of (very sizable) artefacts and (very long-lived) materialities to 'store' past agency in ways which then channel future technopolitical action? Under what circumstances is nuclear energy perceived as an impenetrable Arcanum whose administration is best left to the representatives of nuclear priesthood⁵⁷ or, conversely, as an all-pervasive technology whose potential to affect everybody necessarily makes it a matter of concern for grassroots democracy?

Another benefit of a multifarious approach is that it brings to the fore aspects which are easily overlooked when the focus of research is more narrowly circumscribed. For instance, Cold War historiography has long since acknowledged the "centrality of the nuclear",⁵⁸ but has focused almost exclusively on the military-strategic implications of the nuclear age while largely treating the techno-scientific complex itself as a black box.⁵⁹ But as it turns out, studying trans-systemic contacts on the techno-scientific level offers important insights for our understanding of Cold War superpower relations. To give another example, research on the Soviet nuclear project provides a focus on the USSR's techno-scientific elites, which have been mostly absent in the recent study of the

54 STS scholars refer to these processes as hybridisation and purification. See LATOUR *We Have Never Been Modern*.

55 LIPOVETSKY *Poetics*.

56 The first to (erroneously) predict that the possession of nuclear technologies would hasten the transformation of democracies into dictatorships was JUNGK *Atomstaat*. Recently, the concept of authoritarian modernisation has suggested a more nuanced interpretation of the connections between authoritarianism and specific patterns of techno-scientific development. See, e.g. GEL'MAN (ed.): *Modernization*.

57 The term "nuclear priesthood" can be traced back to LIFTON/FALK *Indefensible Weapons*, p. 31.

58 KRIGE/BARTH *Introduction*, pp. 5–9.

59 See e.g. the chapters on nuclear topics in LEFFLER/WESTAD (eds.): *Cambridge History of the Cold War*.

post-Stalinist Soviet Union.⁶⁰ Bringing the technical intelligentsia back into the picture of late Soviet history is crucial if we are to gain a realistic understanding of the elites on whose support the post-Stalinist state relied, particularly in view of the fact that the sprawling technical intelligentsia co-defined the late Soviet project to a significant extent and therefore had a manifest interest in its continued existence.

Third, a multi-level approach can complement the prevailing genre of *national* nuclear histories in illuminating ways. This is by no means to say that the question of how the atom inspired high-modern projects of nation-building – or the “construction of Communism” – have become unproductive, let alone irrelevant. However, a more deliberate inclusion of local and global perspectives offers a wealth of new insights waiting to be tapped into. Thus, the close study of nuclear research and production centres reveals the micro-logic of how loyalty and dissent, knowledge and ignorance, privilege and deprivation were traded and negotiated.⁶¹ More studies are needed to further explore these dynamics. Conversely, a focus on international cooperation highlights the interconnect-edness of Soviet and global nuclear histories and draws attention to techno-diplomacy as an alternative channel of superpower relations in which opposing geopolitical world-views were mitigated by shared technocratic mindsets. Clearly, Soviet nuclear history was written not only in Moscow, but also in Cheliabinsk, Obninsk, Shevchenko, Geneva and Vienna.

When scholars first started to explore Soviet nuclear history in depth a quarter of a century ago, it seemed as if the subject could be consigned to the past fairly expediently and with a rather specific historical *meaning*. In the aftermath of the Chernobyl catastrophe, it appeared to epitomise the specific inferiority of Soviet science, technology, economy and politics. Ironically, from today’s perspective, it appears considerably more ambiguous and open-ended as a result of both domestic and international developments. In view of the nuclear accident at Fukushima in 2011, Chernobyl has lost its singular historical status and has belatedly been acknowledged as offering important comparative lessons for the interpretation of the gains and losses of global high modernity in general. Equally significant, the nuclear industry, once seen as the late USSR’s greatest liability and a heavy burden on its post-Soviet successor states, has recently emerged like a phoenix from the ashes and is today considered a major technological and economic asset by Russia’s political leadership. While scepticism about the future prospects of the industry may well be warranted, it cannot be ignored that even after Fukushima, a *nuclear renaissance* unfolds with unabated momentum in some parts of the world. Clearly, against the background of these developments, the nuclear age cannot be consigned to history just yet, and the study of its past still holds significant explanatory potential for the present and future of a techno-scientific modernity which, despite numerous claims to the contrary, continues to escape obsolescence.

60 Most prominently YURCHAK *Everything*.

61 See the contributions by Khandozhko, Sembritzki, Guth.

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